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The co-integration and causal relationship between saving and economic growth in India

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Abstract. *The role of saving in promoting economic growth has received considerable attention all over the world. Saving is considered as real driving force behind the growth of an economy. The aim of this paper is to examine the casual relationship between economic growth and savings in India. To analyze this relationship time series data from 1960 to 2019 was used. To check the stationarity of data ADF and PP test were used. The Johansen co-integration test was employed to check the relationship between the variables. Finally Granger causality test was applied to see the direction of causality. The results have shown that all the variables are non stationary. The Johnson method shows that both the variables share the relationship with one another. The econometric evidence supports that savings do cause economic growth and economic growth in turn to savings. The bi-directional casual relationship was observed, which suggests that in India higher economic growth leads to higher savings and higher savings to more economic growth.*

Keywords: GDP, economic growth, saving, casual relationship, integration.

JEL Classification: E20, E21, O1, O4.

Introduction

India has started the process of economic development through the establishment of planning commission in March 1950, hoped to achieve economic growth in an established manner and subsequently launched its first five year plan in 1951 based on Harrod Domar model (Hashmi and Sedai, 2016). The Classical economists believed that the existence of savings is a necessary and sufficient condition for investment creation and subsequently for economic growth. They believed that if savings go up, investment increases because the rate of interest rate will decrease and economic growth will prevail in the economy (Najarzadeh et al., 2014).

The Keynes model states that saving is the function of economic growth, it is the saving which leads to economic growth, in contrast to Solow model of growth that suggests saving is the determinant of economic growth; therefore it is the economic growth which is the function of savings.

Economic growth is a key factor to most of the economies these days. Everybody wants to live with comfort having better standard of living and a better welfare. Government in each nation wants to reduce the poverty and increase the level of national income. Therefore to achieve the main target of increase in economic growth, policy makers have implemented various kinds of policies to encourage savings and therefore stimulate investment.

With the inception of planning process, India has made considerable progress in terms of GDP growth and volume of savings. The GDP growth rate at constant prices increased from 3.6% in 1950-51 to 7% in 2018-19, with an average of 5.2%. There are some exceptions when the GDP growth rate was very high (10.3% GDP growth rate in 2009-10) and very low (1.2% GDP growth rate in 1990-91). On the other side, saving rate has been constantly increased since planning process, from an extremely low level of 8.2% in 1952-53 to 30.5% in 2018-19 (Figure 1).

It is also important to mention here that Indian economy has undergone several transformations. These evidences were given by many researchers. Rajkrishna (1983) found long term rate of growth of 3.5% and called “the Hindu growth rate”, Dandekar (1992) states improvement in GDP growth rate from early 1980’s in India. The growth trajectory of the Indian economy is often conceived in terms of transitional dynamics from one crisis to another. These are the evidence which showed India’s dynamic growth.

The role of savings in promoting economic growth has received considerable attention all over the world (Verma, 2007). The central idea of Lewi’s theory (1955) and Harrod-Domar (1956) growth models specified saving as the key factor in promoting economic growth. The neoclassical models like Solow (1956) also proposed that higher savings leads higher growth in per capita capital and per capita income from the transition to the steady-state of economic growth.

The endogenous growth models also suggested that higher saving rate contributes to long term growth rates. The policy implication of these models for development is that those countries that manage to increase their saving rate, and therefore investment, will increase their rate of growth (Alguacil et al., 2004). The importance of savings for economic growth can be witnessed in the economic progress made by countries like China, India, Indonesia, South Korea, Singapore, Thailand and Malaysia (Joshi et al., 2019).

The post-neoclassical endogenous theory of economic growth that came into picture since the mid-1980s predicts that increase in savings generate a higher rate of economic growth through its positive effects on investment and capital accumulation (Mankin et al., 1992; Barro and Sala-i-Martin, 1995; Lucas, 1988; Romer, 1986).

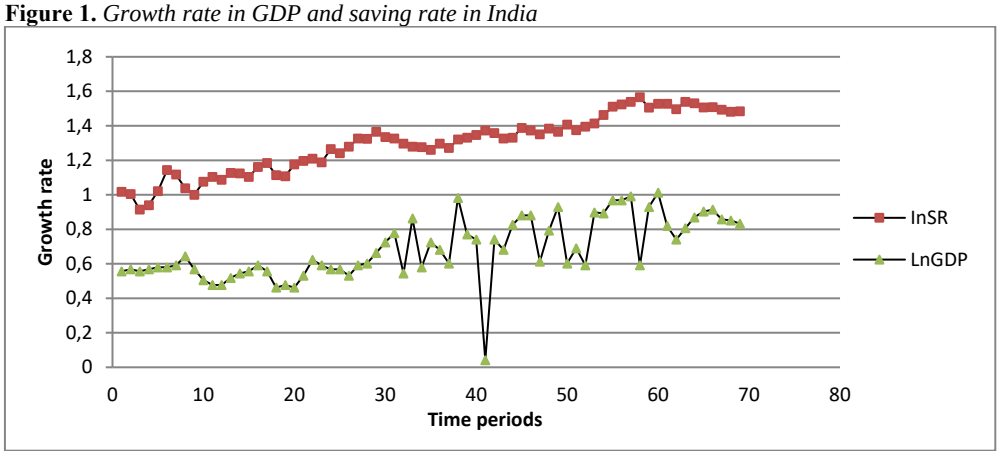
The casual relationship between economic growth and savings were examined by many researcher across the globe had not reached any settled conclusion. There are three approaches regarding the casual relationship between saving and economic growth.

1. Fundamentalists view states that a casual relationship runs from saving to economic growth which is supported by set of studies like Bacha (1990), Otani and Villannueva (1990), DeGregorio (1992), Levine and Renelt (1992), Hebbel et al. (1992), Jappelli and Pagano (1994), Sinha (1999), Misztal (2011), and Jangili (2011) concluding that higher savings contribute to higher economic growth.
2. Keynesians view that growth contributes to saving. This hypothesis gets support from the studies by Keynes model (1936), Houthakker (1960, 1965), Marglin (1976), Cullison (1993), Carroll and Weil (1994), Anoruo and Ahmad (2001), Agrawal (2001), Sahoo et al. (2001), Alguacil et al. (2004), Narayan and Narayan (2006), Lorie (2007), Verma (2007), and Abu (2010). All these empirical studies view that higher economic growth rate proceed higher savings.
3. A third set of studies conducted by different researcher's supported the view that causality runs from both sides and concluded that savings and economic growth reinforce each other. This hypothesis is supported by Schmidt et al. (1996), Singh (2010), Foul (2010), Bayer (2014), Najarzadeh et al. (2014), and Hashmi and Sedai (2016). These researchers are of the view that there is a bi-directional causality between saving and economic growth.

Data and methodology

Annual data of India from 1960 to 2019 were used collected from internet websites of World Bank and RBI. The data which was used in this study are all in the form of growth rates. Economic growth has been measured using GDP growth rate and saving in the form of Gross Domestic saving. The graphical representation of the data is shown in Figure 1 given below.

Figure 1. *Growth rate in GDP and saving rate in India*



The figure shows that variables are moving in the same direction. Therefore, before using any econometric technique to analyse the data, it is important to know the stationarity of the data. For this purpose Augmented Dickey-Fuller (ADF) model (Dickey and Fuller, 1981) was used at 5% level of significance. The model is shown as:

$$\Delta Y(t) = \mu + \gamma Y(t-1) + \vartheta T + \sum_{i=1}^{k} \delta(i)\Delta Y(t-i) + e(t) \qquad (1)$$

In addition to ADF test, the Phillips-Perron (PP) unit root test was also used to cross check the results. It is very important to select the optimal lag length, because all the econometric tools are very sensitive to number of lags used. For this purpose Schwarz Information Criteria (SIC) technique was employed to fix the optimal number of lags used in the model.

Further to check whether there exists a co-integration between economic growth and saving, we use the multivariate co-integration method by Johansen and Juselius (1990) and Johansen (1992) to verify the co-integration among the variables. The Maximum Eigenvalue (λ_{max}) and Trace Statistics (λ_{max}) tests are used to trace out the co-integration rank r (the number of independent co-integrating vector):

$$\lambda_{max}\,(r) = -T\ \sum_{i-r+1}^{n} In(1-\lambda i) \qquad (2)$$

$$\lambda_{max}\,(r, r+1) = -T\ In(1-\lambda_{r+1}) \qquad (3)$$

This method was used to know the direction of causality and cause and effect relationship between the variables in India.

Empirical results

Unit root test

Before we analyse the casual relationship between economic growth and saving, it is important to know the order of integration. This order is tested here by means of augmented Dickey and Fuller (1979, 1981) and Phillips and Perron (1988) tests. The results of unit root test are reported in Table 1.

Table 1. *Stationary test based on Augmented Dickey-Fuller Test and Phillips-Perron Test*

	Augmented Dickey-Fuller Test	Phillips-Perron Test
LGDP	-4.350843 (0.0009)*	-4.192187 (0.0015)*
DGDP	-7.465034 (0.0000)*	-34.37598 (0.0001)*
LGDS	-2.598519 (0.0990)	-2.369569 (0.1546)
DGDS	-7.988550 (0.0000)*	-17.81849 (0.0000)*

According to these results the null hypothesis is rejected both at level (denoted by L) and first difference in case of GDP. In case of savings the null hypothesis of non-stationary is accepted at level but can be rejected at first difference (denoted by D), indicating unit root at level.

Time series models are very sensitive to lag length. We employed the Schwarz information criterion to check the optimal lag length. On the basis of the Schwarz information criterion optimum lag length for this model is 2 as shown in Table 2.

Table 2. *Optimum lag length*

Number of lags	Schwarz information criterion
0	10.92178
1	9.936935*
2	10.09344
3	10.09177
4	10.23503

* Indicates lag order selected by the criterion.

Co-integration test

It has been observed that both the variables are integrated at first difference, we proceed to test co-integration between economic growth and saving. For this purpose Johansen co-integration test was used. The results of Johansen test are shown in Table 3.

Table 3. *Johenson co-integration test results*

H_o – there does not exists co-integration

Variables in the system	Trace statistic	Maximum Eigen value statistic	Conclusion
GDP and GDS	26.19584 (15.4947)*	22.63546 (14.2646)*	Co-integrated
GDS and GDP	28.74866 (15.4947)*	26.84825 (14.2646)*	Co-integrated

Note: *indicate statistical significance at 5% level.

It can be seen from Table 3 that null hypothesis of no co-integration is rejected at 5% level of significance. Therefore accept the alternate one, which shows variables are co integrated. Both the trace statistics and maximum Eigen value is above the 95% critical value.

Causality test

After getting confirmation that variables are co-integrated, it is obvious that the existence of granger causality is in at least one direction between economic growth and saving. Granger causality test was run and the results are presented in Table 4.

Table 4. *Causality tests based on VECM/VAR F-statistic*

Null hypothesis	F-Statistic	Prob.	Result
Gross Domestic Product does not granger cause Gross Domestic Saving	15.1221	0.0003	Reject
Gross Domestic Saving does not granger cause Gross Domestic Product	4.15096	0.0463	Reject

It indicates that the variables are mutually reinforcing to each other during the study period. Therefore the direction of causality is from both sides. Higher economic growth boosts savings and higher savings leads higher economic growth in India. These results are consistent with Schmidt et al. (1996), Singh (2010), Foul (2010), Bayer (2014), Najarzadeh et al. (2014), and Hashmi and Sedai (2016).

Conclusion

The savings in India play an important role in promoting economic growth. Saving is considered as real driving force of the economy and has shown an increasing trend since 1950 in India. Overall growth rate has shown an increasing trend but failed to match the extraordinary savings performance. In order to understand this phenomenon, this study was conducted under empirical lines to test the causality between economic growth and savings in India. The econometric evidence supports that savings do cause economic growth and economic growth causes savings. The bi-directional casual relationship was observed, which suggests that higher economic growth leads to higher savings and vice versa in India. The policy makers in India need to stimulate as well as effective mobilization of savings in productive sectors, which in turn lead to increase the capital formation and thus economic growth.

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