RELEVANCE OF SAVING AND INVESTMENT FOR GROWTH IN INDIA: A GRANGER CAUSALITY APPROACH

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Abstract

The puzzle to know the growth story of a nation has always been interesting. During this course we try to identify the factors which lead to more growth of few and less of others. Savings and investments are supposed to play a major role in this story. In the present paper we have tried to analyze the relevance of saving and investment for growth in India by understanding their interrelations. For this matter we have applied the granger causality test on the annual data from 1951-2011.The results indicate that saving and investment granger cause growth but the other way round could not be accepted. Feedback granger causality was found between saving and investment. Our analysis proposes to focus on policies promoting savings as well as investment for growth to accelerate.

Key Words: Savings, investment, growth, co integration, granger causality

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I INRODUCTION

The neo-classical literature because of the advantages involved, was in favour of free trade and open markets for growth motive for all nations (no distinction was made for different stages of development). But the capitalist development theories, modelled on the neo-classical theory highlighted the basic differences in developed and developing countries but their suggestions were more or less same for both. They advocated that the path of technical and structural changes followed by developed nations should also be followed by developing nations as well. They, at the same time maintained that some policies associated with openness may increase the poverty levels there. The new theoretical construct, dependency theory differed from the orthodox viewpoint and introduced a new paradigm in development analysis but could not get the success in explaining the process and sources of development.

Everyone knows the fact that a nation needs capital accumulation for growth which depends on the level of savings. The levels of savings depend on income levels. The lower income leads to lower savings and hence there is a shortage of funds for investment motive. Because of this circular connection a catch22 kind of problem arises for a developing nation for further advancement. So we need to find out the direction of relation amongst the variables for the particular nation in whose development we are interested in.

In this era of Globalization there is no doubt that international savings and investments affect the global inflows and outflows of funds but at the same time the role of domestic saving and domestic investment in promoting economic growth is not lesser. The topic has received considerable attention not just in India but in many nations world over. The relation amongst saving, investment and growth has been the central point in many theories like that in Lewis's (1955) traditional theory it was highlighted that an increase in saving would accelerate economic growth, while the early Harrod-Domar model particularly emphasized that investment plays the key role to encourage economic growth. There are many other models like the neoclassical Solow (1956) model which argued that the increase in the saving rate enhance steady-state output by more than its direct impact on investment. Different models also differ on the direction of the relationship like on the one hand are the models e.g. Jappelli and Pagano (1994) which claimed that saving is the factor which contribute to higher investment first and then higher GDP

growth next in the short-run, whereas, the Carroll-Weil hypothesis (1994) stated that it is economic growth which facilitate the saving to rise and not the other way round.

The rise of optimism about Indian economy in the recent times which is wavering after Global Economic Crisis has further aroused the interest in the causal relation of growth with that of savings and investments. We know that capital formation implies growth. All the three variables i.e. capital formation, investments and savings affect and are being affected by each other. Here in this paper we will try to analyse these interrelations.

II REVIEW OF LITERATURE

Sinha (1996) in his study of causality between the growth rates of gross domestic saving and economic growth found no causality running in either direction. But significant causality was found from growth to saving in a study by Mühleisen (1997), however even his analysis rejected causality from saving to growth for all the forms of savings.

The paper by Attanasio et.al.(2000) did a descriptive analysis of the long-run and short-run correlations among saving, investment and growth rates for 123 countries over the period 1961-94. Three results were found robust across data sets and estimation methods in their study which included- lagged saving rates are positively related to investment rates whereas investment rates Granger cause growth rates with a negative sign and growth rates Granger-cause investment with a positive sign.

Zangeneh (2006) applied Granger causality test on data extracted from International Monetary Fund's International Financial Statistics for variables real income, real private savings and real private investments. The study concluded one-way granger causalities running from savings to investment, and from disposable income to investment and found the results true with one or more lagged values as independent variable. He suggested to undertake policies that foster savings to spur investment, and as a result, capital accumulation.

Verma (2007) used the ARDL co-integration approach to determine the long run relationship of GDS, GDI and GDP for the period 1950-51 to 2003-04 and supported the Carroll-Weil hypothesis that saving does not cause growth, but growth causes saving. Another work by Sinha and Sinha (2008) examined the relationships between growth rates of the GDP and different form of savings for the period 1950 to 2001 and found that economic growth produced higher saving in various forms and never the other way around.

III RESEARCH QUESTIONS

- To overview the level of growth, savings and investments in economy of India.
- To find the relation and the direction of relation amongst the three variables in India.
- To highlight the various implications drawn from the study.

IV METHODOLOGY AND DATA SOURCES

We have taken the data on gross domestic product (GDP), gross domestic savings (GDS) and gross domestic capital formation (GDCF) on India from 1950-2011.The data is in annual form, in billion rupee at nominal prices and taken from Handbook of Indian Economy 2012 published by Reserve Bank of India (RBI).We have converted the data in log terms for the purpose of analysis. We have employed the granger causality and co-integration techniques to examine the relationship amongst the variables after checking for unit root problem.

Steps involved in implementing the Granger causality test:

1. Test for the stationarity of the data using Augmented Dickey Fuller (ADF) test.

2. If found non-stationary, difference the data and conduct the ADF test again on the differenced data.

3. Exclude the variables, whose order of integration is not the same.

4. Test for the presence of co-integration using the same order of integrated variables.

5. Finally apply Granger causality test at various lag orders.

Unit Root Tests: Augmented Dickey –Fuller (ADF) test is most frequently used test of unit root. No econometric model, expect the co integration regression, can be constructed using non-stationary time series. Therefore, the series is required to be transformed to get a stationary series by differencing till it becomes stationary series. If a non-stationary series is required to be differenced "d" times to make it stationary, the time series is said to be integrated of order d, I (d) process. If series is not stationary at level we can use granger causality only if the series are co integrated.

Co integration: If two or more than two variables are integrated of same order and there exists a stationary linear combinations of these variables, the variables are said to be co integrated. We have applied Johansen-Juselius method and interpreted the results on the basis of Trace Statistic and Maximum Eigen value Statistic.

Granger Causality: A statistical approach proposed by Clive W Granger (1969) to infer cause and effect relationship between two (or more) time series is known as Granger causality. Granger Causality is based on the simple logic that effect cannot precede cause. It is important to note that the statement "x Granger causes y " does not imply that y is the effect or the result of x . Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term.

Procedure of Traditional Granger Non-Causality Test-In its original form it is based on following bi-variate regression model (there are some other procedures used for causality testing such as Sim's Causality test, Hasiao Causality Test etc.)

$$X_t = \alpha_0 + \sum_{i=1}^{l} \alpha_i X_{t-i} + \sum_{j=1}^{l} \beta_j Y_{t-j} + \varepsilon_t$$

$$Y_t = \omega + \sum_{i=1}^{l} \gamma_i Y_{t-i} + \sum_{j=1}^{l} \theta_j X_{t-j} + \varepsilon_t$$

If all the coefficients of Y in first regression equation of X, i.e. β_i for $i = 1.....l$ are significant, then the null hypothesis is that Y does not cause X. However, the significance of the coefficient cannot be evaluated based on usual t-statistic. For this purpose F-ratio is

$$F = \frac{(R^2{}_2 - R^2_1)/k^*}{(1-R^2{}_2)/(n-k)}$$

Where k^* are the number of lag orders l of variable Y, k is the total number of the parameters estimated and n is the number of observations. The null hypothesis of non-causality is rejected if F statistic is greater than its critical value at k^* and (n-k) degree of freedom. Similarly from the

second equation above, we can test the null hypothesis that 'X does not cause Y' . If only one of the two variables causes the second variable but the second variable does not cause the first variable it is called one-way causality. If both the variables cause each other it is called the feedback causality. The decision rule for the test is where the value of the F-statistic is low and the probability value is high, we reject the null hypothesis. On the contrary, where the F-statistic value is high and the probability value low, we accept the null hypothesis.

V EMPIRICAL RESULTS

First we analysed the basic statistics of the original data and on the basis of Bera--Jarque statistic found that all the three series are not distributed normally but when took the log values of the data the series were found close to normal distribution. So we have applied all the tests on series in log form.

Table-1: Unit root Test Results

Variable	With Trend
GDP	3.973
ΔGDP	-5.468*
GDS	1.855
ΔGDS	-6.996*
GDCF	1.249
ΔGDCF	-8.036*

Note: Δ in front of the variable indicates first difference

* indicates at 1% level of significance.

Source: Author's Calculations

As all series are non stationary at level but stationary after differencing once. So the order of their integration is same i. e. I(1).We can check for the co integration and the results are as follows-

Table 2: Empirical Results of the Co-integration Test based on Johansen-Juselius method

Variables in the system- LGDP,LGDS,LGCF, H_0: There does not exist co-integration

Hypothesized number of co-integrated relations	Trace Statistic (0.05 critical values)	Maximum Eigen value Statistic (0.05 critical values)
None*	65.64(42.91)	36.76(25.82)
At most one*	28.88(25.87)	22.03(19.38)
At most two	6.85(12.51)	6.85(12.51)

Note: Both Trace test and Maximum Eigen value test indicates two co-integrating equations at.05 level and *denotes rejection of the hypothesis at 0.05 level

Source: Author's Calculations

The series are co integrated and hence we performed granger causality test on the level data for lag two. The lag length is selected on the basis of AIC (Akaike information criterion) and SIC (Schwarz information criterion)

Table 3: Granger-causality test

Null hypothesis	F Statistic	p-value	Conclusion about Null hypothesis
GDS does not Granger cause GDP	6.708	0.0025	Reject
GDP does not Granger cause GDS	1.130	0.3304	Do not reject
GDCF does not Granger cause GDP	10.236	0.0002	Reject
GDP does not Granger cause GDCF	0.810	0.4501	Do not reject
GDS does not Granger cause GDCF	9.978	0.0002	Reject
GDCF does not Granger cause GDS	5.642	0.0060	Reject

Source: Author's calculations

VI CONCLUSION AND POLICY IMPLICATIONS

On the basis of above analysis we can conclude the following-

- All the variables included in study are integrated of order one.
- There are two co integrating equation for the three variables.
- Granger causality analysis implies that growth does not granger cause either of savings or investments but savings and investments granger cause growth.
- Savings and investments have feedback causality.

On the basis of above analysis we would like to suggest that in the present state of affairs the growth and investments can be promoted by encouraging savings. So the fiscal and monetary policies should be geared towards increasing savings. In the current scenario for that matter we should control inflation, give tax reduction to personal income tax. At the same time the investments granger cause savings and hence India needs to encourage investments. For that matter it needs to go faster on project clearances and increase ease to do business.

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