P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-3* ISSUE-3* June- 2018
E: ISSN NO.: 2455-0817 *Remarking An Analisation*

Causal Relationship between Household Savings and Economic Growth

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Abstract

Since independence the policies are framed to boost economic growth in India. The pivot role is assigned to Saving and Investment in achieving higher rates of economic growth. It is conceived that increasing the level of output, more and more capital formation is required which have to be backed by an appropriate volume of savings. Thus, without appropriate volume of savings, we can't achieve our ultimate objective of higher economic growth. The present paper is an attempt in this regard. We shall we examining the causal relationship between Total Household Savings (THS) and Gross Domestic Product (GDP) for India over the period 1970-2015. In the present analysis, we shall be using Augmented-Dickey Fuller test to test presence of unit root in the series. Further, Johansen (1990) co-integration technique will be used for establishing long run relationship between the variables and for checking the direction of causality between the variables, Granger's Causality test will be applied.

Keywords: Causal Relationship, Economic Growth

Introduction

In both theory and practice, we find that Gross Domestic Saving (GDS), Gross Domestic Investment (GDI) and Economic Growth in terms of Gross Domestic Product at market price (GDP) shares some relationship with each other. For providing the better standard of living to citizens of the country, government frame and implement policies related to higher level of growth and development. For formation and successful implementation of such policies, the key role is assignment to the most important macro-economic variables i.e. Savings and Investment. Right from the initiation of economic planning in India, saving and investment have been considered as the primary instruments of economic growth. One of the main objectives of almost all the five year plans has been to increase the level of output in the economy and thus economic growth. For increasing the level of output, more and more capital formation is required which have to be backed by an appropriate volume of savings. Thus, saving and investment plays a pivot role in achieving higher levels of economic growth and development. Seeing the integrity of saving and investment in promoting economic growth, it has caught the attention of many researchers and policy makers of both developed and developing countries. Right from the classical economists to the researchers of recent vintage, everyone has assigned different degrees of importance to saving and investment in achieving higher rates of economic growth. Classical models of growth supported saving-led growth whereas, Domar-Harrod models promoted investment-led growth. In the present analysis we would be focussing only on the impact of household savings on the economic growth of Indian economy.

Review of Literature

Importance of savings in promoting economic growth was first of all witnessed by **classical economists**. They assigned the pivot role to savings which will further helps in promoting productive investment in the economy and leads to higher rate of capital accumulation and thus, higher growth. **Lewis (1955)**, **Solow (1970**) also assigned prime place to savings in achieving higher rates of economic growth and development of any under-developed economy. Besides these, many researchers of recent vintage examined and analysed the relationship between these two variables. Some of them favoured already existing theories in the literature of economics whereas others found contrasting results. Some of such theories are briefly discussed below:

Mehta and Rami (2014), Sothan (2014) found no evidence of causality in any direction between per capita GDP and per capital saving in India and Combodia respectively. **Rasmidatta (2011)** councluded that causality go unidirectional from economic growth to domestic savings only

in Thailand. **Al-Foul (2010)** examined a long-run bidirectional causality in Morocco, whereas no long-run relationship exist between savings and economic growth in the case of Tunisia. **Mohan (2006)** also found mixed results i.e. economic growth rate causes growth rate of savings in 13 countries and opposite results prevailed only in 2 countries whereas, in 5 countries bi-directional causality was seen. **Oladipo, (2010)** suggested that both the variables are positively cointegarated, indicating long run equilibrium relationship and a unidirectional causality exist between them. **El-Seoud (2014**), **Hussain and Sayeed (2015), Rotich *et.al*., Chua (2009)** also found that bilateral causality exists between the two variables in Bahrain, UAE, Bahrain, and Malaysia respectively.

We can say that there is no consensus seen amongst the researchers regarding the impact of these variables on each other. Thus, the present study is an attempt to resolve the ongoing debate regarding relationship and direction of causality between household savings and economic growth of Indian economy.

Objective of the study

The main of objective of the study is to examine the co-integration and causal relationship between Household Savings and Economic Growth.

Data Source and Methodology

The present analysis is based upon secondary data for the period 1970-2016 for India. The data is collected from Handbook on Indian economy by Reserve Bank of India collected by Central Statistical Organisation (C.S.O).

To investigate the co-integration and causality Household Savings and Economic Growth, first of all, Augmented Dickey Fuller test (ADF) will be used to test the presence of unit root in the series. If the variables will be of the same order of integration then, Johansen (1990) co-integration technique will be used else Auto-regressive Distributed Lagged (ARDL) can be applied. Lastly, to check the direction of causality, Granger's Causality test will be used.

Relationship between Household Savings and Economic Growth

Before knowing the exact relationship between these two variables, let us know the meaning of these variables in brief. Economic growth in Indian is calculated in terms of GDP i.e. Nominal GDP or GDP at current prices, which is the market value of final goods and services produced within the domestic territory of the economy during an accounting year inclusive of depreciation whereas GDP at constant prices is also known as real GDP, which is calculated in the form of production of goods and services in the economy during an accounting year. It depicts the actual picture of economic growth in the economy. On the other hand household savings are that part of household income which is not used for consumption. In fact these are saved for meeting the future requirements. Total household savings consists of physical savings (in terms of real estate, precious metals etc.) of household sector and financial savings (In terms of paper claims such as shares, bonds etc.) of household sector.

In the present analysis, we shall be examining the impact of these two variables on each other. For testing the relationship between the two following model will be used:

lnGDP= f (lnTHS) ……. (1)

lnTHS = f (ln GDP) ……. (2)

where, lnGDP is Gross domestic product at market prices taken in its natural log form. lnTHS Total Household Savings taken in its natural log form. The econometric expression of the equation (1) and (2) is as follows:

$\ln RGDP_t = \alpha + \beta_1 \ln(THS)_t + \varepsilon_t$ ..... (3)

$\ln RTHS_t = \alpha + \gamma_1 \ln(GDP)_t + \varepsilon_t$ …….. (4)

Where ε_t denotes a serially uncorrected white noise error term with a mean of zero and a constant variance. The variables are transformed to their natural logarithm in order to avoid the problem of heteroskidasticity in the residuals of estimated model.

Testing of Unit Root: Augmented-Dickey Fuller (ADF) Test

For examining the co-integration between the two variables, it is mandatory to test the presence of unit root in the series for which Augmented-dickey Fuller (ADF) test is used. The application of ADF test carries the null hypothesis of non-stationarity of time series against the stationary alternative. The rejection of null hypothesis will be done on the basis of three guidelines: 1. p-value should be significant at 1%, 5% or 10% level of significance. 2. The value of trace-statistics in absolute terms (ignoring negative sign as mentioned in econometric literature) should be greater than critical values at 1%, 5% and at 10%. 3. For the acceptance of model, the value of coefficient should be negative. Table 1 exhibits the results of ADF test statistics for GDP and THS.

Table: 1Unit Root Table : Augmented Dickey-Fuller Test (Schwarz Info Criterion)											
Variables	At level (Trend and Intercept)					First difference (Intercept)					Order Of Integration
	p-value	t-statistic	Critical Value @ 1%	Critical Value @ 5 %	Coefficient	p-value	t-statistic	Critical Value @ 1%	Critical Value @ 5 %	Coefficient	
Gross Domestic Product	0.353	-2.445	-4.181	-3.516	-0.183	0.000	-4.803	-3.589	-2.930	-0.678	I(1)
Total Household Savings	0.704	-1.767	-4.176	-3.513	-0.217	0.000	-7.352	-3.589	-2.930	-1.154	I(1)
Note: 1. The results have been computed by using ADF test using eviwes software 9. 2. Total Household savings comprises of Financial Savings and Physical Savings of House hold sector.											
Source: Author's Calculations											

It is clear from table1 that both the variables are stationary at same order of integration i.e. I(1) so, we can successfully apply Johansen (1990) co-integration technique.

Testing Of Co-Integration: A Long Run Empirical Analysis

Now, we are ready to apply co-integration test to check existence of long run relationship between the variables. Since we are interested only in knowing presence of co-integrating relationship between the variables not the number of co-integrating vectors, therefore we would be applying Johansen co-integration technique. The first step to apply Johansen co-integration technique is to search the optimum lag length. The optimum lag length criteria may be observed by using SBC and AIC values of Vector Autoregressive (VAR) model shown in table 2:

Table 2: Testing of Optimum Lag length Structure

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-39.15609	NA	0.026838	2.057805	2.142249	2.088337
1	134.3713	321.0257*	5.59e-06	-6.418567	-6.165235*	-6.326970*
2	139.2836	8.596424	5.36e-06*	-6.464179*	-6.041959	-6.311517
3	139.7670	0.797598	6.42e-06	-6.288348	-5.697240	-6.074622
4	143.1554	5.252123	6.67e-06	-6.257772	-5.497776	-5.982981
5	144.3611	1.748252	7.77e-06	-6.118056	-5.189172	-5.782201
6	146.7389	3.210058	8.60e-06	-6.036947	-4.939176	-5.640028

As per the guidelines quoted in econometric literature, the optimum lag length is at the minimum of AIC and SBC criterions amongst all the values and if any clash emerges between these two criterions then one must decide optimum lag length based on SBC criterion. In our case too, the same controversy emerged as AIC is minimum at with 1-2 lag length and SBC is minimum with 1-1 lag length. Thus, we proceed with 1-1 lag length for the testing of co-integration relationships under Johansen technique.

Johansen Test Of Co-Integration

The Next Step Is To Apply Johansen Test Of Co-Integration which is based on the guideline that the variables must be non-stationary at level but stationary at their first difference. The null hypotheses for the test depicts that there is non-existence of co-integration to existence of co-integration as alternate hypotheses. The guideline for rejecting null hypotheses is that the value of trace statistic should be greater than critical value. Table 4.3 shows the lts of the application of Johansen co-integration procedure between GDP and THS.

Table 3: Unrestricted Johansen Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.388992	38.13963	15.49471	0.0000
At most 1 *	0.325864	16.95592	3.841466	0.0000
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.388992	21.18371	14.26460	0.0035
At most 1 *	0.325864	16.95592	3.841466	0.0000
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Author's Calclulations

The trace tests of Johansen co-integration test suggests that the time series is co-integrated in long run i.e. the value of trace statistics at 38.13963 is higher than critical value at 15.49471 and p-value is significant at zero successfully fulfilling the guideline and confirms the existence of at least one co-integrating relationship at 5% level of significance. Maximum Eigenvalue test also confirms the same results by rejecting null hypothesis of non-existence of co-integration between the variables. Thus, we can say that the impact of THS is positive on GDP which means that if the savings are properly mobilized then there will be a definite increase in GDP in the economy thus, it is advocating Lewis idea of saving-led growth. As we can see that the variables are co-integrated in long run and there is presence of at least one co-integrating vector, therefore we will use vector error correction model (VECM) to check the short run fluctuations in the variables in the preceding section 4.1.5

Vector Error Correction Model

As we know that Johansen co-integration test showed the existence of long run equilibrium therefore, we are now ready to run Grangers Causality under VECM framework. The presence of co-integration implies the existence of stable long run equilibrium but there may exists short run disequilibrium. Error correction mechanism not only corrects the short run disequilibrium but also ties short run behaviour with the long run. Following are error correction equations:

D(GDPMP) = C(1)*(GDPMP(-1) - 0.868931435638*TOTAL_HOUSEHOLD_SAVINGS(-1) - 3.41131368059) + C(2)*D(GDPMP(-1)) + C(3)*D(TOTAL_HOUSEHOLD_SAVINGS(-1)) + C(4) ……. (1)

D(TOTAL_HOUSEHOLD_SAVINGS) = C(5)*(GDPMP(-1) - 0.868931435638*TOTAL_HOUSEHOLD_SAVINGS(-1) - 3.41131368059) + C(6)*D(GDPMP(-1)) + C(7)*D(TOTAL_HOUSEHOLD_SAVINGS(-1)) + C(8) ……(2)

Where, C(1) is error correction term or speed of adjustment towards long run equilibrium.

Table: 4 Bayesian Vector Error Correction Estimates

Variables ⟹	D(GDP)	D(THS)
Error Correction Term	α_{11}	α_{21}
Sample Estimates of EC Term	-0.868931 (0.01885) [-46.0893]	-1.150839 (0.02560) [-44.9621]
Notes: i) Bayesian VAR has been estimated with first difference variables as endogenous with co-integration variables. **ii)** Figures are presented at 5% level of significance. **iii)** Figures in parentheses of types ( ) and [ ] are Standard errors and t-statistics respectively.		

It is evident from table 4 if there would be any disequilibrium in the short run in then, it will take 1 year and approximately 2 moths for GDP to converge with THS using formula 1/ $\alpha_{11.}$ Whereas, THS is will take approximately 8months to converge to GDP using formula 1/ $\alpha_{21.}$

Residual Diagnostic Test

Johansen model is based on the assumption that the time series variables should free from the problem of serial correlation and heteroskedasticity. This model also assumes that the data should be normally distributed. Thus, it becomes imperative for us to go for diagnostic checking before applying Granger's causality test. Table 5 depicts the results of residual's testing:

Table: 5 Diagnostic tests: GDP and GDS

Serial Correlation		**Heteroscedasticity**	
LM version		**LM version**	
Chi-square	**p-value**	**Chi-square**	**p-value**
4.716898	.3176*	5.233566	0.5142*

Note: * Denotes statistical significance at 5%.

Source : Author's calculations

The above table shows that there is neither problem of serial correlation nor heteroscedasticity as p-value is greater than 5% level of significance so we accept null hypotheses of non-presence of serial correction and heteroscedasticity in residuals by using Breusch-Godfrey serial correlation LM Test and Breusch-Pagan-Godfrey heteroscedasticity test respectively.

Short-Run Causality

After analysing the long run equilibrium relationship between the variables, we shall now be testing the existence of short-run causality by using Granger's Causality test.

Granger's Causality Test

For analysing the short run impact of variables on one another and to also check if there exists any bi-directional causality between the variables, we will be using Granger's Causality test. Table 6 is showing the analysis of short run equilibrium between GDP and GDS.

In the present analysis following Granger Causality model is used.

$\ln(GDP) = \alpha_1 + \sum_{i=1}^{n} \beta_l \ln(THS)_{t-i} + e_{1t}$

$\ln(THS) = \alpha_1 + \sum_{i=1}^{n} \gamma_l \ln(GDP)_{t-i} + e_{2t}$

Table 6 indicates that THS does not granger cause GDP as p-value is insignificant at 0.891 whereas, GDP granger cause THS as p-value is significant at 0.0390. Which clearly indicates a uni-directional causality running from GDP to THS at 5% level of significance.

Table 6: Granger's Causality Test

Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**
TOTAL_HOUSEHOLD_SAVINGS does not Granger Cause GDPMP	45	0.01869	0.8919
GDPMP does not Granger Cause TOTAL_HOUSEHOLD_SAVINGS		4.53951	0.0390

Summary and Conclusion

The major objective of the paper is to examine the causal relationship between GDS and THS over the period 1970-2016 using Johansen co-integration test, Vector Error-Correction model and Granger's Causality test. The study found a uni-directional causality running from GDP to THS. Therefore, it is a signal for the government to increase GDP in order to increase THS.

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