

## CAUSALITY BETWEEN SAVING AND ECONOMIC GROWTH IN INDIA

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**Abstract:**

The objective of this paper is to examine Co-integration and the direction of causality between savings and growth as these have important implications for development policy. We estimate long run interrelationships between sectoral savings and their roles in the process for growth in India for the period 1952 to 2013. We also carry out an analysis of the direction of causality between savings and growth. We hypothesize that gross domestic household saving is more important in determining GDP. We find that gross domestic saving, their components such as HHS, PCS and PS and the sub sectors of HHS such as FS and PhS are co-integrated with GDP. However, the results of causality tests suggest that there is a one-way causation from growth of GDP to the total saving rates, HHS, Financial saving (sub sector of HHS), and PCS. In the case of Public saving, physical saving (sub sector of HHS) and the growth of GDP it is indicated that the causality does not run in any direction.

**Keywords:** Savings, economic growth, trends, unit root, co-integration, and causality.

**Introduction:**

The role of savings is important for economic growth in India. This article investigates the stationarity, inter-relationship as well as direction of causality between savings and growth of GDP in India for the period 1953 to 2013 taking 2004-05 as base year. The relevant annual data on Domestic Savings and GDP for the sample period have been collected from the Handbook of Statistics on Indian Economy published by Reserve Bank of India. We use trend analysis, unit root test, co-integration test and Granger causality test. This paper has 5 sections, in section I, we discuss briefly literature on the topic of the present study. In section II, we present the trend analysis of Gross Domestic Savings (GDS) and their sectoral components such as Household Savings (HHS), Private Corporate Savings (PCS) and Public Savings (PS) as well as Gross Domestic Product (GDP) in India. In section III, we test whether the total saving rate, its three sectoral components and GDP are stationary, and whether a long run relationship between savings rates and gross domestic product (GDP) exists and the direction of causality in India. Findings and conclusions are presented in section IV.

**I. Literature Review:**

There are many Indian studies on the topic. K. Krishnamurthy and P. Saibaba (1981) examine the determinants of savings rate in India; Sinha (1996) considers the impact of growth of private and gross domestic savings on economic growth; Prem Chandra Athukorala and Kunal Sen (2001) examine the determinants of private savings rate; Sahoo *et al.* (2001) consider total savings only; Md. Abdus Salaam and Umma Kulsum (2002) examine the savings behaviour considering household saving, private corporate saving and public saving; Sagar (2003) in his econometric estimations, combines household and private corporate sectors; Pradeep Agrwal, Pravarkar Sahoo, Ranjan Kumar Dash (2007) study the trends in savings and growth rates of India, determinants of savings rate and examine the direction of causality between the savings rate and growth of income for India for the time period 1960-2004; Ramesh Jangili studied the Causal Relationship between Saving, Investment and Economic Growth for India over the period 1950-51 to 2007-08.

**I: Trend analysis:**

In this section, we briefly discuss the trends in gross domestic saving and their sectors as percent of GDP (Figure-1). The savings rate in India has been increasing with total savings rate (GDS) averaging about 21% for entire period of study. We can also observe that the gross domestic saving has been highly affected by the household saving (15%) than by private corporate saving (3%) and public saving (3%).

The savings rate has increased from about 9% in 1952-53 to 32% in 2012-13 and the maximum total saving rate has about 40% in 2007-08. The household saving as percent of GDP has increased from about 6% in 1952-53 to 24% in 2012-13 and maximum household saving was about 27% in 2009-10. The private corporate saving as percent of GDP has increased from about 1% in 1952-53 to 8% in 2012-13 and maximum private corporate saving was about 9% in 2009-10. The public saving as percent of GDP has decreased from about 2% in 1952-53 to 1% in 2012-13 and maximum public saving was about 6% in 1976-77, while the public saving had a negative trend between 1998 and 2003. For statistical evidence, we used trend analysis test and found (Table-1) that total savings, household and private corporate savings have significantly upward trend while public saving has no trend.

**II: Econometric Analyses:**

In this section we have made an attempt to find the long run relationship among GDS, HHS, PCS and PS with GDP. As mentioned above, gross domestic saving had major contribution from the household saving. Further in study, we also included the sub sectors of HHS such as financial saving and physical saving. The time series data may be non stationary. So, first we apply the unit root test ADF for transforming all variables into stationary form. To test the long run relationship we employ co-integration test and if all variables are co-integrated then we test the direction of causality.

**(a) Unit Root Test:**

For a time series variable the most important attribute is that the variable is stationary. Hence, we perform the unit root tests in levels and first differences to test whether the variables are stationary. ADF test examines the null hypothesis of a unit root against a stationary alternative.

The results are presented in Table-2. It is evident from the table that all the variables are stationary at first difference. To perform the Johansen co-integration test, all the variables are integrated of the same order. Hence from ADF test we can conclude that, the order of integration is the same for all variables. Therefore we can apply the Johansen co-integration test for empirical analysis.

**(b) Co-integration Test:**

After establishing that all variables are integrated of the same order, we proceed to test for presence of co-integration among the variables. We apply Johansen co-integration test. In Table 3, we present the results of testing of the null hypothesis that there does not exist co-integration against the alternative hypothesis that co-integration exists. Here the test rejects the null hypothesis of no co-integration in favor of co-integration. Thus, both the trace and maximum eigen value test statistics suggest that there exist co-integration relationship among GDS, HHS, PCS, PS, FS and PhS with GDP. Hence, we use Vector Error Correction (VEC) Model for all other series to test for causality.

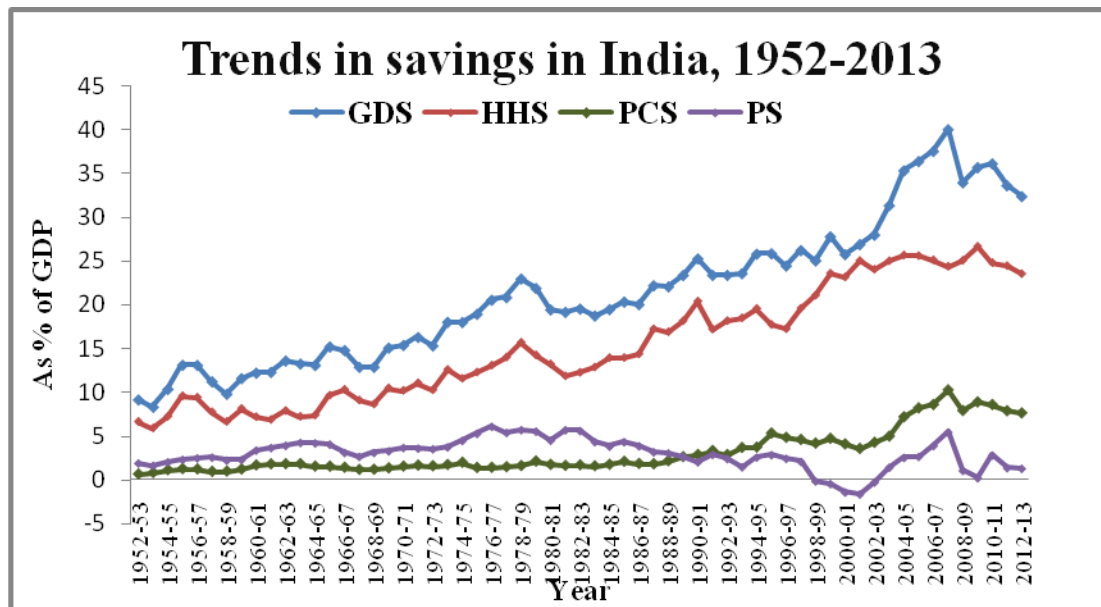
**(c) Granger Causality:**

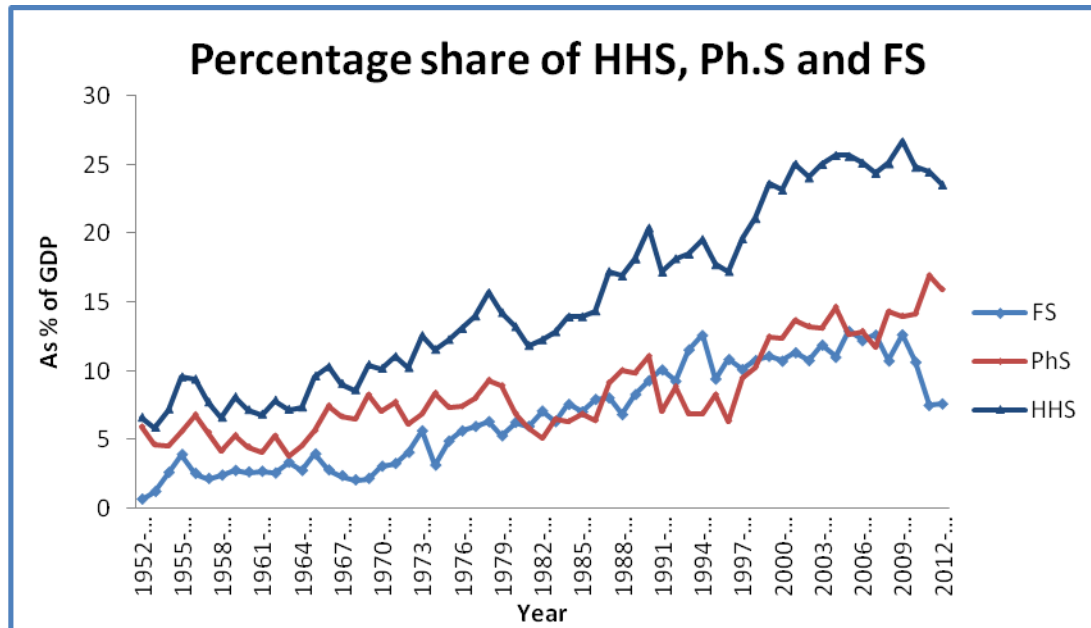
The results of co-integration test, suggest that to determine the direction of causality between growth of GDP and saving as well as their sectoral components, we can apply the vector error correction model (VECM). The results of the causality tests under the VECM are shown in Table 4. They provide strong evidence that in the case of India the causality is uni-directional from saving to growth of GDP. Hence we can conclude that, higher saving improves the growth of GDP but not vice versa. Further, it is evident that household sector saving causes higher growth of GDP but higher growth of GDP does not necessarily promote higher household saving. In addition, there is evidence that among the components of HHS, Financial Saving (FS) supports but Physical Saving (PhS) does not support the growth of GDP. Moreover, private sector saving leads to higher growth of GDP, whereas, growth of GDP does not lead to higher private sector saving and higher savings in the public sector does not cause growth of GDP and vice versa.

### III. Conclusion:

In this paper, we found that the share of household saving is more than that of private saving and public saving in the gross domestic saving. We also established the long run relation between total domestic savings rate, household savings rate, private domestic savings rate and public saving rate using co-integration procedures. The results show that there exists a stable and long run equilibrium relationship among these savings rates and growth of GDP. From Granger causality test, we found that the higher total saving rate improves the growth of GDP but not vice versa. Also the household sector and private corporate saving rates improve the growth of GDP but not vice versa while higher savings in the public sector does not cause growth of GDP and vice versa. As mentioned above, the share of household saving is more in gross domestic saving and increase in household saving improve the growth of GDP. We tested the causality relation between their sectoral components and growth of GDP. We found that the causality between HHS and growth of GDP is established due to financial saving because the components of HHS like financial saving cause GDP but physical saving does not cause to GDP.

Figure – 1



**Figure – 2****Table –1 Trend analysis test**

Variable	Statistic	P-value
GDP	488	0.001**
GDS	1592	0.000**
HHS	1546	0.000**
PCS	1418	0.000**
PS	-328	0.979

‘\*\*’ indicates significant at 5% level of significance.

**Table – 2 Unit Root Test using Augmented Dickey Fuller Test**

Variables	Optimum lag*	At level	At first difference	Conclusion
GDP	5	-2.205	-5.641**	I(1)
GDS	1	-1.005	-5.70**	I(1)
HHS	1	-0.854	-6.235**	I(1)
PCS	1	-0.176	-4.409**	I(1)
PS	5	-1.698	-4.625**	I(1)
FS	2	-1.334	-4.494**	I(1)
PhS	9	1.823	-2.962	I(1)

\*Akaike Information Criterion (AIC) is used to determine the lag order.

‘\*\*\*’ indicates significant at 5% level of significance.

The ADF regressions are included with constant.

**Table 3: Co-integration Test based on Johansen- Juselius method**

Ho: There does not exist co-integration

Variables	Trace statistic	Maximum Eigen value statistic	Conclusion
GDP and GDS	47.49**	38.50 **	Co-integrated
GDP and HHS	55.07**	44.99**	Co-integrated
GDP and PCS	39.410**	35.19**	Co-integrated
GDP and PS	49.02**	41.50**	Co-integrated
GDP and FS	40.583**	37.414**	Co-integrated
GDP and PhS	29.733**	28.517**	Co-integrated

‘\*\*\*’ indicates significant at 5% level of significance.

**Table 4: Granger Causality tests based on VECM**

Null Hypothesis:	F-Statistic	Prob.	Conclusion
GDS does not Granger Cause GDP	9.17334	0.0037**	Reject
GDP does not Granger Cause GDS	0.61793	0.4351	Do not reject
HHS does not Granger Cause GDP	6.51355	0.0135**	Reject
GDP does not Granger Cause HHS	0.88976	0.3496	Do not reject
PCS does not Granger Cause GDP	4.15241	0.0463**	Reject
GDP does not Granger Cause PCS	0.00291	0.9572	Do not reject
PS does not Granger Cause GDP	0.75254	0.3894	Do not reject
GDP does not Granger Cause PS	0.02626	0.8719	Do not reject
FS does not Granger Cause GDP	10.435	0.0021**	Reject
GDP does not Granger Cause FS	0.137	0.712	Do not reject
PhS does not Granger Cause GDP	2.087	0.154	Do not reject
GDP does not Granger Cause PhS	0.0003	0.986	Do not reject

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