CHAPTER V

AN EMPIRICAL ANALYSIS OF LINKAGES BETWEEN FINANCIAL SECTOR INDICATORS AND REAL SECTORS IN INDIA

"Any major change in strategy-say, away from inflation and towards financial growth-must be accompanied by the assurance of an immediate increase in real income or at least no significant decline, in order to be accepted by policy makers. Hence, it is of greatest importance to extend our theoretical schema, supported by empirical evidence to demonstrate that a carefully chosen set of techniques for deflating can have an immediate payoff."


Introduction

Investment is one of key linkages through which macroeconomic policies influence the real sector. The nature of the linkage varies as between countries, the theories of investment differ in terms of the channel of influence. Theoretically there are four popular investment models. These are the accelerator model, the cash flow model, the securities valuation or Tobin's q model and the standard neoclassical model (Bischoff (1971), and Clark (1979). All these models focussed on the movements in net investment, which are briefly reviewed below.

The accelerator model assumes a fixed relationship between the stock of capital and output. It implies that with excess capacity, the accelerator is inoperative and that there are lags between ordering and actual delivery. Koyck transformation introduced adaptive expectations. It assumes that the capital stock was a function of expected future output, which could be modelled by a series of geometrically declining weights on past output. It holds that in any given time period net
investment reflects a partial adjustment from the existing stock of capital to some desired position. This theory yields no direct macroeconomic policy linkages since investment is not dependent on factors such as the discount rate, rental price of capital or relative factor prices. The model’s pure dependence on output is the outcome of technological rigidities, which permit only one capital output ratio for each product. The model is superior to other models, as others do not specify the factors determining the optimum capital output ratio. Output, however, can provide the indirect link between investment and macroeconomic policy as monetary factors affect other expenditures and thus demand variations.

The Cash flows affects corporate investment in two ways. First, increased cash flow means greater profitability in the future. The firm increases its demand for capital to maximise its net worth. Second, increased cash flow permits greater use of internal funds as a financing source. As the cost of financing increases when the firm moves from internal funds to debt and finally to equity, the marginal cost curve slopes upward. Since all the relevant information concerning a firm’s financial position is incorporated in the share price of the firm the cost of capital as determined in the equity market is the variable determining investment. Several versions of the model emphasise different flows, i.e., profits versus cash flow. Nevertheless, monetary link exists only indirectly, to the extent that profits and expected profits are affected by financial shocks. It implicitly captures the influence of the accelerator to the extent that profits are determined by aggregate demand.
Tobin is of the view that investment is influenced by the value of physical capital, as determined in the securities market, relative to its replacement cost. The ratio of market value of a firm to the replacement cost of its capital stock is termed as the Tobin's "q ratio" (Tobin and Brainard, 1969). In his essay "Principles of Debt Management", Tobin (1971) shows how ‘q ratio affects investment and how monetary policy affects ‘q ratio’. In sum, managers seeking to maximise the market value of their corporations, add to their fixed capital stock whenever the marginal increase in the stock exceed the actual cost or replacement value of the addition. In other words, investment responds to the marginal productivity of capital stock relative to the rate of return on capital equity. If this ratio exceeds one, the market valuation of capital is greater than its replacement cost. With incentives to expand production, investment also expands. The numerator and the marginal productivity of capital are determined by factors such as, supply of factors, technology, and future expectations. The denominator is the rate at which households hold the existing stock of capital at current prices. "It is this rate of return, the supply price of capital, which the monetary and debt authorities may hope to influence through changing the supplies and yields of assets and debts that compete with real capital for place in the portfolios and balance sheets of economic units." However, there are some problems in applying this theory. First, no information is available on the marginal effect on market valuation of increased expenditure on fixed capital. The average ratio of the market value of existing physical capital (determined in the financial market) to its reproduction cost is used. Secondly, it is difficult to segregate the market valuation of physical capital from the rest of the assets. According to
Tobin the investment takes time and the cost of acquisition and installation of capital goods is higher both on average and at the margin with faster expansion in capital stock. The speed of additions to the capital stock and the level of q are correlated.

In the neoclassical theory of investment, capital is one of the factors in the production process. The combination of factor inputs is dependent on their relative factor prices. As the rental price of capital is not observable because physical capital is normally purchased, implicit rental price of capital arises from the opportunity cost of purchasing physical capital. Three types of cost are involved in each period of the life of the equipment. First, the interest cost of the capital good, which is the opportunity cost of funds in the capital good. Second, if the market price of new capital equipment rises over time, the price of the old stock increases above the original purchase price, less depreciation. Lastly, there is the cost in terms of the amount of depreciation. Several mathematical derivations of the standard neoclassical theory have been developed which reflect either maximising profits or minimising costs.

After examining the theoretical issues pertaining to the present study, the earlier empirical research is examined so that it would enable to identify the course of the present study. Empirically too, several models have been developed for the industrial countries and notable among them are Kuznets (1961), Jorgenson (1963), Jorgenson and Griliches (1967), Hall and Jorgenson (1967, 1969 and 1971), Christensen and Jorgenson (1969, 1970), Cashin (1995). Kuznets quantified the
long sweep of the historical experience of the United States and 13 other developed
countries. Studies by Jorgenson et al. concentrated on capital as a factor of
production, tax structure for corporate capital income, application of the endogenous
growth models, and asset pricing equations to link prices used in evaluating capital
stocks and rental prices in constant quality index of capital. Cashin emphasised the
role of fiscal policy in economic growth with government expenditure directly
affecting production functions of the private sector in an endogenous growth setting.
In the case of developing countries, only a few studies are available such as
Sunderarajan and Thakur (1980), Tun Wai and Wong (1982), Blejer and Khan
(1984), Joshua and Villanueva (1991) and Mohanty (1995). Of these, studies on
India and Korea by Sunderrajan and Thakur showed that public investment crowd
out private investment in the short-run but in the long run played a complimentary
role. Mohanty finds that 'tests based on direct crowding out' show those public
investments and interest payments reduce private consumption and contribute to
national savings and capital formation. Similar studies in India by Bardhan (1984),
Krishnamurthy and Saibaba (1982), Pradhan et al. (1990), Bhattacharya et al. (1994)
and Pillai et al. (1997) show varied results. The studies on developing countries are
limited in scope due to several reasons such as existence of market segmentation,
valuation problems, and difficulties in measuring capital stock and many other
related factors.

It has been found that from these empirical studies both on developed and
developing countries, the country experience varies. Besides, two opposite views
have emerged. One school advocates that public investment 'crowds out' private investment in the growth process when the former utilizes the scarce resources which normally is available for the use of the private sector. This takes place when the public investment results in the production of marketable goods, which competes with those produced in the private sector. Alternatively, if public investment were financed through taxation, inflation or debt, it would reduce the resources available to the private investments and hence reduce private sector investments. The second school argues that the 'crowding in' occurs when public investment takes place in the form of infrastructure or public goods, it would play a complimentary role to private investments. The 'crowding in' effect is brought about by raising capital productivity, which in turn, pushes up the demand for inputs and other services. All these eventually increase the demand for output produced in the private sector and hence there is an increase in private sector investments.

After identifying the two opposing views on public and private investments, the relevance of this in the Indian context is examined. The key macroeconomic link between real and financial sector comes through the saving-investment behaviour, which sets the pace of activity in the economy. In terms of economic growth, trends in investment are important as it not only adds to capital stock, but also helps to determine the supply potential of the economy over the long period of time. Investment as a component of financial asset is a driving force for financial development in India. In the present context of liberalisation and diversification, financial sector reforms and globalisation, investment has become a key variable.
While part of the saving is in physical assets, a large part of it is in the form of financial savings that gets determined through the process of financial intermediation. The financial intermediaries play an important role in collecting and analyzing information so as to channel investible funds to investment activities yielding highest returns. It is in this context that the private saving and investment behaviour is of a critical importance. In developed countries, it is often considered that if public sector accounts are balanced then the private sector saving behaviour should be entirely left as a private agent's decision with no necessity of any government intervention. Nevertheless, what influences private investment is a matter of economic interest as it has a pronounced influence on overall macroeconomy. This influence is all the more important in case of developing economies. It is in this context that we worry about private investment behaviour in India and attempt to empirically track down this issue. Study of the long-run linkages of private investment has been important, particularly so after the liberalization and reforms. The Government has consciously taken a decision to borrow at market related rates and to reduce its fiscal deficit of the central government. The Gross Fiscal Deficit as a percentage to Gross Domestic Product at current market prices went up significantly from 0.6 per cent in 1951, 3.01 per cent in 1969, to reach a peak of 8.99 per cent in 1987. Government reduced it to 5.23 per cent in 1997 due to fiscal consolidation efforts. This in effect impacts Government borrowings, which as a percentage of Gross Domestic Product increased from 21.9 per cent in 1951 to reach a peak of 36.6 percent in 1988 and then gradually declined to 30.8 percent in 1997. Thus, it also, in turn impacts Government expenditure, particularly the capital
expenditure, which as a percentage to Gross Domestic Product increased from 1.46 per cent in 1951 to 5.3 per cent in 1969, and reached a peak of 7.5 per cent in 1987. Thereafter, it declined gradually to 3.3 per cent in 1997. The Reserve Bank too has been emphasising on the importance of reducing Government borrowings in its Annual Reports. The need to place a statutory limit on Government debt (Kanagasabapathy, Pattnaik and Jayanthi, 1997). In the recent years, the capital expenditure has come down substantially, and, therefore, the level and composition of revenue expenditure has gained prominence in the recent years. The revenue expenditure of the central Government as a percentage to Gross Domestic Product has increased from 3.7 per cent in 1951 to 7.4 per cent in 1969, and reached a peak of 14.1 per cent in 1990. It has marginally declined to 12.45 per cent in 1997.

In India, the process of financial deepening has been prominent since the planning era. The role of financial system in capital accumulation can be best judged by the trends in certain financial deepening ratios. The relationship between financial development and overall economic growth is reflected in the finance ratio. In India, this ratio which was less than 1 per cent during 1951-52 and around 17 per cent in early ‘seventies rose steadily to reach 29 per cent in 1995-96. The relationship between financial development and the growth of physical investment is captured by Financial Interrelations Ratio (FIR). In India, this ratio has gained significance as compared with the other ratios and it increased from 0.08 per cent in 1951-52 to 1 per cent in the ‘seventies and to 2.26 per cent in 1995-96. The expansion of bank branch network since 1969, the growth of development financial
institutions and the later impetus to growth in non-bank financial companies promoted the process of saving, investment and growth in the Indian economy. It has also been found that the household savings by the private corporate sector have been increasing largely in the form of mutual fund investments (Rangarajan, 1994). The proportion of corporate securities in the total sources of funds is showing an increase, as reflected in the proportion of funds mobilised through the issue of corporate securities (equities excluding bonus shares and debentures) from around 10 per cent in 1980-81 to 23.15 per cent in 1991-92. How far has this financial deepening affected private investment is an important area of interest.

Indian economy even today is substantially influenced by developments in the agriculture sector. Earlier, these vagaries of monsoon largely set the rate of Gross Domestic Product growth. While this link has weakened over the years, it is important to empirically quantify the long-run relationship between overall private investment and agriculture output. There is considerable evidence that there are strong agriculture-industry linkages. In a developing country such as India, which has a strong agriculture base, there are five separate linkages, which could arise either from the demand side or from supply side (Rangarajan, 1982). These include, (i) Agriculture requires industrial inputs, (ii) Agriculture supplies inputs for agri-based industries, (iii) Agriculture influences industrial consumption goods, (iv) A rise in agricultural production could result in increased Government savings which, in turn, gets reflected in Government investment, and may generate a demand for output in basic and capital goods industries, and lastly (v) large variations in agricultural
production could affect private corporate investment via impact of terms of trade on profitability. In this process, one of the channels of influence is the savings and investment linkages. According to Rangarajan (1982), the decline in the growth rate of the industrial sector since 1965 could be explained by the fall in public investment. Although the link between public investment and agricultural performance is indirect, it needs to be explored.

For a large part of the planning era, private investments were immensely influenced by the investments in the command economy. Indian development experience has been unique in its emphasis on the mixed economy framework. Public investments in infrastructure and other parts of the economy influenced private investment decisions through two competing mechanisms. On the one hand, they crowded-out private investment opportunities; on the other, they, through enhanced competition with private sector, crowded out part of the latter's investment. In the net terms, the relationship is indeterminate and is to empirically settled by investigating the long-run relationship. Existing evidence shows that declines in public investment were partly responsible for slowdown in industrial production starting mid-sixties (Patnaik, 1972). The trends in the public and private investments in India reveal that the former showed a steady increase since 1950 to 1990, while the latter increased its share in the total investments since 1991.
On the basis of the theoretical, empirical and Indian context, the present Chapter examines the long-run relationship between private investment, financial development, and agricultural output and government expenditure.

Methodology

The present study has adopted multiple cointegration procedure. The vector autoregression (VAR) has an advantage that it does not depend on arbitrary division of variables into endogenous and exogenous categories. The long-run relationship is captured through Johansen (1988) - Jusileus (1990, 1994) multivariate cointegration technique based on Trace and Max-Eigenvalue tests. Financial development is captured through the financial deepening variable, viz., Financial Intermediation Ratio (FIR). India continues to be predominantly rural and agricultural despite fifty years of planned development (Rath, 1989). The proportion of population dependent on agriculture remained unchanged at 70 per cent till 1971 and has registered only a marginal decline during the last two decades. Therefore, the real sector is represented by Agriculture output in the index form. Thus, the analysis uses one dependent variable, viz., private investments and three independent variables, viz., Financial interrelations ratio, Index of Agricultural Production and public investment and their lags.

The multiple cointegration analysis based on Johansen's approach were done on the basis of the following steps:
1. Given a vector of Y of n potentially endogenous variables, the model of Y as an unrestricted vector autoregression (VAR) with k lags of Y can be specified as:

\[ Y_t = a_1 Y_{t-1} + \ldots + a_k Y_{t-k} + u_t \quad \text{where} \quad u_t \sim N(0, \Sigma) \quad \ldots \ldots 1 \]

The Y is (nx1) and \( a_i \) is an (nxn) matrix of parameters.

2. In its reduced form with each variable in \( Y_t \) regressed only on lagged values of both itself and all other variables can be specified as:

\[ \Delta Y_t = C_1 \Delta Y_{t-1} + \ldots + C_{k-1} Y_{t-k+1} + \Pi Y_{t-k} + U_t \quad \ldots \ldots 2 \]

where \( C_i = - (i-a_i \ldots -a_i) \); \( i=1, \ldots, k-1 \) and \( \Pi = -(I-a_i \ldots -a_k) \).

This kind of specification has information on the short run and the long run adjustment to changes in \( Y_t \) through the estimates of \( \hat{C}_i \) and \( \hat{\Pi} \) respectively. The \( \Pi = \alpha \beta', \) where \( \alpha \) is the speed of adjustment to disequilibrium, while \( \beta' \) is as matrix of long-run coefficients in such a way that \( \beta' Y_{t-k} \) in equation 2 represents up to \( (n-1) \) cointegration relationships in a multivariate model ensuring that \( Y_t \) converge in their long run steady state solutions.

3. Rewriting equation 2 as:

\[ \Delta Y_t + \alpha \beta' Y_{t-k} = C_1 \Delta Y_{t-1} + \ldots + C_{k-1} \Delta Y_{t-k+1} + U_t \quad \ldots \ldots 3 \]

enables correcting short run dynamics by regressing \( \Delta Y_{t-k} \) and \( Y_{t-k} \) separately on the right hand side of equation 3.

4. Thus, the vectors \( V_{0t} \) and \( V_{kt} \) are obtained from,
\[ \Delta Y_t = x_1 \Delta Y_{t-1} + \ldots + x_{k-1} \Delta Y_{t-k+1} + V_{0t} \quad \ldots 4 \]

\[ Y_{t-k} = z_1 \Delta Y_{t-1} + \ldots + z_{k-1} Y_{t-k+1} + V_{kt} \quad \ldots 5 \]

5. Equation 5 is used to form the residual (product moment) matrices as:

\[ R_{ij} = z^\prime \Sigma V_{it} V_{jt}^\prime \quad (i,j=0,k) \]

6. The maximum likelihood estimate of \( \beta \) is obtained as eigenvectors corresponding to the \( r \) largest eigenvalues from solving the equation,

\[ \begin{vmatrix} \lambda R_{kk} - R_{k0} R_{00}^{-1} R_{k0} \end{vmatrix} = 0 \quad \ldots \ldots 7 \]

This gives \( n \) eigenvalues, \( \lambda_1 > \lambda_2 > \lambda_3 \ldots \ldots > \lambda_n \) and the corresponding eigenvectors \( \hat{E} = (\hat{e}_1, \hat{e}_2, \ldots, \hat{e}_n) \). The \( r \) elements in \( V \), determining the linear combination of the stationary relationships can be denoted as, \( \beta^* = (\hat{e}_1 \ldots \hat{e}_t) \) and these are cointegrating vectors as the eigen values are the largest squared canonical correlations between the 'levels' residuals, \( V_{kt} \) and the difference residuals, \( V_{0t} \). the marginal magnitude of \( \lambda_1 \) measures how strongly the cointegration relations \( \hat{e}_1 \Delta Y_t \) i.e., \( \beta_i \Delta Y_t \) are correlated with the stationary part of the model.

7. By solving the equation 7, \((n-r)\) combinations are obtained i.e., \( \hat{e}_i \Delta Y_t \) \((i=r+1, \ldots n)\) indicate the non-stationary combinations. Theoretically these are not correlated with the stationary elements in equation 1.
8. Let \( N \) denote the number of time period and the trace test \( T \) is computed as:
\[
Y = N \sum_{i=k+1} \log(1 - \hat{\theta}_i^z)
\]

9. The maximum eigen value test is chosen which uses the largest squared canonical correlation or eigen values as follows:

Maximum eigen value Test = \(-N \log (1-\hat{\theta}_{k=1})\).

10. Lastly, the test statistic is compared with the appropriate table in the Johansen and Juselius (1990).

**Empirical Results and Discussion**

The results are presented in Table V.1. It reveals the results of the relationship between financial and real sector in India. Based on economic theory and the results of the trace and lamdamax tests, the cointegrating vector chosen is as follows:

\[
Pvtlnv = 2.513 \text{ FIR} + 0.018 \text{ IAP} + 0.464 \text{ PubInv}.
\]

Later the error correction model was run and it showed that the error correction term was positive and stable.

The results show that financial deepening (FIR) promoted by private investment (PvtInv), agricultural output (IAP) had a positive effect on public investment. The Government investment crowds in private investment in India, contrary to the crowding out theory. Investment plays a crucial role not only in financial development but also in the economic growth process. In general, financial intermediation facilitated this process of efficient pooling of surpluses of the savers.
and channeling them as investments to sectors having financial deficits. The quality of investment is important in setting the rate of growth. It depends on many factors, of which efficiency of investment is the most prominent one. As the investment kitty comprises public and private investments with the former showing a declining trend due to several factors such as awareness to place a limit on government borrowing, the Government's decision to restrict the Gross Fiscal Deficit (GFD), the changing perception in the operations of the government undertakings etc., besides, with monetary policy aiming to ease the liquidity conditions through a reduction in the statutory reserve requirements, more funds are now available to the private sector. This, therefore supports the 'crowding in' theory.

Concluding Remarks

This Chapter attempted to empirically analyse the linkages between financial sector indicators and real sector indicators in India. The linkage was brought about by Investment through which macroeconomic policies influence the real sector. Within investments, private investment decisions in India have been largely influenced by public investments. The latter either crowds in or crowds out the former. For the purpose of analysis, multiple cointegration technique of Johansen-Juselius was adopted. The results showed that public investments crowds in private investments in India. The public investments play a crucial role in enhancing profitability of private investments. The present results advocates the need for financial and fiscal sector reforms to attain higher levels of economic growth. India has also rightly undertaken financial and fiscal sector reforms. Study of the long-run
linkages of private investment has been important, particularly so after the liberalization and reforms. The Government has consciously taken a decision to borrow at market related rates and to reduce its fiscal deficit of the central government. Thus, it also, in turn impacts Government expenditure, particularly the capital expenditure. There is a large role for government intervention which can take many forms. Policy makers can coordinate private sector production and investment decisions through interventions in credit allocation, taxation and industrial policies and regulations.
Table V.1: Results of Multiple Cointegration Analysis

<table>
<thead>
<tr>
<th>Rank</th>
<th>Lamdamax</th>
<th>Trace</th>
<th>Eigen Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>r=0</td>
<td>35.798</td>
<td>6.006</td>
<td>0.549</td>
</tr>
<tr>
<td>r=1</td>
<td>22.090</td>
<td>30.208</td>
<td>0.388</td>
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<tr>
<td>r=2</td>
<td>7.917</td>
<td>8.118</td>
<td>0.161</td>
</tr>
<tr>
<td>r=3</td>
<td>0.200</td>
<td>0.200</td>
<td>0.004</td>
</tr>
</tbody>
</table>