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Monetary Modelling of the Indian Economy : A Survey

Narendra Jadhav*

This paper presents an analytical survey of monetary sector modelling in India. The analytics of Indian macroeconomic models spanning the entire period of model-building activity upto the year 1990 are reviewed. The attention is focussed on 11 full-fledged, simultaneous, multi-sector, multi-equations macroeconomic models of the Indian economy. While the emphasis is primarily on the monetary sector modelling, relevant feedbacks to and from the other sectors are also delineated. With a view to enhancing readability and comparability, all macroeconomic models have been expressed in a standardised notation. The analytical evolution of the model-building activity in India is traced out and critical comments are offered with the purpose of providing directions for future research.

"EVEN if a scientific regularity were less accurate than the intuitive hunches of a virtuoso, the fact that it can be put into operation by thousands of people who are not virtuosos gives it a transcendental importance".

P. A. Samuelson
(Research in Macroeconomics).

Macroeconometric model building is no longer a matter of esoterics in India. Over the years, an increasing number of studies have resorted to quantitative analyses based on econometric techniques. As a result, macroeconometric model building has become an integral and essential part of many a research effort.

With the growing influx of econometric models, stock-taking in the form of critical surveys would be useful, as it provides new directions for research. Indeed, 34 years have elapsed since the

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publication of the first Indian macroeconometric model (Narsimham, 1956) and roughly half-way through this period, Desai (1974) presented a useful survey of Indian macroeconometric models developed till the end of 1960's. Since then, model building activity has intensified. Several macroeconometric models have emerged which are not only larger in size but also more diverse, complex and technically sophisticated. Yet, barring occasional review comments, no comprehensive survey is available in the literature¹. The present survey makes an attempt to remedy partially the situation.

An extensive survey of all the Indian macroeconometric models in their entirety is a formidable task and is therefore beyond the scope of this paper. This paper is confined to a more manageable task of surveying the monetary sector modelling in the Indian macroeconometric models, with due allowance for feedbacks to and from the other sectors.

The paper is organised as follows: Section I provides a taxonomy of macroeconometric models surveyed. Sections II and III survey selected models of the earlier vintage, i.e., those developed during the 1960's and 1970's respectively, Section IV, then presents a detailed review of the macroeconometric models of relatively recent origin including the latest ones published in 1990. Finally, Section V presents an analytical assessment of the evolution of the Indian macroeconometric models.

I. Taxonomy of Macroeconometric Models and Scope of the Survey

A macroeconometric model, like any other model, represents a compromise between reality and manageability. A model should be realistic in the sense of incorporating the main elements of the real world phenomenon and at the same time, it should be manageable so as to generate insights not readily obtainable from direct observations of the real world². Either extreme is undesirable. The models which are highly realistic but hardly manageable are virtually useless and there is no need to develop such models in the first place. On the other hand, models which are overly manageable but grossly unrealistic may lead to conclusions

which are totally misleading and, at times, even perilous. The essence of good modelling thus, lies in striking the right balance between realism and manageability².

A model must be cohesive. A stack of equations, by itself, is meaningless, for what is important is that intricate inter-linkages among variables must be skilfully delineated so as to make the proposed model logical and realistic. It is in this sense that model building is as much an art as it is a science.

A macroeconomic model can serve one or more of the three basic objectives : explanation, prediction and evaluation. Macroeconomic models which are "explanatory" in their focus, aim at structural analysis, i.e., understanding the real-world phenomena by quantitatively measuring, testing and validating economic relationships. In the broadest sense, such models attempt to enhance understanding of the working of the economy. "Forecasting" type of macroeconomic models go a step beyond structural analysis and attempt to make quantitative predictions, often outside the sample period. Finally, macroeconomic models that emphasise "policy evaluation" aim at assessing the implications of policy actions by simulating them and comparing the relevant conditional forecasts. Clearly, paucity of policy instruments may not be a serious constraint in respect of the "explanatory" or "forecasting" type of macroeconomic models whereas, in the case of the policy-oriented models, the usefulness is directly contingent upon the policy instruments embedded in the model.

Having specified the common yardsticks with which to judge the models under review, broad contours of the present survey may now be outlined :

1. Although the primary focus of the survey is on the monetary sector, its modelling cannot be examined in isolation. A macroeconomic model of a reasonable size may have several sectors such as the real sector, monetary sector, fiscal sector, external sector and the price sector. Since the monetary sector forms an integral part of the overall structure, the impulses that it sends to other sectors and the feedbacks that it receives from them also must be examined while evaluating the monetary sector modelling.

In the Indian context, the interaction of the monetary sector with the fiscal sector is especially important. A substantial part of the so called "fiscal deficit"³, is financed by the net RBI credit to Government - the principal source of reserve money creation, which in turn, is believed to form the basis of the money supply process. Likewise, the interaction of the monetary sector with the real sector is reflected in the demand functions for money stock and its components as well as in the price formation. Similarly, the external sector determines the changes in net foreign assets of the RBI which feeds into the money stock determination.

In the light of these considerations, the monetary sector has been viewed in this survey in a broader sense, making due allowance for relevant feedbacks to and from other sectors, in particular, the fiscal sector.

2. The survey spans the entire period of model building activity in India. To an extent, therefore, it overlaps with Desai's (1974) survey. Given the thematic focus of the present survey, such an overlap is unavoidable for the sake of completeness. As it turns out, there is only one model among those covered by Desai that has a prominent monetary sector. Accordingly, that model, i.e., Mammen (1967) is the only one common to the two surveys.

3. The survey is confined only to the full-fledged simultaneous, multi-equation, multi-sector macroeconomic models. Several interesting econometric studies dealing with narrowly defined issues such as the demand for money or the predictability of money multiplier, etc., within the confines of the monetary sector are ignored. Although important, these studies ought to find a place in relevant topical surveys rather than a broader survey such as the present one.

4. In some cases one finds that the same author has more than one model to his or her credit. Krishnamurty (1964 and 1984), Pani (1977 and 1984), Pandit (1973, 1978 and 1984) are some better known examples. In such cases, only the latest version of the relevant model has been chosen for the survey.

With these considerations, the following 11 models have been

selected for review in this survey :

- 1) T. Mammen (1967)
- 2) G. S. Gupta (1973)
- 3) Isher Ahluwalia (1979)
- 4) Rao D. C. , Venkatachalam T. R. , and Vasudevan A. (1981)
- 5) Madhur Srinivas, Pulin Nayak and Prannoy Roy (1982)
- 6) K. Krishnamurty (1984)
- 7) V. Pandit (1984)
- 8) P. K. Pani (1984)
- 9) T. K. Chakravarty (1987)
- 10) Narendra Jadhav and Balwant Singh (1990)
- 11) C. Rangarajan and R. R. Arif (1990)

Two of the chosen models, viz., Rao, Venkatachalam & Vasudevan (1981) and Madhur, Nayak & Roy (1982) are of the "forecasting" variety, two, viz., G. S. Gupta (1973) and T. K. Chakravarty (1987) are "policy-oriented", whereas, the remaining seven models are "explanatory" in character.

The explanatory models can be further classified into sub-groups, depending upon whether they are economy-wide or focussed on a specific phenomenon. Among the seven explanatory models, four [i.e., Ahluwalia (1979), Krishnamurty (1984), Pani (1984) and Pandit (1984)] are economy-wide whereas, the remaining three [i.e., Mammen (1967), Jadhav-Singh (1990) and Rangarajan-Arif (1990)] focus on specific phenomena.

Alternatively, the explanatory models could also be classified based on their analytical foundations. Those, which take a disaggregated approach to price formation placing emphasis on "structural" or "institutional" factors besides the monetary factors may be termed as "structuralist" models, whereas, those which place an exclusive accent on the monetary factors in price behaviour may be regarded as falling in the so called "monetarist" tradition. According to this criterion, Krishnamurty (1984), Pani (1984) and Pandit (1984) may be classified as "structuralist" models, whereas, Ahluwalia (1979), Jadhav-Singh (1990) and Rangarajan-Arif (1990) may be deemed to be in the "monetarist" tradition.

All these models have been examined in the following sections. With a view to enhancing the readability and comparability, all models have been expressed in a standardised notation summarised in Appendix A. The focus of the survey is on model formulation rather than estimation results, the latter are relegated to Appendices B1 through B11. While standardising the notations, finer differences among some variables may have been obscured due to generic expressions used in the interest of brevity. Such qualitative differences, however, have been made explicit in the Appendices B1 through B11.

II. Early Macroeconometric Models

Most macroeconometric models in the early phase of model-building in India, i.e., before 1970, have been extensively reviewed by Desai (1974)⁴. These models include Narasimham (1956), Choudhary (1963), Marwah (1964) and its extended version Marwah (1969), Krishnamurty (1964) and its extended version, Krishnamurty & Choudhary (1968), Mammen (1967) and Agarwala (1970).

Monetary sector modelling in these studies is either non-existent or is rudimentary. As Desai (1974) has noted, "money supply is an exogenous variable for the models though often it is not clearly specified" (p. 180). Moreover, "Given the increasing role of Government in capital accumulation and growth in the 1950's and 1960's it is also remarkable that the Government sector in these models is so under-specified" (Desai, 1974, p. 180). Absence of a well-defined government sector has meant very weak links between real, monetary and fiscal sectors.

Apart from Desai's 1974 survey, Pani (1977) and Ahluwalia (1979) in their brief comments have identified Mammen's Model (1967) as probably the only one that attempted systematic modelling of the monetary sector in India during the pre-1970 period. Accordingly, the same is chosen for review in the present survey.

Mammen's Model⁵(1967)

Mammen's model, has 24 equations estimated for the period

1948-49 through 1963-64.

The monetary sector in Mammen's Model may be described as follows :-

(a) Components of Money Supply

Demand for currency (C) in nominal terms is postulated as a positive function of nominal income (YN) and time trend (t) but a negative function of the exogenously determined short-term interest rate (Rs). Similarly, demand for nominal demand deposits (DD) is related positively to nominal non-agricultural income (YNAN) but negatively to short-term interest rate (Rs). Likewise, demand for nominal time deposits (TD) is related positively to nominal income (YN) and the own rate of return (RTD) but negatively to the short-term interest rate (Rs). Thus,

$$\begin{aligned} \text{Eq. (1) } C &= f(YN^+, Rs^{-0}, t^{+0}) \\ (2) \text{ DD} &= f(YNAN^+, Rs^{-0}) \\ (3) \text{ TD} &= f(YN^+, RTD^+, Rs^{-0}) \end{aligned}$$

(b) Rates of Return

Among the nominal rates of return, the interest rate on short-term deposits (Rs) and bank rate (RB) are exogenous, which, along with other variables, such as, the exogenous supply of government securities to the non-bank public (GSP) and profits (PRF) determine the remaining rates of return including the rate of return on government securities (RG), the interest rate on time deposits (RTD), the loan rate (RL) and the rate of return on industrial securities (RIS). Thus,

$$\begin{aligned} \text{Eq. (4) } RG &= f(Rs^{+0}, GSP^{+0}) \\ \text{Eq. (5) } RTD &= f(RG^+, (RTD)_{-1}^+) \\ \text{Eq. (6) } RL &= f(Rs^{+0}, RB^{+0}) \\ \text{Eq. (7) } RIS &= f(RG^+, PRF^{-0}) \end{aligned}$$

(c) Commercial Banks' Assets

Required reserves of banks (RR) are positively related to their demand and time deposits, whereas, excess reserves (expressed as percentage of demand and time deposits) are inversely related to the loan rate (RL). Thus,

$$\text{Eq. (8) } RR = f (DD + TD)^{+}$$

$$\text{Eq. (9) } \left[\frac{ER}{DD+TD} \right] = f (RL)^{-}$$

The sum of demand and time deposits is deemed to be equal to the outstanding bank credit to government (BCG) and to the non-bank public (BCC). Thus,

$$\text{Eq. (10) } DD + TD = BCG + BCC$$

The asset choice among (BCG) and (BCC) is determined by the following equation :

$$\text{Eq. (11) } \left[\frac{BCG}{BCC} \right] = f \left[\left(\frac{Rs^0}{RG} \right)^{-}, (BCG + BCC) \right]$$

which implies that the larger the quantum of total credit (BCG + BCC), and/or the lower the return on government securities, banks' credit to the government would be smaller relative to credit extended to the private non-bank public.

Finally, the price level (P) is determined by the exogenous agricultural price level (PA) and the ratio of broad money to nominal income. Thus,

$$\text{Eq. (12) } P = f \left[PA^{+}, \left(\frac{C + DD + TD}{YN} \right)^{+} \right]$$

which completes the monetary sector of the model.

The monetary sector model as discussed above, is combined with a simple real sector model formulated in the Keynesian theoretical framework, with aggregate output determined by effective demand. Stochastic equations have been formulated in exceedingly simple fashion for private consumption, private and government investment, indirect taxes and imports.

III. Macroeconometric models of the 1970's

The model building activity accelerated during the 1970's. During this period, several macroeconometric models emerged including G.S.Gupta (1973), Pandit (1973), and (1978), Pani (1977) and Ahluwalia (1979). For the purpose of the present survey, a model each from the early 1970's (i.e., G.S.Gupta (1973)) and the late 1970's (i.e. Ahluwalia (1979)) are chosen⁶.

A) Gupta's Model (1973)

Gupta's model, originally a part of his Ph.D. dissertation submitted to Johns Hopkins University in 1970, has 42 equations covering the period 1948-49 through 1967-68.

For analytical purposes, Gupta's model may be deemed to comprise three sub-sectors⁷ covering government (including the RBI), commercial banks and the private non-bank sector. Portfolio behaviour of these sectors is examined with reference to six financial assets, viz., currency, demand deposits, time deposits, bank reserves, government securities and credit to the private non-bank sector.

(a) Components of Money Supply

Currency holdings of the non-bank private sector are demand-determined. Demand for nominal currency (C) is postulated as a positive function of nominal income (YN) and time trend (t) but a negative function of interest rate on time deposits (RTD).

$$\text{Eq. (1) } C = f(YN^+, RTD^-, t^+)$$

Demand deposits are also demand-determined. Demand for nominal demand deposits (DD) is posited as a positive function of nominal non-agricultural income (YNAN) but a negative function of the loan rate (RL)

$$\text{Eq. (2) } DD = f(YNAN^+, \bar{RL})$$

"Disposable" demand deposits (DD*) are then given by

$$\text{Eq. (3) } DD^* = DD - RRDL^0 \cdot \left(\frac{DL}{DD}\right)^0 \cdot DD$$

Where $RRDL$ = reserve ratio on demand liabilities (exogenous),

and $\left(\frac{DL}{DD}\right)$ = ratio of demand liabilities to demand deposits of banks (exogenous).

Demand for nominal time deposits of banks (TD) is assumed to be positively related to nominal non-agricultural income (YNAN), time trend (t) and the own rate of return (RTD) but responds negatively to rates of return on competing assets like government securities (i.e., RG) or loan rate (RL). Thus,

$$\text{Eq. (4) } TD = f(YNAN^+, RTD^+, t^+, \bar{RG}, \bar{RL})$$

Once again, nominal "diposable" time deposits (TD*) are given by

$$\text{Eq. (5) } TD^* = TD - RRTL^0 \cdot \left(\frac{TL}{TD}\right)^0 \cdot TD$$

as in the case of demand deposits.

It may be noted that time deposits (TD) in Gupta's model are not demand determined. The supply of time deposits has been modelled in the form of a reduced form equation that determines the rate of return on time deposits (RTD). Thus,

$$\text{Eq. (6) } \text{RTD} = f(\bar{\text{DD}}^*, \bar{\text{TD}}^*, \text{RG}^+, \text{RL}^+, \text{lag})$$

(b) Bank Reserves

Required reserves of banks are determined by the following identity :

$$\text{Eq. (7) } \text{RR} = \text{RRDL}^0 \cdot \left(\frac{\text{DL}}{\text{DD}}\right)^0 \cdot \text{DD} + \text{RRTL}^0 \cdot \left(\frac{\text{TL}}{\text{TD}}\right)^0 \cdot \text{TD}$$

On the other hand, demand for excess reserves of banks (ER) is assumed to be positively related to their deposit base, i.e., "disposable" demand and time deposits (DD^* and TD^*) and the bank rate (RB) but negatively related to rates of return on other assets such as government securities (RG) and loan rate (RL). Thus,

$$\text{Eq. (8) } \text{ER} = f(\text{DD}^{*+}, \text{TD}^{*+}, \text{RB}^+, \text{RG}^-, \text{RL}^-, \text{lag})$$

On the other hand, "borrowed reserves" of banks (i.e., banks' borrowings from the RBI, RBCB) are assumed to be demand determined. Relevant demand relationship is posited as a positive function of banks' resource base (i.e. $\text{DD}^* + \text{TD}^*$), and difference between the loan rate (RL) and the bank rate (RB). Thus,

$$\text{Eq. (9) } \text{RBCB} = f[(\text{DD}^* + \text{TD}^*)^+, (\text{RL} - \text{RB})^+, \text{lag}]$$

The market clearing condition for bank reserves determines the unborrowed reserve money (H^*) as follows :

$$\text{Eq. (10) } \text{H}^* = \text{C} + \text{RR} + \text{ER} - \text{RBCB}$$

The unborrowed reserve money (H^*) is treated as an "endogenous policy variable" in the model.

(c) Government Securities

Since the RBI is treated as a part of the government, there is no room for variables like the net RBI credit to government (RBCG). Instead, attention is focussed on government securities

held outside the RBI, denoted by (GS).

The demand for government securities (held outside the RBI) comes from banks and the private non-bank sector. Banks' demand for government securities (or equivalently, bank's supply of credit to government), denoted by BCG, is assumed to be a positive function of their resource base comprising DD^* and TD^* , as well as the rate of return on government securities (RG) but a negative function of the loan rate (RL). Thus,

$$\text{Eq. (11) } BCG = f(DD^+, TD^+, RG^+, RL^-, \text{lag})$$

The private non-bank sector is assumed to absorb all government securities that are not demanded by the banking sector. In other words, the private non-bank sector's demand for government securities (or equivalently, their credit to government, GSP) is determined residually. In other words, the private non-bank sector is assumed to absorb all exogenously supplied government securities that are not demanded by the banking sector. Thus the equilibrium condition is given by

$$\text{Eq. (12) } GS^0 = BCG + GSP$$

(d) Credit to the Private Non-bank Sector⁸

Demand for credit by the private non-bank sector (CC) is assumed to be positively related to the nominal non-agricultural income (YNAN) and time trend, but negatively to the loan rate (RL). Thus,

$$\text{Eq. (13) } CC = f(YNAN^+, t^+, RL^-)$$

On the supply side, bank credit to the private non-bank sector (BCC) is a positive function of their resource base (DD^* , TD^*), and the loan rate (RL) but a negative function of the rate of return on alternate assets such as government securities (RG). Thus,

$$\text{Eq. (14) } BCC = f(DD^+, TD^+, RL^-, RG^-, \text{lag})$$

Credit of the government sector (including the RBI) to the private non-bank sector (GCC) is exogenous.

The market clearing condition is given by :

Eq. (15) $CC = BCC + GCC^0$ which implicitly determines the loan rate (RL).

(e) Other Equations

Finally, there is a government budget constraint in the model which takes the form :

Eq. (16) $FD = \Delta H^* + (\Delta GS - \Delta GCC) + \Delta OSF$

Thus, fiscal deficit⁹ of the government is financed by new issues of unborrowed reserve money (ΔH^*), government's net borrowings from banks and the private non-bank sector (i.e., $\Delta GS - \Delta GCC$) and changes in other sources of financing (ΔOSF) such as net borrowings from abroad, foreign aid, etc.

The monetary sector model, as discussed above is combined with a simple real sector model in the Keynesian theoretical framework. Nominal income is determined by the effective demand, wherein government consumption, government investment and exports are exogenous. Aggregate output, on the other hand, comprises exogenous agricultural output and endogenous non-agricultural output, the latter being related to the real capital stock and the time as a proxy for technology. The real capital stock is related to a set of endogenous and exogenous variables through private and government investment.

The general price level is determined as a ratio of aggregate nominal demand to aggregate output. Thus,

Eq. (17) $P = \left(\frac{Y_N}{Y_R} \right) \times 100$

B) Ahluwalia's Model¹⁰ (1979)

Ahluwalia's model aims at analysing the behaviour of prices and

outputs in the Indian economy, "combining elements of structural, demand-pull, cost-push and monetary theories of inflation" (p. 17). Unlike the then existing models where the focus was on the components of aggregate demand, this model emphasises the disaggregation on the supply side, dealing with fluctuations in output, marketed surplus and the like.

The model has 67 equations and is estimated using annual data for the period 1950-51 to 1972-73. The monetary sector proper has three blocks : RBI, commercial banks and the non-bank public. Moreover, in addition to the real and fiscal sector, external sector is also incorporated in the model. The monetary sector of the model may be described as follows :-

(a) Components of Money Supply

The stock of money in Ahluwalia's model is defined in terms of the narrow measure, M1, consisting of currency and demand deposits. The role of time deposits (and hence broad money M3) is incorporated separately. A distinctive feature of Ahluwalia's model is that demand functions for these components are couched in real terms unlike the Mammen's model or Gupta's model wherein they are specified in nominal terms.

Demand for real currency holdings (C/P) is postulated as a positive function of real income (YR), but a negative function of the exogenously determined rate of return on short-term deposits (Rs) and the expected inflation rate¹¹ (π). Thus,

$$\text{Eq. (1) } \left(\frac{C}{P}\right) = f(YR^+, Rs^{-0}, \pi^{-0})$$

The demand for narrowly defined real money balances ($M1/P$) has similar specification from which, the demand for demand deposits is derived residually. Thus,

$$\text{Eq (2) } \left(\frac{M1}{P}\right) = f(YR^+, Rs^{-0}, \pi^{-0})$$

$$\text{Eq. (3) } DD = \left[\frac{M1}{P} - \frac{C}{P} \right] \times P$$

The ratio of time-deposits (TD) to demand deposits (DD) is assumed to be positively related to real non-agricultural income (YNAR), and the exogenous rate of return on time-deposits (RTD) but negatively related to the exogenously determined rate of return on government bonds (RG). Thus,

$$\text{Eq. (4) } \left(\frac{TD}{DD} \right) = f \left(YNAR^+, RTD^+, RG^- \right)$$

Demand for nominal time deposits (TD) is then derived simply as :

$$\text{Eq. (5) } TD = \left(\frac{TD}{DD} \right) \times DD.$$

(b) Portfolio of the RBI

Before discussing the portfolio of the RBI, it may be useful to briefly outline the fiscal sector in the model.

Government receipts are decomposed into direct tax revenues, from agriculture and from non-agricultural sector, indirect tax revenues from customs and other indirect tax revenues. Revenues are expressed as function of relevant sectoral outputs and the time trend excepting the customs revenues which are linked-up with the value of intermediate imports. On the expenditure side, government wages and salaries have been endogenised as a function of food prices and other revenue expenditure. Government's capital expenditure is exogenous.

The resultant fiscal deficit feeds into the creation of reserve money. The change in reserve money (ΔH) is modelled in the form of a reaction function i.e., it is assumed that the monetary authorities try to relate the change in reserve money (ΔH) to the government's need to finance its fiscal deficit (FD), expected change in nominal income (proxied by the lagged actual) and their lagged stock of foreign assets. Thus,

$$\text{Eq. (6)} \Delta H = f(\overset{+}{FD}, (\overset{+}{\Delta YN} - 1, (\overset{+}{RBNFA})_{-1})$$

The change in the RBI's holdings of foreign assets ($\Delta RBNFA$) is determined residually from the total change in foreign assets (ΔNFA) generated in the external sector and exogenously determined change in holdings of such assets by others ($\Delta NFAO$). Thus,

$$\text{Eq. (7)} \Delta RBNFA = \Delta NFA - \overset{0}{\Delta NFAO}$$

Endogenous changes in monetary base (ΔH) and in the RBI's holdings of net foreign assets ($\Delta RBNFA$) determined in equations (6) and (7) respectively, when combined with the exogenously determined variations in the RBI's credit to banks ($\Delta RBCB$) and in the RBI's holdings of other assets ($\Delta RBOA$) yield the change in the net RBI credit to the government ($\Delta RBCG$) from the RBI's balance sheet constraint :

$$\text{Eq. (8)} \Delta RBCG = \Delta H - \Delta RBNFA - \overset{0}{\Delta RBCB} - \overset{0}{\Delta RBOA}$$

(c) Other Equations

The excess of government's fiscal deficit (FD) over the exogenous capital receipts, internal as well as external, (GKR), determines the change in the banking system's credit to the government ($\Delta BSCG$). Thus,

$$\text{Eq. (9)} \Delta BSCG = FD - GKR^0$$

This equation is interpreted in the model as the government budget constraint.

Given the banking system's credit to government ($\Delta BSCG$) from the government budget constraint and the RBI's credit to government ($\Delta RBCG$) emanating from the RBI's balance sheet identity (i.e., Eq. 8), the commercial bank credit to the government (ΔBCG) is determined residually. Thus, in flow terms,

$$\text{Eq. (10)} \Delta BCG = \Delta BSCG - \Delta RBCG$$

MONETARY MODELLING

The balance sheet identity of the commercial banks can then be written as

$$\text{Eq. (11)} \Delta BCC = (\Delta TD + \Delta DD + \Delta RBCB^0) - (\Delta BR^0 + \Delta BCG + \Delta BOA^0)$$

which simply states that, in flow terms, bank credit to commercial sector (BCC) is the excess of their liabilities i.e., (time deposits, demand deposits and credit from the RBI) over their assets such as bank reserves (BR), bank credit to government (BCG) and other assets (BOA).

Finally, the nominal supply of narrow money (M1) is given by the adjusted money-multiplier approach:

$$\text{Eq. (12)} M1 = m \cdot (H - RRTD \cdot TD)$$

where the money multiplier (m) is determined by the relevant identity :

$$\text{Eq. (13)} m = \frac{\left(\frac{C}{DD}\right) + 1}{\left(\frac{C}{DD}\right) + \left(\frac{BR}{DD}\right)}$$

The nominal supply of narrow money (M1), thus obtained, when combined with the demand for real narrow money balances $\left(\frac{M1}{P}\right)$ (i.e., Eq. 2) yields the aggregate price level (P). Thus,

$$\text{Eq. (14)} P = \frac{M1}{\left(\frac{M1}{P}\right)}$$

which completes the monetary sector model.

IV : Macroeconometric Models of the 1980's

Having attained analytical sophistication in monetary sector modelling during the 1970's, the modelling effort in the 1980's and of late, has become more diversified.

Macroeconometric models developed during this period

comprise all the types discussed in the taxonomy earlier. Of the eight models chosen for review from this period, two are forecasting models (i.e., Rao, Venkatachalam, Vasudevan (RVV) (1981) and Madhur, Nayak and Roy (MNR) (1982)), three are economy-wide structuralist models (i.e., Krishnamurty (1984), Pani (1984) and Pandit (1984)), one is policy-oriented model (i.e., T.K. Chakravarty (1987)) and the remaining two are topical monetarist Models (i.e., Jadhav-Singh (1990) and Rangarajan-Arif (1990)). These models are reviewed next by groups in the chronological order.

(A) Forecasting Models

Short-term forecasting models are focussed, basically, on developing macroeconometric framework for forecasting macro-economic aggregates as a useful input for policy formulation.

In the Indian context, as mentioned before, two such models can be identified .:

- (i) Rao, Venkatachalam, Vasudevan (RVV) Model and
- (ii) Madhur, Nayak, Roy (MNR) Model.

a) The RVV Model (1981)

The RVV Model contends that "short term monetary analyses for policy decisions must go beyond the conventional balance-sheet approach or the simple money-multiplier approach. In the balance sheet approach, currency, bank deposits and reserve money etc. are separately estimated and these estimates are not necessarily consistent with each other, except in that, they conform to the balance sheet constraints" (p. 144). Moreover, in the money-multiplier approach, the multiplier is assumed to be constant even when, in incremental terms, it is known not to be very stable. Accordingly, the RVV model attempts to provide an alternative methodology for consistent estimation of monetary aggregates.

The RVV model is a simple 8 equation model¹² based primarily on the portfolio behaviour of banks and the non-bank private sector

The public's demand for currency is specified in incremental nominal terms (ΔC) as a positive function of nominal income (Y_N) exogenous bank credit for food procurement (ΔBCF) (as a proxy for the actual expenditures incurred in the public procurement of foodgrains), the rate of change in prices in respect of sensitive commodities ($\dot{P}S$) (purported to reflect the speculative demand for currency) and the exogenously determined inflow of foreign remittances (FR) but is negatively related to the rate of return on time deposits (RTD). Thus,

$$\text{Eq. (1)} \Delta C = f \left(Y_N^+, \Delta BCF^{+0}, \dot{P}S^{+0}, FR^{+0}, RTD^{0-} \right)$$

The currency holdings of the public are demand determined and in turn, given the exogenously determined reserve money or monetary base (H), the supply of bank reserves BR^{13} is determined through the reserve money identity. Thus,

$$\text{Eq. (2)} BR = H^0 - C - X^0$$

Where $X =$ Reserves of banks other than the scheduled commercial banks and other deposits with the RBI.

The bank reserves, so determined then determine the banks' supply of liabilities (demand and time). Specifically, banks' supply of liabilities (L) is posited as a positive function of bank reserves (BR) and time deposit-total deposit ratio but is negatively related to the incremental CRR ratio ($ICRR$) and the call money rate (RC). Thus,

$$\text{Eq. (3)} L = f \left(BR^+, ICRR^{0-}, \frac{TD}{D}^+, RC^{0-} \right)$$

In this formulation the ratio of time deposits to total deposits reflects the stability of banks' deposit base. The higher the ratio, the less is the need to hold excess reserves as a precautionary cushion and the greater is the expansion of liabilities corresponding to a given supply of reserves. Also, since borrowing from the call money market can supplement banks' ability to create own liabilities the call money rate appears as an argument with a negative sign.

From the supply of banks' liabilities, their aggregate deposits (D) are determined through a simple statistical equation of the form :

$$\text{Eq. (4) } D = f(L^+)$$

Demand deposits are assumed to be demand determined. The formulation of demand for demand deposits is fairly conventional; with nominal income (YN), share of non-agricultural income to total income (YNAN/YN) and the rate of return on time deposits as the arguments. Thus,

$$\text{Eq. (5) } DD = f\left(YN^+, \left(\frac{YNAN}{YN}\right)^0, RTD^0\right)$$

On the other hand, time deposits (TD) are supply determined, derived residually from the supply of aggregate deposits (D). Thus,

$$\text{Eq. (6) } TD = D - DD$$

The nominal income (YN) is assumed to be determined by supply of money (C+D) and the variables influencing the demand for money such as the real income (YR), the share of non-agricultural income in total income and the inflationary expectations¹⁴ (π). Thus,

$$\text{Eq. (7) } YN = f\left(C + D, YR^0, \left(\frac{YNAN}{YN}\right)^0, \pi^{+0}\right)$$

The equilibrium between money supply and demand is assumed to manifest itself in terms of variations in nominal income. It follows therefore, that the variables such as real income (YR) and the share of non-agricultural income in total income (YNAN/YN) which have a positive influence on money demand have a negative influence on nominal income, given the stock of money and the opposite is true in respect of the inflationary expectations.

Finally, the general price level (P) is determined simply by the identity :

$$\text{Eq. (8) } P = \left(\frac{YN}{YR^0}\right)$$

which completes the model .

b) The MNR Model

The MNR model, in a similar vein, aims at developing a framework for short-term macroeconomic forecasting and policy formulation. General macroeconomic models, it is argued, are "couched in a framework which is not readily amenable to analysing the implications of the annual Central government budget or for short term forecasting purposes" (p.773). The MNR model accordingly presents a methodology for systematically analysing the effect of the budget on certain key macro variables such as money, credit and inflation.

i) Money Supply

The broad money stock (M3) is determined by the so-called 'proximate determinants' of the money-multiplier and the unborrowed reserve money (H^*). Thus,

$$\text{Eq. (1) } M3 = \left(\frac{1+k}{k+r-q} \right) H^*$$

Where k = currency - deposit ratio (C/D),

r = bank reserves - deposit ratio ($\mathcal{B}R/D$),

q = borrowed bank reserve-deposit ratio ($RBCB/D$),

H^* = unborrowed reserve money .

This of course, is the familiar money-multiplier approach. Unlike the conventional formulation, however, the money multiplier is not treated as a constant but varies depending on the values of the three asset ratios (k , r , and q). The variations in these asset ratios, in turn, reflect the behavioural responses of the relevant economic agents to identified policy variables.

The currency-deposit ratio (k), basically a decision variable of the public, is posited as a negative function of the number of bank branches (NB), their spread as measured by the proportion of rural branches in the total (NRB/NB) and the rate of return on deposits (RTD). Thus,

$$\text{Eq. (2) } k = f(NB^{-0}, (\frac{NRB}{NB})^{-0}, \bar{RTD}^0)$$

The bank reserve-deposit ratio (r), which is essentially a decision variable of banks, is assumed to be positively related to the cash reserve ratio in absolute terms (CRR) and in incremental terms (ICRR) as well as the bank rate (RB) but negatively related to the rates of return on the competing assets such as the loan rate (RL) and the rate of return on government securities (RG). Thus,

$$\text{Eq. (3) } r = f(CRR^{+0}, ICRR^{+0}, RB^{+0}, RL^{-0}, RG^{-0})$$

The remaining asset ratio, i.e., the banks' borrowed reserves to deposit ratio (q), is postulated as a positive function of the cash reserve ratios (CRR and ICRR) and the rates of return on bank lendings to the commercial sector (RL) and on government securities (RG), but a negative function of their cost of borrowings i.e., the bank rate (RB). Thus,

$$\text{Eq. (4) } q = f(CRR^{+0}, ICRR^{+0}, RL^{+0}, RG^{+0}, RB^{-0}).$$

(ii) Assets and Liabilities of Banks

Aggregate deposits (D), which are liabilities of commercial banks, are determined in a manner similar to the determination of broad money stock. Specifically,

$$\text{Eq. (5) } D = \left(\frac{1}{k+r+q} \right) \cdot H^*$$

where k , r , and q are the asset ratios defined above.

The counterpart of deposits on the asset side of banks' balance sheet is the aggregate bank credit (BC), which comprises the bank credit to the commercial sector (BCC) and to the government sector (BCG). The aggregate bank credit (BC) is assumed to be determined by a simple "statistical" function:

$$\text{Eq. (6) } BC = f^{+}(D)$$

Once the aggregate bank credit is determined, its allocation between the commercial sector (BCC) and the government sector (BCG) is posited as a portfolio choice problem, modelled as

$$\text{Eq. (7) } \left(\frac{\text{BCC}}{\text{BCG}} \right) = f((R_L^+ - R_G), R_B^+)$$

Thus, bank credit to the commercial sector as a ratio of bank credit to the government sector¹⁵, is postulated as a positive function of the differential between the banks' lending rate (R_L) and the rate of return on government securities (R_G) as well as the cost of bank's borrowing from the RBI¹⁶.

Thus, given the unborrowed reserve money (H^*), the endogenous asset ratios k , r , and q determine the stock of money, aggregate bank credit and its allocation between the commercial sector and the government sector.

iii) Assets and Liabilities of the RBI

The unborrowed reserve money (H^*) may be defined, from the liability side, as :

$$H^* = C + BR - \text{RBCB}$$

i.e., the reserve money ($C+BR$) minus the borrowed reserve (i.e., banks' borrowings from the RBI, (RBCB)).

Alternatively, from the asset side, it may be defined as

$$\text{Eq. (8) } H^* = \text{RBCG} + \text{RBCC}^0 + \text{RBNFA} - \text{RBNML}^0$$

Where RBCG = net RBI credit to the government,

RBCC = RBI credit to the commercial sector,

RBNFA = net foreign assets held by the RBI and,

RBNML = RBI's net non-monetary liabilities.

In the MNR model, RBNML is assumed to be exogenous while the RBCC is deemed to be a policy variable. On the other hand, RBNFA is endogenous and its variations are determined in the external sector¹⁷. The remaining and the most important variable,

RBCG is determined in the fiscal sector. The link equation takes the following form :

$$\text{Eq. (9) } \Delta \text{RBCG} = f^+ (\text{FD}^*)$$

It may, however, be noted that the fiscal deficit (FD*) as defined in the model is quite different from the conventional formulations. With short-term policy as the primary aim, *ex ante* intentions of the government as revealed in the budget are translated into more plausible numbers on the basis of the past deviations in the budget estimates and the corresponding actuals. For this purpose a simple methodology has been proposed to purge the relevant non-random deviations. Having "corrected" the fiscal deficit of the Central Government, the combined fiscal deficit of the Centre, States and Union Territories is derived by simple "blow-up" factors, which then feeds into Eq. (9) to determine the net RBI credit to government, thus providing the crucial link between the fiscal and monetary sectors.

(B) Structuralist Models

Structuralist Models, as mentioned before, take a disaggregated approach to price formation and avoid exclusive reliance on the monetary imbalance in explaining price movements. In these models, generally, "structural" or institutional (i.e. country-specific) factors are incorporated in the price equations, either supplanting the monetary factors or augmenting them as deemed appropriate.

In the Indian context, several studies based on this approach are available¹⁸. Given the eclectic nature of this survey, attention has been focussed on those models in this group, which are of a more recent vintage and therefore, broadly reflect the salient features of the earlier models as well. With this criterion, the discussion here is confined to the following three models:-

- i) Krishnamurty's Model (1984).
- ii) Pandit's Model (1984), and
- iii) Pani's Model (1984).

a) Krishnamurty's Model

Krishnamurty's Model comprising 77 equations and relating to the period 1960-61 through 1979-80 is deemed to be suitable for "studying the pattern and tempo of growth and other long run movements in the economy." It emphasises the critical role played by the agriculture, the growth-inflation trade-off, the secular relationship between money, output and prices and the productivity changes in the economy.

The monetary sector sub-model is relatively small with 13 equations. Moreover, among the structural models its price formation equations are closer to the quantity theory of money, though structural features do play an important role in the model¹⁹. The model may be described as follows:

Money stock, narrowly defined (M_1), is treated as a positive function of the reserve money (H) and lagged money stock. Thus,

$$\text{Eq. (1) } M_1 = f^+(H, \text{lag})$$

The reserve money (H) is derived as an identity from the asset side of the RBI's balance sheet. It thus comprises the sum total of net RBI credit to government (RBCG), government's currency liability to the public (CLG), RBI credit to commercial sector (RBCC), and RBI's holdings of net foreign assets (RBNFA), in excess of RBI's net non-monetary liabilities (RBNML). Thus,

$$\text{Eq. (2) } H = \text{RBCG} + \text{CLG} + \text{RBCC} + \text{RBNFA}^0 - \text{RBNML}^0$$

As far as the components of the reserve money are concerned, RBNFA and RBNML are assumed to be exogenous; the former because there is no external sector in the model and the latter, being a residual item. The RBI credit to the commercial sector (RBCC) is simply related to its own lagged value. Thus,

$$\text{Eq. (3) } \text{RBCC} = f(\text{RBCC}_{-1})$$

The remaining two components, i.e., net RBI credit to government (RBCG) and government's currency liability to the public (CLG) reflect the monetary sector's integral link with the fiscal sector, modelled as under :

The resource gap arising out of the government's fiscal operations i.e., the fiscal deficit (FD) is financed by borrowings from the RBI, other borrowings (domestic & external) or else by enlarging its currency liability to the public. The external borrowings (FB) are assumed to be exogenous. The domestic borrowings outside the RBI (DB), on the other hand, are endogenised by relating them simply to the resource gap in excess of foreign borrowings. Thus,

$$\text{Eq. (4) } DB = f(FD - FB^0)$$

The resource gap uncovered by these borrowings is termed the "high powered deficit" (HPD). Thus,

$$\text{Eq. (5) } HPD = (FD - DB - FB^0)$$

By the balance sheet constraint, then, the high powered deficit brings about an equivalent change in the net RBI credit to government (RBCG) and government's currency liability to the public (CLG). Thus,

$$\text{Eq. (6) } RBCG + CLG = HPD + (RBCG_{-1} + CLG_{-1})$$

which feeds into the money stock through reserve money (i.e., eq. (1) and (2)).

As mentioned earlier a distinguishing feature of the structuralist models is their elaborate and disaggregated treatment of prices. In Krishnamurty's Model, prices are modelled as under:

The general price level (P), as measured by the GDP deflator is posited as a positive function of money-real GDP ratio and the lagged price level in the partial adjustment framework. Thus,

$$\text{Eq. (7) } P = f \left(\frac{M}{YR}^+, P_{-1} \right)$$

The wholesale price index (WPI) is disaggregated into four components: food (PF), non-food agricultural products (i.e., raw materials) (PR), manufacturing and mining products (PM) and energy items (i.e., fuel, power, light and lubricants) (PE). The WPI is derived simply as a weighted combination of these four sectoral prices with weights assigned as in the official index. Thus,

$$\text{Eq. (8) } WPI = 0.298 PF + 0.106 PR + 0.511 PM + 0.085 PE$$

Among the sectoral prices, all except the energy prices (PE) have money-GDP ratio as an argument. Thus,

$$\text{Eq. (9) } PF = f \left(\frac{M}{YR}, \dots \right)$$

$$(10) PR = f \left(\frac{M}{YR}, \dots \right)$$

$$(11) PM = f \left(\frac{M}{YR}, PR, \dots \right)$$

Additionally, per capita availability and per capita real income appear as explanatory variables in PF and PR. In the latter case, exogenous "other agro-based import prices" has also been included as an additional argument. In respect of the prices of manufactures, cost elements including raw material prices (PR), wage rate and imported raw material prices have been incorporated as additional explanatory variables.

On the other hand, energy prices (PE) are assumed to be regulated by the government and adjust with a lag to the general price situation and the prices of imported fuels. Thus,

$$\text{Eq. (12) } PE = f \left(WPI_{-1}^+, \dots \right)$$

Finally, the consumer price index (CPI) is assumed to adjust to the variations in the (WPI). Thus,

$$\text{Eq. (13) } CPI = f \left(\Delta WPI^+, WPI_{-1} \right)$$

which completes the monetary sector model.

b) Pandit's Model (1984)

Unlike the Krishnamurty's model with its emphasis on long-run movements in the economy, Pandit's model is focussed on the short and medium term problems. Accordingly, it emphasises causes and consequences of inflation, monetary & fiscal policy issues, the saving-investment equilibrium and impulses from the external sector. This model has 60 equations and covers a relatively longer sample period, 1950-51 through 1977-78.

Here again, the monetary sector sub-model is somewhat small, with 13 equations. A move towards the "structural" factors in preference to the monetary factors in explaining the price variations, however, is distinctly discernible.

(a) Money Supply and Related Aggregates

Demand for real currency holdings ($\frac{C}{P}$) is postulated as a positive function of real income (YR) but a negative function of short-term interest rate (Rs) and expected inflation rate²⁰ (π) in the partial adjustment framework. Thus,

$$\text{Eq. (1)} \left(\frac{C}{P} \right) = f^+ (YR, \bar{R}_s, \bar{\pi}, \left(\frac{C}{P} \right)_{-1})$$

Demand for demand deposits has a similar specification with the real income (YR) replaced by non-agricultural real income (YNAR). Thus,

$$\text{Eq. (2)} \left(\frac{DD}{P} \right) = f^+ (YNAR, \bar{R}_s, \bar{\pi}, \left(\frac{DD}{P} \right)_{-1})$$

Nominal money supply, narrowly defined (M1), on the other hand, is specified as a positive function of the monetary base (H) and the lending rate (RL). Thus,

$$\text{Eq. (3)} M1 = f^+ (H, RL)$$

The equilibrium in the money market is assumed to be achieved with the short term interest rate (R_s) and/or the expected inflation rate (π) acting as equilibrating devices. However, as can be seen below, the inflationary expectations have no bearing on the actual inflation rate.

The reserve money (H) is endogenously determined as a function of the exogenously determined net RBI credit to the government (current and lagged) and the RBI's holdings of the net foreign assets which is determined in the external sector. Thus,

$$\text{Eq. (4)} \Delta H = f \left((\Delta RBCG^0 + \Delta RBCG^0_{-1}) (\Delta RBNFA^+ + \Delta RBNFA^+_{-1}) \right)$$

Other components of the reserve money are simply ignored

Further, bank credit to the commercial sector (BCC) is specified in incremental terms as a positive function of the changes in reserve money (ΔH) current and lagged, as well as the interest rate differential between the banks' lending and borrowing rate ($RL^0 - RB^0$). Thus,

$$\text{Eq. (5)} \Delta BCC = f \left(\Delta H^+, (\Delta H)^+_{-1}, (RL^0 - RB^0) \right)$$

(b) Prices

Of the six major components of the WPI (series with base 1970-71) viz., food (PF), raw materials (PR), textiles (PT), (non-textile) manufactures (PM), energy (i.e., fuel, power, light and lubricants) (PE) and minerals (PMN), the first five accounting for as much as 98.7 per cent of the total weight have been endogenised.

Among these, sectoral inflation rates in respect of agriculture related categories such as food articles (PF) and raw materials (PR) are directly affected by monetary factors because money supply growth rate ($\dot{M}$) appears, among others, as an explanatory variable. The impact is indirect in respect of manufactures since (PR) is included in the inflation rate equation for textile products and the rate of expansion of bank credit to the commercial sector is

included as an explanatory variable in the equation for (non-textile) manufactures. Other explanatory variables include supply constraints (in respect of PF and PR), import price changes (in respect of PR and PE), wages corrected for productivity and unit indirect taxes (in respect of PM) besides the relevant lagged dependent variables. Thus,

$$\text{Eq. (6) } \dot{P}F = f(\dot{M}1, \dots)$$

$$\text{Eq. (7) } \dot{P}R = f(\dot{M}1, \dots)$$

$$\text{Eq. (8) } \dot{P}T = f(\dot{P}R, \dots)$$

$$\text{Eq. (9) } \dot{P}M = f(\dot{B}C\dot{C}, \dots)$$

The wholesale price index (WPI) is then determined as a weighted combination of these sectoral prices, with weights based on the official formulae. Thus,

$$\begin{aligned} \text{Eq. (10) } WPI = & 0.431 (PF) + 0.106 (PR) + 0.255 (PM) \\ & + 0.110 (PT) + 0.085 (PE) + 0.013 (PMN)^0 \end{aligned}$$

The sectoral price indices also determine the overall agricultural and non-agricultural price indices. In particular, the implicit deflator for GDP in agriculture (PA) is specified as a function of prices of food and raw materials. Thus,

$$\text{Eq. (11) } PA = f^+(\dot{P}F, \dot{P}R)$$

and, the implicit deflator for GDP outside agriculture (PNA) is specified as a function of prices of textiles, other manufactures and the money wage rate. Thus,

$$\text{Eq. (12) } PNA = f^+(\dot{P}T, \dot{P}N, \dot{W})$$

Finally, the general price level as measured by the GDP deflator (P) is derived as a weighted combination of relevant deflators for agriculture and non-agricultural sector. Thus,

$$\text{Eq. (13) } P = \left(\frac{YAR}{YR}\right) PA + \left(\frac{YNAR}{YR}\right) PNA$$

which completes the model.

c) Pani's Model

Among the models reviewed in this survey, Pani's model is the largest one in size with as many as 79 equations but is applied to an exceedingly short sample period—from 1969–70 through 1981–82. According to the author, the distinguishing feature of the model is that, "compared to some existing descriptions, the theoretical foundations underlying the economic relations in the study are based on considerable subjective evaluation" (p. 118).

As compared to the other structural models, the monetary sector is also relatively more elaborate with 17 equations. The monetary sector of Pani's model is set out below :

(a) Components of Money Supply

Change in nominal stock of currency with the public (ΔC) is specified as a positive function of the fiscal deficit (FD) and change in RBI's net foreign assets ($\Delta RBNFA$) but is negatively related to government's total borrowings outside the RBI (B). Thus ,

$$\text{Eq. (1) } \Delta C = f^+ (FD, \Delta RBNFA, B^-)$$

The stock of currency with the public (C) is given by the simple identity :

$$\text{Eq. (2) } C = \Delta C + C_{-1}$$

Outstanding bank deposits (D) of all banks are derived as a statistical function of scheduled commercial banks' deposits (DS) which, in turn, are determined by the deposit base (i.e., bank reserves (BR) net of exogenous impounded deposits (DI) and the stock of net foreign exchange assets of the RBI ($RBNFA$)). Thus ,

$$\text{Eq. (3) } D = f^+(DS)$$

$$\text{Eq. (4) } DS = f^+(BR-DI), RBNFA^+$$

The stock of broad money (M3) is then given by the definitional identity :

$$\text{Eq. (5) } M3 = C + D + OD^0$$

where OD = other deposits with the RBI.

(b) Other Monetary Variables

Like bank deposits, reserves of all commercial banks (BR) are derived as a statistical function of reserves of the scheduled commercial banks (BRS). Thus,

$$\text{Eq. (6) } BR = f^+(BRS).$$

Scheduled commercial banks' reserves (BRS), in turn, are assumed to be positively related to the stock of currency (C), "used both as proxy for government deficit and demand for currency holdings by the public" (p. 125), and net foreign exchange assets of the RBI but is negatively related to the bank rate (RB) which reflects the tightness of the monetary policy (i.e., supply of reserves to the banking system). Thus,

$$\text{Eq. (7) } BRS = f^+(C, RBNFA^+, RB^{-0})$$

Among the other assets in the portfolio of banks, their combined investment in government securities (BCG) and in other approved securities (BOS) is determined by their deposit base and the exogenous Statutory Liquidity Ratio (SLR). Thus,

$$\text{Eq. (8) } (BCG + BOS) = (SLR)^0 \cdot D + BECS^0$$

where BECS = banks' excess investment in government and other approved securities.

Bank credit to the commercial sector (BCC) is determined not through the relevant balance-sheet identity, but as a statistical function with positive coefficients for liabilities like deposits (D) and the exogenous bank borrowings from the RBI (RBCB) but a negative coefficient for a group of assets comprising reserves (BR), and their investment in government securities (BCG) and in other approved securities (BOS). Thus,

$$\text{Eq. (9) } BCC = f(D^+, RBCB^+, (BR + \bar{BCG} + BOS)^-)$$

(c) Fiscal Feedbacks

Central government's revenue receipts as well as its revenue expenditure is specified as a function of nominal income in the partial adjustment framework. On the other hand, capital expenditure is bifurcated into 'current and capital' transfers, and other capital expenditure, the former is treated as an exogenous variable whereas the latter is linked up with the exogenous government investment in real terms. The fiscal deficit, thus derived, feeds into the currency equation (i.e., eq(1)).

Financing the government deficit involves, among other things, borrowings from domestic as well as foreign sources. Net domestic borrowing of the government (outside the RBI) denoted by (DB) is postulated as positive function of nominal household savings (HSS) but negatively to the inflation rate ($\bar{P}$). Thus,

$$\text{Eq. (10) } DB = f(HSS^+, \bar{P}^-)$$

These borrowings, combined with exogenous foreign borrowings (FB) determine the government's total borrowings outside the RBI. Thus,

$$\text{Eq. (11) } B = DB + \bar{FB}^0$$

which also feeds into the monetary sector through the currency equation (i.e., eq (1)).

Separate equations have also been provided for the Centre and State governments combined. The combined fiscal deficit (CFD), thus derived, is financed either by borrowings outside the RBI (B) (domestic and foreign) or else by expanding the net RBI credit to government. Thus,

$$\text{Eq. (12) } \Delta \text{RBCG} = \text{CFD} - B$$

(d) Prices

In this model, WPI is divided into three sub-groups : food (PF) raw materials (PR), manufactures (PM), with the first one acting as the prime mover.

The ratio of broad money to agriculture and manufacture output (YR^*) appears as an explanatory variable in the food-prices equation along with supply of foodgrains (current and lagged), and output outside the agriculture sector, and non-food agricultural output. In turn, the food prices (PF) determine the prices of raw materials (PR) along with other explanatory variables such as the sector's output (current and lagged) and the output of the manufacturing sector. The two sectoral prices PF and PR, then, determine the prices of manufactures, with import prices acting as an additional influence. Thus,

$$\text{Eq. (13) } PF = f\left(\frac{M3}{YR^*}, \dots\right)$$

$$\text{Eq. (14) } PR = f(PF, \dots)$$

$$\text{Eq. (15) } PM = f(PF, PR, \dots)$$

The wholesale price index (WPI) is derived not as a weighted combination of the sectoral prices but through a behavioural equation postulating WPI as a positive function of money-real income ratio, food prices (PF) and a specially constructed index (PAD) reflecting potential impact of changes in administered prices. Thus,

$$\text{Eq. (16) } WPI = f\left(\left(\frac{M3}{YR^*}\right)^+, PF^+, PAD^+\right)$$

Finally, the general price level as measured by the overall deflator

(P) is specified as a positive function of money–nominal income ratio, food prices (PF), raw material prices (PR), and the administered prices (PAD). Thus,

$$\text{Eq. (17) } P = f \left(\frac{M3}{YN}^+, PF^+, PR^+, PAD^0 \right)$$

(C) A Policy-oriented Model of the 1980's

Among the models developed during the 1980's, apart from the MNR Model (1982) which is a forecasting model, the only other model that is purported to be "suitable for policy analysis"²¹, is the one by T.K.Chakrabarty (1987). This model has been termed as a minimod (i.e., a mini macromodel) which, besides restraining the overall size (to 32 equations) also aims at incorporating "institutional features" of the economy. The monetary sector of this model is described below.

(a) Components of Money Supply

Demand for currency is specified in real terms as a function of change in real income and its own lagged level. Thus,

$$\text{Eq. (1) } \left(\frac{C}{P} \right) = f \left(\Delta YR^+, \text{lag} \right)$$

Similarly, demand for bank deposits, also in real terms, has been posited as a function of real income (YR), exogenous time deposit rate (RTD) and the own lagged value. Thus,

$$\text{Eq. (2) } \left(\frac{D}{P} \right) = f \left(YR^+, RTD^+, \text{lag} \right)$$

Together, these two constitute demand for real money balances.

On the supply side, money stock in nominal terms, is determined simply by the stock of reserve money (H). Thus,

$$\text{Eq. (3) } M3 = f(H)^+$$

The reserve money (H) is determined through the conventional identity²²:

$$\text{Eq. (4) } H = \text{RBCG} + \text{RBCC}^0 + \text{RBNFA}^0 - \text{RBNML}^0$$

where, excepting the net RBI credit to the government (RBCG) which is determined in the fiscal sector, all others are exogenous.

In the fiscal sector, nominal revenue receipts are postulated as a positive function of nominal income and exogenous effective tax rate in the partial adjustment framework. On the expenditure side, nominal revenue expenditure is specified as a function of nominal income and the own lagged value. Capital expenditure is decomposed into gross fixed capital formation and the rest; the former is linked to exogenous government investment whereas, the latter is treated as an exogenous variable.

The fiscal deficit, thus derived, is financed, in part, by government's domestic market borrowings (DBM) which are specified as a positive function of nominal deposits (D) in the partial adjustment framework. Thus,

$$\text{Eq. (5) } \text{DBM} = f(D^+, \text{lag})$$

Government's reliance on the RBI credit is then derived residually as:

$$\text{Eq. (6) } \Delta \text{RBCG} = \text{FD} - \text{DBM} - \text{DBNM}^0 - \text{FB}^0$$

where net non-market borrowing (DBNM) as well as the net foreign borrowings (FB) are deemed to be exogenous.

The stock of net RBI credit to government is given by the identity:

$$\text{Eq. (7) } \text{RBCG} = \text{RBCG} + (\text{RBCG})_{-1}$$

which feeds into the reserve money identity (i.e., eq. (4)).

Finally, the general price level (P) is stipulated as a positive function of money stock (M3), effective excise tax rate (ETR) and inflationary expectations proxied by the lagged price level but a

negative function of real income (YR). Thus,

$$\text{Eq. (8) } p = f(M3^+, ETR^+, \pi^+, YR^-)$$

which completes the monetary sector model, in which the only two policy instruments are the interest rate on one year time deposits and the RBI credit to the commercial sector.

D) Topical Macromodels

The latest modelling effort in India seems to bring into sharper focus single central relationships. In these cases, the overall structure of the model is geared towards analysing various dimensions and inter-sectoral linkages that have a bearing on the chosen central relationship. This class of models has been referred to here as the topical macromodels.

In this regard, the following two models have been chosen for the review:

- a) Jadhav – Singh Model (1990) and
- b) Rangarajan–Arif Model (1990)

both of which may be deemed to be in the monetarist tradition. The former attempts to capture the dynamic nexus between government deficit, money supply and inflation whereas the latter presents "the framework of a model of the Indian economy that emphasises the determination of money supply and its impact on both output and prices" (p.837). As will be shown later, the two models have a fair degree of overlapping, notwithstanding important modelling differences.

(a) Jadhav–Singh (JS) Model (1990)

The model has 14 equations and is applied to the period, 1970–71 through 1987–88. The structure of this model may be described as follows:

Given the primary focus of the study, accent of the model is on the fiscal sector which is disaggregated. In respect of government

receipts, a distinction is made between tax and non-tax sources, whereas, expenditure is decomposed into development expenditure, interest payments and other non-development expenditure.

On the receipts side, both nominal tax receipts (TXR) and non-tax receipts (NTR), and on the expenditure side, non-development expenditure excluding interest payments (NINDE) are specified as positive functions of real GDP and price level in the partial adjustment framework. Thus,

$$\text{Eq. (1) } \text{TXR} = f(YR^+, P^+, \text{lag})$$

$$\text{Eq. (2) } \text{NTR} = f(YR^+, P^+, \text{lag})$$

$$\text{Eq. (3) } \text{NINDE} = f(YR^+, P^+, \text{lag})$$

Of the remaining components, nominal development expenditure (DEVE) is treated as an exogenous policy variable while interest payments (INT) are related to the lagged outstanding domestic debt held outside the RBI (DEBT). Thus,

$$\text{Eq. (4) } \text{INT} = f((\text{DEBT})_{-1}^+)$$

The fiscal deficit emanating from these components is given by :

$$\text{Eq. (5) } \text{FD} = (\text{DEVE}^0 + \text{NINDE} + \text{INT}) - (\text{TXR} + \text{NTR})$$

To the extent that fiscal deficit is financed by net RBI credit to government, it leads to monetary expansion. With the partial adjustment process, money stock (M3) is, thus, related to the fiscal deficit, i.e.,

$$\text{Eq. (6) } \text{M3} = f(\text{FD}^+, \text{lag})$$

Additionally, financing fiscal deficit involves enlargement of the outstanding stock of domestic debt held outside the RBI (DEBT). Thus,

$$\text{Eq. (7) } \Delta \text{DEBT} = f(\text{FD}^+)$$

The incremental domestic debt adds on to the previously

outstanding domestic debt which, after a lag, raises interest payments (i.e., Eq. (4)) thus, feeding back to the fiscal sector.

The fiscal sector transmits a positive impulse to the real sector through real developmental expenditure which augments the production capacity with a lag. Thus, capacity output ($\hat{YR}$) is assumed to be related to the lagged real developmental expenditure in the partial adjustment framework, i.e.,

$$\text{Eq. (8) } \hat{YR} = f \left(\left(\frac{\text{DEVE}}{P} \right)^+_{-1}, \text{lag} \right)$$

Enhanced productive capacity has a bearing on real GDP. Specifically, the incremental real GDP is determined as a positive function of (a) the excess of current period's capacity output over the actual output of the previous period and, (b) the exogenous measure of capacity utilisation (CUTL). Thus,

$$\text{Eq. (9) } YR = f \left((\hat{YR} - YR)^+_{-1}, \text{CUTL}^+ \right)$$

Finally, the price equation is derived as an inverted money demand function in the conventional manner. Thus,

$$\text{Eq. (10) } P = f \left(M3^+, \bar{YR}^+, \pi^+ \right)$$

Where the expected inflation rate (π) is proxied by the previous year's actual.

(b) Rangarajan-Arif (RA) Model (1990)

This model has 20 equations and is applied to the period 1961-62 through 1984-85. The structure of this model is set out below:-

The model describes the money stock determination through the money-multiplier approach. The broad Money stock (M3) is specified as a positive function of reserve money (H), which, in turn, is defined by the usual identity; all components of reserve money other than the net RBI credit to government are treated as exogenous variables. Thus,

$$\text{Eq. (1) } M3 = f^+(H)$$

$$\text{Eq. (2) } H = RBCG + RBCC^0 + RBNFA^0 + GCL^0 - RBNML^0$$

The broad money stock so derived then determines bank deposits (D) through a statistical function specified in incremental terms. Thus,

$$\text{Eq. (3) } \Delta D = f^+(\Delta M3)$$

The crucial determinant of these monetary aggregates, thus, is the net RBI credit to government which is endogenously determined in the fiscal sector.

In the fiscal sector, revenue expenditure (GRE) is determined in real terms according to the partial adjustment process related to real income (YR). Real capital expenditure (GKE/P) is assumed to be a policy determined exogenous variable. On the other hand, nominal revenue receipts (GRR) of the government are related to nominal income (YN) according to the partial adjustment mechanism. These formulations, which are largely conventional, yield government's fiscal deficit (FD). Thus,

$$\text{Eq. (4) } \left(\frac{GRE}{P}\right) = f^+(YR, \text{lag})$$

$$\text{Eq. (5) } GRR = f^+(YN, \text{lag})$$

$$\text{Eq. (6) } FD = \left[\left(\frac{GRE}{P}\right) + \left(\frac{GKE}{P}\right)^0 \right] \cdot P - GRR$$

The fiscal deficit is financed either by government's capital receipts (GKR) or else by extending net RBI credit to the government. Government's capital receipts (GKR) are decomposed into credit to government by banks (BCG), by non-bank financial institutions (NBCG), domestic non-market borrowings (DBNM) and foreign borrowings (FB). The non-bank financial institutions' credit to government and foreign borrowing are treated as exogenous

variables . Thus ,

$$\text{Eq. (7) } GKR = BCG + NBCG^0 + DBNM + FB^0$$

The bank credit to government is constrained by the banks' deposit resources and the Statutory Liquidity Ratio (SLR), and is modelled simply as:

$$\text{Eq. (8) } \Delta BCG = f (\Delta D^+)$$

On the other hand, government's non-market borrowings (DBNM) constitute a part of the household saving and are, therefore, specified as a positive function of nominal income (YN). Thus,

$$\text{Eq. (9) } DBNM = f (YN^+)$$

The government's capital receipts (GKR) thus determined, given the fiscal deficit, indicate the necessary change in net RBI credit to government residually. Thus,

$$\text{Eq. (10) } \Delta RBCG = FD - GKR$$

which feeds into the monetary sector (i.e., eq. (1) and (2)). The fiscal sector also has a feedback into the real sector in the form of a stimulus to growth. Government's real capital expenditure enhances its capital stock which, in turn, fosters the capital formation in the private sector. Addition to the overall real capital stock (KR) being a factor of production promotes real output. The monetary sector also contributes to output with real money balances acting as an additional argument in the aggregate production function. Both variables are assumed to affect output with a one year lag. Thus,

$$\text{Eq. (11) } KR = f \left[\left(\frac{GKE}{P} \right)^0 \dots \dots \dots \right]$$

$$\text{Eq. (12) } YR = F \left[KR_{-1}^+, \left(\frac{M3}{P} \right)_{-1}^+ \right]$$

Here again, the general price level (P) is specified as an inverted money demand function with positive influences from monetary expansion and higher inflationary expectations (proxied by the lagged price level) but dampening impact of larger output. Thus,

$$\text{Eq. (13) } P = f(M^+, \pi^+, Y^-)$$

which completes the model.

V. Analytical Assessment of the Evolution of the Macroeconometric Models

Macroeconometric modelling has come a long way in India. Over the years, macroeconometric models of the Indian economy have acquired technical sophistication as well as diversity while broadening their structural basis.

The evolution of monetary sector modelling in India appears to have been characterised by two distinct phases; the early models constructed during the 1960's and 1970's which constitute the first phase, made pioneering contributions towards putting economy-wide models together with general objectives. The second phase, which began in the early 1980's on the other hand, has been marked by specificity of objectives. Macroeconometric models have increasingly sharpened their focus leading to a greater variety and diversification.

Model building is essentially a process of 'learning by doing'. Not surprisingly, therefore, one finds with the benefit of hindsight, a certain amount of rough edges and loose ends in the early models. For example, the Mammen Model (1967) does not have the government budget constraint. Moreover, it has a simple foreign sector but its feedback to the monetary sector is missing. Similarly, in the G.S. Gupta Model (1973), Reserve Bank has been treated as a part of the government, which obscures the fiscal-monetary linkages.

Since the early models were adapted from similar models of the developed countries, some incongruities with the Indian economic

structure are also evident. For example, in most early macro-models, interest rates have been endogenised. This does not conform to the institutional reality of most interest rates being administratively determined in the years for which data were used in the models.

The foundation phase of macroeconometric modelling in India seems to have culminated in the Ahluwalia Model (1979) which presents a neat analytical formulation of the monetary sector in India. Portfolio behaviour of relevant sectors has been neatly encapsulated in a set of behavioural equations, balance sheet identities and equilibrium conditions. In that sense, it could be regarded as a bench-mark macroeconometric model of the Indian economy.

Having attained analytical sophistication during the first phase, the modelling effort in the second phase became more purposeful and task-oriented-guided as they are by specific rather than general objectives.

First, there were the short term forecasting models developed by Rao, Venkatachalam & Vasudevan (RVV) and by Madhur, Nayak & Roy (MNR). These models essentially focussed on developing macroeconometric framework for forecasting macro-economic aggregates as a useful input into policy formulation.

The RVV Model (1981) has convincingly established the need for an econometric model for consistent forecasting of monetary aggregates. The published version of the model, however, has reported only the 'interim' results. The 'interim' version however does not adequately capture the interaction either between the monetary and real sector or between the monetary and fiscal sector. Explicit specification of the real sector is non-existent: instead real income is simply taken to be an exogenous variable. The fiscal sub-model is also absent. As a result, the crucial link between fiscal deficit, net RBI credit to the government and the reserve money has been left unexplored.

The more elegant MNR Model (1981) seems to have gone beyond a mere forecasting of monetary aggregates and has made the maiden attempt to develop a methodology of forecasting the

impact of government budget on key macroeconomic aggregates. Here again, the published version has reported only 'work in progress'. The interim version does not report sub-models for the real sector as well as for the external sector. This incompleteness has seriously undermined the usefulness of the model, as the promising line of investigation has not been pursued fully.

Another interesting development during the 1980's was the emergence of a different class of so-called 'structuralist' models, which adopted a disaggregated approach to price formation, placing emphasis on 'structural' or 'institutional' factors besides the monetary factors. Krishnamurty (1984), Pandit (1984) and Pani (1984) are some prime examples of such models.

These models have been characterised by a marked degree of heterogeneity which, in the absence of relevant justifications amounts to arbitrariness. In the structuralist models of the Indian economy, this phenomenon is evident in the way money is introduced as well as the form in which it is introduced.

The Krishnamurty model introduces money in the equations for all the sectoral prices (except for energy) as well as in the GDP deflator. The Pandit model introduces money in food and raw materials prices which, in turn, determine other sectoral prices (except energy prices) as well as the GDP deflator. In the Pani model, money enters only in the equation for food price which acts as the prime mover in influencing other sectoral prices. The overall price level (i.e. WPI) in the Pani's model, however, is determined not as a weighted combination of sectoral prices as in the Pandit model, but through a behavioural equation with money as an argument along with food prices.

There is no uniformity even in respect of the form in which money is incorporated. For example, Krishnamurty prefers money per unit of aggregate output (as a proxy for the "excess demand pressure"), while Pani confines it to money as a ratio of output in agriculture and manufacturing. On the other hand, Pandit opts for the rate of monetary expansion as an argument in price equations.

At times, there is asymmetric treatment even within the same

model. For example, in the WPI equation, Pani uses the ratio of money to output in agriculture and manufacturing. When it comes to the equation for GDP deflator, however, the ratio of money to *nominal* GDP is deployed.

There is certain degree of ambivalence even in respect of the macroeconomic role of the money market. The excess demand for money spills over to the commodity market and any disequilibrium in the money market leads to changes in the general price level. By contrast, in the structuralist view, the money market does not determine the general price level and hence, disequilibrium in the money market must reflect somewhere else – say in the determination of some other price such as the interest rate.

In the Krishnamurty model, monetary disequilibrium manifests itself in the general price level, as in the monetarist tradition. In the Pandit model, the money market determines one of the short-term interest rates in the economy, namely the bazaar bill rate. In the earlier version of the Pani Model (1977), the money market determined a wide range of interest rates including the time deposit rate, the call money rate and the banks' prime lending rate. In the later version of the model (1984), this position has been reversed and the monetarist stance has been adopted.

In spite of these limitations, there is no doubt that the structuralist models have drawn a pointed attention to 'structural' factors that have a bearing on inflation and have warned against excessive reliance on monetary factors alone. A lot more research, however, is required before a cohesive and full-fledged paradigm becomes available.

In the meantime, macroeconometric modelling on the conventional lines has continued through the '1980's, with a sharper focus. Jadhav – Singh Model (1990) and Rangarajan – Arif Model (1990) are some latest efforts in that direction.

These two models focus on the interactions between the monetary, fiscal and real sector in a closed economy framework with the inverted money demand function at its core as the price equation. The two models are broadly congruent; both demonstrate

that the government expenditure adjusts more rapidly than receipts to a given change in price level. As a result, inflation tends to widen the fiscal deficit leading to larger money supply exacerbating inflation further. Both the models have made an attempt to capture the self-perpetuating cycle of a deficit-induced inflation followed by an inflation-induced deficit.

There are important differences in the modelling strategy though. The Rangarajan-Arif model follows the budgetary classification—revenue and capital, expenditure and receipts which allows endogenisation of bank credit to government and government's non-market borrowings. On the other hand, the Jadhav - Singh model follows the distinction between development and non-development expenditure which, paves the way for capturing the self-enforcing tendency of fiscal deficits—the large deficit leading to higher domestic debt (outside the RBI), which raises the interest burden with a lag, thereby aggravating deficits in the next period.

In retrospect, what then could be identified as promising areas for future modelling effort? In the conventional as well as the structuralist models, the causation typically runs from the monetary and non-monetary factors to prices whereas the impulses transmitted from prices to other macro variables are generally not incorporated. Such attempts, as in Jadhav-Singh or Rangarajan - Arif model are limited in scope, which however need to be generalised and enlarged for a better capturing of the transmissions to other macro variables. In the formulation of price formation, the conventional and structuralist models are seen as mutually exclusive alternatives. This need not necessarily be the case. Indeed, one could think in terms of combining the desirable features of both types while eliminating the deficiencies of either. In any case, bringing about cohesiveness in the structuralist models is undoubtedly called for. Moreover, the early effort at developing forecasting models which was inexplicably aborted could be taken up again. Most importantly, it must be recognised that even after three decades of modelling effort, a reasonable policy-oriented model is still conspicuous by its absence. In sum, trite as it may sound, one could say that while much has been done, much nonetheless remains to be done.

Appendix A : Notation

Overhead dot (.) denotes the rate of change .

Superscript“(0)” denoted exogenous variables .

“ Δ ” denotes absolute increment while “lag” denotes one period lag .

A) Balance Sheet of the RBI

1. C. = Currency held by the public ,
2. H = Reserve money ,
3. H* = Unborrowed reserve money ,
4. BR = Bank reserves ,
5. BRS = Reserves of scheduled commercial banks
6. RR = Required reserves ,
7. ER = Excess reserves
8. CLG = Currency liability of government ,
9. RBCG = Net RBI credit to government ,
10. RBCB = RBI credit to banks ,
11. RBCC = RBI credit to the commercial sector ,
12. RBNFA = RBI's holdings of net foreign assets ,
13. RBNML = RBI's net non-monetary liabilities ,
14. RBOA = RBI's other assets (variously computed) ,
15. OD = Other deposits with the RBI .

B) Money and Banking

16. M1 = Narrow money stock ,
17. M3 = Broad money stock ,
18. DD = Demand deposits ,
19. DD* = "Disposable" demand deposits ,
20. TD = Time deposits ,
21. TD* = "Disposable" time deposits ,
22. D = Total deposits .
23. DS = Deposits of scheduled commercial banks ,
24. DI = Impounded deposits ,
25. DL = Demand liabilities ,
26. TL = Time liabilities .
27. L = Banks' aggregate liabilities ,
28. BC = Total bank credit ,
29. BCG = Bank credit to government ,

- 30. BCC = Bank credit to commercial sector ,
- 31. BCF = Bank credit for food procurement ,
- 32. BOS = Banks' investment in other approved securities ,
- 33. BECS = Banks' excess investment in government and other approved securities
- 34. X = Reserves of banks other than the scheduled commercial banks and other deposits with the RBI ,
- 35. BOA = Banks' other assets (variously computed) ,
- 36. BSCG = Banking System's credit to government ,
- 37. CRR = Cash reserve ratio ,
- 38. ICRR = Incremental cash reserve ratio ,
- 39. SLR = Statutory liquidity ratio ,
- 40. NB = Number of bank branches ,
- 41. NRB = Number of rural bank offices ,
- 42. k = Currency-deposit ratio (C/D) ,
- 43. r = Bank reserve-deposit ratio (BR/D) ,
- 44. q = Borrowed reserves-deposit ratio (RBCB/D) ,
- 45. m = Money multiplier .

C) Rates of Return

- 46. Rs = Short term rate of return (variously computed) ,
- 47. RTD = Rates of interest on time deposits ,
- 48. RL = Loan rate (variously computed) ,
- 49. RB = Bank rate ,
- 50. RC = Call money rate ,
- 51. RG = Rate of return on government securities ,
- 52. RIS = Rate of return on industrial securities .

D) Fiscal Variables

- 53. GRR = Government's revenue receipts , nominal ,
- 54. TXR = Tax receipts , nominal ,
- 55. NTR = Non-tax receipts , nominal ,
- 56. GKR = Government's capital receipts , nominal ,
- 57. GRE = Government's revenue expenditure , nominal ,
- 58. GKE = Government's capital expenditure , nominal ,
- 59. DEVE = Development expenditure , nominal ,
- 60. INT = Interest payments on government debt ,

- 61. NINDE = Non-interest, non-developement expenditure, nominal,
- 62. FD = Fiscal deficit of the Central Government,
- 63. CFD = Combined fiscal deficit of Centre and States,
- 64. HPD = High powered deficit,
- 65. GCC = Government credit to the commercial sector,
- 66. GS = Government securities outstanding,
- 67. GSP = Government securities held by non-bank public,
- 68. NBCG = Non-bank financial institutions' credit to government,
- 69. DEBT = Government's outstanding debt held outside the RBI,
- 70. B = Government's total borrowings outside the RBI,
- 71. DB = Government's domestic borrowings outside the RBI,
- 72. FB = Government's foreign borrowings,
- 73. DBM = Government's domestic market borrowings,
- 74. DBNM = Government's domestic non-market borrowings,
- 75. OSF = Other sources of financing government deficit,
- 76. ETR = Effective excise tax rate.

E) Output and Income

- 77. YN = Nominal income,
- 78. YNA = Nominal agricultural income,
- 79. YNAN = Nominal non-agricultural income,
- 80. YR = Real income,
- 81. YAR = Real agricultural income,
- 82. YNAR = Real non-agricultural income,
- 83. $\hat{YR}$ = Capacity output

F) Prices

- 84. P = General price level (GDP deflator),
- 85. WPI = Wholesale price index,
- 86. CPI = Consumer price index,
- 87. PS = Price index for "sensitive" commodities,
- 88. PA = Deflator for agricultural output,
- 89. PNA = Deflator for non-agricultural output,

- 90. PF = Price index for foodgrains ,
- 91. PR = Price index for raw materials ,
- 92. PM = Price index for manufacturers ,
- 93. PT = Price index for textiles •
- 94. PE = Price index for energy items (fuel , power , light and lubricants) .

G) Miscellaneous Variables

- 95. t = Time ,
- 96. π = Expected inflation (variously computed) ,
- 97. NFA • = Net foreign assets ,
- 98. NFAO = Net foreign assets held outside the RBI ,
- 99. FR • = Foreign remittances ,
- 100. CC = Total credit to the commercial sector ,
- 101. PRF = Profits ,
- 102. KR = Real capital stock ,
- 103. W = Money wages ,
- 104. HSS = Household sector's nominal savings ,
- 105. CUTL = Capacity utilisation ratio .

Appendix B1 : Behavioural Equations in Mammen Model

1. $C = 3.42 + 0.084 (YN) - 3.60 \log (Rs) + 0.74 (t) - 0.81 (DUM)$
 $(4.46) \quad (6.85) \quad (5.41) \quad (1.52)$
 $R^2 = 0.986, \quad DW = 1.78$
2. $DD = 0.99 + 0.096 (YNAN) - 0.41 \log (Rs)$
 $(11.47) \quad (1.83)$
 $R^2 = 0.931, \quad DW = 1.03$
3. $\dot{TD} = -3.65 + 0.090 (YN) + 0.96 (RTD) - 0.69 (Rs)$
 $(6.39) \quad (2.32) \quad (3.11)$
 $R^2 = 0.985, \quad DW = 2.61$
4. $RG = 2.02 + 0.38 (Rs) + 0.063 (GSP)$
 $(13.02) \quad (5.36)$
 $R^2 = 0.95, \quad DW = 0.98$
5. $RTD = -1.70 + 0.789 (RG) + 0.554 (RTD)_{-1}$
 $(2.40) \quad (2.88)$
 $R^2 = 0.934, \quad DW = 1.77$
6. $RL = -1.63 + 0.70 (Rs) + 0.63 (RB)$
 $(4.92) \quad (3.48)$
 $R^2 = 0.912, \quad DW = 1.26$
7. $RIS = 0.67 + 1.71 (RG) - 0.55 (PRF)$
 $(4.17) \quad (4.98)$
 $R^2 = 0.63, \quad DW = 1.55$
8. $RR = 0.098 + 0.0333 (D+T)$
 (8.56)
 $R^2 = 0.83, \quad DW = 1.55$
9. $\left(\frac{ER}{DD+TD} \right) = 8.88 - 1.28 (RL)$
 (10.71)
 $R^2 = 0.89, \quad DW = 1.92$

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$$10. (DD+TD) = BCG + BCC$$

$$11. \left(\frac{BCG}{BCC} \right) = 1.28 - 0.817 \left(\frac{Rs}{RG} \right) - 0.013 (BCG + BCC)$$

(8.04) (2.80)

$$R^2 = 0.91, \quad DW = 1.79$$

$$12. P = -17.96 + 0.92 (PA) + 1.14 \left(\frac{M3}{YN} \right)$$

(18.66) (3.39)

$$R^2 = 0.98, \quad DW = 0.49$$

Notes : 1) DUM = 1 from 1958-59 onwards (for the IBA agreement on ceiling on interest rates),
= 0 otherwise,

2) Rs = Rate of interest offered by commercial banks on 3 months time deposits,

3) RL = Inter bank rate on loans of very short notice,

4) RIS = All India average yield on variable dividend industrial securities (tax-free rate),

5) Figures in brackets indicate respective 't' values; signs of 't' values are ignored.

Behavioural Equations in Appendix B₂ : G.S. Gupta's Model

1. $C = 4.081 + 0.092 (YN) - 1336 (RTD) + 645 (t)$
 $(8.14) \quad (2.19) \quad (4.63)$
 $\bar{R}^2 = 0.982, \quad DW = 1.86$
2. $DD = -2006 + 0.240 (YNAN) - 1396 (RL)$
 $(10.09) \quad (3.85)$
 $\bar{R}^2 = 0.979, \quad DW = 0.769$
3. $TD = -287 + 0.26 (YNAN) + 864 (RTD) - 2136 (RG) - 1458 (RL) + 301 (t)$
 $(14.01) \quad (1.92) \quad (2.12) \quad (3.36) \quad (5.26)$
 $\bar{R}^2 = 0.997, \quad DW = 1.93$
4. $RTD = -3.52 - 0.000074 (DD^*) - 0.000023 (TD^*)$
 $(1.58) \quad (0.58)$
 $+ 1.483 (RG) + 0.11 (RL) + 0.22 (RTD)_{-1}$
 $(2.65) \quad (0.50) \quad (1.53)$
 $\bar{R}^2 = 0.97, \quad DW = 1.57$
5. $ER = 673 + 0.047 (DD^*) - 0.0453 (TD^*) + 0.75 (RB)$
 $(2.90) \quad (3.65) \quad (0.05)$
 $- 30.7 (RG) - 115 (RL) - 0.284 (ER)_{-1}$
 $(0.15) \quad (1.48) \quad (1.47)$
 $\bar{R}^2 = 0.874, \quad DW = 2.15$
6. $RBCB = 33.2 + 0.0209 (DD^* + TD^*) + 12.3 (RL - RB) + 322.7 (DUM)$
 $(1.61) \quad (0.07) \quad (2.48)$
 $- 0.307 (RBCB)_{-1}$
 (1.30)
 $\bar{R}^2 = 0.71, \quad DW = 2.11$
7. $BCG = -421.9 + 0.0338 (DD^* + TD) + 0.4248 (TD^*) + 1315 (RG) - 833 (RL)$
 $(0.58) \quad (4.91) \quad (1.72) \quad (2.72)$
 $+ 0.074 (BCG)_{-1}$
 (0.41)
 $\bar{R}^2 = 0.98, \quad DW = 1.84$

$$8. \text{CC} = -8665 + \begin{matrix} 0.3803 \text{ (YNAN)} \\ (21.53) \end{matrix} - \begin{matrix} 1556 \text{ (RL)} \\ (4.19) \end{matrix} + \begin{matrix} 224 \text{ (t)} \\ (3.07) \end{matrix}$$

$$\begin{matrix} -2 \\ R \end{matrix} = 0.9976, \quad \text{DW} = 1.92$$

$$9. \text{BCC} = 1011 + \begin{matrix} 0.6426 \text{ (DD}^* \text{)} \\ (3.04) \end{matrix} + \begin{matrix} 0.28 \text{ (TD}^* \text{)} \\ (2.09) \end{matrix} - \begin{matrix} 1514 \text{ (RG)} \\ (1.40) \end{matrix} + \begin{matrix} 1093 \text{ (RL)} \\ (2.03) \end{matrix} + \begin{matrix} 0.458 \text{ (BCC)} \\ (1.95) \end{matrix}$$

$$\begin{matrix} -2 \\ R \end{matrix} = 0.997, \quad \text{DW} = 1.96$$

Notes : 1) DUM = Based on the author's subjective evaluation of the qualitative changes in the Bill Market Scheme. For 1948-49 to 1950-51 value zero is assigned while for 1951-52 through 1967-68, various values in the range 1 to 2.42 are assigned.

2) DD, TD refer to commercial as well as cooperative banks.

3) ER, RBCB, BCG, BCC refer to commercial banks only.

Appendix B3 = Behavioural Equations in Ahluwalia's Model

$$1. \log \left(\frac{C}{P} \right) = 2.48 + 0.66 \log (YR) - 0.502 \log (Rs) - 1.029 \log \left(\frac{YAR}{YR} \right) - 0.539 (\pi) \\ (4.2) \quad (2.8) \quad (3.8) \quad (1.7) \\ R^2 = 0.901 \quad DW = 1.07$$

$$2. \log \left(\frac{M1}{P} \right) = -0.959 + 0.973 \log (YR) - 0.162 \log (Rs) - 0.188 (\pi) \\ (13.7) \quad (1.7) \quad (1.2) \\ R^2 = 0.958, \quad DW = 1.66$$

$$3. \log \left(\frac{TD}{DD} \right) = -3.655 + 1.014 \log (YNAR) + 0.362 \log (RTD) - 0.796 \log (RG) \\ (6.3) \quad (3.3) \quad (2.3) \\ R^2 = 0.902, \quad DW = 0.44$$

$$4. \Delta H = -771 + 0.193 (FD) - 0.009 \log (\Delta YN)_{-1} + 0.56 (RBNFA)_{-1} \\ (8.0) \quad (0.6) \quad (1.1) \\ R^2 = 0.851, \quad DW = 1.82$$

-
- Notes : 1) Rs = Interest rate on bazaar bill rate.
 2) RTD = Interest rate on three month deposits.
 3) RG = Interest rate on government bonds.

Appendix B-4 : Behavioural Equations in RVV Model

$$1. \Delta C = 2307 + \begin{matrix} 0.0223 \text{ (YN)} \\ (1.23) \end{matrix} + \begin{matrix} 0.9183 \text{ (}\Delta\text{BCF)} \\ (2.07) \end{matrix} + \begin{matrix} 851.6 \text{ (PS)} \\ (0.95) \end{matrix} \\ + \begin{matrix} 1.2259 \text{ (FR)} \\ (1.50) \end{matrix} - \begin{matrix} 526.3 \text{ (RTD)} \\ (2.95) \end{matrix} \\ R^2 = 0.71, \quad DW = 2.84$$

$$2. L = -139517 + \begin{matrix} 4.87 \text{ (BR)} \\ (16.85) \end{matrix} - \begin{matrix} 7132 \text{ (ICRR)} \\ (3.76) \end{matrix} \\ + \begin{matrix} 200126 \left(\frac{TD}{D}\right) \\ (8.76) \end{matrix} - \begin{matrix} 440 \text{ (RC)} \\ (4.02) \end{matrix} \\ R^2 = 0.997, \quad DW = 2.69$$

$$3. D = 60.95 + \begin{matrix} 0.942 \text{ (L)} \\ (387.6) \end{matrix} \\ R^2 = 0.999, \quad DW = 3.16$$

$$4. DD = -3778 + \begin{matrix} 0.087 \text{ (YN)} \\ (14.2) \end{matrix} + \begin{matrix} 0.9780 \left(\frac{YNAN}{YN}\right) \\ (4.59) \end{matrix} - \begin{matrix} 457.4 \text{ (RTD)} \\ (7.40) \end{matrix} \\ R^2 = 0.993, \quad DW = 2.13$$

$$5. YN = 55143 + \begin{matrix} 1.42 \text{ (C + D)} \\ (8.66) \end{matrix} - \begin{matrix} 0.97 \text{ (YR)} \\ (2.38) \end{matrix} \\ - \begin{matrix} 78936 \left(\frac{YNAN}{YN}\right) \\ (3.02) \end{matrix} + \begin{matrix} 384.6 \text{ (TT)} \\ (8.43) \end{matrix} \\ R^2 = 0.994, \quad DW = 3.04$$

-
- Notes : 1) RC = The call money rate,
2) RTD = Weighted average of interest rates on fixed deposits of scheduled commercial banks.

Appendix B-5 : Behavioural Equations in MNR Model

1. $k = 3.159 - \frac{0.1319}{(9.33)} \text{ (RTD)} - \frac{0.00001}{(2.75)} \text{ (NB)} - \frac{2.326}{(2.71)} \left(\frac{\text{NRB}}{\text{NB}} \right)$
 $R^2 = 0.948, \quad DW = 1.18$
2. $r = 0.062 + \frac{1.028}{(4.45)} \text{ (CRR)} + \frac{0.175}{(2.87)} \text{ (ICRR)}$
 $+ \frac{0.00991}{(2.06)} \text{ (RS)} - \frac{0.00959}{(2.06)} \text{ (RL)}$
 $R^2 = 0.844, \quad DW = 1.39$
3. $q = 0.048 - \frac{0.00078}{(0.17)} \text{ (CRR)} + \frac{0.02114}{(3.65)} \text{ (RL)} - \frac{0.02926}{(3.11)} \text{ (RB)}$
 $- \frac{0.0217}{(2.06)} \text{ (DUM1)}$
 $R^2 = 0.474, \quad DW = 1.76$
4. $BCC = 3.946 + \frac{1.030}{(128.4)} \text{ (D)} + \frac{1013.66}{(6.14)} \text{ (DUM1)}$
 $R^2 = 0.999, \quad DW = 0.71$
5. $\left(\frac{BCC}{BCG} \right) = \frac{0.699}{(3.18)} + \frac{0.0306}{(1.73)} \text{ (RL - RG)} - \frac{0.0195}{(1.73)} \text{ (RB)}$
 $- \frac{0.0826}{(3.80)} \text{ (DUM2)} + \frac{0.0434}{(N.A.)} \text{ (DUM1)}$
 $R^2 = 0.828, \quad DW = 0.85$
6. $\Delta RBCG = -14.70 - \frac{1.216}{(7.18)} \text{ (FD*)}$
 $R^2 = 0.716, \quad DW = 2.98$

Notes: 1) The behavioural equations reported here are somewhat different than the corresponding formulations presented in the text.

- 2) DUM 1 is a dummy variable that captures the structural shift caused by the revisions of the credit data by the Second Working Group on Money Supply Compilation, RBI.

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- 3) DUM 2 is a dummy variable included to capture the unusual increase in the banks' investment in government securities in 1958-59 and 1959-60 on the institutional arrangements of keeping the PL 480 counterpart funds with the State Bank of India . After 1959-60 , these funds were gradually transferred from the SBI to the RBI .

Appendix B 6 : Behavioural Equations in Krishnamurthy Model

$$1. M1 = 243.7 + 0.4296 (H) + 0.7456 (M1)_{-1}$$

(2.78) (5.5)

-2

$$R^2 = 0.98, \quad DW = 2.31$$

$$2. RBCC = 65.31 + 1.0768 (RBCC)_{-1}$$

(14.79)

-2

$$R^2 = 0.92, \quad DW = 2.27$$

$$3. DB = -170.5 + 0.8885 (FD-FB) - 1615.85 (DUM)$$

(14.29) (4.46)

-2

$$R^2 = 0.93, \quad DW = 1.76$$

$$4. P = 0.0045 + 1.6264 \left[\frac{M1 + (M1)_{-1}}{YR} \right] + 0.4037 (P)_{-1}$$

(6.78) (4.08)

-2

$$R^2 = 0.99, \quad DW = 1.77$$

$$5. CPI = 0.1856 + 1.6546 (WPI)_{-1} + 1.5465 (\Delta WPI)$$

(47.54) (9.74)

-2

$$R^2 = 0.99, \quad DW = 1.41$$

Notes : 1) DUM = Dummy variable for the years 1979 and 1980 "as they happen to be outliers" (p.46).

Appendix B-7 : Behavioural Equations in Pandit's Model

1. $\left(\frac{C}{P}\right) = 2.869 + \begin{matrix} 0.045 \text{ (YR)} - 0.575 \text{ (Rs)} \\ (3.49) \quad (2.82) \\ -0.166 \text{ (TT)} + 0.826 \left(\frac{C}{P}\right)_{-1} \\ (3.84) \end{matrix}$
 $R^2 = 0.959, \quad DW = 1.72, \quad h = 0.91$
2. $\left(\frac{DD}{P}\right) = \begin{matrix} -3.151 + 0.044 \text{ (YNAR)} - 0.153 \text{ (Rs)} \\ (3.46) \quad (1.47) \\ -0.132 \text{ (TT)} + 1.027 \left(\frac{DD}{P}\right)_{-1} \\ (6.37) \quad (15.83) \end{matrix}$
 $R^2 = 0.995, \quad DW = 1.62, \quad h = 1.05$
3. $M1 = -0.157 + \begin{matrix} 1.024 \text{ (H)} + 1.262 \text{ (RL)} \\ (4.53) \quad (1.92) \\ +0.551 \text{ (DUM1)} \text{ (H)} - 15.82 \text{ (DUM1)} \\ (3.06) \quad (4.01) \end{matrix}$
 $R^2 = 0.998, \quad DW = 1.43$
4. $\Delta H = 0.714 + \begin{matrix} 0.3125 (\Delta RBCG + \Delta RBCG_{-1}) \\ (7.40) \\ +0.4065 (\Delta RBNFA + \Delta RBNFA_{-1}) + 6.099 \text{ (DUM2)} \\ (16.69) \quad (9.70) \end{matrix}$
 $R^2 = 0.953, \quad DW = 1.31$
5. $BCC = \begin{matrix} -0.979 + 0.523 (\Delta H) + 0.801 (\Delta H)_{-1} \\ (9.09) \quad (8.45) \\ +0.492 \text{ (RL - RB)} \\ (1.84) \end{matrix}$
 $R^2 = 0.986, \quad DW = 1.40$

Notes : 1) Rs = Bazaar bill rate.

- 2) DUM1 = 0 before 1962-63,
 = 1 1962-63 and later years.

The two dummy variables in eq. (3) above are intended to capture "a prominent structural shift in money supply", one each for the slope and the intercept.

- 3) Dum2 = 1 for 1973-74
 = -1 for 1975-76
 = 0 elsewhere

This dummy variable captures relatively liberal and tight conditions in these two years.

Appendix B-8 : Behavioural Equations in Pani's Model

$$1. \Delta C = -193.8 + 0.2732 (FD) + 0.1621 (\Delta RBNFA) \\ (4.90) \quad (2.07) \\ -0.2254 (B) - 302.76 (DUM) \\ (2.61) \quad (1.12) \\ \bar{R}^2 = 0.98, \quad DW = 2.46$$

$$2. D = 117.02 + 1.0893 (DS) \\ (869.48) \\ \bar{R}^2 = 0.99, \quad DW = 1.83$$

$$3 DS = 1980.04 + 10.825 (BRS-ID) + 0.3805 (RBNFA) \\ (21.54) \quad (1.38) \\ \bar{R}^2 = 0.98, \quad DW = 3.01$$

$$4 BR = -12.36 + 1.1155 (BRS) \\ (62.08) \\ \bar{R}^2 = 0.98, \quad DW = 3.56$$

$$5 BRS = -1298.05 + 0.6033 (C) \\ (16.18) \\ + 0.0158 (RBNFA) - 200.62 (RB) \\ (0.32) \quad (3.16) \\ \bar{R}^2 = 0.98, \quad DW = 1.88$$

$$6 BCC = -106.42 + 0.776 (D) + 1.917 (B) \\ (3.01) \quad (3.10) \\ -0.2274 (BR+BCG+BOS) \\ (0.45) \\ \bar{R}^2 = 0.99, \quad DW = 1.43$$

$$7. DB = 4922.6 + 0.00296 (HSS) - 4759.7 (P) \\ (13.61) \quad (2.66) \\ \bar{R}^2 = 0.94, \quad DW = 3.15$$

$$\begin{aligned}
 8. P = & -69.78 + 37.4947 \left(\frac{M3}{YR} \right) \\
 & (3.17) \\
 & + 0.2466 (PF) + 0.3701 (PR) + 0.9884 (PAD) \\
 & (3.96) \quad (4.78) \quad (1.54) \\
 & \bar{R}^2 = 0.99, \quad DW = 1.50
 \end{aligned}$$

$$\begin{aligned}
 9. WPI = & -0.5975 + 37.59 \left(\frac{M3}{YR} \right) + 0.5402 (PF) + 0.272 (WPI)_{-1} \\
 & (5.29) \quad (6.40) \quad (2.72) \\
 & \bar{R}^2 = 0.98, \quad DW = 2.04
 \end{aligned}$$

-
- Notes : 1) DUM = 1 for 1975-76
 = 0 Otherwise ,
- 2) YR in Eq. (9) above relates to output in agriculture and manufacturing only.

Appendix B – 9 : Behavioural Equations in T.K. Chakrabarty's Model

$$1. \left(\frac{C}{P}\right) = 142.74 + 0.07 (\Delta YR) + 0.96 \left(\frac{C}{P}\right)_{-1}$$

(1.48) (6.86)

$\bar{R}^2 = 0.71, \quad DW = 1.89$

$$2. \log\left(\frac{D}{P}\right) = -6.71 + 0.95 \log(YR) + 0.01 (RTD) + 0.63 \log(YR)_{-1}$$

(3.5) (0.05) (5.47)

$\bar{R}^2 = 0.989, \quad DW = 1.71$

$$3. M3 = 4042.38 + 3.17 (H)$$

(80.58)

$\bar{R}^2 = 0.997, \quad DW = 1.85$

$$4. \log(DBM) = -1.98 + 1.00 \log(D) - 0.14 (DBM)_{-1}$$

(4.19) (0.61)

$\bar{R}^2 = 0.74, \quad DW = 2.09$

$$5. \log(P) = 10.82 + 0.5 \log(M_3) + 0.02 \log(ETR)$$

(2.03) (0.13)

$-1.46 \log(YR) + 0.75 \log(P)_{-1}$

(1.16) (3.47)

Appendix B-10 : Behavioural Equations in Jadhav-Singh Model

$$1. \log (TXR) = -3.15 + 1.0931 \log (YR) + 0.3321 \log (P) + 0.4686 \log (TXR)_{-1}$$

(3.34) (2.48) (3.73)

$$R^2 = 0.996, \quad h = -0.72$$

$$2. \log (NTR) = -6.27 + 1.8611 \log (YR) + 0.4183 \log (P) + 0.247 \log (NTR)_{-1}$$

(1.88) (1.60) (0.97)

$$R^2 = 0.979, \quad h = 0.34$$

$$3. \log (NINDE) = -6.7075 + 2.0365 \log (YR) + 0.3338 \log (P)$$

(1.61) (0.72)

$$+ 0.1708 \log (NINDE)_{-1}$$

(0.68)

$$R^2 = 0.923, \quad h = 0.23$$

$$4. INT = -392 + 0.0733 (DEBT)_{-1}$$

(71.8)

$$R^2 = 0.997, \quad DW = 1.57$$

$$5. \log (M_3) = 0.1591 + 0.0784 \log (FD) + 0.9154 \log (M_3)_{-1}$$

(1.61) (16.97)

$$R^2 = 0.999, \quad h = 1.31$$

$$6. \Delta DEBT = -815 + 1.1591 (FD)$$

(11.30)

$$R^2 = 0.90, \quad DW = 2.62$$

$$7. \log (\hat{YR}) = 0.2852 + 0.0361 \log \left(\frac{DEVE}{P} \right) + 0.9152 \log (YR)_{-1}$$

(2.53) (32.46)

$$R^2 = 0.999, \quad DW = 1.89$$

$$8. \Delta YR = -45034 + 0.7537 (\hat{YR} - (YR)_{-1})$$

(10.12)

$$+ 458 (CUTL) - 506 (DUM)$$

(9.0) (1.07)

$$R^2 = 0.937, \quad DW = 1.43$$

$$\begin{aligned}
 9. \quad \log (P) = & \quad 2.742 - 1.0917 \log (YR) + 0.6439 (TT) \\
 & \quad \quad \quad (5.0) \quad \quad \quad (3.44) \\
 & + \log (M_3) - 0.4473 \log \left(\frac{M_3}{P} \right)_{-1} \\
 & \quad \quad \quad -2 \\
 R^2 = & 0.987, \quad h = 0.47
 \end{aligned}$$

Notes : Dum = dummy variable for drought years .

Appendix B-11 : Behavioural Equations in Rangarajan Arif Model

1. $M3 = -4390.72 + 3.249 (H)$
(87.52)
 $R^2 = 0.997, \quad DW = 2.20$
2. $\Delta D = -33.63 + 0.7908 (\Delta M_3)$
(66.96)
 $R^2 = 0.995, \quad DW = 2.02$
3. $\log \left(\frac{GRE}{P} \right) = -4.5415 + 0.9555 \log (YR) + 0.3803 \log \left(\frac{GRE}{P} \right)_{-1}$
(3.86) (2.366)
 $R^2 = 0.970, \quad DW = 1.90$
4. $\log (GRR) = -1.0692 + 0.4303 \log (YN) + 0.6191 \log (GRR)_{-1}$
(3.03)
 $R^2 = 0.998, \quad DW = 1.30$
5. $\Delta BCG = -164.22 + 0.2927 (\Delta D)$
(8.07)
 $R^2 = 0.744, \quad DW = 2.09$
6. $DBNM = -881.7 + 0.0762 (YN) - 930.87 (DUM 1)$
(18.22) (1.645)
 $R^2 = 0.939, \quad DW = 0.74$
7. $\log YR = 4.938 + 0.2941 \log (KR)_{-1} + 0.234 \log \left(\frac{M3}{P} \right)_{-1}$
(5.931) (5.931)
 $R^2 = 0.972, \quad DW = 1.50$
8. $\log P = 2.7625 + 0.2940 \log (M3) - 0.5252 \log (YR)$
(7.71) (1.88)
 $+0.7183 \log (TT) + 0.568 \log (DUM2)$
(6.3) (4.34)
 $R^2 = 0.995, \quad DW = 2.13$

Notes : DUM 1 = Dummy variable for non-market government borrowings (1967-68, 1974-75, and 1979-80).
DUM 2 = Dummy variable for high inflation (1973-74 and 1974-75).

Notes

1. Brief review comments on few Indian macromodels are found in Pani (1977), Ahluwalia (1979) and Krishnamurty and Pandit (1984).
2. Intriligator (1978), p. 14.
3. For alternative ways of measuring government deficit, see Rangarajan, Basu and Jadhav (1989).
4. Most of these models were developed as Ph.D. dissertations at various American and British Universities.
5. Accounts of this model in Desai (1974) and Pani (1977) have been the main sources for the discussion here. Mammen's model was a part of his Ph.D. dissertation submitted to University of Pennsylvania.
6. Pani's model in his (1984) study and Pandit's model in his (1984) study are reviewed in the next section.
7. Actually Gupta has treated the cooperative banks as a separate sector. However, for expositional simplicity, that sector can be clubbed together with the commercial banking sector without much loss of generality.
8. Gupta has modelled this asset in terms of "liabilities of the private non-bank sector". It is however, simpler to present the model in terms of 'supply of credit to the private non-bank sector' rather than its equivalent, "lenders' demand for private non-bank liabilities" as Gupta's model does.
9. Throughout this study, the fiscal deficit is taken to mean the excess of revenue and capital expenditure of the Central government over its revenue receipts, unless specified otherwise.
10. The published version of the model is based on her Ph.D. dissertation submitted to the Massachusetts Institute of Technology (MIT) in 1976.
11. Assuming static expectations, π is proxied by the actual inflation rate in the previous period.
12. The model provides interesting variants for a number of equations. Attention here, however, is focussed on the authors' "preferred" formulations.
13. Relating to the scheduled commercial banks.
14. Proxied by the price level in the previous year.

15. From the formulation in the model, it is not clear whether the dependent variable is the ratio as defined above or is the *proportion* of credit to commercial sector in the total bank credit.
16. It has also been argued that the said ratio is inversely related to the Statutory Liquidity Ratio, (SLR). The authors, however, could not get reasonable results with SLR as an additional explanatory variable.
17. Specification of the external sector is *not* included in the published version of this model.
18. For example, Bhattacharya (1982), Chakravarty S. (1977), Krishnamurty (1984), Pandit (1978, 1984) and Pani (1977, 1984).
19. Indeed, Lahiri, Madhur and Wadhwa (1985) study has classified the model as a monetarist one (p. 15). According to them the "structural" models are those "in which the sectoral prices are determined first and the general price level is obtained as a weighted average of the sectoral prices" (p. 15). This is slightly different from the way these models have been defined in this survey.
20. Proxied by the inflation rate based on WPI in the *current* period, which implies fully realised expectations.
21. Chakrabarty, (1987), p. 207.
22. The non-monetary liabilities of the RBI are adjusted for the government's currency liability to the public.

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On Disaggregation of Household Saving into Rural and Urban Components

K. G. K. Subba Rao and A. K. Nag*

The saving of the household sector, which is derived as a residual after eliminating saving of the public sector and private corporate sector from the aggregate saving of the economy, account for 65 to 80 per cent of total saving. Given the importance of this sector, an attempt has been made in this paper to estimate rural and urban saving for a benchmark year, 1981-82 for which All India Debt and Investment Survey (AIDIS) 1981-82 data could be used partially. For purposes of comparison, a similar attempt has been made to build up estimates of saving for rural and urban households for the year, 1971-72

THE saving of the household sector, either in the form of physical or financial assets, is derived as a residual after eliminating transactions of the public sector and private corporate sector from the aggregates for the economy as a whole. The details of methodology adopted in this estimation are given in the publications brought out by the Central Statistical Organisation (CSO) from time to time¹. The saving of the household sector accounts for about 75 per cent of the total saving in the Indian economy. The income of the rural sector constituted about 60 per cent of the total net domestic product of the economy in 1980-81, there was a slight decline in this share, compared to the pattern a decade ago². The disaggregation of the household saving into rural and urban components assumes considerable importance, in the context of consideration of themes much as measurement of regional development, resource mobilisation and taxable capacity. There is dearth of information on these aspects, primarily because the data are not readily available to build up such estimates. An attempt in this

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direction was made by the Reserve Bank way back in 1965 when the estimates of household saving were published for the years 1950-51 to 1962-63. The broad methodology adopted was on the basis of the relationship between rural saving and agricultural income in some benchmark years, and using the ratios thus obtained to the different years under reference to get saving of rural households. The saving of urban households was derived as a residual. In 1977, Sarkar and Murthy built up these estimates using fragmentary data available from the NCAER and NSSO surveys and other ad-hoc information available from secondary sources. Each of the credit instruments on the financial side was split up into two categories, while the saving in physical assets was split up at the aggregate level. The estimates so compiled were presented for five reference years between 1960-61 and 1971-72.

The saving of the household sector can be estimated either from the current account (as the difference between current income and consumption) or from the capital account as change in networth (i.e. difference between changes in assets and liabilities) provided complete enumeration of all the items in current/capital account is ensured. From the AIDIS, 1981-82, covered in the 37th round of the National Sample Survey (NSS), it is not possible to derive the saving of the household from current account, as the relevant items are not included in the schedules. Even from the capital account, this cannot be attempted, as the transactions excluded currency and inventory holdings. Further, the stock data on assets/liabilities are not uniformly available for the two end points of the reference period of the survey. The estimates from NCAER Surveys referred to above are based on a thin sample of about 5,000 households and as such are subject to a number of limitations. In this milieu, it may be worthwhile to examine afresh data available from alternative sources and build up estimates of rural and urban saving for a benchmark year 1981-82, for which AIDIS, 1981-82 data could be used partially. An attempt is made in this direction in this paper. For comparison purpose, similar attempt has also been made to build up estimates for rural and urban households saving for the year 1971-72. It may be noted that estimates for some transactions (physical and financial) are available for rural and urban households for 1981-82, which could be advantageously used for

the relevant break-downs. Similar estimates for 1971-72 for urban households were not available and, as such, the rural/urban estimates for this year were built up using other sources of data, in addition to the survey data of the rural households from AIDIS, 1971-72. In this paper, an attempt is made to present these estimates for 1971-72 and 1981-82 with the methodological details against the background of the overall saving scenario over the plan periods. In Section I, a brief overview of saving scenario over the plan periods is presented. In Section II, the methodological details for the estimates for the two reference years are given and estimates are presented in the annexure. The concluding observations are given in Section III. The demarcation of the household sector in the rural and urban categories is same as per the Census definition, as followed in all the surveys conducted by NSSO.

Section I Saving Scenario Over Plan Periods

The domestic saving rate (gross domestic saving as per cent of gross domestic product at current market prices) showed a substantial increase from around 10 per cent in 1951-52, the beginning year of the first plan period, to around 23 per cent in 1978-79 and thereafter declined to around 19.5 per cent at the end of 7th plan period. The household sector accounted for the bulk of the domestic saving, the share of this sector in gross domestic saving ranging from 65 to 80 per cent. The plan period-wise gross saving rate as well as household saving rate (as percentage of personal disposable income) is given in Table 1.

It may be seen therefrom that the peak domestic saving rate was attained during the 5th Plan Period. However, the household saving rate was found to be at its peak in the first three years of the 7th plan. Between 1971-72 and 1981-82, the two reference years of this study, the household saving rate has increased from around 14.6 per cent to 18.4 per cent. Through disaggregation of household saving into its rural and urban components, it will be possible to account for the differentials in the saving rates of the two segments of the household sector.

Table 1 : Gross Domestic Saving Rate and Gross Household Saving Rate for different Plan Periods

Period	Gross domestic saving Rate (%)	Gross household saving Rate (%)
1.	2.	3.
1951-52 to 1955-56 (1st Plan)	10.3	8.7
1956-57 to 1960-61 (2nd Plan)	11.7	10.5
1961-62 to 1965-66 (3rd Plan)	13.3	11.0
1966-67 to 1968-69 (Annual Plans)	13.6	13.1
1969-70 to 1973-74 (4th Plan)	16.3	15.5
1974-75 to 1978-79 (5th Plan)	20.6	18.2
1980-81 to 1984-85 (6th Plan)	19.8	17.8
1985-86 to 1987-88 (7th Plan - 3 years data)	19.8	19.3

Notes : Gross Domestic Saving Rate = $\frac{\text{Gross Domestic Savings}}{\text{Gross Domestic Product at current market prices}}$.
Gross Household Saving Rate = $\frac{\text{Gross Household Savings}}{\text{Personal Disposable Income}}$.

Sources : Gross Domestic Saving and Gross Domestic Product have been taken from (i) National Accounts Statistics (New Series) 1950-51 - 1979-80; CSO (1989) and (ii) National Accounts Statistics (NAS) 1990. Data on Personal Disposable Income upto 1969-70 are taken from NAS - 1987 and after 1970-71 are taken from the earlier cited two publications.

One way of obtaining the marginal saving rate is by regressing saving on income. Adoption of this procedure yielded a marginal saving rate for the entire period (1951-52 to 1987-88) of about 20 per cent. The marginal saving rates for two different periods,

viz. , 1951-52 to 1969-70 and 1970-71 to 1987-88 are also obtained. The rate for the first period was around 15 per cent while for the second period, it was around 20 per cent. The double log specification of the regression of gross domestic saving on gross domestic product at current market prices gives an elasticity of 1.22 for the entire period, i.e. 1951-52 to 1987-88. Estimates of elasticities for two sub-periods (First Sub-period: 1951-52 to 1969-70 and Second sub-period: 1970-71 to 1987-88) are 1.25 and 1.09 respectively.

The marginal household saving rate for the first period is estimated at around 15.6 per cent while the corresponding rate for the second period worked out to 19.7 per cent. The estimate of elasticity of household saving with respect to personal disposable income, as obtained from double log specification is found to be higher at 1.36 for the first period than that of 1.13 for the second period.

The structure of household saving for different plan periods is furnished in Table 2. It may be seen therefrom that there has been a shift from physical saving towards financial saving in recent periods. Since saving in the form of physical assets is more likely to be the dominant form of saving in rural areas, the shift in favour of financial saving may be considered as indicative of the fact that a greater part of gross household saving emerged from urban households. The result of our exercise reported in the latter part of this paper is an effort towards quantification of this trend.

Section II Methodological Details

(i) 1981-82 :

The financial saving of the household sector is arrived at by netting out the financial sources from the uses side. The different credit instruments entering these accounts are shown in Annexure. The basic data on household saving are culled out from the National Accounts Statistics (NAS) brought out by CSO. As indicated above, the survey data do not provide information on the currency holdings of the households. The household sector's saving in the

Table 2 :- Structure of Gross Household Saving in Different Plan Periods

(Rs. crore)

Period	Gross Saving in		Total
	Physical Assets	Financial Assets	
1.	2.	3.	4.
1951-52 to 1955-56	2909	939	3848
(1st Plan)	(75.6)	(24.4)	(100.0)
1956-57 to 1960-61	4107	1875	5982
(2nd Plan)	(68.7)	(31.3)	(100.0)
1961-62 to 1965-66	5592	3517	9109
(3rd Plan)	(61.4)	(38.6)	(100.0)
1966-67 to 1968-69	7751	2524	10275
(Annual Plans)	(75.4)	(24.6)	(100.0)
1969-70 to 1973-74	19512	9588	29100
(4th Plan)	(67.1)	(32.9)	(100.0)
1974-75 to 1978-79	40620	23655	64275
(5th Plan)	(63.2)	(36.8)	(100.0)
1979-80	11298	6081	17379
	(65.0)	(35.0)	(100.0)
1980-81 to 1984-85	70320	62049	132369
(6th Plan)	(53.1)	(46.9)	(100.0)
1985-86 to 1987-88	67128	69628	136756
	(49.1)	(50.9)	(100.0)

Note : Figures in brackets indicate percentage to total.

Sources : Same as in Table 1.

form of currency has, therefore, been split up into rural-urban components on the basis of distribution of consumer expenditure into rural and urban areas, as reported in the 38th round of the National Sample Survey relating to the reference year 1983-84. Implicit in this procedure is the assumption that the liquid assets of the

households will be in proportion to the expenditure incurred by them. The share of the rural households in total consumption expenditure, thus worked out to 70 per cent. In the publication brought out by the Reserve Bank of India on the AIDIS, 1981-82, information of financial assets is tabulated under two captions viz., (i) Shares, and (ii) Other types of financial assets³.

The shares of rural households in the aggregate holding of these two asset categories worked out to 24 per cent and 38 per cent respectively. Although these shares relate to the distribution of stock of assets between two categories of households owning them, in the absence of any other data these percentages have been applied to the corresponding credit instruments enumerated under uses side in the financial saving of the households. The trade debt is split up into two components on the basis of the value of output of the Directory Manufacturing Establishment (DME)⁴ summary results of which were released by CSO for the reference year 1984-85. Implicit in this procedure is the assumption that the trade credit of the households will be in proportion to the sales. In the absence of data on sales, value of output is taken as a proxy. The share of the rural sector under this category was about 17 per cent.

On the sources side, the borrowings of rural and urban households from (1) banks (commercial banks and co-operatives), (2) financial institutions, and (3) Government are estimated using the proportions available from the AIDIS, 1981-82 which give borrowings of the households by credit agency. The share of the rural sector under each of the above categories worked out to 70 per cent, 23 per cent and 47 per cent respectively.

The saving in the form of physical assets is split up into the two categories using the information on fixed capital formation of rural and urban households available from the AIDIS, 1981-82. As inventories are not covered therein, the estimate obtained by using these proportions are subject to this limitation. The error involved on this account will, however, be low as inventories form only 15 per cent of the total capital formation for the entire household sector. The share of the rural sector thus worked out to 62 per cent.

(ii) 1971-72 :

As in the case of estimates for the year 1981-82, the basic data have been taken from NAS. As regards rural-urban break-up of saving in the form of currency, the data reported in NSS 24th round (July 1970 - June 1971) consumer expenditure survey have been used in the way described above in respect of 1981-82. As regards other items under financial uses, the estimates for rural households as given in AIDIS, 1971-72 have been used in conjunction with the estimates of aggregate financial assets and liabilities as reported in the sector-wise national balance sheets compiled by Venkatachalam and Sarma (1977). For example, to arrive at the share of rural households in aggregate bank deposits held by the household sector, the estimated total bank deposits of all rural households furnished by AIDIS, 1971-72 have been compared with the corresponding estimate for the entire household sector (rural plus urban) furnished by Venkatachalam and Sarma. The share thus obtained is applied to the corresponding credit instrument entering under uses side of NAS estimates. Similar procedures are followed in respect of other financial instruments appearing either on uses or sources side.

As regards the saving in the form of physical assets, respective shares of rural and urban areas as given in NCAER Survey⁵ (excluding the assets categories like gold, consumer durables, which are not included in estimates of saving in form of physical assets by CSO) have been applied to NAS estimates.

Section III

Concluding Observations

Considering both physical and financial assets, the share of rural households worked out to 42 per cent of the total household saving (gross) in the year 1981-82. The corresponding estimate for 1971-72 worked out to 59 per cent. The structure of saving is strikingly different between rural and urban areas. The share of financial saving in total saving of rural households was very low at 11.7 per cent in 1981-82 although this share had improved from 3.3 per cent in 1971-72. In case of urban households, however, the saving has remained predominantly in the form of financial

saving, the share of financial saving to total saving for these households being 64.9 per cent in 1971-72 and 61.6 per cent in 1981-82. As regards the distribution of the two types of saving between rural and urban areas, financial saving is predominantly undertaken by urban households whereas saving in the form of physical assets is concentrated more in rural households. In 1971-72, the share of rural households in total financial saving of households sector was 6.9 per cent, the share getting increased to 11.8 per cent, in 1981-82. As regards saving in physical assets, the rural households accounted for 80 per cent and 61.8 per cent in 1971-72 and 1981-82 respectively.

The gross saving of the households constituted 14.6 per cent of the personal disposable income in 1971-72 and increased to 18.4 per cent in 1981-82, as per the NAS data. An estimate of income of rural households could be obtained from the NCAER Surveys, blowing up the average income per household by the number of household, as available from the 1981 Census. The disposable income of the urban households is obtained as a residual. Similarly, rural-urban break-up of personal disposable income for 1971-72 could be obtained by using the NCAER Survey estimate of per rural household income and 1971 Census data on the number of rural households. The share of rural sector in total personal disposable income so obtained was applied to 1971-72 NAS estimates of personal disposable income.

The rates of saving in personal disposable income of rural and urban households are worked out as under :

Table 3

	1971-72 :	1981-82
Rural	14.2	15.1
Urban	15.2	21.9
All Households	14.6	18.4

Thus, the increase in saving rate of the household sector may

be primarily attributed to the increase in saving rate of urban households. It may be noted here that Prem S. Vashista⁶, on the basis of NCAER Survey data on income and saving concluded that the saving rate of rural households increased from 3.63 per cent in 1970-1971 to 10.27 per cent in 1981-82⁷. The structure of gross saving of rural households as per NCAER estimates is given in the following table.

Table 4

Item	Gross Saving of the Rural Households			
	Estimates (Rs. crore at current prices)		As % to household income at current prices	
	1970-71	1981-82	1970-71	1981-82
1.	2.	3.	4.	5.
1. Financial (Gross)	264	3596	1.44	5.74
2. Liability	1069	1736	5.85	2.77
3. Financial (Net)	(-805)	1860	(-4.41)	2.97
4. Physical	1467	4556	8.04	7.30
Total Saving	662	6416	3.63	10.27

Source : Prem S. Vashishta (1988).

It may be seen from the table that there was net dissaving in respect of financial assets of the rural households in the year 1970-71. The NCAER estimate of financial liability of rural households in the year 1970-71 was put at Rs. 1069 crores whereas under the NAS estimate, the total financial liability of the entire household sector was only Rs. 658 crores. This seems to suggest that the NCAER estimate of financial liability of rural households may have been on the higher side, resulting in a substantial low saving rate of rural households. In fact, if we consider only the saving in the form of physical assets, the rate of such

saving in the rural household income appears to have declined as per NCAER Survey estimates. Furthermore, if the structure of saving of the entire household sector is analysed, it becomes evident that the rate of saving of rural households could not possibly move up significantly between 1971-72 and 1981-82. Firstly, the share of saving in the form of physical assets in total savings declined between 1971-72 and 1981-82. Secondly, the exercise carried out with AIDIS- 1981-82 Survey data, clearly shows the bulk of rural saving is still in the form of physical assets. The NCAER Survey estimates also confirm this. Even if the rural-urban break-up of aggregate saving in the form of physical assets as derived by us from 1981-82 AIDIS Survey data is applied to the 1971-72 NAS estimates for aggregate household saving (which should give a much lower estimate of rural sector saving), we may observe that the increase in rural sector saving rate still remains marginal. These figures are worked out in the following table.

Table 5

	(Rupees Crore)	
	Total for 1971-72	Rural (Applying proportion as obtained from 1981-82 data)
Net financial saving of the households	1555	183
Gross Household saving in physical assets	3912	2418
Gross Household saving	5467	2601
Saving Rate (as % of personal disposable income)	—	11.4

It will be seen from the calculations that the rural saving rate could not possibly be lower than 11.4 per cent in 1971-72, which is much higher estimate than given by the NCAER Survey. We may, therefore, conclude that rural household saving rate remained stagnant while the saving rate of urban households has increased

steeply during the decade between 1971-1981. The rural-urban differential in the saving rate of households widened over the two reference periods.

Notes

- 1 Reference may be made to the publication "National Accounts Statistics : Sources and Methods", Central Statistical Organisation (CSO), 1989.
- 2 See the Article on "Estimates of Rural and Urban Income" in *Monthly Abstract of Statistics*, July 1989 (CSO).
3. Share in co-operative societies, banks and companies, units of Unit Trust of India, etc., owned by the households are recorded under "Shares". The other types of financial assets cover National Plan Certificates, Government Securities, deposits (Post Office, co-operative societies and co-operative banks/commercial banks, non-banking companies), insurance premia paid for life policies, provident fund, compulsory deposits, etc.
4. The DME survey covers establishments employing at least one hired worker and having a total of six or more workers.
5. Reference may be made to National Council of Applied Economic Research, 'Household Income and its Disposition' (mimeo) with reference year 1975-76.
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ANNEXURE : SAVING OF THE HOUSEHOLD SECTOR

(Rs. Crores)

	1971			1981-82		
	Total	Rural	Urban	Total	Rural	Urban
1.	2.	3.	4.	5.	6.	7.
A. Saving in Financial Assets	2260	579	1681	13829	3837	9992
1. Currency	381	274	107	955	669	286
2. Deposits with banks including co-operative banks and societies	1047	150	897	5194	1257	3937
3. Deposits with non-banking companies	64	9	55	915	221	694
4. Life Insurance Funds	238	34	204	1048	257	791
5. Provident and Pension Funds	566	81	485	2486	602	1884
6. Claims on Government	(-149)	-	(-149)	1784	432	1352
7. Shares and Debentures	49	1	48	610	230	380
8. Units of U.T.I.	12	-	12	114	43	71
9. Trade Debt	52	30	22	723	126	597
B. Financial Liabilities	705	471	234	4025	2679	1346
1. Bank advances	589	393	196	2570	807	763
2. Loans from financial institutions	22	15	7	256	58	198
3. Loans and advances from Government	94	63	31	128	61	67
4. Loans and advances from co-operative banks and societies	-	-	-	1071	753	318
C. Net financial saving in household sector (A-B)	1555	108	1447	9804	1158	8646
D. Gross household saving in physical assets	3912	3130	782	14114	8722	5392
E. Gross Household Saving (C + D)	5467	3238	2229	23918	9880	14038

Sources : National Accounts Statistics, 1987, for column (2). The estimate, according to new series, for gross household saving is 5477, comparable to earlier series estimate. National Accounts Statistics 1989 for column (5). Figures, in columns (6) and (7) are estimated as explained in the note.

BOOK REVIEWS

Managing India's Food Economy : Problems and Alternatives, by D.S. Tyagi (New Delhi : Sage Publications, 1990); pp. 240, Price : Rs. 165.

Increasing Access to Food : The Asian Experience, by D.S. Tyagi & V.S. Vyas(eds) (New Delhi: Sage Publication, 1990); pp. 455, Price: Rs. 250.

CLASSIC writings in economics have traditionally emerged from the pens of academicians, and addressed in many cases to fellow- academicians. In them, the clinically academic treatment of stylized facts usually camouflage issues in jargons and econometric symbols, which for a lay person are akin to the hitherto undeciphered Harappan script. But the books under review are exceptions to these perceptions : they are simple, illustrative, informative and yet analytical.

The first book under review is an essay on managing India's food economy, while the latter contains experiences of Asian countries in managing their food security systems and may be called a compendium of comparative food economics. Though there are some overlapping areas in the two books, the books are essentially complementary in nature. Being essays on managing food economy, they provide enough food for thought and make compulsory reading for all policy makers, professionals, and students.

The two books under review are the by-products of Kellogg International Fellowship Programme in Food Systems. Dr. Tyagi, who had been a consultant to FAO and the UNDP, was associated with the Commission for Agricultural Costs and Prices (CACP), when he took up the fellowship in the middle of 1986. He is presently, Member-Secretary to the CACP. His rich experience as a professional expert is no doubt reflected in his numerous

contributions to journals and in books authored or co-authored by him. His latest book, being reviewed here, stands out as possibly the best study so far on the issue of food security management in India.

The edited book by Tyagi & Vyas results from the decision taken to publish a volume on the subject by the Kellogg International Fellows from Asian countries at their Seminar on the experience of Asian countries in managing their food economies, held at Guangzhou in China in October 1988. The book contains contributions on India, China, Indonesia, Sri Lanka, Thailand and the Philippines.

Tyagi's book has 10 chapters. Chapter I discusses the main objectives of the study after delineating the broad contours of the national food policy. Chapter II presents a description on the prevailing food management system *inter-alia* tracing, its evolution in brief manner beginning with the Bengal Famine of 1943. Rich in information, the chapter covers the role of various players in the food market. The action of the concerned ministries, their departments and institutions is explained in the context of bufferstocking and public distribution policy.

Chapter III of the book highlights two major achievements of the food policy pursued in the country, *viz.*, a more rapid growth in foodgrains output than in population leading to an increased physical and economic access to food, and avoidance of widespread famine. It explains how the agricultural price policy and the policy of public distribution of food grains in conjunction with provisions of scarcity relief contributed to these achievements. The write-up here displays a sound understanding of the theoretical underpinnings to the State policy. The author explains the logic of food subsidies and Government intervention to support the role of technology in the rightward shift of the supply curve. He also illustrates how a favourable price climate can help in increasing the economic access to food of a net purchaser.

However, the goals of equitable distribution and assuring supplies to the vulnerable sections of society at reasonable prices, ensuring the minimum price to grain producers and containing the rise in prices of foodgrains have not been achieved under the present

system of managing food economy. These failures are analysed in chapter IV. The author builds a strong case for increasing coarse cereal procurement and promoting its consumption in this regard.

Chapter V examines the emerging problems as a result of the growing role of the Government in the marketing of foodgrains. Putting CACP data to extensive and worthy use, the author shows how the markets get choked, how the difference between economic cost and the prices paid to producers has increased over time and how for some years stocks had been in excess of the contemplated levels.

To ascertain whether India has emerged and is likely to remain self-sufficient in cereals during the next decade, the author uses a mix of data from the Ministry of Agriculture and the National Sample Survey Organisation (NSSO), in chapter VI. Here, the author resorts to an analysis which helps to match domestic supply with domestic demand at the current levels of income, or at best a normative approach based on per capita consumption requirement derived from nutritional needs. However, what is important in the context of food policy is that supply-demand balances should be viewed in a dynamic sense where incremental supply brings down prices and increase exchange entitlements of the millions of poor in this country. It is here the analysis could perhaps have been enriched by drawing on the works of Amartya Sen, Srinivasan, Dharam Narain and Bardhan in this area.

The author also presents forecasts of production, consumption, procurement and public distribution levels for the next 8-10 years. A scenario of 23-45 million tonnes of distribution, entailing a subsidy of upto Rs. 6,000 crores at 1987-88 prices has been presented. Tyagi's scenario appears probable unless fundamental changes are brought about in the system itself and this is precisely the point that the author has tried to drive home. One may, however, disagree with Tyagi's prediction of annual production growth rates of 3.5, 3.0 and 0.4 per cent respectively, for wheat, rice and coarse cereals for the next 8-10 years. If bias against coarse cereals in State policy is corrected, it may be possible to attain significant increment in the production of these cereals. It may be pertinently pointed out in this context that coarse cereals' production has grown at an annual average growth rate of

0.74 per cent during 1980-81 to 1988-89 despite a fall in the area under crop at a rate of 1.35 per cent per annum.

Chapter VII examines why a distrust in free market has developed and whether complete free trade could be relied upon for food management in the country, now that food self-sufficiency is in sight. Examining the past, present and future, the author rules out complete privatisation or an unrestricted trade policy for foodgrains keeping in view the paying capacity of the large mass of low income consumers.

Chapter VIII presents the central theme of the study – alternatives for managing food economy. Far-reaching recommendations have been made in this chapter covering suggestions to limit food subsidies and FCI operations, stagger arrivals of grains in market, recast public distribution system by enhanced coverage of coarse cereals among other things, re-orient the bufferstock policy and increase the scope of private and futures trading. In terms of the recommendations, the book to an extent, appears to be a forerunner to the Bhanu Pratap Committee Report. A necessary corollary of this Chapter would be to re-examine the question of optimal level of food-stocks that the country needs to maintain for its food security. The present food-stock norms have been in operation since March 1984 following the submission of the Gangaopadhyay Technical Group (1982) and need revision. The norms for stock-levels may be worked out afresh using a better methodology and more upto-date data. This is an aspect on which one wishes the book has devoted some attention.

Chapter IX evaluates whether the prevalent information system would be able to cope with the modified food management system outlined in the preceding chapter. It shows that there is a pressing need to improve the reliability and timelines of the estimates from the NSSO, the CSO and the Directorate of Economics and Statistics, Ministry of Agriculture. Chapter X summarises the main findings of the study.

The major strength of the book lies in the cogency and logic of its arguments, backed up by meaningful statistical information. Rare time-series data takes the form of as many as 84 tables in the book. The book also has 8 appendices and 5 graphical

illustrations, besides 57 footnotes, an index of 63 terms and a rich list of 88 references, which include 29 official Government of India reports. This, apart from incisive analysis, is an attraction that makes the book a part of researcher's fine collection.

The edited volume by Tyagi & Vyas contains important lessons on food security derived from the experiences of some Asian countries. The progress made over the last decade by the countries of South and Southeast Asia in managing food problem has been quite remarkable. The achievement is even more striking when viewed in the light of the trends in land-man ratio and productivity brought out by Vyas in his introductory analysis.

The cornerstone of the book is the Chinese experience illustrated by Simei Wan and Yan Rui-Zhen in chapters IV and V of the book, respectively. These contributions are rich in description of the Government policies in the food sector and the economic reforms undertaken particularly in rural areas. It has been emphasised that industrial bias led to policies, especially in food pricing that implicitly taxed agriculture in order to promote industrial growth. Only in 1961, 1966 and after 1978 were state procurement prices allowed to rise. Chinese history shows that agricultural production responds encouragingly to price incentive. However, the logic of transfer of learning cannot be hastily applied for generalisation in this case. Notwithstanding the implied logic in this part of the book, raising farm-gate prices appears to be neither a sufficient, nor a necessary condition for higher agricultural growth in the Indian case. Even conceding the contention of Kahlon and Tyagi that there may have been some movement in terms of trade against agriculture, it is imperative to recognise the merit of Newberry & Stiglitz argument, which suggests that in case of low or zero price elasticity of supply and underpricing of agricultural products, fiscal policy should be active enough to tax and re-invest in the agricultural sector (specially infrastructure) rather than to raise prices of agricultural products.

Perhaps a more relevant country study for sharing development experiences in food management is that of Indonesia. Institutional developments in areas of production, pricing and marketing have been covered by Piggot & Treadgold in chapter VI. They trace the role of state policy in transforming Indonesia to a rice surplus

State. Particularly interesting is the fixation of food-stock norms for BULOG following the Falcon Team Report of 1985; the system appears analogous to the FCI operations in India. Perhaps, in case of Indonesia, commitment to ensuring food security and nutritional status appear to be even stronger than in the Indian case. Description of the local 'timely warning and intervention system (TWIS)' and the national 'food and nutrition surveillance system (FNSS)' by Syarief in chapter VII reinforces this view.

There are three chapters narrating the experiences of Sri Lanka, Thailand and the Philippines. Both, Sri Lanka and Thailand have a sizeable export share in their agricultural production. But, while in case of Thailand free trade market mechanism has played a leading role in the overall food system, the Sri Lankan System has evolved round interventions in food market by governmental as well as non-governmental organisations. This is not to say that intervention is altogether non-existent in case of the Thai food market. Export premia, some kind of levy rice as a proportion of exports, export licensing and export quotas, support-prices, fair price shops and Food & Nutrition Programmes have helped in ensuring food security in Thailand.

In the case of the Philippines the story is somewhat different. The food system appears to be more anarchic with low nutrition status and absence of adequate agrarian reforms contributing considerably to a mix of widespread poverty and enormous political instability in the country.

The book also has chapters on India by Tyagi and Bapna, and one on South Asia by V.S. Vyas. Like Tyagi's book, the edited book has rich data and 127 tables, besides useful bibliographies for comparative development studies in food systems. Both books make compulsory reading, notwithstanding their somewhat stiff price. Afterall, if food is basic to survival, thoughts on food management are fundamental to evolve sustainable systems - physiological, political or ecological.

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Resources, Institutions and Strategies : Operation Flood and Indian Dairying, (ed.) Martin Doornbos and K.N.Nair, Indo-Dutch Studies on Development Alternatives 4, Sage Publications, New Delhi, pp. 400, Price : Rs. 295.

FROM the position of an importer of milk powder some fifteen years ago, India has achieved self sufficiency in the dairy sector, largely through the Anand type of dairy co-operatives, thanks to the dairy development programme code-named 'Operation Flood'. It demonstrated the efficacy of co-operative method of management in the area of dairy farming. Given the nature of dairying activity—that it is an enclave of small and marginal farmers and landless-labourers – co-operativisation has by and large enabled adaptation of modern technology in milk production while guaranteeing remunerative prices to the milk producers. The National Dairy Development Board (NDDB) which pioneered this concept in dairy sector has lately extended its fold to the oilseeds sector as well.

The success story of the dairy development programme of India has attracted a great deal of attention both in India and abroad. This has been mainly due to a variety of factors which include, *inter alia*, the programme's anti-poverty orientation, its project planning approach, which is said to be replicable under widely differing conditions, the implications of the programme for livestock development in India and the possible longer-term dependence of India's dairy industry on imported inputs. The book under review is a collection of essays examining some of these crucial issues. It is a companion volume to *Dairy Aid and Development : India's Operation Flood*, by Martin Doornbos et al, in the same series. The articles included in this book, numbering in all seventeen, divided into five sections, were prepared as part of the research project on the origins and impact of Operation Flood, sponsored by the Indo-Dutch Programme on Alternatives in Development, and coordinated

by the Institute of Social Studies, The Hague, between 1982 and 1988.

The editors of the book, Martin Doornbos and K.N. Nair, have brought together the strands of thought on the 'Operation Flood' project in the article titled 'The State of Indian Dairying : An Overview'. This article discusses the aims of Operation Flood, viz., "(a) capturing a dominant share of the urban milk market, hitherto served by a multitude of small milk vendors : (b) creating a procurement network to link numerous co-operative producer societies in different milkshed areas to the organised urban dairy industry; and (c) upgrading the milk production capacity of the Indian bovine stock through a programme of cross-breeding, veterinary services and auxiliary activities". Various aspects of Indian dairying, viz., resource utilisation and institutional interventions, intrinsic strength and validity of organisational models as also the replicability are dealt with in detail. They have provided an insight into the range of issues of resource utilisation policies that are to be followed in one of India's food and energy resource bases, viz., livestock and dairying sector, without the use of a maze of statistics.

Livestock evidently constitutes a major source of animal protein for India's immense population as well as a key source of energy for agricultural production in the form of draught power and dung. Being one of the major regions of the world with an ancient milk culture, the Indian subcontinent poses a major and growing demand on the agrarian production system. "It is the structural imbalance between the demand for milk and milk products for urban consumption and the potential for tapping the rural surplus to meet this demand which formed the point of departure for the major institutional intervention in Indian dairying which provides the focus of this volume", the editors maintain.

As the specific aim of the programme is to model the procurement network of milk collection in different parts of India on the basis of the organisational pattern that evolved in the Kheda District in Gujarat, commonly known as the 'Anand Pattern' it would mean a three-tiered structure linking primary producer societies responsible for procurement to district co-operative unions engaged in processing and product manufacturing while at the State level the

district unions are grouped together into federations charged with the coordination of marketing functions. The declared strategy of the national dairy development policy is to replicate the three-tiered 'Anand Pattern' structure in all other States of India, entailing the introduction of detailed bylaws governing milk collection, testing for fat content and payment to producers as well as the provision of service packages built in the Anand model of co-operative infrastructure.

In the section dealing with 'The Model', Sujata Patel, in her article entitled 'The Anand Pattern : A Socio-Historical Analysis of its Origin and Growth', probes into the historical evolution of the Anand model of co-operative by tracing its growth over a hundred years of economic, social and political dynamics. According to her, the reasons for the success of the Anand model lie largely outside the model's organisational structure and are, per definition, not replicable. The age-old dairy culture of the Charotar tract, the Patidar solidarity and their political edge, the coincidence of the dairy co-operative movement with the nationalist movement, the sizeable portion of the milk market that could be captured from a relatively distant milkshed area and the significant donations of foreign aid which the Kaira District Co-operative Milk Producers' Union (KDCMPU) and the Anand Milk Producers' Union Ltd., (AMUL) had been receiving in the pre-Operation Flood period were the reasons attributed by her for the success of the Anand pattern.

The chapter on 'The Impact of AMUL on the Milk Economy of the Kheda District' by F. van Dorsten, examines the empirical evidence on the socio-economic impact of KDCMPU and AMUL on the milk economy of the Kheda District in Gujarat on the basis of farm level evidence, covering the period until the mid-seventies. Most of the studies analysed by the author come out with a finding that the intervention of the Kheda Union has brought about an improvement in the dairy economy in particular and farm economy in general in the district. It may however, be noted that the empirical base underlying these findings is weak due to inconsistent and ambivalent portrayal of the 'before' situation and a number of biased assumptions regarding the 'without' situation.

Concerned with the striking degree of centralisation in the

Indian co-operative dairying, Shanti George, in the chapter 'Operation Flood and Centralised Dairy Development in India' underscores the need for independent assessment of the programme, as such centralisation led to homogenisation and hegemony within the country's dairy sector. As the design of Operation Flood is essentially a centralised one at all levels of production, procurement and marketing, the author is of the view that "these three centralised systems can be seen as superimposed upon each other in a larger centralised system -- one organising milch animals, another mobilising milk producers and a third channelling milk -- and all three coordinated by the NDDB through Operation Flood. A still wider framework of centralisation can be traced if perspectives are widened from the national to the international to encompass Europe's milch animals, milk producers and milk, since EEC milk surpluses have served to sustain the Operation Flood programme through at least two phases".

The papers in Section II deal with the 'Replication of the Model'. Articles by V.H. Joshi, Prahlad Singh Shekhawat and M. Mitra have examined the replication of Anand pattern in Saurashtra, Rajasthan and Bihar, respectively, in the context of socio-economic and agro-ecological conditions prevalent in these regions, on the basis of case studies. Though Saurashtra is a region with a livestock industry of prime importance, the replication of Anand pattern in regions with an ecosystem akin to that of Saurashtra and an equitable distribution of the benefits of modern dairy development among different income groups is reported to be of remote possibility. With regard to Rajasthan, the conception of the Anand pattern as a model applicable to different regions has been flawed as it had not taken into account the agro-ecological and social specificity of Rajasthan, especially of its arid region. The need for more coordinating institutional roles with more decentralised institutions that are more in tune with local conditions is stressed. While the process in the Kheda district was a spontaneous one to start with, in Bihar it involved State initiative and supervision with its own adversities. In Bihar, caste and class contradictions have reportedly kept the landless and the Harijans out of most of the co-operatives and the co-operatives also have not attempted to end such inequalities. The case studies in the section have thus brought out the serious shortcomings of the Anand

replication policy .

In Section III dealing with 'Resource Base', K.N.Nair and A.C.Dhas have analysed (a) the extent to which cross-breeding has affected the composition of the cattle population ; (b) factors shaping animal and mechanical sources of draught power in agriculture; (c) changes in the draught and milch animal population; and (d) implications of the expansion in the cross-breeding programme on the draught power situation. The expansion of cross-breeding technology, as envisaged under Operation Flood, the authors aver, might contribute to an increase in milk production but it would be at the expense of draught power availability in the small and marginal farms and an increased application of fossil fuel to the agricultural sector. The paper entitled 'Cattle Development, Nutritional Requirements and Environmental Implications', pointed out that the introduction of exotic livestock with the objective of raising milk production has made dairying a specialised activity thus weakening the interdependence with agriculture. Given the situation that the country with a mere one fortieth of the world's land but supporting over half of its buffaloes and seventh of its cattle and goats, lack of cohesive fodder plan in the modern dairy development programmes as Operation Flood is likely to endanger the harmonious integration of animal husbandry with agriculture which would lead to a further degradation of the natural environment with its adverse effects on weaker sections. The need for a comprehensive programme and policy to regenerate the resource base and development of new mechanisms governing the utilisation of communal lands in an equitable manner is highlighted.

The chapter 'Structure of Milk Production in Tamil Nadu : An Analysis of Trends and Sources of Growth' by A.C.Dhas is devoted to an analysis of trends in milk production and interrelationships between the milk economy and agricultural economy in Tamil Nadu. The available evidence, according to the author, does not corroborate the official claim that the increase in milk production in the State has been largely due to the impact of various development projects, including Operation Flood. Though the organisation of dairy co-operatives appears to have given a fillip to the development of commercialisation of milk production in recent years, the coverage of co-operative sector has not been satisfactory in the

State. As the milk production is getting more and more capital intensive, the author is of the view that there is a need to fix procurement prices based on information collected from systematic cost surveys.

The papers on 'Operation Flood and the Rural Poor' by M. Verhagen, 'Dairy Co-operatives and Rural Development in Gujarat' by B.S. Baviskar, 'Dairy Development Amongst the Tribals in Surat District' by M. Savara and 'Profiles of Women Dairy Producers in Andhra Pradesh' by M. Mitra presented in Section IV under the head 'The Question of Equity' examine the extent to which dairying under Operation Flood could be considered as a viable enterprise for the rural poor, as a vehicle for social change, its scope for organised dairying in the context of tribal development and the women's gains in co-operative dairying. All these studies come to the conclusion that the effectiveness of dairy development programmes in reducing poverty is severely limited and the potential of Operation Flood to combat rural poverty has been rather exaggerated. It has been made amply clear that as a programme of intervention, Operation Flood aimed at selected categories of farmers and therefore cannot escape from the inevitability of differentiation and marginalisation of landless labourers who have no access to fodder or the keepers of other ruminants such as sheep and goats. In the case of tribals of Surat District, despite the increased quantity of milk produced by the small and marginal farmers and landless labourers who are mostly tribals, dairying as a means of economic development in poor backward areas has not been viable without the perpetual inflow of money in the form of subsidies from Government. The infrastructure for education, fodder development and veterinary care is simply insufficient and therefore, dairying in the tribal areas cannot be said to be a self-sustaining activity. On the basis of profiles of selected women in different villages in Andhra Pradesh, Mitra has cautioned that the prospects of rural women deriving material benefits from increasing labour inputs into dairying require close attention as it would imply, among other things, withdrawal of girls from schools.

The extent to which the Indian dairying industry has been depending on external aid or imports is dealt with in the papers included in section on 'The Question of Dependence' by

S. Chatterjee, S. Baviskar and P. Terhal and S.M. Batra. Chatterjee has examined the evolution of the aid link between New Zealand and India in the field of dairying, on the basis of extensive use of material contained in reports and documents prepared by the New Zealand officials and experts. The thrust of the arguments put forward by Baviskar and Terhal as also by Batra is that India has been made itself dependent upon continued external aid and imports of dairy commodities from abroad. While aid has certainly helped to check short-term unwarranted rise in retail prices of milk, the supply response of milk producers to rising urban demand for milk is low. The lesson that the analysis in the section throws up is that the third world countries need to handle dairy commodity aid with caution. A large part of funds generated out of dairy surpluses has to be used for enhancing milk production in the country so that dependence on aid will be reduced over time. Furthermore, heavy emphasis on procurement alone is likely to increase the financial burden on the public exchequer.

This book draws together multiplicity of themes on the subject of Indian dairying. The various studies presented in the book have, in general, come forth with the conclusion that AMUL pattern of co-operative dairying does not seem to be feasible in differing socio-economic environment. The successful experiment at Anand was due mainly to the infrastructural and managerial factors suited to the launching of the country's dairy development programme in this part of the region and such a favourable atmosphere has to be created for emulation of the scheme in other parts of the country. The papers bear mark of painstaking efforts made by the authors with detailed and indepth analyses of the relevant aspects; and as such facilitate a better appreciation of the dynamics of dairy farming in India.

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Protectionism : Regional Negotiation and Defence Strategies, By Economic Commission for Latin America and the Caribbean (United Nations, Santiago, Chile, 1988 pp.261, Price : \$6.)

THE Report under review seeks to place in perspective the practice of retaliation and bargaining as a legitimate course of foreign trade policy. In a sense, this report may be credited with a degree of novelty in that it departs from the conventional wisdom in literature of deploring and reprehending interventionist policies in international trade, especially on the part of the developed countries, and of exhorting countries (both developed and developing, especially the former) to do everything necessary and possible for moving towards a regime of less hindered trade. Instead, it takes the prevailing tendencies and practice of protectionism in the developed countries as immutable, and counsels developing countries in general and those of Latin America and the Caribbean in particular to develop and perfect techniques of retaliatory protectionism as a bargaining counter.

The Report emphasises the practical irrelevance of the "false dilemmas" that influenced economic debate and policies in Latin America during 1970s, such as free trade versus protectionism, and export promotion versus import substitution (p. 17).

With a view to establishing sufficient intellectual and moral basis for their subsequent advocacy of retaliatory trade restrictions on the part of Latin American countries, the Report discusses the policies and measures of the developed countries that hinder and/or limit imports from developing countries in general and from Latin American countries in particular.

At the outset, the Report highlights the important fact that the protective instruments in the industrialised countries have tended to

take on less and less transparent forms in recent years, with the result any quantitative measure of the impact of these instruments on the third-world exports turns out to be imprecise and incomplete. An extreme example of this is to be found in Japan, whose protectionism is "manifested not so much through the nature of its domestic economic and trade structures and its very particular social and cultural make up". (p.27). It follows then that any specific quantitative estimates of protectionism in the developed countries would necessarily understate the impediment caused by such protectionism to the exports of developing countries.

The Report makes a telling point when it points out that developed countries use their technological know-how for regaining comparative advantage in the traditional activities, on which the developing countries depend heavily for export earnings, while possessing natural comparative advantage in the same (p.69). Such a stance of policy—of holding onto 'traditional' activities even in the face of abundant opportunities for deploying factors of production in activities of superior productivity, which the rival trading partners are incapable of emulating in like degree—smacks of a kind of xenophobia on the part of developed countries towards goods coming from developing countries.

Latin American countries as a group have been advised by the Report to use concertedly what is called their 'purchasing power', which is an increasing function of the volume of goods and services which each Latin American country imports from developed countries. More specifically, the Latin American countries are advised to exploit the opportunities of diverting (to the extent possible) their purchases from the developed country concerned towards intra-regional sources, or even to other developed countries.

Such an advocacy of bargaining approach is sought to be buttressed with the help of a few specific commercial facts and figures. For e.g., according to 1982 figures, the United States sold to Latin America about 20 per cent of its total wheat exports. Describing this 20 per cent 'export dependence' as very high, the authors suggest that Latin America should use the redirection of these wheat purchases towards other countries (especially to other Latin American countries) as a means of extracting trade concessions from the United States. This diversion is held to be very much

in the realm of possibility, especially as Latin America's own global wheat exports in 1982 could meet 56 per cent of the requirements then met by the United States, with the remaining 44 per cent expected to come from increased regional production and from other developed country suppliers. Likewise, to take another instance, France depended on Latin America for 98 per cent (again according to 1982 figures) of its total exports of Motor Vehicles, including mechanically propelled tramway cars. At the same time, France accounted for only 42 per cent of total world exports of this group of products. As against this, Japan accounted for 21 per cent of the world exports, while other developed countries together accounted for 35 per cent thereof. Thus it is shown that the dependence of French exporters on Latin America in respect of this group of products is much greater than that of Latin American importers who could switch over their purchases to other developed countries.

Similarly, at a much more macro level of analysis, the authors bring out the fact that since 1982, the United States suffered a loss of 800 thousand jobs as a result of reduction in their imports effected by Latin American countries, in order to spare sufficient foreign exchange for servicing their external debt. This was not, the Report categorically emphasizes, "the consequence of any deliberate move by Latin America in execution of a negotiating plan or of the application of retaliatory trade measures". It was merely a result of the economic crisis that afflicted Latin America during 1980's. Hence, it is argued that in the event of deliberate policy of concerted trade diversion on the part of Latin America, the economic loss to USA through reduced exports might be much higher.

However, a critical reader is not easily convinced merely by the above-mentioned facts and figures (though weighty as they are) of the possibility of net trade gains for Latin America on a durable basis from the approach of retaliation and bargaining.

The Report mentions one difficulty (p. 81) that may beset such an approach. This relates to the depth of the pre-existing commercial links along with the technological features involved therein. For example, if a Latin America country "A" were to stop the purchase of an industrial equipment from the developed country "B", "B".

may retaliate by stopping supply of spare parts to the equipment already in operation in country "A". Therefore, country "A" must assess the technical and economic feasibility of replacing the spare parts formerly imported from "B" with those obtained either from a national source or from other industrialised country suppliers. Nonetheless, difficulty of this kind is apparently considered too few and far-between to materially detract from the case for retaliatory protectionism as a generally policy, espoused in the book.

But, there are other considerations, not touched upon by the Report that cast doubt on the commercial expediency of the policy-approach. To take one specific fact in this connection, United States depends on Latin America for 13 per cent of its global exports, whereas Latin America's dependence on the U.S. market is to the extent of 38 per cent of its global exports: EEC sells only 3 per cent of its total exports to Latin America, while the corresponding figures for Latin America sales to EEC is as much as 18 per cent of the total sales. (p.79). Thus, it should be clear that Latin America's export dependence on the U.S. market is almost 3 times the U.S. export dependence on the Latin American market; with respect to EEC, Latin America's dependence is as much as six times that of the former on the latter. Consequently, in any all out trade war, Latin American countries have more to lose than the developed countries. However, the authors seek to dismiss or at any rate belittle such conspicuous arithmetics by arguing that extent of trade dependence is not determined by quantitative indicators, but by the capacity to substitute one trading partner for another; that Latin America's ability to redirect its trade to its own market is greater than that of developed countries with regard to themselves; and that in the case of large number of primary commodities and manufactures, Latin America's dependence on the developed countries could be significantly reduced, since the region is both an importer and an exporter of goods which can be substituted for one another (p.79). Such arguments can hardly be convincing on the empirical plane, when one considers the fact that developed countries' imports from Latin America consist largely of primary products, many of which they can procure from intra-developed country sources, as is the case with products like wheat, maize, sugar, meat and dairy products even products such as coffee, copper, iron ore etc, which the developed countries may not be able to procure from among themselves can be imported from

non-Latin American developing countries, especially from those of Africa. Similarly, fall in the exports of any developed country to Latin America may be offset (wholly or partially) by rise in its exports to other developed countries and to other non-Latin American developing countries; this should be especially true for EEC, with having to redirect just 3 per cent of its total exports. As far as Latin America's purchases are concerned, intra-regional sources of supply cannot be expected to supplant in full the withdrawal of imports of developed countries, especially in respect of many sophisticated capital goods and intermediates, or even (though to a lesser extent) of durable consumer goods; this applies to volume, quality as well as price considerations.

Again, a discerning reader is struck by certain difficulties that beset both the formulation and implementation of a strategy of trade retaliation on the part of Latin-America against developed countries as a group. These difficulties stem from the variety of import restrictions practised by different developed countries against Latin American countries (both collectively and individually). To take one specific example, in respect of both tariff and non-tariff measures, Latin American countries as a group face highest degree and complexity of restrictions in the markets of EEC and Japan; in the case of U.S. market, these restrictions, while being more severe than those applied to the imports coming from African developing countries, are nevertheless less severe than those applied to imports coming from Asian developing countries (pp. 54-55). Now, one might suggest that Latin America should divert more of its purchases from EEC and Japan than those from USA, and the degree of trade retaliation should be in direct proportion to the degree of restrictionism practised by the trading partner or partners concerned. However, with EEC's dependence on the Latin American market being only to the extent of 3 per cent of its global exports (as already noted) and with Japan's dependence being only to the extent of $4\frac{1}{2}$ per cent of its global exports (p. 79 of the book), Latin America would be less successful in accomplishing the objective of retaliation, which is to compel or induce dismantling of import restrictions by the trading partners against whom the retaliation is intended; thus what is fair and proper in principles and norms, may prove to be inefficacious in practical terms.

Similarly, to take some individual country examples, 73 per

cent of Columbia's exports face non-tariff barriers in the markets of EEC, as against only 37 per cent in the case of exports from Uruguay and 34 per cent in the case of those of Argentina; corresponding figures for Brazil and Jamaica are as low (in relative terms) as 27 per cent and 22 per cent respectively (p. 59). In the Japanese market, the highest percentage of imports subject to non-tariff barriers are those coming from Honduras (91 per cent followed by Haiti and Jamaica (82 per cent), Costa Rica (63 per cent) and Columbia (60 per cent). Thus, it may be seen that Columbia, which ranks first among the victims of non-tariff barriers in the EEC market, is fifth among such victims in the case of Japanese market, while Honduras which does not figure at all among the top five victims in the former, ranks number one in the case of the latter. When it is borne in mind that non-tariff measures of protection, while being more insurmountable than tariff measures, are also less negotiable under the prevailing GATT scheme, the practical difficulties of formulating and implementing a strategy of concerted trade retaliation on the part of Latin American countries towards developed countries as a group, should be sufficiently self-evident.

There are also other factors that militate against the efficacy of retaliatory protectionism on the part of Latin America towards industrialised countries as a group. According to the Report's own finding, two-thirds of the intra regionally reorientable supply in the event of trade diversion are concentrated in order of importance in countries of Brazil, Argentina, Mexico, Columbia, Chile, Peru and Venezuela (p. 104). Now, it can scarcely be taken for granted that these countries already possess or would come to possess soon enough the requisite production facilities to actually make use of these additional supplies. Furthermore, there is a notable degree of mismatch between the bargaining capacity of individual Latin American countries in terms of their purchasing power and their capacity to increase intra-regional supplies. Thus, Venezuela with one of the highest negotiating capacities in terms of its volume of imports from the industrialised countries, has very low capacity to supply the goods which are now imported by Latin America from these countries, while Brazil and Argentina with highest capacities for intra-regional supplies, have very low degree of negotiating power in this respect (Ibid).

The book has a very interesting discussion on the decision - making processes in the developed countries that have a special bearing on their protectionist policies and measures. In this connection, the authors bring into bold relief the complex interplay of influences exerted by the legislature, the executive and the private economic sectors.

One of the important findings that emerges from the exposition of the decision-making process is the high degree of strictly legislative and technical weight that is brought to bear on the specific protectionist measures in USA, as compared to EEC, where purely political influences play a much larger role in shaping such measures. In USA, the ITC (International Trade Commission entrusted with the task of determining the admissability of the plea for protection on the part of domestic producers) holds public hearings; the legislation unequivocally lays down the factors to be taken into account and the methods of calculation to be used for arriving at a decision; and hence, its recommendations are based essentially on the technical aspects of the issue in question. By contrast, in EEC, there is a marked disinclination to hold hearings at all; the legislation on the matter is open to a variety of interpretations; and even the procedures and documents that serve as the basis for a decision concerning existence of an alleged 'unfair trade practice', are kept confidential. All these go to show that in USA, the aggrieved party whether a domestic producer or a foreign exporter, can present its case more effectively, which minimises the chances of political arbitrariness in matters of trade policy; while in EEC, the opposite situation prevails with considerable scope for political manoeuvring.

Before concluding this review, it may be worth mentioning a few points in the book that deserve some comment.

Firstly, the productive structures of the developed countries have increasingly acquired a pattern in which the tertiary sectors have come to acquire relative preponderance, with the result that these countries now possess a high comparative advantage in services. This, according to the Report, explains the interest of these countries in liberalising this sphere of world trade. Developing countries however, are resisting inclusion of services in the agenda of ongoing multilateral trade negotiations under the framework of

GATT, But pragmatism suggests that developing countries would do well in their own interest to agree to the inclusion of services in the agenda, and even to offer to liberalise their trade in the same on their part, upon the condition of the developed countries liberalising in quid pro quo their imports of products in which developing countries have superior comparative advantage.

Secondly, the Report has done well to highlight the inevitably infructuous nature of the negotiating style of developing countries in multilateral trade negotiations in that it mostly consists in hackneyed presentation of demands and claims in which the countries of the south appear to be asking for outright concessions, while offering nothing, in return (especially pp 64, 72-73, 74). Of course, the Report brings up this point as a factual ground to emphasize and vindicate its advocacy of bargaining approach through retaliatory trade barriers in that Latin American countries by diverting their purchases away from particular developed countries, would be in a position to offer substantive concessions in return for dismantling of import barriers by developed countries. However, it fails to note the fact that even aside from the policy of concerted trade retaliation espoused in this book, the disingenuous negotiating style of developing countries is not in any way forced on them by the prevailing trading conjunctures : developing countries, instead of asking for trade preferences under G.S.P. etc., which are anyhow watered down by preference giving countries through a variety of stipulations and qualifications, should strive to extract liberalisation by the developed countries under the very rules and requirements of the GATT scheme-trade preferences constitute a departure from the GATT principles of reciprocity and non-discrimination. In particular, trade liberalisation by developed countries even on MFN basis should be the focus of such negotiations, since liberalisation under MFN, being mandatory under the GATT scheme, would secure more dependable and durable export opportunities for developing countries than those under discretionary preferences.

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Financial and Other Ratios – Public Limited Companies, 1980-81 to 1987-88

Reserve Bank of India has brought out the above publication in two volumes based on the annual accounts of public limited companies covered in the regular studies undertaken by the RBI. It has been designed to met the requirements of various users, particularly the banks, financial institutions, corporate entities, regulatory bodies and research and other academic institutions.

Volume I presents the medians, quartiles and average of 40 selected financial and other ratios according to different size-groups of paid-up capital, total net assets and sales for all industries taken together.

Volume II contains the medians, quartiles and averages of the 40 selected ratios separately for each of the 54 selected industries/industry-groups, broadly classified into plantations, mining and quarrying, processing and manufacturing, and other industries.

Volume I is priced Rs.45 (\$ 15 outside India) and Volume II Rs.60/\$20.

Copies of the publication are available from the Sales Section, Division of Reports, Reviews and Publications, Department of Economic Analysis and Policy, Reserve Bank of India, Amar Building, Ground Floor, P.M. Road, Post Box No. 1036, Bombay-400 001. Payment should be made by crossed cheques/drafts drawn on Bombay payable to Reserve Bank of India.

Exchange Control Manual and Compendia of A.D. (M.A. Series) Circulars

The current edition of the Exchange Control Manual was published by the Reserve Bank of India in November 1987 incorporating all directions of a standing nature to authorised dealers in foreign exchange, licensed money changers, shipping and airline companies, freight/travel agents and insurance companies. The Manual is also an invaluable guide to companies/firms engaged in the import-export trade, Export Promotion Councils, Chambers of Commerce and Industry etc. Amendments to the Manual are advised through issue of A.D. (M.A. Series) Circulars (with amendment slips) to authorised dealers in foreign exchange. In order to make available to all holders of the Manual copies of amendment slips at one place, Reserve Bank has so far brought out two Compendia of these Circulars issued since the publication of the Manual up to December 1989. The price of the Manual set is Rs. 200 and the prices of Compendium No. 1 and Compendium No. 2 are Rs. 12 and Rs. 4 respectively. However, the entire set will be sold at Rs. 200 to those who purchase copies of the Manual, i.e., without any additional charge for the Compendia. A discount of 20 per cent on the official price of the Manual and the Compendia will also be offered to Booksellers.

Copies of the Manual (3 Volumes) and copies of Compendia are available at Sales Section, DRRP, Department of Economic Analysis and Policy, Reserve Bank of India, Amar Building, (Ground floor), P.B. No. 1036, Sir P.M. Road, Bombay 400 001 and also from offices of the Exchange Control Department of the Bank at 16 other centres in the country. The Bank will not be in a position to entertain requests for supply of copies of the Manual by Post.

Handbook of Instructions of Basic Statistical Returns 1 and 2

The handbook presents detailed instructions for filling up BSR-1 and BSR-2 returns, and enclosing the list of revised codes to be used for classification of borrowal accounts. This revised system will be effective from the March, 1990 round of the survey on an annual basis, the reference date for the year being 31st March.

Copies of the Hand Book of Instructions are available on sale from :

Division of Reports,
Reviews and Publications (Sales Section).
Department of Economic Analysis & Policy,
Reserve Bank of India,
Amar Building (Ground Floor),
Sir P. M. Road,
Post Box No. 1036.
Bombay - 400 001.

Price - Rs. 10 per copy (including postage)

Note : - Cheques/Drafts should be drawn in favour of Reserve Bank of India, payable at Bombay.

A Review of the Agricultural Credit System in India

The Reserve Bank of India has published the Report entitled "A Review of the Agricultural Credit System in India" prepared by the Agricultural Credit Review Committee (ACRC) constituted by it under the Chairmanship of Prof. A.M. Khusro. The Committee has reviewed the entire gamut of rural financial system, problems and issues currently affecting the agricultural credit system and the role of the credit system to support the national plans for agricultural development. Copies of the Report are available with Sales Section, Division of Reports, Reviews and Publications, Department of Economic Analysis and Policy, Reserve Bank of India, Amar Building, Ground Floor, P.M. Road, Post Box No. 1036, Bombay - 400 001. Price per copy is Rs. 211 (Rs. 245 inclusive of postage) and \$70 outside India. A discount of 20 per cent is available for public libraries and educational institutions in India.

REPORT OF THE STUDY GROUP FOR EXAMINING INTRODUCTION OF FACTORING SERVICES IN INDIA

The recommendations of the Study Group on Factoring Services constituted by the Reserve Bank of India in January 1988 have been accepted by the Bank and the modalities for the setting up of factoring organisations are being worked out. Factoring being a new concept, it has been decided to make available copies of this Report as a priced publication. The price per copy is Rs.30 (inclusive of postage). Copies of the Report are available from the Sales Section, Division of Reports, Reviews and Publications, Department of Economic Analysis and Policy, Reserve Bank of India, Amar Building, Ground Floor, P.M. Road, P.B. No. 1036, Bombay 400.001.

BALANCE OF PAYMENTS COMPILATION MANUAL

The Reserve Bank of India has recently brought out a Balance of Payments Compilation Manual which presents information on the concepts and methodology of balance of payments, and the sources of data used for compilation of these data for India. The publication is intended to satisfy the growing public interest in the subject.

The Manual comprises three Chapters and three Appendices. Chapter I deals with the concepts and definition of balance of payments. Chapter II outlines the sources of data used and Chapter III describes major constituent items of balance of payments and methods of compilation. Appendix I provides a list of returns regarding foreign exchange transaction submitted by Authorised Dealers and Appendix II presents general guidelines to compilers of data. The area-wise classification of countries presently adopted for balance of payments compilation is given in Appendix III.

The publication is priced at Rs. 17 (inland - postage free), and U.S. \$ 5 (foreign - postage free by surface mail). It is available in bilingual form also at the cost of Rs. 45.

Copies of the Manual are available from Division of Reports, Reviews and Publications (Sales Section), Department of Economic Analysis and Policy, Reserve Bank of India, Amar Bldg., Ground Floor, Sir P.M. Road, P.B. No. 1036, Bombay - 400 001.

Cheques/drafts should be drawn in favour of Reserve Bank of India and payable at Bombay.

RESERVE BANK OF INDIA OCCASIONAL PAPERS

**ALL INDIA DEBT AND INVESTMENT
SURVEY, 1981-82**

The Reserve Bank of India has brought out three publications based on the results of the "All-India Debt and Investment Survey, 1981-82".

1. Assets and Liabilities of Households as on 30th June 1981

This publication presents the detailed estimates of assets and liabilities of rural and urban households as on 30th June 1981.

Price : Inland : Rs. 75.00 and Rs. 85.00 (by post)
Foregin : US \$ 15 (postage free).

**2. Statistical Tables relating to Capital Expenditure and Capital
Formation of Households during the year Ended 30th June 1982**

Details estimates of capital expenditure and fixed capital formation of households in (i) residential plots, houses or buildings (ii) farm business and (iii) non-farm business, during the year ended 30th June 1982 are given in this publication.

Price : Inland Rs. 125.00 and Rs. 135.00 (by post)
Foreign : US \$ 25 (postage free)

**3. Statistical Tables relating to Cash Borrowings and Repayments
of Households During July 1981 to June 1982 and Cash Dues
Outstanding as on 30th June 1982.**

This publication present detailed estimates of cash borrowing of households classified according to credit agency, purpose, security and rate of interest as well as repayments during 1981-82. Besides, estimates of cash dues outstanding as on 30th June 1982 are also presented.

Price : Inland Rs. 100.000 and Rs. 110.00 (by post)
Foreign : US \$ 32 (postage free)

These publications can be purchased from :-

Sales Section,
Department of Economic
Analysis & Policy,
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Amar Building, Ground Floor,
P.B. No. 1036, Bombay - 400 001.

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REPORT ON TREND AND PROGRESS OF BANKING OF INDIA , 1989-90 (JULY - JUNE)

The publication brought out by the Reserve Bank of India every year in terms of Section 36(2) of the Banking Regulation Act, 1949 is now available for the year 1989-90. The Report containing four chapters is presented in a diglot form in Hindi & English.

The introductory chapter highlights banking trends and outlook during the year and discusses some key issues relevant to the healthy development of the banking system. The subsequent three chapters incorporate detailed reviews of major trends and developments during the year in the fields of Commercial Banking, Co-operative Banking (including activities of NABARD) and other financial institutions (IDBI, UTI, DICGC, EXIM Bank and NHB). The Report is interspersed with over 60 Tables and 8 graphs providing a variety of data and trends in the respective fields. It contains a detailed chart on credit policy measures and mutual fund schemes and appendices on the interest rate structure of banks.

The volume is priced Rs. 45 inland and US \$ 35 foreign. Price is inclusive of postage (air mail abroad).

Copies of the Report are available from Division of Reports, Reviews and Publications (Sales Section), Department of Economic Analysis and Policy, Reserve Bank of India, Amar Building, Ground Floor, P.M. Road, Post Box No. 1036, Bombay - 400 001.

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IECD BOOK OF CIRCULARS

The Industrial and Export Credit Department has brought out a book of circulars covering the period July 1986 – June 1989. These circulars pertain to credit monitoring arrangement, bank credit to various industries, advances to sick industries, export finance, etc. Apart from banks and other financial institutions the book will be a useful reference guide to large borrowers and various associations and other bodies representing trade and industry.

The book containing 617 pages is priced at Rs.70 (postage extra).

Copies are available at Sales Section (DRRP), Department of Economic Analysis and Policy, Reserve Bank of India, Amar Building (Ground Floor), Post Box No.1036, Bombay - 400 001.

Cheques/Drafts should be drawn in favour of Reserve Bank of India payable at Bombay.

Price : Inland : ' Rs. 395
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STATISTICAL TABLES RELATING TO BANKS IN INDIA – 1987

The Publications presents comprehensive statistical information on the working of commercial banks (including Regional Rural Banks) and P.O. Saving Banks in India during the calendar year 1987 along with revised data, where available, for the previous years also. The publication is divided into three parts :

(i) Summary tables, (ii) Detailed tables & (iii) Appendices. The summary tables give the consolidated data in respect of selected items of liabilities and assets of the banks as also information in regard to their earnings and expense. The detailed tables give data on the liabilities and assets of each bank. The two appendices furnish

- (i) a complete list of commercial banks and the number of their offices in all States & Union Territories, and
- (ii) the list of districts allotted under the Lead Bank Scheme to the respective Indian Scheduled Commercial Banks.

The Publication also presents data on :

- (i) maturity classification of fixed deposits with scheduled commercial banks,
- (ii) ownership of deposits with scheduled commercial banks,
- (iii) investments of scheduled commercial banks,
- (iv) advances to priority sectors,
- (v) deposits and credit of offices opened after nationalisation.
- (vi) State-wise details of commercial banks' investments, and
- (vii) State-wise distribution of commercial banks' employees.

Price : Inland : Rs. 94.00
 Rs. 109.00 (By post)
 Foreign : US \$ 14 (By Air Mail)

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