Relationships among Household Saving, Public Saving, Corporate Saving and Economic Growth in India

Dipendra Sinha and Tapen Sinha

Ritsumeikan Asia Pacific University, Japan and Macquarie University, Australia and ITAM, Mexico

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Corresponding author:
Dipendra Sinha, Ritsumeikan Asia Pacific University, Japan and Macquarie University, Australia, E-mail: dsinha@apu.ac.jp
dipendra.sinha@gmail.com
Address: Ritsumeikan Asia Pacific University
Beppu, Oita 874-8577
JAPAN
Phone: +81-977-78-1214
Fax: +81-977-78-1123

Tapen Sinha, Instituto Tecnologico Autonomo de Mexico (ITAM), Mexico
E-mail: tapen@itam.mx

Abstract:

This paper examines the relationship between the growth rates of household saving, public saving, corporate saving and economic growth in India using multivariate Granger causality tests. The conventional wisdom suggests that the causality flows from saving to economic growth. We show that the causality goes in the opposite direction for India. Hence, higher saving is the *consequence* of higher economic growth and not a cause.

JEL Codes: E21, O11, O16
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1. Introduction

After fifteen years of economic reforms, India has finally embarked on a growth path never seen before in the history of the subcontinent. This has led to a resurgence of interest on economic growth in India. A number of popular magazines have picked up on this theme. In a recent article, the Economist (2006) declared: "…it is argued, will help raise the level of private savings from about 29% of GDP now to 34% over the next five to seven years. Investment will follow, so GDP will continue to grow at 8%". Clearly, the presumption is that *the growth in saving now will lead to a growth in GDP in the future.*

In theories of economic growth such as that of Solow (1956), higher economic growth *follows from* higher saving. This has been the conventional wisdom. The World Bank regularly recommends developing countries to adopt policies that increase the saving rate for these countries to achieve a higher rate of economic growth.

Recently, a number of studies have examined the relationship between saving and economic growth. Our study provides the following new elements to uncover saving and economic growth relationship in India. First, we use three distinct measures of saving: household saving, public saving and corporate saving. Second, we conduct multivariate Granger causality tests to examine the relationship. No other previous studies have used all these three elements of saving in their causality tests.

2. Previous Studies

A number of studies examine the relationship between saving and economic growth. Using annual data for India, Sinha (1996) looks at the causality between the growth rates of gross domestic saving and gross domestic private saving and economic growth. The bivariate causality results show that there is no causality running in either direction between the growth rate of gross domestic private saving and economic growth or between the growth rate of gross domestic saving and economic growth. Sinha and Sinha (1998) perform multivariate causality tests between the growth rates of private saving and public saving and economic growth for Mexico. The results show that the growth rates of private and public saving Granger cause economic growth. However, there is no evidence of reverse causality. This runs counter to the conventional wisdom. For Pakistan, Sinha (1998-1999) finds somewhat different results. Using annual data for 1960-1995 and an augmented Granger causality tests in an error-correction framework, he finds that growth rate of GDP Granger causes the growth rates of both private saving and total saving. However, the growth rate of private saving is found not to be Granger causing growth of GDP while the growth of total saving is found to be causing the growth of GDP. Sinha (2000) finds similar results for the Philippines.

While the above studies find evidence mostly contradictory to the conventional wisdom, Sinha (1999) finds some evidence that causality flows from both gross domestic saving and from gross domestic private saving to economic growth for Sri Lanka. So, the conventional wisdom does hold for Sri Lanka. Alguacil, Cuadros and Orts (2004) also find support for the conventional wisdom for Mexico when foreign direct investment is taken into account as a form of foreign saving.

3. The Present Study

We use two data sources. These are the *Economic Survey of India* (2006) and the *International Financial Statistics* of the International Monetary Fund (2006). We collected annual data for 1950-2001 for GDP, household saving, public saving and corporate saving. All data are in billions of Indian rupees and are in real terms (2000=100). We construct growth rates of each variable. Specifically, we examine the relationships among growth rates of the GDP (denoted by GDPGR), household saving (denoted by HHSAVGR), public saving (denoted by PUBSAVGR) and corporate saving (denoted by CORPSAVGR) respectively. The causality tests are valid if the variables are either stationary or cointegrated. Therefore, we examine the stationarity of each variable.

We use the Kwiatkowski-Phillips-Schmidt-Shin (1992) for testing for stationarity. The test takes trend or level stationarity as the null hypothesis. In contrast, the augmented Dickey-Fuller and Phillips-Perron tests take the unit root as the null hypothesis.

Let us consider the following equation consisting of a deterministic trend, random walk and stationary error:

$$y_t = c_t + c_2 t + \nu_t \qquad (1)$$

where ν_t is a stationary process, t is the time trend and c_t follows the random walk $c_t = c_{t-1} + \mu_t$ with $\mu_t \sim iid(0, \sigma^2_\mu)$. The null hypothesis is: $\sigma^2_\mu = 0$ or c_t is a constant. We can drop the trend term in (1) if we want to test the stationarity of a non-trend variable.

As Maddala and Kim (1998) point out, equation (1) is a special case of a test for parameter constancy against the alternative that parameters follow a random walk. This was first considered by Nabeya and Tanaka (1988). In Nebaya and Tanaka, the test statistic is as follows:

$$\text{LM} = \frac{\sum_{t=1}^{T} S_t^2}{\hat{\sigma}_e^2} \qquad (2)$$

In (2), e_t are the residuals from the regression of y_t on a constant and time trend. $\hat{\sigma}_e^2$ is the residual sum of squares divided by T (or residual variance) and $S_t = \sum_{i=1}^{T} e_i$ where t = 1,2,…..T. This is an upper tail test. When errors are not *iid*, the appropriate denominator of (2) is an estimator of σ^2 that Kwiatkowski-Phillips-Schmidt-Shin interpret as the "long run variance," rather than of $\hat{\sigma}_e^2$. σ^2 equals $\lim_{T \to \infty} T^{-1} E(S_T^2)$. A consistent estimator of σ^2 is given by

$$s^2(l) = T^{-1} \sum_{t=1}^{T} e_t^2 + 2T^{-1} \sum_{s=1}^{l} \omega(s,l) \sum_{t=s+1}^{T} e_t e_{t-s} \qquad (3)$$

$\omega(s,l)$ is an optional lag window that corresponds to the choice of a spectral window. Kwiatkowski-Phillips-Schmidt-Shin use the Bartlett window, $\omega(s,l) = 1 - \frac{s}{l+1}$. This ensures the non-negativity of $s^2(l)$. The lag parameter l is set to correct for residual serial correlation. If the residuals are *iid*, then a lag of zero is appropriate. All variables in our study, namely, GDPGR, HHSAVGR, PUBSAVGR and CORPSAVGR are found not to have trends. The results of the Kwiatkowski-Phillips-Schmidt-Shin unit root test are displayed in Table 1. The results show that *none of the variables* has a unit root. Thus, we employ the block Granger non-causality tests (Granger, 1969).

The methodology for the block Granger causality is as follows. Consider the augmented vector autoregressive model:

$$z_t = a_0 + a_1 t + \sum_{i=1}^{p} \phi_i z_{t-i} + \Psi w_t + u_t \qquad (4)$$

where z_t is an m x 1 vector of jointly determined (endogenous) variables, t is a linear time trend, w_t is q x 1 vector of exogenous variables, and u_t is an m x 1 vector of unobserved disturbances. Let $z_t = (z'_{1t}, z'_{2t})'$, where z'_{1t} and z'_{2t} are m_1 x 1 and m_2 x 1 subsets of z_t, and $m = m_1 + m_2$. We can now have the block decomposition of (3) as follows:

$$z_{1t} = a_{10} + a_{11} t + \sum_{i=1}^{p} \phi_{i,11} z_{1,t-i} + \sum_{i=1}^{p} \phi_{i,12} z_{2,t-i} + \Psi_1 w_t + u_{1t} \qquad (5)$$

$$z_{2t} = a_{20} + a_{21}t + \sum_{i=1}^{p} \phi_{i,21}\, z_{1,t-i} + \sum_{i=1}^{p} \phi_{i,22}\, z_{2,t-i} + \Psi_2 w_t + u_{2t} \qquad (6)$$

The hypothesis that the subset z_{2t} do not 'Granger cause' z_{1t} is given by

H_G: $\phi_{12} = 0$ where $\phi_{12} = (\phi_{1,12}, \phi_{2,12} \ldots, \phi_{1p,12})$.

4. Results

Table 1 gives the results of unit root tests. The results show there are no unit roots in our series of four variables. Therefore, Granger causality does not produce spurious correlations. If some of the variables did exhibit unit roots, we could not be sure that standard causality tests are not the results of such data generating processes.

Table 2 provides the results of a series of (block) causality tests postulated in equations (5) and (6) above. We asked tested two sets of causalities. First, we test to see if the growth rate in GDP is caused by (in the Granger sense) one or more of different components of total saving in India. Any number of combinations point to the same inevitable conclusion: there is no causality flowing from different components of saving to the growth rate of GDP. Second, we test to see if various combinations of different components of total saving is caused by the growth rate of GDP. The answer is inevitably positive. Thus, economic growth is Granger causally prior to household saving, corporate saving and government saving.

5. Conclusion

We showed that in India, over a period of five decades, economic growth has produced higher saving in various forms and never the other way around. The policy implication is that any policies that encourage saving are not likely to contribute to economic growth.

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Table 1. Kwiatkowski-Phillips-Schmidt-Shin Unit Root Tests (No Trends)

Variable	Test Statistic
GDPGR	0.2770
HHSAVGR	0.3809
PUBSAVGR	0.1113
CORPSAVGR	0.1238

Notes: The growth rates of GDP, household saving, public saving and corporate saving are denoted by GDPGR, HHSAVGR, PUBSAVGR and CORPSAVGR respectively. The critical value at 5% level of significance is 0.4630.

Table 2. Multivariate Granger Causality Tests

Cause	Effect	Test Stat. (*)	Probability (**)
HHSAVGR, PUBSAVGR, CORPSAVGR	GDPGR	1.77(1)	0.622(3)
HHSAVGR, PUBSAVGR	GDPGR	0.12(1)	0.942(2)
HHSAVGR, CORPSAVGR	GDPGR	1.77(1)	0.413(2)
PUBSAVGR, CORPSAVGR	GDPGR	1.76(1)	0.414(2)
GDPGR	HHSAVGR, PUBSAVGR, CORPSAVGR	12.69(1)	0.005(3)
GDPGR	HHSAVGR, PUBSAVGR	13.08(1)	0.001(2)
GDPGR	HHSAVGR, CORPSAVGR	12.45(1)	0.002(2)
GDPGR	PUBSAVGR, CORPSAVGR	11.81(1)	0.003(2)

Notes: The growth rates of GDP, household saving, public saving and corporate saving are denoted by GDPGR, HHSAVGR, PUBSAVGR and CORPSAVGR respectively. The test statistic indicates the chi-square value. *The number in the parenthesis indicates the lag order which was determined using the Schwarz Bayesian Criterion (AIC). **The number in parenthesis indicates the degrees of freedom for the relevant chi-square statistic.