



Empirical Study of the Relationship between Capital Formation and Saving in Rwanda: An Econometric Approach

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Abstract

The objective of this study was to investigate the empirical relationship between capital formation and saving in the case of Rwanda. The empirical literature review reveals that saving has a positive effect on capital formation. Results of the research obtained using the Ordinary Least Square method show that in Rwanda there is positive correlation between capital formation and saving. Saving is used to finance investments useful for the development of the country.

In the equation formulated, endogenous variable was capital formation while exogenous variables were saving, foreign direct investments and money supply. It has been demonstrated that coefficient of saving is positive. In Rwanda, an increase 1% of saving ends at an increase of gross capital formation of 1.271241%. Analyses done end at results that estimated coefficients are statistically significant at 5% margin of error i.e. 95% level of confidence. The relative probability for LSAV is less than 0.5. R-squared is 0.980003. This goes to mean that exogenous variables selected explain Gross Capital Formation at 98% and the model is fitted. Therefore, the government of Rwanda should make supplementary effort to encourage saving in the country so to boost the economy through more investment in order to meet its major objective, i.e the economic and social development.

Keywords: Rwanda, Gross Capital Formation, Saving, Investment.

1. Introduction

The development process requires intervention of several indicators among which saving plays an important role. It acts indirectly on development through its effect on economic growth. It has been demonstrated that there is no development without economic growth i.e. an increase of production in the long term. The economic growth itself depends on the capacity of a country to mobilize more capital. This capital mobilization depends also on the capacity of the country to mobilize saving. However when the level of income is too weak in a country it becomes difficult to save for investment and this jeopardize the development process.

Capital formation and its relationship with saving is so important in the development process that it has drawn a particular interest in the economic literature. Therefore, the issue of capital accumulation has been tackled by several authors. The literature shows that capital formation can be influenced by many factors. It is notably about Foreign Direct Investment (Combes, 2011) and money supply (Shawaqfeh and Tareef, 2019). However saving is the most determinant of capital formation. According to Tariki and Arslan (2019), the process of capital formation is threefold starting with increasing saving followed by mobilization of saving using financial and credit services institutions and finally culminating

in investment. Tariki and Arslan (2019) state that, the process of capital formation is threefold starting with increasing saving followed by mobilization of saving using financial and credit services institutions and finally culminating in investment. The level of saving itself depends on the level of income. Therefore, the level of income being weak in Low Developed Countries especially in African Countries, one can wonder whether there is a positive relationship between saving and capital formation.

Concerning the case of Rwanda, it has been noted a positive evolution of gross capital formation especially in the sector of construction from 1990 up to 2021 although a decrease has been noticed from 1994 due to the war and genocide. A close assessment of the Rwandan economy reveals important contribution of foreign financing in the construction projects that have contributed to the growth in capital formation (MINECOFIN, 2022). The question to be asked is to know if there is a positive correlation between this increase in capital formation and saving insofar as looking in long term it may not always be the case. Indeed as pointed out by Hsing (1958) “an increase in saving may discourage investment rather than lead automatically to increasing investment. An increase in savings being equivalent to decrease in spending reduces expectations of all entrepreneurs producing consumption goods”. As a decrease in production leads to a decrease in income, in long run we may face a decrease in saving. This has been demonstrated in the empirical literature review in the case of Nigeria. For a period of 33 years from 1981 to 2014, the study conducted in this country by Abusomwan and Ezebuihe (2017) did not find causal relationship between saving and capital formation. Hence the interest of this research is to investigate the case of Rwanda in order to check the existence of positive correlation or negative correlation between saving and gross capital formation.

In fact, no trustworthy investigation had been done to demonstrate the correlation between

saving and gross capital formation in Rwanda. That is why the case of Rwanda requires an empirical analysis.

Indeed, this article aims at showing that, the correlation between saving and capital formation is possible when saving doesn't prevent an increase of income in the long term. Thus, the problem statement of this research is oriented towards one concern i.e. to study the relationship gross capital formation and saving in Rwanda. The problem under study as presented in above pushes us to formulate the following question: Is there any relationship between gross capital formation and saving in Rwanda?

In the current study secondary data have been used. They were drawn from annual report of national bank of Rwanda and Ministry of finance and economic planning of Rwanda. Data collected were related to: the evolution of the capital formation in Rwanda from 1990 to 2021, the evolution of saving, foreign direct investment and money supply.

As regards data analysis econometric method has been used through the E-views software.

This study has been structured as following: The first part is devoted to the general introduction in which the basic part is the problem statement. As it is important to know some theories related to capital formation, the second part carries on literature review. The third part is devoted to the research methodology. In the fourth part results were presented and discussed. In the fifth part it has been about to present conclusions related to findings.

2. Literature Review

2.1. Theoretical Literature Review

The theoretical review discusses themes of study with reference to the theories or research findings that have been established by scholars. This section is focused on theories developed by some authors on concepts capital formation and saving.

The concept capital is one of the words that are most frequently used by economists but only few

have provided its accurate meaning, may be because some of the authors take it as self-explained or obvious to the reader. Larger number of economists have used a simplistic view of the capital as mean of production thus forgetting its other attributes. In economics the term capital is generally used as one of the factors of stylized production, other factors being land and labour. According to Menger (2007) capital means economic goods available to the economic agents in the present time for future economic uses.

Menger (2007) opines that short time goods or goods that are likely to lose their productivity must be excluded from capital goods and objected to include indiscriminately all sources of income in the concept of capital. The author notes a difference between capital and items of durable wealth such as land and building. Contrarily to capital that is a combination of economic goods of “higher order” or means of production and can be used to yield income, durable goods have both goods character and economic character (goods available in limited quantities against the requirements of economizing individuals). The economic goods are opposed to non-economic goods “whose available quantities are larger than the requirements for them.

Literature about the theories capital formation emerged as scholars try to answer the questions about why some countries have experienced economic development while others remain underdeveloped (Tariki & Arslan, 2018). Theories discussing capital formation have been mainly found in theories about economic growth. Discussing the economic growth, Nurkse cited by Tariki and Arslan (2018) places low capital formation in the middle of the poverty vicious cycle; and this is confirmed by Burkey (2002) as illustrate in the figure below.

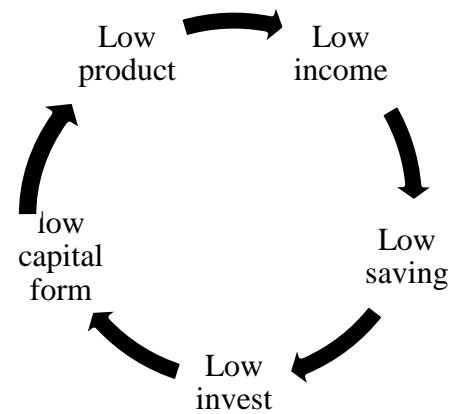


Figure 1: Vicious cycle of poverty

The poverty vicious cycle is presented as the contrast of economic growth and it can be reversed by the contrasts of its constituent elements. The Nurkse reasoning on the economic growth and capital formation falls under the balanced theory.

The balanced theory of capital formation implies a simultaneous balance between different segments of the economy and argues that both the demand and the supply should be dealt with in a balanced way (Tariki & Arslan, 2018). In alignment with the balanced theory of capital formation different scholars identified factors that contribute to capital formation notably money supply (Olanipekun & Akeju, 2013; Tareef & Shawaqfeh, 2019) and Saving (Abusomwan & Ezebuihe, 2017).

Another theory is the unbalanced theory of capital formation which advocates for a big push for only certain key sectors. For the unbalanced theory, there are limited resources in the country and economic growth including capital formation can be attained only through prioritization.

In the modern growth model, capital formation and the labour force are thought to be endogenous variables for economic growth. In fact, to produce goods and services, economic agents use different resources available in the economy. Economists have spent a lot of time analysing the production process and factors that enter it. There are three main factors of productions namely labour, land and capital. Whereas land and labour

is the originary factors of production, capital is a “produced factor of production”, thus production employs capital “if it uses originary factors of production” (Striglitz, 2000).

Mankiw (2010) describes capital as the kit of tools at the hand of a labourer to produce a much-wanted output for the satisfaction of an economic need. Thus, Mankiw (2010) starts with the following simple production function with using only two variables: $Y=F(K, L)$. In this simple function of production Y represents the number of units produced, K is the quantity of physical capital used while L is the number of hours worked by human resources at the firm’s disposal. Later, discussing the capital accumulation and quoting Solow growth model, Mankiw (2010) enriches the production function and transforms it into $zY=F(zK,zL)$ by introducing an element called the scale which is a result of the technology applied to both labour and capital and affecting the output. This model underpins that any increase in the rate of capital formation is likely to bring about sustained economic growth and development (Tariki&Arslan, 2018).

Theories on the concept saving and its relationship with capital formation have been developed. Saving is defined as that part of disposable income which is not spent on consumption (Bime &Mbanasor, 2011). From this definition one can deduct that saving is giving up the current consumption in the effort to increase the living standard and fulfilling the daily requirements in future.

The USGAO (2001) defines national saving as “the sum of saving by households, businesses and all levels of government. Gross national saving, which reflects resources available both to replace old, worn out capital goods and to expand the capital stocks. It is noteworthy to mention that saving being affected by the time factor, it can be subdivided into long term, medium term and short-term saving. Short term saving is that one covering longer time and comprises for example pensions funds and other retirement schemes.

Medium term savings are made for a medium term and include saving in real estate, shares and long-term bonds. Short term saving are the ones form a shorter period and the good example is the excess liquidity.

Capital formation depends on savings and the first question that capital formation deals with is the creation of saving. Savings are done mainly by individuals or households but also by firms. They save by not spending all their incomes on consumer goods. When individuals or households save, they release resources from the production of consumer goods. At macroeconomic level saving is that part of national income which is not spent on consumption goods. Mankiw (2010) summarizes the saving identity as $S=Y-C-G$ with S representing the national saving, Y the aggregate national income, C the household’s consumption and G the government spending. From the saving identity, Mankiw (2010) deducts two major terms of the national saving namely the public saving and the private saving as in the following identity: $S=(Y-T-C) +(T-G)=I$, where $Y-T-C$ is the private saving and $T-G$ is the public saving. Creation of savings takes place as results of positive change in the level of national saving or negative change in the level of consumption (Kostoglou & Nagi, 2010).

According to the macroeconomic theory, saving is converted into investment through gross capital formation. However, even if saving is a turnkey stage for capital formation, it may not directly and automatically lead to the production of capital goods. Often people save money, but this saving largely goes waste because saving is hold in the form of idle balance or to purchase unproductive assets like gold and jewelry. To have capital goods required for economic growth, savings must be invested in more profitable assets. Therefore, to accelerate the rate of capital formation it is essential to convert savings into investible resources, and it is noteworthy to bear in mind that savings of households must be channelized and converted into loanable funds from which

investors will borrow. The conversion of saving requires a scale level involvement of money market, capital and share markets, banking and other institutional facilities, government machinery for 'the mobilization of savings, insurance and investment facilities. The greater the institutional facilities and greater the efficiency of these institutions are, the larger would be the mobilization of the savings for productive activities.

In fact, banks and other financial institutions collect the savings of the community and make loans available to business firms. This means that one capital formation to take place and sustain, there must be strong financial network consisting of banks and other finance companies which help to mobilize the savings of the public and enable investors to claim them. Indeed, a well-developed financial system can help an economy grow by mobilizing savings, allocating funds to investment and redistributing risks (World Bank, 2015).

Finally there is conversion of money-savings into the making of capital goods, or what is known as investment. As Taraki and Arslan (2019) indicated, this stage is concerned with the utilization of saving into productive projects that is creating real assets. It put together the existing technical facilities available in the country, existing capital equipment, entrepreneurial skill and venture, rate of return on investment, rate of interest, government policy to maximize profit for entrepreneurs. Given that the rate of investment in developing economies is in most cases very low, domestic sources for capital formation may require to be supplemented by external sources.

2.2. Empirical literature review

In the empirical literature review, the effect of saving on capital formation has been examined in different countries. As mentioned above, saving is an essential instrument for capital accumulation and formation which further enhance economic growth and development through investing the saved fund. However, one can notice an

antagonism if we consider results of researches from some countries.

In his study in Nigeria for a period from 1980 to 2012, Osundina (2014), using OLS double log regression, has found that saving has a positive and significant effect on capital formation through investment. Conversely, the level of saving was increased as result of increase in capital formation. This bi-directional positive relationship between saving and capital formation indicates a mutual dependency between these two variables. Osundina (2014) argues that in Nigeria the extent to which the level of saving can affect capital formation and growth largely depends on the capacity of the economy to channel the saving into productive use. In the same country, Abusomwan.s and Ezebuihe.J (2017) reached result that saving is positively related to gross capital formation. Regarding the case of Thailand, Rasmidatta (2011) conclude that savings, specifically in developing countries leads to less consumption, which results in a large amount of capital investment and finally a higher rate of economic growth.

Results of Hsing (1958) on the case of developing countries in general are opposite to the ones highlighted above. In his thesis he demonstrated that an increase in saving may discourage investment too much saving may end at income decrease in the long term because production decreases. As a decrease in production leads to a decrease in income, in long run we may face a decrease in saving harmful in the process of capital formation. Therefore saving may have a negative or positive effect on capital formation.

3. Research Methodology

3.1. Introduction

Research methodology is a systematic way to address a problem. It displays how research is to be or has been carried out. Essentially, these are procedures used by researchers to go about their work describing, explaining and predicting phenomena. It is also defined as the study of

methods with which knowledge is gained. It aims at providing the work plan to research (Rajasekar S. et Al., 2013)

Research requires use of tools or instruments to collect data and this chapter intends to make an overview of such tools. In this chapter, topics like study area, research design, sample size, data collection, model specification, data analysis and processing will be developed.

3.2. Study area

The area for this research is the territory of Rwanda. So, the analyses conducted are of macroeconomic nature. Rwanda is a landlocked country located in central Africa. It is bordered by Uganda to the North, Tanzania to the East, Burundi to the South and the Democratic Republic of Congo to the West. According to Rwanda Development Board (2012), the country surface area is 26 338 kilometers square. The total population of Rwanda is 11 920 000 inhabitants. The GDP per capita is 729 USD at current price while the currency is Rwandan francs (MINECOFIN, 2022).

3.3. Sample size

For the purpose of this study, the sample has been taken from yearly data ranging from 1990 up to 2021.

3.4. Data collection

For the sake of this research, secondary data were mainly used. The secondary data are those which have already been collected by someone else and which have already gone through statistical process. In case of secondary data the nature of data collection work is merely that of compilation. Secondary data may either be published data or unpublished data (Kothari C.R., 2004). They can provide a useful source from which to answer, or partially to answer the research question (Saunders M. et Al., 2012).

Data related to evolution of capital formation of Rwanda from 1990 to 2021 were collected. Other data collected were related to the evolution of saving, debt, money supply and foreign direct investment. Reports which have been consulted

include those of the Ministry of finance and National banks of Rwanda, the World Bank, etc. The observation technique was used because during the research process it was mandatory to visit the service in charge macroeconomic analyses in Rwanda.

3.5. Model building

The objective of this research is to analyze the empirical relationship between capital formation and saving. The econometric model related to this objective is inspired from theories developed by Olanipekun & Akeju (2013); Tareef & Shawaqfeh (2019) and Abusomwan & Ezebuihe, (2017).

The econometric modelling can be described as the process of applying mathematics and statistics to a real-world problem in order to understand the latter. It is about considering the data related to the problem and after a deep analysis build a mathematical relationship between the variables in the problem keeping in mind the available data. The economic model described in section shows the relationship between capital formation and saving. The current study specifies that capital formation is a result of combined contribution of national saving, money supply, and foreign direct investment. Thus the following econometric model has been formulated:

$$GCF = FDI_i^{\beta_1} SAV_i^{\beta_2} MS_i^{\beta_3} + \mu_i$$

Where GCF is the gross capital formation in current US dollars, FDI is the Foreign Direct Investment, SAV is the Adjusted Saving in current US dollars, MS is Money Supply in broad money, β_0 the intercept, and β_1 , β_2 and β_3 the coefficients, and μ_i the stochastic error term.

The equation under study can be presented as follows:

$$GCF_i = \beta_0 + \beta_1 FDI_i + \beta_2 SAV_i + \beta_3 MS_i + \mu_i$$

By introducing the natural logarithm on both sides, we obtain

$$\ln GCF_i = \beta_0 + \beta_1 \ln FDI_i + \beta_2 \ln SAV_i + \beta_3 \ln MS_i + \mu_i$$

Expected signs are presented in the following table:

Table 1: Expected signs and parameters for the econometric model objective 1

Parameters	β_1	β_2	β_3
Expected signs	+	+	+

Source: The author

The expected signs of β_1 , β_2 , β_3 are positive because a positive effect of saving, money supply and foreign direct investment is expected.

3.6. Data Analysis and Processing

In order to verify whether there exist a positive correlation between capital formation and saving in Rwanda, an econometric analysis was carried out on data with capital formation as endogenous variable. In this case, the E-views software is unavoidable. However, other methods such as analytical methods have been used.

3.6.1. Data Analysis

To reach objectives of this study, an econometric analysis has been carried out. Modeling the correlation between capital formation and saving is the analysis conducted in this research. The objective is to get facts in order to reach reality with regards to the relationship between these two variables. Econometric studies aim at analyzing facts (Waquet and Montousse, 2006). It is about making a regression analysis in order to test the relationship. According to Gujarati (2005), regression is the main tool in econometrics. Thus, the model has been tested for Rwanda. The model developed is a multiple regression model with several variables. A concept that can be measured is called a variable (Kumar, 2011). In an econometric model, the dependent variable depends on two or more explanatory variables, or regressors (Gujarati, 2005). In this research, time series have been used for the period 1990 up to 2021.

Most of macroeconomic time series data are non-stationary (mean and variance are not constant). As when dependent and independent variables in time series data are non-stationary, a non-sense regression or spurious regression model is likely

to occur, the stationarity test through the unit root test is unavoidable. The R-square is high and coefficients seem to be statistically significant while they aren't. This case can mislead the economic interpretation. When series are stationary, we use the Ordinary Least Squares (OLS), but when the series are not stationary OLS cannot be used because there may be a non-sense regression or a spurious regression (Gujarati, 2005).

Hence, before coming to the regression, a stationarity test has been conducted with the unit root test, then, the estimation of the equation. The test of unit root has been done using the Augmented Dickey Fuller test. All analyses have been done in the E-views Software. After this process of stationarity, next was the regression using OLS to find the long run equation and thereafter perform the cointegration test. The cointegration test has helped knowing whether series are co integrated. The reason for cointegration test is to determine whether a group of series is cointegrated or not. Different variables in the model are cointegrated if the residuals from the long run estimated model are stationary.

In a word, steps of the econometric analysis for reaching objectives of this research were the following:

- i) Data collection from MINECOFIN and World Bank
- ii) Data transformation: all data have been transformed into logarithm before regression in order to facilitate interpretations in terms of percentage.
- iii) Time series determination: data used for the econometric analysis were time series, that is, annual data from 1990 to 2021
- iv) Stationarity test: before the regression the unit root characteristics of the data were done. The stationarity test was done in order to allow using the Ordinary Least Square (OLS) method.

The ADF is used to verify whether there is stationarity or not. When $ADF_{cal} < ADF_{crit}$: there

is no unit root. Time series are stationary. In the opposite case series are not stationary.

v) Estimation of the long run equation

It helped to calculate coefficient and probability in order to determine the long run relationship gross capital formation and saving. The decision rule is such as the probability calculated must be inferior to the probability critical (1%, 5% or 10%). Also, in order to conclude that there is a positive long run relationship between endogenous variable and exogenous variables, coefficients should be positive, otherwise there is a negative relationship.

vi) Cointegration test

The objective of this test was to check whether residuals from the long run estimated model are stationary. There is cointegration when ADF calculated value is less than critical value at 1%, 5% or 10%. In this case, residuals of the long run equation have no unit root.

vii) Causality test

Granger causality test was computed to check the causal relationship between saving and public capital formation.

viii) Interpretation of results

All results were explained in order to verify whether results reached are connected to the main objective of the research, that is, to study the existence of relationship between gross capital formation and saving in Rwanda. Results related to the relationship between endogenous and exogenous variables were interpreted as well.

3.6.2. Data Processing

Quantitative data collected from several reports, namely reports of MINECOFIN, Index mundi and National Bank of Rwanda were sorted and analyzed with E-views software. The analyses

done in this research are based on a quantitative approach.

4. Presentation and Discussion of Results

Analyzing the empirical relationship between capital formation and saving was the objective of this research. To reach that objective, an empirical analysis has been conducted. The main purpose of the econometric analysis is to test the long run relationship saving and capital formation considering that there is no capital formation without saving. However, before establishing the long run relationship a stationarity test has been done on variables of the model as the Ordinary Least Square method has been used.

a. Stationarity test

Stationarity test is very important in modeling since the macroeconomic data without the same moment cannot be included in the same model. In fact, whether a series is stationary or not, it influences the choice of the model to be adopted. When all series are not stationary, we have to transform them until they become stationary by differentiating them before modeling and estimating parameters associated to the stationarity component.

The rationale behind stationarity lies much on the conventional asymptotic theory for least squares method used in regression. This test is used to know the methodology to be adopted. When the series are stationary, we use the Ordinary Least Squares (OLS), but when the series are non-stationary, OLS cannot be used because there may be a non-sense regression or a spurious regression in the terminology of Granger and Newbold.

The series in stationary process will tend to turn around its mean and fluctuations around its mean (variance) will have generally constant amplitude. The stochastic process is stationary if a non-stationary process becomes stationary by differencing it n^{th} times. A time series is said to be integrated of order d , written $I(d)$, when after being differencing it d times it becomes

stationary. A series is integrated of order zero when it is stationary at level.

Examples: - I (0): The series are stationary at level

- I (1): The series become stationary after the first difference

The Augmented Dickey-Fuller (ADF) tests are performed to test the unit root in time series.

The ADF tests follow these rules:

- When $ADF_{cal} < ADF_{crit}$: There is no unit root
- When $ADF_{cal} > ADF_{crit}$: There is unit root

After analyses using the e-views software, results are such as series are not stationary at level, rather they are stationary at the first difference. Results related to the stationarity test are presented in the table above:

Table 2: Stationarity test at the first difference

Variables	ADF Critical at 5%	ADF Calculated	Conclusion
GCF	-3.568379	-4.939300	Stationary
SAV	-3.568379	-4.331147	Stationary
FDI	-3.568379	-9.116379	Stationary
MS	-3.568379	-4.034042	Stationary

Source: Econometric analysis

From the results of the stationarity test at the first difference, series that were not stationary at level become stationary after the first difference, they are integrated of order one (I (1)) as all ADF calculated are inferior to ADF critical at 1% level of confidence.

b. Long run equation of empirical relationship between gross capital formation and saving in Rwanda

The long run equation allows analyzing the empirical relationship between saving and capital formation. The linear model takes into consideration logarithms of both sides of the equation. Thus, the equation can be presented as follows:

By introducing the natural logarithm on both sides, we obtain:

$$\ln GCF_i = \beta_0 + \beta_2 \ln FDI_i + \beta_3 \ln SAV_i + \beta_4 \ln MS_i + \mu_i$$

The model was converted into logarithm form to allow a proper interpretation of the results in terms of percentages. Coefficients and probabilities are presented in the following table:

Table 5: Results for the Long Run equation

Variables	Coefficients	Probabilities
LSAV	1.271241	0.0000
LFDI	0.075656	0.0196
LMS	0.000472	0.0143

Source: Econometric Analysis

According to these results, the LSAV, LFDI and LMS are statistically significant as their respective probabilities (0.0000), (0.0196) and (0.0143) are less than critical value of 5%.

After the regression results obtained as regards the long run equation are presented below:

$$LGCF = 1.271241LSAV + 0.075656LFDI + 0.000472LMS + 3.5070863$$

R-squared 0.980003

R-squared is 0.980003. There is goodness of the model and the model is fitted. Independent variables i.e. saving, foreign direct investment and money supply explain foreign direct investment at 98%.

Discussion of results from the long run model:

Based on the results of the long run model, LSAV, LFDI and LMS are correlated to capital formation as their estimated coefficients are statistically significant at 5% margin of error; their relative probabilities are less than 0.05. Furthermore, coefficients related to LSAV, LFDI and LMS are positively correlated to the foreign direct investment at 98%. as signs related to their respective coefficients are positive.

Results above mean that when:

- i) LSAV increases by 1%, the LGCF increases by 1.271241%;
- ii) LFDI increases by 1%, the LGCF increases by 0.075656%;
- iii) LMS increases by 1%, the LGCF increases by 0.000472%

Thus, results of analyses show that there is a positive correlation between saving and capital formation in Rwanda. Estimated coefficient of saving is statistically significant at 5% level of confidence. Also, the coefficient of saving is positive, what means that a positive correlation exists between saving and capital formation in Rwanda. The rationale is that in Rwanda national saving is used to finance capital formation through private and public investment. Saving is not mostly used for acquiring nonproductive assets.

c. Cointegration

According to Engle and Granger, different variables in the model are cointegrated if the residuals from the long run estimated model are stationary. The cointegration mechanism suggests the following steps:

1. Test the order of co-integration of all variables
2. Estimate the long run model
3. Test the stationarity of residuals

The first and the second steps have been performed previously; the remaining step is to test the stationarity of the residuals. The stationarity of the residuals was tested by E-views 7.1. After regression it has been noticed that t-statistics is equal to 113.5414 and critical value is 40.17493 at

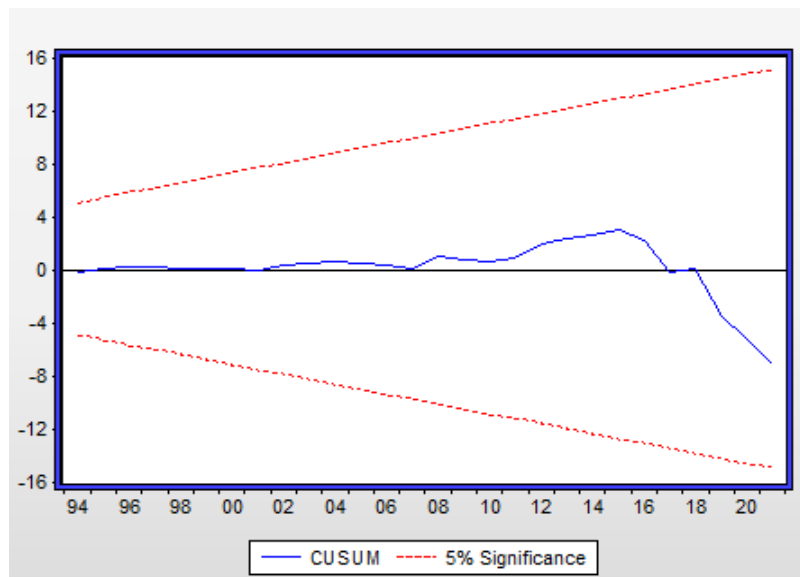
5% margin of error. As t-statistic is far superior to the critical value there is a cointegration relationship. Residuals of the long run equation have no unit root.

d. Causality analysis

Granger causality test was computed to check the causal relationship between saving and public capital formation. Based on findings, the researcher found that saving Granger causes the capital formation as the probability is equal to 0.0208 (2.08%) less than critical value of 5% what allows rejecting the null hypothesis. Indeed in Rwanda saving is used to finance investments necessary for the development of the country. One can notice it through several projects created in the country in several domain these last year all over the country.

e. Stability test

Stability test is conducted by the CUSUM TEST which test is based on the cumulative sum of recursive residuals. The cumulative sum is plotted with the 5% critical lines and parameter instability is found when the cumulative sum goes outside the area between the two critical lines. The graph below was generated by Eviews7.1:



Parameters are stable because the cumulative sum does not get outside the area of two critical lines at 5% significance. This test is very important

because as the parameters are stable, the predictions are possible with the model.

5. Summary of Results and Conclusion

This article had as objective to analyze the empirical relationship between capital formation and saving. In the equation formulated, endogenous variable was capital formation while exogenous variables were saving, foreign direct investments and money supply. Analyses done end at results that estimated coefficients are statistically significant at 5% margin of error i.e. 95% level of confidence. The relative probabilities for LSAV, LFDI and LMS are 0.0000, 0.0196 and 0.0143 respectively less than 0.5. Also, it has been demonstrated that is long term, all coefficients are positive. In Rwanda, an increase 1% of saving ends at an increase of gross capital formation of 1.271241%.; an increase of foreign direct investment of 1% ends at an increase of capital formation of 0.000472% while an increase of money supply of 1% entails an increase of 0.075656% of capital formation. R-squared is 0.980003. This goes to mean that exogenous variables explain Gross Capital Formation at 98% and the model is fitted.

In conclusion, in the case of Rwanda, results show that there is a positive relationship between saving and capital formation. Saving is used to finance investment instead of being used for acquiring non-productive assets.

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