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**A Macro Model of Indian Economy with Special Reference to
Output, Demand and Prices (1969-70 to 1981-82)**

P. K. Pani

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A MACRO MODEL OF INDIAN ECONOMY WITH SPECIAL REFERENCE TO OUTPUT, DEMAND AND PRICES

(1969-70 to 1981-82)

P. K. Pani*

“Is there really a difference between judgement forecasts and econometric forecasts as a guide to private and public policy making? The answer, it seems to me, is that the model as a forecasting device is not an alternative to judgement. It is not a product in and of itself. It is a tool in the hands of a trained economist”.

— Arthur M. Okun¹

A. Introduction

There is a considerable difference of opinion about the utility of macro-econometric models. The past three decades of experience with the working of the models abroad as well as in this country shows that the computer models when mechanically used are not much better than judgemental forecasts but an economist can perform better when he has a model than when he bases his assessment on his insight alone. Several advantages are cited in favour of the use of macro-models for the structural analysis of the economy, for assessing the implications of policy actions and for forecasting future trends in the economy. They are : (1) A model quantifies the relative influence of several factors on a given phenomenon. This alerts an economist to the importance that should be given to a particular set of factors in a given situation or a set of configurations so as to achieve a desired result. (2) The model summarises the available evidence in a systematic and consistent way, bringing into its fold the specialized knowledge of economists in various fields participating

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1, **Gary Fromm** and **Lawrence R. Klein** (ed.), “Uses of Models for Policy Formulation”, in **The Brookings Model : Perspective and Recent Developments**, 1975. North Holland Publishing Co., and American Elsevier Publishing Company.

in the model project, which may be difficult, if not impossible, for an individual in a one-man forecasting operation. This is different from group discussions where the final result could be less objective being derived from consensus, averaging and compromises. (3) It is possible to work from a model as to which of the assumptions have gone wrong when an **ex ante** projection does not tally with the **ex post** realisation, as models are generally not built just to describe the existing structure of the economy only. A model incorporates, in a sense, the stock of past knowledge on the working of the economy. It gets improved upon with the addition of experience, being subject to revision and reproducibility with modification, and is not hampered by any preconceived or dogmatic notions. As with an individual analyst, it is possible to feed external information into the model projection to achieve better forecasting accuracy. In effect, it does not function as if it is a rigidly fixed machine with outputs strictly conforming to inputs of information or data. It is better described as a flexible system which could, to some extent, incorporate the economist's judgement of particular events. The assessment, obtained through the use of a model incorporating the economist's analysis, will, in turn, help to indicate how it would fit in with the configuration of other phenomena that the system or model would put forth with the feeding in of the external information. Without the help of a systematized description of the economy, the universe of possibilities incorporating the analysts' evidence and information could be infinitely large. To precisely foresee an outcome in the right direction in a majority of cases could only be attributed to gifted individuals². A model thus narrows the range of possibilities that are consistent with the past experience.

B. Model for Indian Economy

1. Objects and Plan of Study

The objects of this study is to analyse the factors determining output, demand, government fiscal operations, money supply and prices in the Indian economy. For this purpose a disaggregated macro-econometric model of the economy is formulated. The data for the model start from 1969-70. This period was chosen because of a major structural change in the banking sector, viz., the nationalisation of 14 leading commercial banks. It has been suggested by some scholars that the Banking and Monetary System could be given a separate treatment by appropriate segmentation of the period of coverage of data, (or by a suitable use of slope or intercept dummies, to indicate structural break if any) while the equations for the rest of the economy, i.e., the real sector, could be estimated by considering the data

2. "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**, mimeo (1965) Cambridge, Mass, quoted in **A Guide to Econometrics**, Peter Kennedy, The MIT Press.

from 1960-61 onwards³. All the structural equations of the model, which had earlier covered 1969-70 to 1978-79, have been reestimated (based on 13 observations) by including the data in respect of recent years, i.e., 1979-80, 1980-81 and 1981-82. It is observed that the structural parameters of the model by and large remain unaffected indicating thereby their stability during the period under study. As a measure of further confirmation of this result, we have reestimated the same model using data from 1950-51 to 1969-70. They indicate some significant structural changes.

The model is so specified as to capture the main characteristics of the structure and some important linkages between the major sectors. The incorporation of supply constraints, particularly agricultural output, and the transmission of the effect of fiscal operations to money supply, which in turn influences price behaviour, are two main elements of the model. As stated earlier, the model is estimated using the annual time series data for the period 1969-70 to 1981-82. The supply-side is dis-aggregated into five sectors, viz., (i) agriculture, (ii) mining and manufacturing (registered), (iii) unregistered manufacturing, (iv) transport and communications and (v) other services. Individual components of the aggregate demand have been analysed although not in detail. These are : private consumption expenditure, government consumption expenditure, private investment, imports and exports. Money supply is endogenously determined by the link to the government deficit, which in turn is determined endogenously. Food prices are determined by the money stock circulating in the economy apart from demand and supply factors. Prices of non-food articles are explained likewise. The explanation of the manufactured products' prices is based on a fixed mark-up hypothesis. The link between the monetary sector and the real sector is postulated according to the Quantity Theory with money affecting the price level (wholesale price/national income deflator), given the output of agricultural and non-agricultural goods. The model does not, however, study the interaction between the availability of funds and production in different sectors. Similarly, the impact of foreign trade on investment and output has also not been considered in detail. The study is organised into four sections. This section deals with the specification of the structural equations of the model. The estimated equations are discussed in Section C. Section D presents the results of (i) a simulation experiment to assess the performance of the model in capturing the behaviour of the economy during the last seven years of sample period and also (ii) simulations to assess the effects of specific policies relating to important macro variables. In the concluding section the sources of inflation in recent years are dealt with.

The past two decades have seen a number of macro-econometric models for India. A list of references is given at the end of the study. A **resume** of the state of the art follows.

3. The larger sample of observations is expected to impart greater precision to the estimated parameters and therefore to the results derived from them.

2. Recent Macro-Econometric Models of India

Nearly after three decades of experimentation, quantitative descriptions of Indian economy — through macro-econometric modelling — can be said to have come of age in terms of both statistical sophistication and application. They have at least come out of the academic stage and stopped being just quantitative exercises. Government and quasi-Government organisations and various committees appointed by them no more take a passive look at these efforts but attempt to get some insight and try to know what these constructions are about.

Models of recent vintage like those constructed by Isher Ahluwalia, B. B. Bhattacharya, V. N. Pandit, K. Krishnamurty and D. Ghose, *et al.* are innovative in terms of incorporating special features or specific aspects of the Indian economy in model building. Their models are somewhat removed from the earlier ones which, as Meghnad Desai aptly shows in his review, were akin to models of Western economies based on the works of Klein and Tinbergen⁴. Some features that distinguish the current models are : (1) Most of them use annual data and are thus annual models. In view of this they do not attempt to study structural changes in the economy in a major way. The lack of degrees of freedom in terms of number of observations as against the number of variables to be estimated possibly seems to hamper such an investigation. (2) A common feature is the characterization of the functioning of the economy in the form of a two-sector model — agricultural sector the output generation of which at the aggregate level is, by and large, exogenous and the rest of the economy where growth is more or less demand-determined. The interaction between the two sectors is postulated in several ways — (i) by propagation of price changes from one sector to the other, either one way or both ways, (ii) by the transmission of demand for another sector's product due to income generation and additional output in one of the sectors and (iii) the common impact of monetary impulses on the prices of both sectors. (3) All models underscore the importance of Government sector operations but the perceived impact on the two sectors varies. Government investment is assumed to be crucial as a generator of additional demand for capital (manufactured) goods. It augments infrastructural facilities and adds to productive capacity in the economy. The crowding out, if any, of private investment by Government's investment/expenditure operations is studied in detail in some while others leave it at the periphery. (4) The important links between Government fiscal operations and generation of monetary impulses is formulated in many of the models. While some models make a thorough study of the role of budgetary constraint on sources and uses of funds and of budget deficit in the creation of money and related aspects, others postulate the links in a reduced form, recognizing,

4. Meghnad J. Desai, "Macro-Econometric Models for India — A Survey", *Sankhya, Series B*, 35, 1973. Some earlier models were, however, exceptions to this.

at the same time, the fact that the use of monetary policy parameters is to a great extent constrained by public sector's actions by way of draft on commercial banks' resources as well as by resort to borrowing from the central monetary authority. (5) The general description of price determination is more or less common for all the models, though again each model has its own nuances. Sectoral prices and aggregate price levels are affected by excess liquidity in the economy in the standard classical framework following the Fisherian identity. However, relative prices are stated to act as equilibrators of demand and supply in the agricultural sector while cost mark-up relations (fixed or variable mark-up over different costs of inputs per unit of output) are a general rule for industry and services. (6) Labour market descriptions are either absent or rudimentary. While the trade-off between unemployment and inflation is, for obvious reasons, not tested as a proposition applicable to Indian economy, wage-price dynamics is postulated on the assumption that labour, or the organized labour, tries to obtain a real wage rate in the long run. (7) Description of banking operations appear in considerable detail basically to determine the level of money supply. The links between banking activity, credit and output generation are, however, rarely formulated. Even if postulated, they are not based on well-established theoretical foundations. Two reasons can be cited for this state. For one thing, while a large amount of theory exists on the demand for money or on the asset-holding behaviour of the household, the theory on demand for credit for production purposes or demand for funds for investment is neither well postulated nor empirically well tested even for developed economies. This makes the adoption or modification of the existing theory to suit Indian conditions somewhat difficult. In the absence of a well-formulated or articulated theory of credit or a theory that can explain the flow of funds between sectors, which is suitable for Indian conditions, where a dual credit system with an unorganized market for funds exists, it seems **prima facie** difficult to quantify the role of credit in economic activity. Added to this complexity is the system of administered interest rates in the banking sector which prevent a proper analysis of the role of interest rate as an allocative mechanism of available funds in an optimal way. Understandably the working of monetary and financial system in its relation to economic growth is not a well-explored area and its treatment in model building in this country tends to be weak. (8) Another field which is under-specified in many models is the foreign sector. The links between domestic economy and foreign sector are superficially formulated for the simple reason that we are yet to understand the role of trade and balance of payments transactions which so far have accounted for only a small proportion of gross national product. That exports and adverse terms of trade affect aggregate demand and domestic prices is well recognised. However, foreign exchange constraints, regulated imports and related trade restrictions have an impact on economic growth as some of the important gaps in demand and domestic supply could not be filled in due to them. In view of the considerable changes in the foreign exchange markets,

international financial flows and growing inter-dependence of economies in the 1970s and 1980s, this is an area where one would wish some firm empirical results were available to enable the formulation of suitable policy actions.

The economic model presented here is not in any way very much different from the existing ones. It does not purport to show new or substantially new results. Possibly, compared to some existing descriptions, the theoretical foundations underlying the economic relations in this study are based on considerable subjective evaluation which happens to be an accepted part of the model-building work. However, even within this frame, it would be interesting to know how various researchers view the functioning of the economy. Is there a consensus on the important factors that affect the movement of major economic variables, which are robust and insensitive to a finer specification of economic relations? The divergence could be due not only to broad economic explanation but also to the use of data, time period, estimation technique, etc.

3. Basic Structure of the Model

(a) Output

Production is divided into that of agricultural and non-agricultural sectors. The non-agricultural sector is sub-divided into four sub-sectors, viz., mining and manufacturing (registered), unregistered manufacturing, transport and communications and other services.

(i) Agricultural Sector

Net Domestic Product from Agriculture at Factor Cost at constant prices (YAR)⁵, includes the output of allied activities like forestry, fishing and animal husbandry. The output of this sector is estimated as being dependent on production of foodgrains and non-foodgrains. The area under foodgrains is specified as a function of the relative price of foodgrains and rainfall in a partial adjustment framework (equation 36)⁶. A similar function is specified for the area under non-foodgrains (equation 37). Production of foodgrains is estimated as a function of area under foodgrains, percentage of area under irrigation, which, in turn, is related to capital stock in agriculture (equation 73), and rainfall (equation 1). Production of non-foodgrains is also explained likewise (equation 2). Agricultural production is then obtained as a statistical function of foodgrains and non-foodgrains production. The net domestic product at factor cost originating from agricultural sector (value added) is estimated as a function of the gross output of the agricultural sector (equation 3 & 4), assuming that the input costs are proportional to the

5. For explanation of notation used please see Appendix I.

6. The equations are presented in Appendix II.

value of output. This procedure also implies that net output in allied activities is directly related to agricultural production.

(ii) Mining and Manufacturing (registered)

The output of manufacturing sector is determined by the capital stock, demand for manufactured goods as reflected by 'real' capital expenditure of government, gross domestic expenditure in real terms excluding Government investment (equation 5).

The manufacturing output equation is framed on the lines of the usual production function, (net) output being explained in terms of the factors of production, viz., capital and labour. In the present version of the production function, however, labour is not considered as a separate variable; the model does not attempt to describe or incorporate a separate labour market. It assumes that labour is not a major constraining factor in the process of production and the supply of labour is perfectly elastic at a given wage rate.

With the labour market being assumed away, the major determinants of net manufacturing output (YMR) are the existing capital stock and the rate of its utilisation. A typical production function framed on this line, can be of the form :

$$YMR = f_1 (Ct, Kt) \dots\dots\dots (1)$$

where YMR = (Real) Net Domestic Product from the (registered) Mining and Manufacturing Sector.

Ct = Capacity Utilisation in the (registered) Mining and Manufacturing Sector.

Kt = (Real) Capital in the (registered) Mining and Manufacturing Sector.

When excess capacity exists, its utilisation could be either demand constrained or supply constrained. In the former category two of the variables that influence the manufacturing output are (Real) Domestic Expenditure (GDER) and (Real) Government Investment (capital) Expenditure $\frac{(GE-CGN)}{PCF}$.

In the latter category, inadequate infrastructural facilities like power or the supply of raw materials which limit output can be cited. The supply factors which influence availability of power can be represented through a proxy like Government Investment programmes in developing domestic energy resources. Other constraints like supply of raw materials can be, to some extent, obviated by drawing on inventories or by imported raw materials which can augment domestic supply. The postulation ignores the extent to which power and other bottlenecks can constrain the utilisation of capacity.

An explanation of capacity utilisation is then formulated as follows :

$$Ct = f_2 \left[(GDER-IGR), \frac{(GE-CGN)}{PCF} \right] \dots\dots\dots (2)$$

Rigorous econometric analysis, of course, demands that for explaining the manufactured output (YMR), both the above equations, viz, equations (1) and (2) should be estimated. However, it was found after much empirical work that the capacity equation was not yielding statistically significant results, due mainly to the fact that no reliable time-series data are available in respect of this variable. It may also be mentioned that we have tried output of non-foodgrains and bank credit to industry as variables affecting capacity utilisation. The latter did not yield plausible results while the former had shown insignificant impact. Hence, as an alternative choice, the following reduced form of equation (derived after substituting equation (2) in equation (1)) was adopted.

$$YMR = f_3 \left[(GDER-IGR), \frac{(GE-CGN)}{PCF}, KMR \right] \dots\dots\dots(3)$$

The advantage in considering the above-mentioned version is that we could obviate the transmission of errors in the estimation of capacity variable to the equation for output from the Mining and Manufacturing Sector.

Although production functions are generally estimated in a log-linear form, it may be mentioned that linear formulations are found to be a close approximation to the corresponding log-linear versions during a short period of, say, 10 to 12 years. The main result of the relation is that demand constraints have a strong influence on the supply of output in this sector.

(iii) **Manufacturing (unregistered)**

The value added from the unregistered manufacturing sector is stated to be determined by the capital stock in that sector and the output in the registered manufacturing sector (equation 6). The latter acts as a proxy for both demand and supply factors. Demand influences arise when large-scale units in the registered sector are not vertically (fully) integrated but obtain a part of their input requirements from ancillary units in the unregistered sector (backward linkage). Supply impact is felt when factories in the registered sector meet input requirements of the manufacturing units in the unregistered sector (forward linkage, e.g., yarn for power looms/handlooms from textile mills). The results show that in this sector also the capacity utilisation is a major determinant of total output.

(iv) **Transport and Communications**

The net output of this sector is also considered as a hybrid function of the capital stock in this sector and the income from the agricultural and

manufacturing sectors, the latter again acting as a proxy for demand factors (equation 7).

(v) **Other Services**

Value added from the residual sector is equated to aggregate demand in the economy less the incomes generated in agricultural, manufacturing (registered and un-registered) and transport sectors (equation 8). In effect the incomes generated in this sector act as equilibrators between the aggregate demand and aggregate supply at macro level.

This is somewhat an unrealistic way of formulating the demand-supply equilibrium. **Ex post** the value of output should equal to the value of overall demand in real terms. This can be stated as : Gross domestic expenditure (GDER) in real terms which is the sum of private and Government consumption expenditures in real terms ($CPR + CGN/PCG$) and investment in real terms (IR) + net imports in real terms $\left(\frac{XV}{XP} - \frac{MV}{MP}\right)$ is equal to net domestic supply in real terms (YNDR) [sum of outputs in agriculture (YAR), manufacturing (YMR + YUR), transport (YTR) and residual sectors (YOR)] plus capital consumption allowances (CCAR) adjusted for indirect taxes net of subsidies (IDTR). That is, in the model notation,

$$(1) \quad CPR + \frac{CGN}{PCG} \times 100 + IR + \frac{XV}{XP} \times 100 - \frac{MV}{MP} \times 100 \\ = GDER + DISR = YNDR + IDTR + CCAR$$

(Where DISR is the Statistical discrepancy)

$$(2) \quad YNDR = YAR + YMR + YUR + YTR + YOR$$

$$(3) \quad IR = IAGR + IAPR + IMGR + IMPR + ITR + IUR + IOR$$

In the absence of such a postulation, the **ex ante** values of variables differ from the **ex post** values and statistical estimation of either demand or supply relations becomes difficult. The same equilibrium relation can also be postulated as saving being equal to investment in real terms adjusted for capital flow from abroad, for the economy as a whole. It is generally assumed that inventories act as absorbing factor of the differences between saving and fixed investment. The same hypothesis is used in formulating the price equations for foodgrains and non-foodgrains in the model. However, in our attempt to explain output and investment sector-wise, it has become difficult to adopt this hypothesis at the aggregate level as data on sectoral holding of stocks are not separately available and sectoral investment data includes inventory holdings. A hypothesis which was tried to ensure consistency between gross domestic expenditure in real terms and total supply of output is that investment in sectors other than in Government, private

agriculture, manufacturing and transport sectors would be the equilibrating variable. The implication of this approach is that investment by private agencies in the residual sector (for example residential construction) would fluctuate with the real savings after investment demand of other sectors is met. This type of closing of the model did not yield acceptable results in some of the policy simulations. Similar problems arose when 'statistical discrepancy' is made endogenous to ensure consistency between total real expenditure and total real output in the economy, by making this as the absorbing variable for the differences. It is hoped that improved versions of the model will be able to correctly identify the sector (component of supply/demand) which will act as an equilibrating factor between aggregate demand and aggregate supply.

(b) Demand

(i) Consumption demand

Private final consumption expenditure at constant prices is specified as a function of personal disposable income and an income distribution variable, viz., ratio of agricultural output to net domestic product (equation 9). Government consumption expenditure is considered as a function of Government revenue and the consumption price deflator and is postulated in nominal (value) terms (equation 11). This equation provides one link between the real sector and the fiscal sector. Government expenditure equation has been formulated on lines which are more or less similar to private consumption function. It has been argued by some that the target income variable should be considered as a major determinant of Government's current expenditure. It is difficult to agree with this. This approach not only involves an assumption regarding the computation of target incomes but also presents difficulties from the point of view of forecasting. It may be seen from the private consumption expenditure (CPR) equation, i.e., equation 9, that its determination is in real terms. Hence, price variable does not enter this equation. The demand for consumption goods, their supply and price variables of these goods are determined simultaneously in the model and as such the feed-back effects between relevant variables appearing in the model have been taken care of. Besides, it may be added that even when the consumption relationship is formulated in aggregate terms, the relevance of the price as an explanatory variable centres round the issue as to what extent consumers trade current consumption with future income/consumption, i.e., on the interrelationship that subsists between inflation and saving. The interrelationship that depicts consumer behaviour could be (a) increased saving on further expectations of a price rise so as to maintain future real consumption levels and (b) reduction in saving so as to maintain the existing or high real current consumption foregoing future consumption in view of uncertainty about the future price variations. The former implies a reduction in current level of real consumption and the latter the maintenance of the exist-

ing or higher real consumption level with reduced real saving. The impact of inflation on aggregate savings could be uncertain in the face of divergent behavioural patterns displayed by public in regard to price expectations as it is with respect to real interest rates. While this is so at the macro-level determination of saving (and hence consumption) pattern, the relevance of the price variable at the disaggregated (commodity wise) level is well established in view of its role as a factor facilitating substitution among various commodities or commodity groups. In the absence of a well-established theory or empirical evidence, price as an additional explanatory variable in the aggregate consumption function is not considered in the present model postulation.

(ii) **Investment**

Besides output, government investment including that for providing infrastructural facilities is considered as important in influencing the tempo of investment in the private sector. Investment functions are specified for each production sector (equations 12 to 15 & 72). Government investment is taken as exogenous. Investment in respect of private manufacturing, transport and other services is related to output in the respective sector or total output, Government investment and in the first case to lagged capital stock. Separate functions for fixed capital formation and change in stocks have not been formulated due to absence of details. Private investment in agriculture is essentially in terms of land improvement works like bunding, well digging, purchase of equipment including tractors, pumpsets, and construction of barns, etc. Investment decisions in this sector are taken, by and large, by farm households. The farmer's perception of improving productivity of land could be time-phased being based on his permanent income. His investment in the farm sector in a year need not necessarily be completely related to real incomes received in that year or preceding year as fluctuations in farm output are large. Also there could be competing avenues of investment like residential houses. Government investment in agriculture through construction of irrigation works may some time act as a stimulant for private investment. We found it difficult to explain adequately the fluctuations in private investment in agriculture: part of the failure could perhaps be attributed to data deficiencies. Considering various aspects, a simple relation linking annual gross investment (including inventories) in agricultural sector to average of current and previous years' agricultural incomes is postulated (equation 12).

(c) **Foreign Trade**

Exports are explained by world demand as indicated by world gross domestic product (equation 16). Aggregate imports depend upon domestic economic activity and relative import price (equation 17). A point could be made that the income and export prices of India's trade partners should be

considered. A separate Foreign Trade Model is being developed which will look into this aspect.

In the model exports have been determined in the framework of supply-demand equilibrium as follows :

$$X_d = g_1 (WGDP) \dots (1)$$

$$X_d = X_s (X_p) \dots (2)$$

$$X_p = g_2 (WP) \dots (3)$$

With the world income determining demand for exports (with supply assumed to build up to demand at a given domestic price level), the only constraint for exports is provided by the domestic price level. It is to be noted that international factors (international price and world income) have been taken into account in equation (1) above.

(d) **Fiscal Sector**

Fiscal operations of the government provide the link between government budgetary deficit, monetary expansion and prices. Government investment is mainly considered as a policy variable and treated as exogenous. The specification of the government consumption expenditure is described in the consumption sector. Government revenue on current account is related to national income (equation 19). Revenue and expenditure equations have been formulated separately for Central Government and for Central and State governments together (equations 20 to 22). The purpose of such separation is to enable us to study the impact of Central Government fiscal operations as revealed by budget documents on the economy, in particular on money supply and prices. This means an integration of data as appearing in the national accounts with the data provided by budget documents, which is obtained by linear statistical relations. All the equations are in nominal values. It is difficult to incorporate the subsidy variable in the model as it would involve an assessment of the impact of subsidies on outputs and inputs which would mean further disaggregation of the model.

(e) **Monetary Sector**

The specification of the monetary sector consists of a behavioural equation for currency expansion (equation 24), an equation for bank reserves (equation 26), and a function connecting deposit expansion to bank reserves (equation 27). Government's fiscal deficit is determined by government's total expenditure and revenue receipts. Given domestic borrowing and external borrowing (NFDB), the deficit to be financed by the RBI is obtained. This, along with increase in foreign exchange assets of RBI and increase in net absorption of government securities by RBI, explains currency expansion. For the purpose of estimating the currency equation only the deficit out of Central government operations and increase in foreign exchange reserves has been

considered. This could be a serious limitation as Reserve Bank credit to State Governments and commercial sector is of autonomous character. These factors also influence reserve money changes (currency plus commercial bank reserves) to a substantial degree. The influence of private sector transactions with the rest of world on reserve money could be only through balance of payments transactions and changes in exchange reserves. Equations for determining the bank reserves and deposits were, in the first instance, specified for scheduled commercial banks as they account for ninety per cent of aggregate deposits. Total reserves of the scheduled commercial banks are determined by currency, used both as a proxy for government deficit and demand for currency holding by the public, Bank Rate representing the tightness of monetary policy (supply of reserves to banking system) and the level of net foreign exchange assets of RBI (equation 26). Deposits are determined by the volume of bank reserves (deposit base) and the level of net foreign exchange assets of RBI (equation 27). The rationale for inclusion of the latter variable is that the multiplier or the rate at which banking system as a whole can expand deposits is related to it. In periods when banks sell more foreign exchange than they purchase from the RBI, they can be confident of obtaining reserves with greater ease following this autonomous (from the banks' point of view) inflow of reserves. They need to keep low excess reserves without fear of default and therefore deposit expansion potential will be higher. Total deposits of all banks are obtained as statistical functions of the scheduled commercial banks' deposits (equation 28). The other important variables of the monetary sector are borrowings of banks from RBI, banks' investment in government and other approved securities and bank credit. Borrowings of banks from RBI are considered to be policy-determined and are therefore treated as exogenous. Investments of banks in government and other approved securities are determined by the deposits of banks and Statutory Liquidity Ratio (SLR). Given the liabilities and the preempted resources, bank credit could be obtained residually from the balance sheet identity of the banks. However, it is estimated as a statistical function of deposits, borrowings from RBI, total reserves and investment in government and other approved securities to obviate the difficulty in explaining 'other liabilities and other assets' (equation 29). All interest rates are regarded as exogenous. Money supply is obtained following the broad definition of money and comprises currency, deposits and other deposits with RBI, the last item being taken as exogenous.

Although non-banking financial intermediaries are gaining importance in the economy their assets and liabilities are not included in the model due to lack of adequate data, the need for further disaggregation and also due to the absence of a well-defined theory on the impact of the operations of these institutions on output, demand and prices.

Certain odd or queer features in the above formulations of the monetary relations may be noticed. The standard approach to describe the monetary

sector in a simple model is as follows. Instruments associated with the Reserve Bank are currency (C), banks' reserves held with RBI (R), and RBI credit to commercial banks (BR). The instruments associated with commercial banks are deposits (D), banks' reserves (R) and borrowings from Reserve Bank (BR), while those associated with the public are currency holding (C) and deposit holding (D). High-powered money or base money (H) is defined as the sum of currency (C) plus bank reserves (R) minus borrowed reserves (BR).

The postulated economic relations between these variables are

$H = C + R - BR$	...(1)	Definition
$C + D = M = m H$	...(2)	"
$C = k (y, \bar{r}, p)$	...(3)	} Demand for currency by public
or		
$C/D = k (y, \bar{r}, p)$	...(3')	
$R = r (D, CRR, \bar{r})$	...(4)	} Demand for reserves by banking system
or		
$\frac{R}{D} = r (CRR, \bar{r})$	...(4')	
$BR = g (D, CRR, \bar{r})$	...(5)	} Demand for borrowed reserves by the banking system
or		
$\frac{BR}{D} = g (CRR, \bar{r})$	...(5')	
m (multiplier) $= \frac{k + 1}{k + r - g}$	...(6)	Equilibrating factor between demand for money and supply of money. k, r, g , as shown in (3), (4) & (5).
$H = \bar{H}$	(Government Budget deficit, autonomous variables like changes in foreign exchange reserves, RBI credit to commercial sector, etc.)	High-powered money or base money determination (supply) generally due to factors outside the monetary system
	...(7)	

Here y represents national income/income of households, p price level, \bar{r} vector of interest rates and CRR statutorily-determined cash reserve ratio.

It may be noted that in the market for various instruments the transactor on the supply side is the Reserve Bank for C, R and BR and commercial banks for D. Public, by and large, are the transactors on the demand side for C and D and commercial banks for R and BR. The highpowered money H is considered as supply-determined by fiscal operations, trade transactions and general economic activity. In the market for demand and supply of various instruments, the costs and prices that enter are deposit rates for bank deposits,

zero or nil price for currency (not for currency substitutes) and bank rate or discount rate for bank reserves and borrowing of banks from RBI. Since all the prices or costs expressed in nominal terms are either fixed or administered, commodity prices can act as equilibrating factors for demand for and supply of various instruments.

In the case of bank reserves and borrowing from RBI, commodity prices do not enter as the transactions are reckoned or assessed only in nominal terms. Thus the demand for and supply of currency, deposits or money is equated through price changes. The same cannot be said of demand for and supply of bank reserves or RBI lending to commercial banks. Thus the composition of high-powered money in terms of R and BR may change still keeping the same level of high-powered money, provided R and BR are perfect substitutes assuming that whatever currency is supplied, is absorbed by the system through variations in the price, nominal income, etc., which determine the demand for money. The problem then is how to reconcile the demand for the components of base money with their supply so that, in the process, the money multiplier is suitably defined. Writing suffixes d and s to denote demand and supply aspects, the above set of equations can be written as :

$$\bar{H} = C_s + R_s - BR_s \quad \dots\dots\dots(8)$$

[Combining (1) and (7)]

$$\left. \begin{aligned} C_d &= k(y, \bar{r}, p) \\ \frac{C_d}{D_d} &= k(y, \bar{r}, p) \end{aligned} \right\} \quad \dots\dots\dots(9)$$

Rewriting (3) and (3'),

$$\begin{aligned} R_d &= r' (D_s, CRR, \bar{r}) \\ \frac{R_d}{D_s} &= r' (CRR, \bar{r} \dots\dots) \quad \dots\dots\dots(10) \end{aligned}$$

Rewriting (4) and (4'),

$$\left. \begin{aligned} BR &= g' (D_s, CRR, \bar{r}) \\ \frac{BR_d}{D_s} &= g' (CRR, \bar{r}) \end{aligned} \right\} \quad \dots\dots\dots(11)$$

Rewriting (5) and (5')

$$D_d = D_s \quad \dots\dots\dots(12)$$

which is implied in equations (2) and (6) on multiplier. Three additional equations implied in the system are

$$C_d = C_s \quad \dots\dots\dots(13)$$

$$R_d = R_s \quad \dots\dots\dots(14)$$

$$BR_d = BR_s \quad \dots\dots\dots(15)$$

The above analysis indicates that some assumptions should be made to see that all the equations (12) to (15) are satisfied and a few of them may not be compatible with reality. Equation (8) says that ignoring the feedback effect, the total $(C_s + R_s - BR_s)$ is given to the monetary system. If the assumption is that $C_d = C_s$ through price or nominal income mechanism, $(R_s - BR_s)$ is predetermined and this with four equations (10), (11), (14) and (15) determine the four variables — the supply and demand for bank reserves and borrowings from Reserve Bank. If R_d and BR_d are perfect substitutes, either (10) or (11) can be omitted. If, as claimed by some that both R_s and BR_s are predetermined given \bar{H} , C_s becomes a residual which is determined by budget deficit and other factors. Either R_s along with (14) and (10) determines deposit supply or BR_s with (15) and (11) determines deposit supply. C_s with equation (9) determines prices and nominal incomes. This is the approach followed in the formulation of the monetary sector in our model. (see diagram on page 129 for alternative formulations) We do not have a demand equation for banks' borrowing from Reserve Bank. The distribution of supply of currency and supply of reserves for a given level of base money in equation (8) is postulated to depend on institutional factors, Government payment mechanism or use of the instruments in the expenditure pattern of goods, which, in turn, depends on the banking habit of the public including cash leakages that occur in the deposit multiplier process when commercial banks extend loans. One could also reformulate the model by assuming that currency holding is demand-determined in which case supply of reserves would take a residual character, which in turn determines the potential deposit creation of commercial banks (see diagram on page 129). In the model for developed countries this is the logic that is followed. Possibly in our case too, as the currency component of money supply becomes small, one can follow the same procedure as the volatile element in the high-powered money is the bank reserves component. One would then formulate straight-away

$$R_s = r'' \text{ (Budget deficit, monetary parameters, trade transactions, etc.)}$$

The model incorporates a demand for money function though it is not formulated in the conventional manner. This may be seen from equations (31) and (34) which may be reformulated as demand for money functions. In this model, while considering the demand for money functions, a broad distinction was made between the demand for money emanating from the foodgrains sector and the rest of the economy. In other words, the demand for money function, which is normally represented as

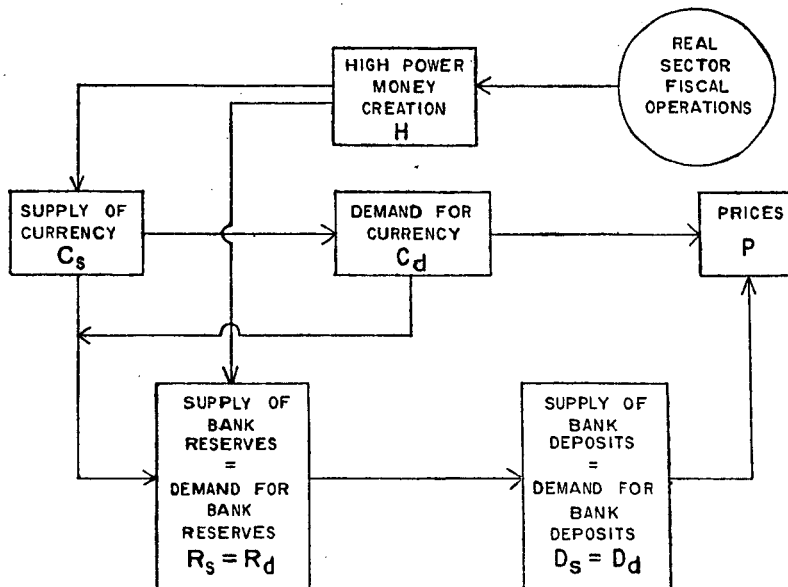
$M_3 = K(Y_r, P)$ is reformulated as follows :

$$M_3 = K_1(SFG, QNF, WPF) \text{ Demand for money from food sector}$$

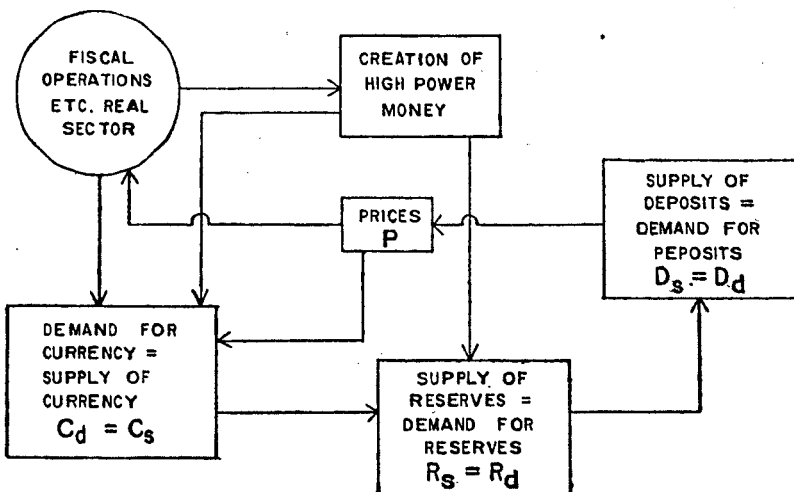
$$M_3 = K_2((YMR + YAR), WPM) \text{ Demand for money from non-food sector}$$

ALTERNATIVE FORMS OF FORMULATING
MONEY SUPPLY RELATIONS

HYPOTHESIS : (I) SUPPLY OF CURRENCY IS RELATED TO 'HIGH POWER' MONEY IN A STABLE WAY DUE TO GIVEN INSTITUTIONAL SYSTEM, GOVERNMENT PAYMENT MECHANISM ETC.



HYPOTHESIS : (II) SUPPLY OF CURRENCY IS EQUAL TO DEMAND FOR CURRENCY AS INDICATED BY REAL VARIABLES



A third demand for money function that is considered in the model (in respect of the services sector) is as follows : (equation 38)

$$M_3 = K_3 (Y\text{NDR}, \text{NID})$$

The underlying hypothesis in considering the above-referred three functions of demand for money is that the liquidity variable will have a differential impact on the price level in these three sectors. The interest rate variable has not been considered in the model as interest rates are assumed to be non-significant links in the interrelationship.

The bank credit variable emerges as a residual from the Monetary Sector Model. Since this variable is of paramount importance from the point of monetary policy considerations, the bank credit equation is presented in the model though its feedback mechanism is not built in. It is our intention to incorporate this variable into the model at a latter stage after fully exploring the nature of the feedback mechanism.

(f) Prices

Food prices are determined by supply of foodgrains, current as well as lagged, income of the non-agricultural sector and the liquidity in the economy represented by money supply (equation 31). The demand factors are thus taken into account in the form of the liquidity variable $\left(\frac{M_3}{Y\text{NAR}}\right)$ and output originating from non-food agricultural sector (QNF) and non-agricultural sector (YNAR). The role of price support policy in price determination arises mostly when the prices (especially those of foodgrains) fall below a certain floor level. As such a phenomenon is a rare occurrence in India, this aspect was not taken into account. This is not to deny that in view of the 'Ratchet Effect', the fixing of support prices has a built-in effect to bring about a long-term rise in food prices. Revisions in support prices are made to account for rising costs which, in turn, could be a result of inflationary conditions and might aggravate inflation rather than regulate it. Prices of other agricultural commodities are explained as a function of availability, demand for agricultural raw materials from the manufacturing sector and the impact of food prices (equation 32). The wholesale price of manufactured products is formulated as a function of food prices, prices of agricultural raw materials and import price (equation 33).

Import prices of food articles and industrial raw materials do not explicitly figure in the price equation. Foodgrain imports augment domestic supply and thereby influence prices. Import price is assumed to be exogenous. The overall price level (national income deflator) is determined by real output, money and price of foodgrains. The wholesale price of all commodities is specified as a function of liquidity in the economy relative to the output of agricultural and manufacturing sectors. Export price is determined by the

domestic wholesale price of all commodities. In the present model, the mechanics of wage-price spiral is worked out as follows :

Initially, the prices of consumer goods (PCP) will affect the wage rate (thereby affecting the total wage bill) which, in turn affects the Government consumption expenditure (CGN), a major part of which consists of wages and salaries. The Government consumption expenditure feeds into the Government Sector leading to the determination of Government deficit. The latter variable affects currency and thereby money supply which in turn influences price behaviour (including consumer goods). We have not explicitly introduced wage rate but provided for it in a proxy, *viz.*, price deflator for consumer goods. Similarly, price of foodgrains is introduced in the equation for the determination of prices of manufactured goods (equation 33) as a proxy for wage rate.

Prices of agricultural (non-food) commodities are determined by among others the output of the manufacturing sector, which represents the demand for agricultural raw materials. It may be worthwhile to consider the output of agro-based industries alone. The import of non-food agricultural commodities would also have a significant impact on prices of non-food agricultural commodities. These additional features have not been empirically built in from the point of view of demand for additional data and also to avoid further disaggregation.

Private consumption price deflator is obtained from the identity which states that the gross domestic product at current market prices is equal to the value of various components of demand comprising gross domestic expenditure. This is however translated in the form of a statistical relation (equation 70). Government consumption deflator is, in turn, estimated as a function of the private consumption deflator (equation 45).

4. The Model

The model has 79 equations. About forty-nine variables are determined by behavioural technological equations. The rest are determined as statistical functions or Identities. The important endogenous variables are area under foodgrains/non-foodgrains, output in agriculture, manufacturing (registered and unregistered), transport and other sectors, personal disposable income, private consumption expenditure, government consumption expenditure, private investment demand, imports, exports, government revenue receipts, reserve money, deposits of banks, money supply, bank credit and prices of agricultural and non-agricultural commodities. The main exogenous variables of the model are rainfall, government capital expenditure, foreign borrowings of government, borrowings of banks from RBI and import prices.

Estimates of the structural equations of the model are reported in the following section along with the identities which complete the model.

However, prior to that, a few points relating to methodology and specification need to be dealt with.

(a) **Is the Model over-identified ?**

In equilibrium, aggregate demand equals aggregate supply (at equilibrium price level). This means that if we determine any two of aggregate output, demand and price level then the third is determined by the equilibrium condition. If output is given in the short-run (or mainly determined by exogenous factors) then aggregate demand (influenced either by fiscal pressure—**a la** Keynesian Economics - or by monetary pressure — **a la** Quantity Theory) determines general price level. This model determines aggregate demand, supply and price level separately. It may therefore be criticised as being over-identified.

The criticism will be true in a simple description of the economy with a homogeneous one-commodity output. The approach in the model, however, takes into account the dual production structure in the Indian economy where, in one sector the demand-supply equilibrium is achieved through price adjustment while, in another sector, it is obtained through quantity adjustment. In the agricultural sector recourse is made to the classical theory. Here, the supply of output is, by and large, assumed to be pre-determined while the demand for output, either from within the sector or from outside, determines the price level. This is shown in equations (31) and (32) of the model, which are reduced from relations depicting the transactions between the agricultural and non-agricultural sectors. Agricultural sector depends for certain of its requirements on non-agricultural sector even as the non-agricultural sector obtains its food and industrial raw materials from agricultural sector. The relative prices of the agricultural and non-agricultural goods will be determined in the process. The relative price could be altered by increased money supply, as the impact of a higher monetary or aggregate demand may be different in the two sectors depending on the relative supply responses. Thus, money enters price relations both as a **numeraire** and as a surrogate to capture the differential impacts in the two sectors. The composite price for the economy as a whole will be a combination of the prices in agricultural and non-agricultural sectors whose absolute level could vary with higher levels of aggregate demand. Though aggregate demand equals aggregate supply for individual sectors and for all sectors taken together, the ultimate macro-economic equilibrium is achieved through different economic processes in the sectors. It is also necessary to note in this context that, apart from the above-mentioned equilibrium condition stated in real magnitudes, there is also an accounting identity which states that the overall (total) nominal expenditure (by various economic agents) is equal to the value of output produced in the economy. This accounting identity is essentially a definition of aggregate price index for the economy comprising a basket of goods viewed

either from the demand side or from the supply or output side. Having once obtained a basic price, (in terms of **numeraire** designated in the form of, say, either money or commodity standard) the aggregate price can be determined as stated above. For the sake of simplicity, it can be expressed as a statistical relation which includes the basic price (in our case the food price) and aggregate nominal demand and aggregate real supply. This is the type of price index which is shown in equations (34) and (38). In effect, in the context of the special features we are trying to capture through the above model, it cannot be categorically concluded that it is overdetermined. Even in a pure Keynesian model where prices are taken as given and quantities adjust to bring in equality between demand and supply, a **numeraire** is provided in the form of money wage rate measured in terms of number of units of money at which a specified quantity of labour will be made available (labour standard). In our case, since the basic price is determined in the food sector, the **numeraire** (accounting) happens to be the number of units of food supplied per unit of money. The above description can be illustrated mathematically in the form of two-sector model as follows :

(A) Accounting Relations :

- (1) $X_a^d = X_{1a}^d + X_{2a}^d$
- (2) $X_{na}^d = X_{1na}^d + X_{2na}^d$
- (3) $X_a^s = X_{1a}^s + X_{2a}^s$
- (4) $X_{na}^s = X_{1na}^s + X_{2na}^s$

(B) Equilibrium Relations :

- (5) $X_a^d = X_a^s = \bar{X}_a$ (fixed/exogenous)
- or
- $X_{1a}^d = \bar{X}_a - X_{2a}^d$
- or
- $X_{1a}^d = \bar{X}_a - X_{na}^s$
- (6) $X_{na}^d = X_{na}^s = X_{na}$

(C) Behavioural Relations :

- (7) $X_{2a}^d = f_1 \left[X_{na}, \frac{P_a}{P_{na}} \right]$ Demand for agricultural output by non-agricultural sector
- (8) $X_{2a}^s = f_2 \left[\bar{X}_a, \frac{P_a}{P_{na}} \right]$ Supply of agricultural output to non-agricultural sector
- (9) $X_{2a}^d = X_{2a}^s$ Sectoral Equilibrium

$$(10) \quad X_{1na}^d = f_3 \left(\bar{X}_a, \frac{P_a}{P_{na}} \right) \quad \text{Demand for non-agricultural output by agricultural sector}$$

$$(11) \quad X_{1na}^s = X_{1na}^d \quad \text{Sectoral Equilibrium}$$

$$(12) \quad X_{2na}^d = f_4 \left(X_{na}, \frac{P_a}{P_{na}}, X_{2a}^s \right) \quad \text{Demand for non-agricultural output by non-agricultural sector}$$

$$(13) \quad X_{2na}^s = X_{2na}^d \quad \text{Sectoral Equilibrium}$$

Accounting Identity

$$(14) \quad \frac{P_{na} X_{na}^d + P_a X_a^d}{X_a^s + X_{na}^s} \quad \text{or} \quad \frac{P_{na} X_{na}^s + P_a X_a^s}{X_a^d + X_{na}^d} = P = f_5 (M) \quad \text{Say}$$

X_{1a} = Output in agricultural sector going to agriculture either for consumption or stocks

X_{2a} = Output in agriculture supplied to non-agricultural sector

X_a = Total output in agriculture

X_{1na} = Output in non-agricultural sector going to agriculture

X_{2na} = Output of non-agricultural sector going to non-agricultural sector

X_{na} = Total output in non-agricultural sector

P_a = Price of agricultural commodities

P_{na} = Price of non-agricultural commodities

M = Money (exogenous)

P = General price level

s = Supply variable

d = Demand variable

The total number of variables is 16 of which two are exogenous, It will be noted from the above formulations that given fixed supply \bar{X}_a , the demand X_{1a}^d includes the demand for additions to agricultural (food) stocks. One could formulate that prices of agricultural goods vary depending on levels of stocks and fluctuate to bring in equality between aggregate demand and aggregate supply in the agricultural sector. The specific feature, namely, treatment of inventories as absorbing excess demand/supply could not be specifically incorporated in the model in the absence of data on the stocks held with farmers. However, this aspect was implicitly taken care of in equation (31).

The theoretical abstraction of dividing the economy into two-commodity sectors, as above, does not take into account many imperfections that underlie the real world. In the general equilibrium context with many commodi-

ties, many assumptions can be made about the manner in which prices or quantities react to excess demand/supply of individual commodities, which in aggregation could be reflected in both sectoral prices and quantities adjusting and not just either one or the other. To describe it in a different way, the "fixed" and "flexible" price mechanism may operate differently for different commodities even within a broad group of sectors like agriculture or industry. When the entire economy is divided into suitable sectors, it becomes difficult to form distinct groups in such manner that in each sector there could be relations which describe only demand, supply or price aspects and not all the three.

Apart from this, the basic assumption of perfect competition in commodity and factor markets without any structural bottlenecks, either in supply creation or in the transmission of demand to be reflected in price behaviour, is itself questionable. Theoretical niceties have to be given up in such a context to capture some of the economic realities. For example, one has to consider the exogenous elements impinging on price behaviour like administered prices, Government subsidies, import prices and changes in prices of factor inputs like labour, which can be independently altered by bargaining power associated with the strength of trade unions, sticky or rising mark-ups (over cost price) due to contractual pricing system in the short run, and in the presence of search or information costs. Some of these factors are adduced as limitations for the perfect competition assumption and are explained as the elements in stagflation in some of the Western economies. It is difficult to say, at this stage, whether one can assume the existence of equilibrium conditions as is generally understood in such markets. The above-mentioned explanation can thus justify the over-explanation of price, if there is any, in the current model.

(b) **Role of population in the model**

The effect of population growth has been completely ignored in the model. The population variable is assumed to have a neutral effect on the structural parameters of the model. The non-neutral effect of population variable is generally taken care of in the disaggregated models, as for example in Dr. K. Krishnamurty's study on savings, wherein the demographic distribution of population as between rural and urban areas was considered to assess the savings potential in the rural and urban sectors.⁷ Such an approach is a *sine qua non* in view of the fact that there are wide differences in marginal propensities to consume as between rural and urban areas. Thus, if we assume population to be exerting a non-neutral effect on the parameters of relationships, we have to necessarily go in for sectoral studies. It is well

7. Krishnamurty, K(1982), "Savings Behaviour in India", Occasional Papers : New Series, No. 6, Institute of Economic Growth, Hindustan Publishing Corporation, Delhi, 1982.

known that the literature on the theory of aggregation is meagre. The complications which arise when a system of inter-related macro-equations comes from micro-relations have been examined by Theil.⁸

(c) Utility of Model for Policy Formulation & forecasting

The present model incorporates the variables for analysing the impact of selected monetary, fiscal and other policy measures. The model does not, however, enable us to fully quantify the role of the exogenous policy variables like Bank Rate (RB), Statutory Liquidity Ratio (SLR), Borrowings of Banks from RBI (B) and Impounded Deposits (ID) as there is no proper feedback of some of these into the Additional Policy simulations could be attempted by effecting appropriate changes in the parameter values (as, for example, through effecting desired changes in the multiplier associated with the deposit supply equation, i.e., equation 27) and by omitting the endogenous explanation to make the corresponding variable a policy variable.

The multipliers, both short-term and total, are computed for limited policy options and are given later.

Macro-economic models, as are generally conceived, attempt to capture the broad economic interrelationships; the forecasting ability depends upon the tracing of the expected values of the exogenous variables and incorporating the broad structural shifts that may occur in the economy at the time of forecasting. These aspects can be taken care of at the simulation level by appropriately effecting changes in the structural coefficients of the model and providing for alternative scenarios for the growth paths of exogenous variables-

(d) Some limitations of the model

The model does not take into account some important events like the consequences of 1971 Pakistan War and spread of 'Green Revolution'. It is, however, difficult to incorporate the effect of a rare and one-time event into the macro-model. Not only is it difficult to ascertain precisely the variables affected by such events, it would rather be not desirable to attempt any quantification, say, through a set of "dummy" variables which absorbs additional degrees of freedom available for estimating the error. Further, since the model considers time series data (13 years), it is likely that the effect of these events is included in some of the variables appearing in the model. For example, the 'Green Revolution' may have resulted, in the ultimate analysis, in bringing about a change in productivity of land which, in turn, would have affected output. Quite likely, by 1969-70 (the initial year of our model) the full impact, whatsoever it may be, of the Revolution might have been realised in terms of its effect on productivity. Hence, the

8. Theil, H (1954), "Model and Welfare Maximisation", *Weltwirtschaftliches Archiv*, 72, 60-81.

impact of the 'Green Revolution' could be expected to have been caught by the input variable, especially acreage, to some extent. However, one need not presume that the increase in productivity is due to the 'Green Revolution' only. There may be other interesting variables, the influence of which it is difficult to delineate. Further, as the effect of the 'Green Revolution' is limited not only to certain pockets of the country but also to only a few crops, principally wheat, it is necessary to attempt a disaggregated approach to catch the true impact. Besides the problem of data limitation, the question arises whether such a disaggregation need be attempted, especially when our objective is to measure the general influence of selected major factors at the macro level rather than pinpoint the specific impact of particular events.

(e) **Other Limitations of the Study and Scope for further work**

(i) **Size of Sample**

An important limitation is the shortness of the time series used for the model. The nationalisation of 14 leading commercial banks in 1969 brought about substantial changes in the banking and monetary structure of the economy. It was hence felt desirable to confine the study to the period from 1969-1982. The model is estimated using the annual time series data for the period 1969-70 to 1981-82, i.e., on the basis of 13 observations only. As such it may be felt that no firm conclusions could be drawn on the basis of such a small sample. The statistical non-significance of the 't' ratios for many of the slope coefficients in the regressions could be due to the fewness of the observations. The relatively high values of the \bar{R}^2 statistics in the regressions could also be due to the fact that about 4 to 5 parameters (in about 14 equations) are being estimated from just 13 observations. We have reestimated the model for the period which covers the data from 1960-61 to 1969-70. The results show that for the same set of equations the coefficients in some of the equations are appreciably different from those estimated using the data from 1969-70 onwards. Two decades seem to be a long period for a developing economy not to show any major structural changes. Further the model was originally estimated for the period 1969-70 to 1978-79. By updating the model for three more years, i.e., by covering the period 1979-80 to 1981-82, we have found that there is no substantial change in the parameters. To that extent there is stability in the model.

(ii) **Statistical Determination of Identities**

The model has estimated statistically a number of equations which can ideally be expressed as a linear or non-linear identity, e.g. changes in stock of currency, bank credit and so on. In a number of cases the aggregate expressed as a statistical relation of the components when a linear identity using residual as exogenous variable, would serve the purpose. For instance,

total bank deposits are expressed as a statistical function of commercial bank deposits. An appropriate treatment could have been to say that total bank deposits equal commercial bank deposits plus co-operative bank deposits. Similarly, personal disposable income is expressed as a stochastic function of national income when, in fact, it can be expressed as a linear identity.

We have preferred the adoption of statistical constructs basically due to the non-availability of data in respect of some of the components constituting the sector under study. For example, data relating to co-operatives are available with substantial timelags. Hence we determined the aggregate deposits (of scheduled commercial banks and co-operatives) through a statistical construct. This approach has yielded a better estimate of aggregate deposits than by assuming the magnitudes of the deposits of cooperatives separately and adding them to the estimated deposits of scheduled commercial banks. The latter approach is also beset with the problem that errors in the assumed magnitudes of Co-operative Bank Deposits are likely to feed into the aggregate deposit variable. Similar is the case with other variables like personal disposable income.

(iii) **Estimation Procedure used in the Model**

The model is estimated in linear form by OLS method. It is well known that macro time-series data incorporate strong trend elements. Though high explanatory power is achieved in the equations, in view of multicollinearity the parameters in the relationships might not have been estimated with enough precision. It may, therefore, be felt that a more sophisticated form of estimation using first differences, percentage of growth rate, etc., is necessary to distinguish between apparent and real relationships. We also intend to reestimate the model by using methods which may not involve the 'simultaneity bias'. It is not very evident from the theory of small samples whether the bias due to OLS estimation could compensate for the bias/errors in more sophisticated method of estimation arising out of wrong or inadequate specification and other factors. It is very rarely that maximum likelihood estimation is adopted in large-scale model building.

(iv) **Other Limitations**

In the present analysis, emphasis is laid on the crucial role played by supply constraints and fiscal and monetary factors in the economy. On the supply side attention is given to the determinants of agricultural output. The determination of manufactured output could perhaps be analysed in greater detail than at present. Government spending by way of generating demand in the economy provides impetus to investment in manufacturing sector and output. The other effect of government spending is in raising the capital stock in the public enterprises and also the infrastructure which ultimately lead to increases in output. These linkages have been partially

built into the present analysis. The impact of fiscal operations on money supply through government deficit is brought out in the present study. Similarly the role of monetary factors in the inflationary process is demonstrated. However, the role of money and credit in influencing the output has not been investigated. Another limitation of the study is that the linkage between the foreign sector and the domestic economy has not been considered in detail especially in the direction of capital account constraints, debt servicing problems, etc. The effect of inflation on government's fiscal operations and output of the economy also needs further exploration. There is scope to enlarge the present study to get a greater insight into the working of the economy.

C. Estimates of Model Structure

The empirical estimates of the equations are obtained using the annual data for the period 1969-70 to 1981-82. The basic data are collected from National Accounts Statistics, Report on Currency and Finance and Economic Survey. Data used in the estimation of the model are given in Appendix VI.

The format of most of the equations is linear. Ordinary Least Squares (OLS) procedure is used to estimate them. For each behavioural variable several alternative formulations have been worked out. In assessing the adequacy of the selected regression equations economic criteria like the appropriateness of the sign and the magnitude of the regression coefficient and statistical criteria like coefficient of determination \bar{R}^2 , Durbin-Watson Statistic (DW), Standard Error of Estimate (SEE) and 't' values of the regression coefficients have been used. Finally, the goodness of fit of the estimated equations is judged by the number of turning points the estimates explain as well as the closeness of the graph of the estimated values to that of the actual values. Notation of the variables is given in Appendix I. The estimated equations are presented in Appendix II-A.

(a) Output

The important results provided by the relations in the agricultural sector are the following : The short-term impact of relative prices on acreage allocation between the two categories of crops viz. foodgrains and non-foodgrains is very small at the level of aggregation studied (equations 36 and 37). The acreage planted under foodgrains seems to have reached a plateau during the 1970s and the early 1980s. The pre-sowing weather conditions, in terms of precipitation received, influence acreage planted under foodgrains (i.e., additions or subtractions to the existing crop acreage) only to a minor degree. On the other hand, similar influence on the acreage under non-foodgrains is larger; the long-term effect is being heightened due to difficulties by way of adjusting to desired changes. Adjustment to desired acreage could come about by shifting areas from established food crops or by the addition of new

reclaimed areas. Timely rainfall is still an important factor to be reckoned with in the output of foodgrains and non-foodgrains. Output elasticity with respect to rainfall, given acreage, is 0.15 for foodgrains (equations 1). The total impact of rainfall (i.e., including its impact on acreage which is devoted to food crops) works out to 0.41. The speed of adjustment of the actual area to the desired area is 0.90 in the case of foodgrains while it is low (0.46) in the case of the area under non-food crops.

The large direct impact of rainfall on non-foodgrains production is to be cautiously interpreted as the associated parameters are not statistically significant in the output function. The important influence of irrigation on foodgrains output is again stressed in the estimated relations. Higher level of capital investment in agriculture is closely correlated with increasing irrigation potential (equation 73). This would in a way provide an indirect justification for the priority given to large scale investment in the agricultural sector in various Five Year Plans. The derived net impact of capital stock per acre on foodgrains output is 0.09 which is more than the total of elasticities of irrigation and capital stock for non-foodgrains.

Manufactured output (registered) is satisfactorily determined by capital stock, aggregate consumer demand (agricultural and non-agricultural) and government capital expenditure (equation 5). Ninety eight per cent of the variation in manufactured output is accounted for by this specification. Attempts at using the capacity utilisation variable directly were not successful due to the unsatisfactory nature of the data. The elasticity of manufactured output with respect to capital stock is found to be 0.04. The net output from unregistered manufacturing industries is explained by capital stock (in the unregistered sector) and output of the manufacturing sector (equation 6). The elasticity of output with respect to capital stock is 0.17 in this sector. Income from transport and communications sector is estimated with a high coefficient of determination. As expected the demand for these services depends upon the tempo of agricultural and industrial production besides the capital stock employed.

The following table gives the elasticity of output (at the mean level) with respect to proxies for capacity utilization and capital stock.

Elasticity of output at the mean with respect to

	Proxy for capacity utilisation	Capital stock
(1) Registered manufacture	0.97	0.04
(2) Unregistered manufacture	0.47	0.17
(3) Transport, etc.	0.20	0.38

(b) (i) Consumption Demand

The estimated personal consumption function has real personal disposable income as the major determinant (equation 9). The marginal propensity to consume is estimated at 0.76 in the long run. Other things remaining the same, an increase of 1% in the share of agricultural income in total income would raise the real personal consumption expenditure by 0.2 per cent.

The price variable in the Central Government consumption equation is meant to explain two phenomena : (1) The escalation of wages and salaries due to the built-in clauses in wage contracts, which compensate for a rise in the cost of living; and (2) additional expenditure undertaken by government to counteract the effects of drought (rises in food prices) by special relief programmes (equation 11). The long-term elasticity of central government consumption expenditure with respect to revenue collection is 0.82. An increase of 1% in the government consumption expenditure deflator (proxy for consumer price index) would, other things remaining the same, lead to an increase of 0.14 per cent in the short run and 0.23 per cent in the long run in the nominal (central) government consumption expenditure. The relation shows that when prices remain stable, Government consumption expenditure falls much short of Government revenue and Government accounts tend to show a surplus on current account.

(ii) Investment

The accelerator theory could not be shown to be fully applicable in respect of the private investment in the manufacturing sector during the study period. The explanatory power of the investment function as specified (equation 72) is satisfactory for private investment in manufacturing (registered sector) and for investment in transportation and communications sectors (equation 14). The sectoral investment data include both fixed investment and additions to stocks. The elasticity of private investment in agriculture is 2.77 with respect to agricultural output (equation 12). The elasticity of private investment in registered manufacturing sector with respect to Government investment is found to be 1.51. Thus the Government investment expenditure has a strong influence on the investment in the manufacturing sector. Similarly total investment in transport and communications sector is largely related to Government capital expenditure in that sector.

The main factors which explain private investment in manufacturing sector (registered) seem to be the level of national product in the real terms, Government real investment during the period and the existing capital stock. The absence of variables like profitability and changes in sales (or demand for manufactured goods) seems to be contrary to intuition, as well-established theories are not borne out by the relation. Earlier it was postulated that output in the manufacturing sector is demand-determined with the presence of excess capacity. It seems useful to set out the rationale behind the chosen formulation. It may also be mentioned in this context that our formulation

and that of Krishnamurty differ only to the extent that the latter includes a proxy for profits with non-wage income deflated by investment goods price index.⁹ This happens to be a dominating variable in the explanation of private investment in manufacturing. Our inclusion of real output in manufacturing sector as a proxy did not yield statistically significant co-efficients. Secondly, for the period studied by Krishnamurty 'real' profits could be an important variable; for the years subsequent to 1969-70 they may continue to be so, though somewhat less influential. Our studies on real rate of return and cost of capital in the corporate sector show that the annual rates of investment for the corporate sector as a whole are not related to 'real' profitability in relation to capital.¹⁰ One may hasten to add that the hypothesis underlying Krishnamurty's formulation is different as it is 'real' profits and not profitability that explains annual investment. At this stage what can be said is that institutional and non-economic factors could have dominated private investment more in the 1970s than in the 1960s. According to Isher Ahluwalia's study, the decline in rate of industrial output was, by and large, in the basic capital goods industries and not in consumer or intermediate goods.¹¹ Since prices of investment goods have increased relative to prices of other goods, capacity utilisation of the former industries in the private sector could have been lower only due to demand factors. The decline in the demand for investment in consumer goods could be partly due to the rising capital costs, which would have made entrepreneurs postpone investment in these industries. It may be pertinent to point out the difference between our results and those of Krishnamurty. Krishnamurty finds that the existing capital has only a small inhibiting effect on new investment in terms of elasticity (-0.44) while the relation estimated by us shows a substantial impact (-0.72). Government investment crowds out private investment in the short run (elasticity 0.32) in Krishnamurty's model while it stimulates private investment substantially in our model (elasticity 1.51). Finally the dummy indicates that private investment was higher than anticipated between 1978-1981 as against being lower as shown by Krishnamurty. Private investment in un-registered manufacturing sector could not be suitably explained in the current model and hence is taken as exogenous. Since investment in this sector could react to the economic environment, the assumption of exogenously determined private investment in the unregistered sector could, in policy simulations, yield output or production levels which are not accurate with the consequent biased measures of impact on the rest of economic aggregates. It is hoped to rectify this in the next version of the model.

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9. **K. Krishnamurty, Inflation and Growth, A Model for India, 1961-80**, Institute of Economic Growth, Delhi (Mimeo).
 10. **P. K. Pani, Trends in profitability and cost of capital in the private corporate Sector** : RBI Occasional Papers June 1982.
 11. **I. J. Ahluwalia, Industrial Performance in India : 1959-60 to 1978-79** (Mimeo), Indian Council for Research on International Economic Relations, New Delhi.

(c) Foreign Sector

The relations in the foreign trade sector (equations 16 to 18) show that while the quantum of exports from India responds fairly well to world gross domestic product (income elasticity 1.55), the elasticity of our imports with respect to real domestic product is much higher (3.07) though such imports are tempered by the effective prices at which these are secured in relation to the prevailing domestic prices. Price elasticity of exports is assumed as negligible in the above formulation which would imply that exchange rate variations do not alter the quantum of our exports in any appreciable manner. As stated earlier, these results which are observed at a highly aggregate level have to be verified by further disaggregation. The preliminary relations which we have estimated indicate that the import propensity and price elasticities changed considerably between the period 1950-51 to 1965-66 and the subsequent one-and-a-half decades in respect of major trade categories (Appendix VII).¹² Part of the change could be due to the change in the pattern of our imports, essential imports forming a greater proportion now, compared to earlier period; the price elasticity of imports could have therefore, declined. As for exports, though aggregate exports to all regions appear price-inelastic, there is some competitiveness in our exports to dollar and EEC areas. In these regions there is considerable price response, the elasticity being more than 1.0.

Besides domestic activity variable (domestic product) and relative price of imports (ratio of price of imports to domestic price), the import function has a dummy variable to study the shift in the pattern of imports, if any, subsequent to 1975-76 following oil price hike.

The quantum of imports (MQ) in equation (17) of our model is formulated from the demand side. The negative sign of $\frac{P \cdot M}{WP}$ in the import equation is in line with the theory. This variable represents the relative price of imports *vis-a-vis* the domestic price level. A rise in relative price by 1 per cent will result in a fall in imports by 0.49 per cent.

(d) Fiscal Sector

Fiscal operations of the public sector are distinguished into two categories : (i) entire public sector including State Governments, Public Sector enterprises, etc., and (ii) Central Government alone. Two of the sources of funds, viz., public revenue and net domestic borrowings are endogenously estimated in our model to which net foreign aid — exogenous to the system — is added. On the expenditure (uses of fund) side, two categories are distinguished : (i) consumption expenditure (ii) capital expenditure. A sizeable figure appears in the Government accounts under miscellaneous capital

12. R. Kannan, *An Econometric Model of India's Foreign Sector (1956-57 to 1979-80)*, Paper presented at the twenty-third annual conference of the Indian Econometric Society, Hyderabad, January 3-5, 1985.

receipts. This is basically a gross item consisting of inter-unit transactions within the public sector. It comprises capital transfers from general Government, increase in paid-up capital of non-departmental Government undertakings, capital consumption allowances, loans from Government administration and financial enterprises to non-departmental and non-financial undertakings, apart from miscellaneous domestic liabilities net of domestic financial assets. This item is also endogenised as being related to the Government capital expenditure and domestic borrowings (equation 79).

Central Government current account revenues are related to national income at current prices according to a partial adjustment mechanism (equation 19). The speed of adjustment of actual revenues to the expected revenues is low 0.44. The elasticity of Government revenue with respect to national income is 0.58 in the short run and 1.3 in the long run. To arrive at a realistic estimate of domestic borrowings, it is necessary to take into account the availability of savings in the economy. The level of household savings (in nominal terms) and the rate of inflation are therefore considered as explanatory variables in the functional form (equation 76) for net domestic borrowings. It may be mentioned that changes in RBI's claims on Government are deducted from the series on net domestic borrowings so as to reflect the Government sector's draft on private savings accurately. The marginal domestic borrowings to savings ratio was found to be 0.30.

Of the two components of Government expenditure, total consumption (CGN) is fully endogenised. Central Government expenditure is related to prices and revenue in a lagged adjustment form (equation 11). Total consumption expenditure of the public sector as a whole is endogenously determined as a linear function of Central Government expenditure (equation 10). The introduction of price as the additional variable is, as stated earlier, to take into account the increase in current expenditure of Government due to a rise in wage costs, etc., following an increase in the price level. These equations represent one of the links between the real and fiscal sectors built into the system. As regards capital expenditure,¹³ transfers (GCT) are treated as exogenous and the rest of Government capital expenditure is esti

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13. Capital expenditure comprises, besides investment of general Government and non-departmental undertakings,
- (i) Current and capital transfers of general Government,
 - (ii) Contribution to capital of companies.
 - (iii) Loans to Government and non-Government companies on a net basis and
 - (iv) Other miscellaneous items.

In the national income accounts (due to grossing up of data for general Government, departmental and non-departmental undertakings, etc.) there is a large element of contra-entry items under capital expenditure and miscellaneous capital receipts as defined earlier. For our analysis, miscellaneous capital receipts are netted out of total Government expenditure in estimating the resource gap.

mated as a function of price and Government investment in real terms (equations 74 & 75). Total Government expenditure (GE) can be derived as a sum of current and capital expenditures. An estimate of the resource gap covered by deficit financing would then be obtained though the identity in equation 78 by deducting the sum of total revenue, net domestic borrowings, miscellaneous capital receipts and net foreign aid from the total Government expenditure. It is estimated that 53 per cent of the resource gap is financed by Government draft on the private sector and 38 per cent by RBI credit to Government.+ The remaining portion of the gap is covered by foreign aid.

The following table indicates the relationship between the variables in the fiscal sector.

Public Sector Finances

Sources		Uses	
1. Total Public Sector Revenue	GR	1. Total Public Sector Current Expenditure	CGN
Of which :		Of which :	
(Central Government Revenue)		(Central Government Expenditure)	CGN1
2. Miscellaneous Capital Receipts	MCR	2. Total Public Sector Capital Expenditure	GC
3. Resource Gap (GE - GR - MCR)	RG	Of which :	
		(Nominal Investment)	(IGR* x PCF)
		(Current Transfers)	GCT*
		(Other Capital Expenditure)	GCE
		3. Total Public Sector Expenditure (CGN + GC)	GE
4. Net Domestic Borrowings	DB	4. Resource Gap	RG
5. Net Foreign Aid	NFA*		
6. Aggregate Budgetary Deficit of the Public Sector (RG - DB - NFA)	BD@		

* Except these variables, the rest are endogenously determined.

@ Net RBI Credit to Government.

+ Please see Appendix VIII(I) Rows III(I)—III(III), Col-4, for long-term financing of Resources gap changes. The quoted figures are related to average resource gap.

In this study estimate of budgetary deficit, as defined above, does not have a feed back to the rest of the system due to various reasons. To begin with, the data on the different variables originate from different sources. There is a problem of data lags between series and comparability of different aggregates conforming to the same concept between various data sources : for example, between those available in the national income accounts and central/government budget figures. In view of this and our interest in studying the impact of central government operations on the system, a slightly different link is introduced between the budgetary deficit and the monetary sector. For this purpose, the fiscal data pertaining only to Central Government are used to describe the budgetary gap which are then introduced as variables contributing to currency expansion (equation 24).

(c) Monetary Sector

The estimated equation of the change in currency holding by public (equation 24) shows that about 81 per cent of the variation is accounted for by government deficit, domestic and foreign borrowing of government and change in foreign exchange assets. Domestic borrowings and borrowings from abroad have the expected negative impact on currency expansion. Given the government's fiscal deficit, an increase of 1 per cent in domestic and foreign borrowing would lower currency expansion by 0.77 per cent. The elasticity of currency expansion with respect to change in foreign assets is 0.04. The estimated equation catches all the turning points in the movement of the actual values of changes in currency stock. The estimated equation of the total reserves of the scheduled commercial banks has currency, Bank Rate and foreign exchange assets of the banking system as explanatory variables (equation 26). The explanatory power of the equation as revealed by \bar{R}^2 is very high. Currency, which is taken both as a proxy for fiscal deficit increasing the reserve base and preference for currency holding contracting it, has a significant net positive effect on the reserves of the banking system. The elasticity of supply of reserves with respect to the stock of currency is estimated to be 2.43. Lower level of currency with public would, in the context of branch expansion and development of banking habit, result in a larger inflow of reserves when public changes its preferences towards the holding of deposits instead of cash. Thus changes in the coefficient associated with the currency variable would reflect this type of structural change taking place in the economy. Bank Rate has been included in the supply of reserves equation as an indicator of the tightness of monetary policy. The inclusion of borrowings from RBI as an explanatory variable has not yielded any plausible result. The role of call money market in augmenting the reserves of the banking system could not be ascertained satisfactorily and therefore the results are not reported here. The effect of Bank Rate on the reserves of the banks is negative and significant. As an approximate measure of the monetary authorities' intentions, the supply of reserves may be expected to decline as Bank

Rate rises. According to the estimated equation, the elasticity of supply of reserves to the banking system with respect to Bank Rate is -0.80 . Deposits of the scheduled commercial banks are determined by supply of bank reserves, deposit multiplier and net foreign exchange assets of RBI. Bank reserves are adjusted for impounded deposits during 1976-77, 1977-78 and 1978-79 to take care of the changes in deposit multiplier. The average deposit multiplier works out to 10.82. The cash reserve ratio varied between 3 per cent to 7.5 per cent during the period. With the additional reserve requirements the effective CRR would have been at 10% level during some years. The potential supply of deposits would vary from period to period as the multiplier changes with changing CRR. However, the deposit supply function assumes a stable multiplier except to the extent to which it is altered by foreign exchange reserves. The equation further shows that the effective multiplier is declining over the period (except for the period during which the foreign exchange assets of RBI were rising).

It may be noted that with a CRR of $r\%$, the potential multiplier on a reserve base R , is $\frac{1}{r}$ yielding total deposits $D = \frac{R}{r}$. The difference between potential multiplier and actual multiplier arises due to the following reasons.

(1) Banks keep excess reserves for various reasons. If e is ratio of excess reserves to total deposits, the potential multiplier works out to $1/(r + e)$.

(2) Banks keep some vault cash for daily transactions which is generally included in the reserve base. The ratio of vault cash to total deposits is found to be about 1.2% (16% of total reserves). The multiplier is further reduced to $1/(r + e + c)$ where c is vault cash to deposits ratio. When banks extend loans which are utilized, the deposits that flow back to the banking system would depend on the cash leakage or currency preference of borrowers/beneficiaries of loan proceeds. This leakage amounts to banks keeping extra cash/excess reserves to meet the additional cash requirements. If the cash leakage to deposit is l , the multiplier would come down to $1/(r + e + c + l)$. It is generally estimated that with the increase in the reserve ratio, e , c and l are coming down, i.e., banks are keeping less excess reserves given the level of deposits as compared with the earlier periods. This is due to the higher returns on loans and other assets in the portfolio. Similarly they are economizing on vault cash. With the development of banking habit l is also going down. It is difficult to quantify as to how much of increase in r is compensated by these rises. The impact of monetary policy measures could be somewhat lessened by the presence of these elements. At the end of March 1983 scheduled commercial banks had a cash deposit ratio of 11.85 per cent. Adjusted for impounded incremental deposits it works out to 8.23 per cent. Its reciprocal is 12.15. The estimate from the relation can be worked out as follows :

$$\begin{aligned}
 \frac{\text{SCD}}{(\text{SCBR} - \text{ID})} &= \frac{1980}{(6086 - 1859)} \\
 &+ 0.3805 \times \frac{1684}{(6086 - 1859)} \\
 &+ 10.82 \\
 &= 0.47 + 0.15 + 10.82 \\
 &= 11.44
 \end{aligned}$$

The actual and estimate differ by 0.71 percentage point. At the end of March 1983, CRR was of the order of 7 per cent yielding the sum of $e + l + c = 1.2$ (i.e., 8.2 — 7.0)

Assuming a partial equilibrium approach one would be interested in knowing what would be the change in the potential level of deposits associated with a certain change in the reserve base between an initial year to year t , during which the CRR is raised by $x\%$ of deposits. For the years t_0 or t_1 the R_0 , FEA_0 , R_1 and FEA_1 would be available so that the deposit multiplier in the year t_0 which is equal to $\frac{1}{r_0 + e + c + l}$ would change to $\frac{1}{r_1 + e + c + l}$ the assumption being that e , c , and l would not have altered meanwhile. Given these parameters one can also work out the reserve base (R_1) and/or change in foreign exchange assets (FEA_1) which would be compatible with an envisaged deposit growth. Since the relation between the budget deficit and reserve changes is well postulated, one can further determine the level of budget deficit that can be incurred which would be in consonance with a given level of deposit growth. When cash reserve ratio (CRR) is stipulated in terms of the level of deposits, both the average and marginal CRR are the same during a period. When CRR is stipulated in terms of different average and marginal ratios, as they were in the past and currently, the application of the above formula needs certain modifications. If r and s are the average and marginal ratios and g is the growth rate for deposits per annum, it will be seen that the effective CRR, say w , after n periods works out to $w = (r + s) - \frac{s}{(1 + g)^n}$ being dependent on the number of periods after which the marginal CRR is imposed and on the rate of deposit growth. With 9% CRR, 10% marginal CRR and $g = 17\%$, the effective CRR $w = 19 - \frac{10}{(1.17)} = 19 - 8.5$
 $= 10.5$ after a year

This effective CRR could be substituted in the place of r in the above formula.

The total reserves and deposits of the entire banking system are obtained by linking them to reserves and deposits of the scheduled commercial banks.

Given the deposits of the banking system and borrowing from RBI, which is exogenously obtained, their total liabilities (except inter-bank liabilities) are determined. Total reserves of the banks are determined as described before. Investment of banks in government and other approved securities is determined by SLR. Interbank liabilities and assets are ignored. In view of this, bank credit is obtained as a statistical function of the liabilities and assets enumerated above. Money supply is obtained as the sum of currency with public, deposits and other deposits with RBI.

(f) **Prices**

The main determinants of the food prices are non-agricultural income, supply of foodgrains (current and lagged) and money supply. The output of the non-foodgrains agricultural sector is also included as an explanatory variable representing the incomes from non-food agricultural sector. These factors explain 94 per cent of the changes in food prices (equation 31). The results show that, *ceteris paribus*, an increase of 10 per cent in the ratio of money supply to non-agricultural income would push up the foodgrain prices by 2.4 per cent. On the other hand, an increase of 1 per cent in the supply of foodgrains in the current year alone would bring down food prices by 3.53 per cent. Impact of demand from non-food agricultural sector on foodgrain prices is also significant. The long-term elasticities of food prices, as estimated by us and by Krishnamurti, are as follows :

	This model	Krishnamurty
Money supply	0.24	0.84
Supply of foodgrains	-5.34	-2.42
Demand for foodgrains	4.53	3.00

Prices of agricultural commodities other than foodgrains are determined by the output of the manufacturing sector, which represents the demand for agricultural raw materials, production of agricultural raw materials, current and lagged, and food price, which acts as the prime mover of other prices in the economy. The degree of explanation provided by the estimated equation \bar{R}^2 is 0.96 (equation 32). Production of agricultural raw materials in the current year as well as in the previous year has the expected negative impact on prices of agricultural raw materials. The coefficient of the current year's production is not, however, statistically significant. The elasticity of agricultural raw material prices with respect to the production of agricultural raw materials (current as well as lagged) is found to be -1.21. An increase of 1 per cent in the output of manufactures would increase the prices of agricultural raw materials by 1.24 per cent by raising the demand for agricultural raw materials.

Foodgrains price has a significant positive influence on non-agricultural prices. The prices of manufactured goods are well explained by the cost-push hypothesis, the major cost-push factors being prices of foodgrains, prices of agricultural raw materials and import prices (equation 33). The price of agricultural raw materials has a large influence followed by prices of foodgrains. Behavioural relationships are also estimated for studying the movement of the general price level. Two indicators of the general price level are considered. These are the wholesale price of all commodities and the national income price deflator. Wholesale price of all commodities is sought to be determined by excess liquidity in the economy in relation to production of agricultural and manufactured goods and foodgrain prices according to a partial adjustment process (equation 34). This specification provides a reasonably good description of the movement of the general price level in the economy. The regression coefficients of all the variables are found to be statistically significant. The elasticity of the general price level with respect to the variable representing the monetary demand in relation to real output is 0.25 in the short run and 0.34 in the long run. Food prices, however, play a dominant role in the movement of the general price level.

The inclusion of a lag term in the explanation of wholesale prices of commodities is done to capture two elements : (1) Since the price equation can be written as an inverted demand for money function, price expectations enter the public's desire to hold money balances; lagged price variable would partly take care of this. (2) Nearly a fifth of the weight in the computation of wholesale price index is allotted to commodities whose prices are administered. Since these prices change infrequently within a period, there is no mechanism in the model to take care of the exogenous variations arising out of these price changes. The lagged variable would again partly take care of the effects of these on wholesale prices, if not in that year, at the latest in the next year. We have also tried to measure the impact of administered prices on the economic system through the use of Input-Output Tables. We have used the index of potential impact in place of the lag variable. We find that the net impact of changes in the administered prices on the wholesale price of commodities is higher, the elasticity being of the order of 1.8. Some simulation results using this relation are given later in Appendix VIII J. The national income price deflator is formulated according to the Quantity Theory (equation 38). The price equation implies that price level varies to match the nominal money supply determined on the monetary side and the real demand for such balances by raising or lowering nominal incomes on the assumption of a stable demand for money function. Foodgrains price is included as an additional explanatory variable as agricultural production shocks would be exogenous and food prices could as well set the trend in the movement of the overall price level. The estimated price equation accounts for 98 per cent of the variation in the over-all price level and catches almost all the important turning points in the movement of the price level. The

results show that an increase of 10 per cent in the ratio of money supply to real output would lead to rise of 3.4 per cent in the overall price level. This is besides the liquidity effect experienced by food prices where the elasticity is estimated at 0.24. The total impact of excess liquidity in the economy would thus work out to an elasticity of 0.46 [$0.34 + (0.49 \times 0.24)$].

(g) **Others**

Net domestic product of the economy at constant prices is equal to the total expenditure on all goods and services in real terms. It is also the sum of net outputs of the different sectors. National income at current prices is obtained as a product of the real income (sum of total net output of different sectors) and national income deflator which are both endogenously determined (equation 66). Personal disposable income at constant prices, capital consumption allowances, indirect taxes, etc., are obtained through statistical constructs.

A majority of the selected equations fit well to the actual data as could be seen from the graphs of the actual and estimated values of the variables (Appendix III). Many equations are free from first order auto-correlation of the residuals. The standard errors of estimate of the regression equation are reasonable in a good number of cases. The individual equations seem to provide an adequate description of the important elements of the structure of the Indian economy.

D. Simulation of Model

(a) **Working of the Model**

The basic structure of the model of the Indian Economy and the empirical estimates were presented in the previous sections. An attempt is made in this section to study the performance of the model as a whole in describing the behaviour of the economy. The model is expected to work as follows.

Agricultural output is essentially determined by area under crops and weather conditions. The output of the manufacturing sector depends upon the demand factors. The demand for manufactured products is determined by gross domestic expenditure (consumption, export demand), and government's investment. Output of the tertiary sector is determined by and large by the demand created by agricultural and industrial output and the capital stock in that sector. Thus the total domestic output in the economy is obtained.

Personal and government consumption expenditures are related to personal disposable income and government revenue collection, respectively, which, in turn, are dependent upon national income. Private investment is

determined by sale (proxy for profits) while government capital expenditure is determined by policy consideration. Imports are related to domestic economic activity and relative import price. Exports are determined mainly by world demand. Government expenditure and government revenue, together with the endogenously determined capital receipts, determine government budgetary deficit. This, in turn, affects the reserve money and the deposits of the banking system. Money supply is, therefore, determined by government budgetary operations and the foreign exchange assets of the banking system. Foreign assets are, however, treated as exogenous. Once agricultural output and non-agricultural incomes are determined and money supply is estimated, they feed into the food and non-food agricultural price equations to determine food and other agricultural prices.

The prices of manufactured foods are then determined by the 'cost push' mechanism. The over-all price level in the economy, i.e., wholesale price of all commodities and national income price deflator, are determined by aggregate output and aggregate demand. The current price estimates of the various macro-economic aggregates are obtained once the real sectoral magnitudes and the prices are estimated. The over-all price level and the sectoral prices again feed into the system to determine government deficit, money supply and some of the sectoral outputs though the linkage of the last with prices is somewhat weak. The linkages that are expected to play an important role in the behaviour of output, money and prices in the economy are those between government fiscal operations and monetary sector, government investment operations and output in the real sector, government consumption and investment demand and private sector investment and output.

The endogenous variables and the exogenous variables together with the flow chart of the model are given in Appendix IV.

While the individual equations for the endogenous variables appear to be satisfactory, it is necessary to test the collective performance or goodness of fit of the model by obtaining a simultaneous solution of the model. The technique of simulation has been used for this purpose. In simulation an iterative procedure is adopted to solve the simultaneous equation system for the set of endogenous variables. Both the static and dynamic simulation experiments are performed. In static simulation the actual lagged values of the endogenous variables are used in obtaining the solution, whereas in dynamic simulation the lagged values are given only for the initial period and the estimated lagged values are used for the subsequent periods. Thus in static simulation the result represents a single-period solution without any inter-period linkage through the values of endogenous variables generated by the model in the previous periods. In the dynamic simulation the estimates of the various endogenous variables are linked over the period and therefore the solution gives a dynamic time-path of the endogenous variables. The

static simulations can be used to judge how the model tracks the behaviour of the economy over the sample period. The dynamic solution is useful to study the dynamic multipliers. For purpose of dynamic simulation only the seven year period 1975-76 to 1981-82 is considered.

In assessing the goodness of fit of the model two aspects of model simulation have been considered. These are (i) mean absolute error and root mean square error of prediction and (ii) ability of the model in capturing the turning points in the movement of the endogenous variables. The mean absolute and the root mean square errors of prediction of the important endogenous variables are presented in Appendix V for OLS as well as for static and dynamic simulations.

The table shows that in static simulation the root mean square errors of prediction of real outputs are generally less than 5 per cent. Similarly the errors of prediction of consumption expenditure, investment, exports and imports are less than 5 per cent. The errors are large between 5-15 per cent in the case of monetary aggregate and prices. Fifty-three per cent of the endogenous variables have errors less than 5 per cent while 85 per cent and 92 per cent of variables have below 10 per cent and 15 per cent errors, respectively, in static simulation.

Graphs of the actual and estimated values of the endogenous variables show that the model succeeds in capturing a majority of the turning points of the important variables over the sample period.

The evaluation of the model based on errors of prediction and turning points shows that the performance of the model is satisfactory in analysing the behaviour of the economy—sectoral as well as aggregate—over the period 1975-76 to 1981-82.

(b) Policy Simulations

In the earlier paragraphs selected indicators which validate the model for the sample period like the root mean square errors were discussed. The model has not been examined in terms of properties like stability, sensitivity to parametric variations and exogenous shocks. The sample period errors indicate that forecasts of some important variables have a low precision or high root mean square errors in both static and dynamic simulation. If combined with this, the model is also sensitive to parametric variation (small changes in the co-efficients of explanatory variables), the results of policy simulations based on the model may not be accurate and it is not possible to obtain valid and reliable inference of the impact of selected crucial exogenous variables on the system. The general approach to assess whether the model could be used for forecasting is to subject it to stochastic variations and study whether the variation in endogenous variables is within a narrow range both

in the static and dynamic simulations. In the absence of such an analysis, it is hoped that whatever policy simulation exercises we have carried out do indicate the broad direction in the movement of selected endogenous variables if not their precise magnitude. The results of simulation exercises are reported in Appendix VIII. In these simulations a positive multiplier value or elasticity implies that the impact on the endogenous variables is in the same direction as the change effected in the exogenous variables, while a negative figure indicates that the change effected in the exogenous or policy variable affects the endogenous variable in the opposite direction. Since output in agriculture has a large element of autonomous variation, it will be useful to know how changes in foodgrains output affect the economy. The result of a one per cent increase in foodgrains production each year is shown in Appendix VIII (A). It may be noted in this context that, on an average, between a fourth and a fifth of the total net domestic product at factor cost, was accounted by production of foodgrains during the sample period. The impact of a one per cent rise in the foodgrains output is such that it increases non-agricultural output by 0.14 per cent in the year in which the former takes place. In the long run (over a seven-year period) the rise in non-agricultural output is 0.24 per cent. Total net domestic product therefore increases by 0.31 per cent in the short run and 0.40 per cent in the long run. The increase in the foodgrains output has the additional effect of improving the rate of capital formation in the economy by 0.22 per cent in the short run and 0.33 per cent in the long run. Associated with this rise in the productive capacity of the economy and the rise in national income, prices decline by 1.58 per cent in the short run and by 2.79 per cent in the long run when the price level is measured in terms of wholesale prices of commodities. Similar result is observed in the aggregate price level when it is measured in terms of the national income deflator.¹⁴ The rise in foodgrains output has a further beneficial effect of reducing the resource gap of the public sector and decreasing money supply.

If the one per cent increase in output is effected in both foodgrains and non-foodgrains (total agricultural production) the impact on the economy is somewhat similar as observed in the earlier case Appendix VIII (C). The short-term impact on domestic product as well as on prices is, however, lower than the long-run impact. In the dynamic context, a one per cent increase in the total agricultural production increases the net domestic product by about 0.56 per cent. This figure is lower than 0.70 per cent obtained by Dr. Rangarajan for the decade ending 1971-72¹⁵. The smaller impact in the post-1970 period could be attributed to two factors : (i) the lower share

14. P. K. Pani, *A Macro Economic Model of Indian Economy* 1977 Macmillan (Page 241). For the pre-1970 period there is an increase of 0.6 per cent in the real output and 1.1 per cent decline in prices in the long run associated with a one per cent rise in foodgrains output.

15. C. Rangarajan, *Agricultural Growth and Industrial Performance*, International Food Policy Research Institute.

of agricultural sector in the total domestic output, the share declining from 46.5 per cent in 1970-71 to 38.3 in 1981-82 and (ii) the output growth in non-agricultural sector responding more to demand generation in that and other sectors and becoming less dependent on the rural or agricultural demand. Part of this change in response structure could be attributed to changing income distribution and consequential change in the production pattern. Another point to be noted in this context is that the demand generated for the non-agricultural output due to a rise in agricultural production is somewhat phased over time. In the year in which the agricultural production rises, the impact is almost negligible but picks up subsequently as private consumption increases and capital formation moves up. As for the lower impact on prices the rise in non-foodgrains output appears to be the contributory factor. A rise in non-foodgrains output need not necessarily result in a decline in the overall price level. While the increase in production of commercial crops like oilseeds, cotton and jute has the impact of lowering the prices of the raw materials used as industrial inputs, the further transmission of this effect through a decline in the prices of manufactured goods to the general price level appears to be weak. On the other hand, the rise in the incomes of farmers growing commercial crops has the effect of raising the prices of wage goods like foodgrains. The operations of commercial agriculture may be likened to that of industry except that the factor inputs that go into production of the former include land and production in this sector is dependent on exogenous factors like weather. A rise in the output of industrial raw materials and consequential accrual of incomes to farmers who sell these products to the industry could have a similar effect on the economy as that of a rise in production of manufactured goods when both are unaccompanied by a rise in the production of wage goods. An increase in the demand for wage goods like foodgrains would raise foodgrain prices which in turn increase wage rates. While the decline in prices of industrial raw materials has a salutary effect on the prices of manufactured goods for which they are the inputs, the rise in prices of basic goods has the opposite effect in as much as wage costs which are an important component in the prices of manufactured goods of up substantially. The net effect appears to be an increase in the wholesale prices of commodities or national income deflator. Our simulation results show that a 1 per cent increase in the non-foodgrain production increases the net domestic production by 0.16 per cent and wholesale prices by about 0.44 per cent in the long run Appendix VIII (B). Thus while increase in the foodgrain production has the advantages both in terms of increase in domestic product and price stability, that in non-foodgrains production could involve a trade-off between domestic product and prices. A rise in the output of non-foodgrains, however, reduces the resource gap of public sector and lowers money supply level in the long run.

Another important policy simulation relates to an increase in total public sector investment and its distribution over sectors. It is generally assumed

that Government investment, being in the nature of improvements to infrastructure and generally in basic capital goods industries, would have low incremental income-investment ratio. The additions to consumer goods being small, depending on the way in which the increase in investment is financed, public sector investment may result in inflation. The numerous channels through which public sector investment affects the domestic economy has already been enumerated in the section on the formulation of the model. To recapitulate, while public sector investment increases the demand for manufactured goods and thereby raises the output in that sector, it adds to productive capacity by increasing the total capital stock in various sectors. For financing its capital expenditure Government may draw on the savings of the private sector in a large degree besides incurring budget deficit. In the process, the savings available for private sector investment could diminish and capital formation in the private sector could thereby decrease. Thus increasing capital investment by public sector could mean : (i) increase in the private sector investment as Government investment creates additional demand for capital goods and favourable externalities provide stimulus to private investment by augmenting necessary infrastructural facilities: and (ii) decrease in private investment, if the financing of the public sector capital formation is through increasing the draft on the resources available for the private sector. The private sector's savings may not rise to fully compensate for this diversion of funds to the public sector. In effect, if the increases in output or incomes due to Government investment do not generate additional savings in the community commensurate enough with the additional capital formation undertaken by the Government, the availability of finance for investment in private sector may come down resulting in the so-called crowding-out effect.¹⁶ The impact multiplier associated with an increase in Government investment is 1.9, for net domestic product Appendix VIII (D). While the short-term elasticity of the net domestic product with respect to Government investment is 0.21, that of prices (national income deflator) is higher at 0.26 showing a trade-off between output and prices in the ratio of 45 : 55. If non-agricultural output alone is considered, the trade-off improves to 58:42. It is assumed here that the increase in Government investment is distributed proportionately between various sectors in the existing manner, i.e., as in the sample period. Agricultural output responds much less to public sector capital formation than output in other sectors. Total capital formation in the economy has a short run elasticity of 0.64 per cent with respect to Government investment indicating that there is no crowding-out effect as public sector investment forms less than a half of the total investment in the economy. The long-term impact of public sector investment is, however, different. There is no net increase for the domestic product other than what is experienced in the first year. Total capital formation has a lower elasticity in the long run indicating that, in a dynamic context, public sector investment could be replacing private

16. The flow of foreign resources is ignored here.

sector investment to some extent. Prices, on the other hand, go up sharply in the long run, the elasticity of national income deflator increases to 0.52 as against the impact elasticity of 0.26. On the whole the trade-off shows that the increase in nominal national income is distributed in the ratio of 23 : 72 between output and prices in the long run as against 45 : 55 in the short run. The corresponding distribution in the case of non-agricultural output is 39 : 61 in the long run as against 58 : 42 in the short run. Public sector investments in different sectors have differential impacts on the economy (Appendix VIII E, F & G). A major benefit of public sector investment arises when investment is confined to agriculture. In such a case the output increases faster while the rise in prices is much smaller. In this case in the long run the increase in nominal output is distributed in the ratio of 71 : 29 between 'real' output and prices. The corresponding trade-off for non-agricultural output works out to 78 : 22. When the public sector investment is entirely in the manufacturing sector, the results are somewhat similar to the first simulation Appendix VIII (D). The long-term elasticity of total domestic product is hardly 0.09 per cent compared with 0.20 per cent of the first simulation. Price increases would however be lower, the corresponding long-run elasticity being 0.31 per cent compared to 0.52 per cent of the first simulation. Much less satisfactory results in terms of output are obtained when Government investment is entirely in the transport sector. The long term elasticity of output in this case is 0.04 per cent. Price rise is again small. The long-term elasticity of money supply with respect to Government investment varies depending on the sectors in which such investment takes place. In general, a one per cent increase in total Government investment will give rise to 0.8 per cent increase in money supply, in the long run. A lower elasticity is indicated when Government places its entire investment either in agriculture or transport sectors.

One of the problems that arise in interpreting the short-term and long-term (dynamic) impact of changes of exogenous policy variables on endogenous economic aggregates is that the estimated impacts are subject to differential errors. Consequently the differences in the multipliers (elasticities) based on the static and dynamic simulations may not correctly portray the spill-over effects embedded in the model. The dynamic simulation carries the error part implied in the equations, over the 7 year period in a cumulative fashion. The measured dynamic impact at the end of 7th year is subject to large cumulative error and therefore may not measure accurately the long-term influence. This could give rise to some unreliable or unacceptable results as shown in appendix IX A which presents the alternative scenario of comparative long-term elasticities at the end of 7 years in respect of selected target variables associated with changes in 5 policy variables. Thus, the budget deficit which shows a decline in the short run when either food production or agricultural production increases would, according to the results, rise at the end of the 7th year, the long-term elasticity being positive. This

seventh period observation seems to be a result of the large dynamic error implied in the model. One could get over this problem by averaging the dynamic impacts over the entire period studied. Appendix IX B shows the same alternative scenario where the comparative elasticities are averages of dynamic results for the 7 years over which the simulation was effected. The averaging brings down the error component of the estimated parameters. Thus, budget deficit in this table has a negative elasticity as is to be expected with respect to both foodgrains production and agricultural production.

In many of the cases the results of the comparative elasticities between the two sets of calculations are identical. They only differ to a significant degree in the case of money supply and budget deficit possibly because in the model, these two economic aggregates are estimated with a lower degree of precision. Further simulation results using other policy packages are given in Appendices VIII H and I.

E. Concluding Remarks

Sources of Inflation

In their famous 1963 survey of traditional Theories of Inflation, Martin Bronfenbrenner and Franklyn D. Holzman differentiated between two major different inflationary regimes the demand-pull and cost-push models.¹⁷ In the former excess demand raises the price level; in the latter an increase in unit costs of output (wages, material costs, etc.) leads to a price rise. It was, however, later pointed out that effective demand was a necessary adjunct for a cost-push inflation. This led to a sub-division of demand and cost-push inflation into four classes, viz., (i) autonomous demand inflation — which is a result of purely excess demand which arises due to fiscal pressure (*a la* Keynesian fiscal-induced, money-accomodating inflation) or due to monetary pressures as viewed by monetarists (*a la* quantity theory, money-initiated), (ii) induced demand-pull, a consequence to cost-push inflation, (iii) autonomous cost-push inflation arising out of bargaining power of labour, profit margins, etc., independent of the state of excess demand and (iv) induced cost inflation — a resultant of increase in aggregate demand with attendant excess demand in labour market.

The current theories of inflation concentrate attention at the macro level on Phillips curve dynamics, distinguishing between various hypotheses like the natural rate of unemployment, price expectations and short-term *vs.* long-term shifts in the Phillips curve, etc. The demand-pull and cost-push explanations were, in some cases, integrated by extending the Phillips curve analysis through additional explanatory variables (other than unemployment

17. M. Bronfenbrenner and F. D. Holzman, "A Survey of Inflation Theory", American Economic Review, September 1963,

rate) like profit rate, degree of unionization and lagged price level. In support to the labour market approach and to justify non-clearance in employment markets in the short run, factors like imperfect information or a cost of acquisition of information, contract theories, etc., are adduced. All these give rise to a steady inflation, when some excess demand is present in the economy. The monetarist inflation model described inflation as purely a monetary phenomenon arising out of the excess supply of money in relation to production potential underscoring again the primary role of excess demand attributable to excess liquidity. Three basic assumptions underlie the monetarist explanation of inflation :

(1) Commodity and labour markets are highly competitive and flexible; the excess demand/supply clears through price adjustment; (2) Money supply is exogenous; and (3) The velocity of money or the demand function for money is a stable function of certain economic variables. From these the result follows that any change in the rate of growth of money supply induces real effects (employment or production effects) only temporarily. In the long run, wage rates, prices and interest rates adjust upwards depending on the rate of change in money supply. Price expectations in the monetarist model are crucial. They are endogenous and are not exogenous. Expectations on the rate of inflation adjust or adopt to the actual rate. The monetarist exposition brings into specific focus the mode of financing of public investment and its impact on the economy. According to them deficit financing (creation of money) would result in inflation and crowd out private investment.

While the above theories explicitly assume closed economies, the stimuli for the price rise may come from external factor (e.g. oil price rise) exogenous to the domestic system. In view of the interdependence of economies through trade and capital markets and the transmission of fiscal and monetary policy impulses generated in one country to other countries participating in international transactions, inflation need not be of domestic origin alone. Further, increases in world money stock could be independent of national factors and could affect world prices which have a bearing on domestic inflation rates even when national economies are only partly open. Helmut Frisch in his "Second Generation Survey of Inflation Theory" summarises the theories of inflation and tries to find out a common base through which all theories can be synthesized.¹⁸ In all inflation theories the question that is basically answered is : how is a change in money income divided into a change in real income and a change in price ? The answer implies an explanation of how excess demand gets generated, the formulation of price or inflation rate equations linking prices to excess demand, price expectations and other exogenous factors, and specification of how inflationary expectations get

18. Helmut Frisch, "Inflation Theory 1963-75 : "A Second Generation' Survey" Journal of Economic Literature, December 1977.

formulated. In the case of cost-push inflation, as stated earlier, monetary expansion is an attendant factor. The cost-push inflation would result in stagflation if it is broken through a reduction in money supply. This could act as an identifying factor between this type of inflation and the demand-pull inflation. Thus if inflation can be reduced by a reduction in aggregate demand (by fiscal and monetary measures) without a fall in output or employment, it would be demand-pull inflation. If, on the other hand, when aggregate demand is reduced by fiscal and monetary policy measures, a fall in output and employment results without inflation being controlled, the inflation can be classified as one of cost-push.

We may try to analyse to what extent the above theories of inflation are applicable to the Indian conditions. One can also ask the question in what manner does the macro-model presented incorporate the factors that are responsible for the general price increase we experienced over the last decade. Could these be classified into the type of influences mentioned in the literature? It seems possible from the empirical evidence we have that three major factors describe adequately the Indian inflation over the last ten years. These are : (1) autonomous supply shocks in the form of bad weather conditions, drought for one or two successive years which shift the supply schedule of the output to the left resulting in an excess demand-pull inflation. The inflation generated in one sector could percolate to the entire economy through wage-price nexus — a cost-push inflation with attendant ratchet effects; (2) exogenous price shock emanating from the external sector in the form of oil price hikes or other adverse terms of trade we experienced in the trade sector resulting in the transmission of inflation in external prices to domestic prices either directly or in the form of induced effects through cost increases, etc. Government efforts to absorb part of the imported inflation could, only be partly successful when goods imported have low price elasticity and/or could not be fully substituted by domestic production. Government's efforts to regulate their prices by making them available at subsidised rates can result in budget deficits which have an inflationary impact. The policy of the Government in administering the prices of selected goods and making them available at concessional rates to the users of these goods by absorbing the difference between the cost of manufacture (import) and the price at which it is issued to the user may result in the difference between these being borne by the rest of the economy. To the extent, the differential structure of relative prices has differential impact on supply of and demand for goods, this process of Government absorbing certain costs may have beneficial social effects. In the absence of market pricing which could eliminate the disequilibrium between supply and demand for these goods, Government can be said to be trying to benefit the users/consumers in order to bring about a certain structure of production and consumption in the economy. Autonomous changes in the administered prices will have a differential impact on the general price level or on the rate of inflation which may or may not be the same as when

Government withdraws purchasing power by taxation or by a budget surplus. Price increase due to an upward revision in administered prices can have counteracting influence in the form of inflow of additional resources to Government reducing budget deficit and therefore general inflation. However this and the earlier mentioned sources of inflation in the form of production shocks may and do arise in the form of prices of particular goods or prices in individual sectors having impact on those of other goods and services and thereby transmitting the rise to all prices in the economy. (3) The third and more important element of inflation arises when Government makes an attempt to draw on the resources available for meeting its expenditures by injecting additional purchasing power through a general budget deficit. In the earlier two cases, money supply rises to follow or accommodate a price increase. If budget deficits are created to cater to drought relief programmes, (i.e., Government trying to put extra purchasing power in the hands of the weaker section of population) or when industry requires additional credit for its working operations following increases in administered prices, the direction of causation between rise in money supply and rise in prices is clear. However, such a clear-cut origin of inflation may not be found in all other cases. The process of the draft on private sector savings by the public sector to realize its targets of expenditures can make the aggregate investment in the economy exceed the saving available. The excess demand may generate an inflationary price rise.

In the simulation exercises presented earlier we have seen how a rise in the foodgrains production through production increases affects money supply and the price level. The impact of a fall in foodgrains output in one or successive years can be measured accordingly. We have also seen the impact of increases in investment expenditures of the government in selected sub-sectors on the money supply and general price level in the economy. This is studied under the assumption that associated increase in Government capital expenditure in nominal terms will result in a specific amount of budget deficit.

The role of administered prices in accounting for inflation in the economy may now be considered. The major commodities/services whose prices are administered are 9 in number, viz., (i) coal and lignite, (ii) crude petroleum and natural gas, (iii) petroleum products, (iv) fertilizers, (v) iron and steel, (vi) other basic metallic products (non-ferrous metals), (vii) electricity, (viii) railway transport services and (ix) communication. The value added (including depreciation) by these commodities, amounts to 5 per cent in the total gross national product. Excluding services, the commodities whose prices are administered account for 15 per cent by weight in the compilation of all-India Index Number of Wholesale Prices of commodities (Appendix X). The macro-model does not fully incorporate the feature of cost-push inflation arising out of a rise in the prices of administered goods. However, one can

have an idea of the degree of inflationary impulses generated in the economy due to this factor. This is done by constructing a hypothetical index of commodity prices using input-output tables on the assumption that the input costs are passed on by the producers to the output prices, i.e., there is a fixed mark-up of the output prices over the input prices. A similar assumption underlies the specification of the manufacturing price relation in the macro-model. However, the direct and indirect impact of an exogenous increase in the administered prices can be worked out from the following formula in a standard notation :

$$P_j = \sum_{i=1}^{n-k} a_{ij}p_i + \sum_{i=1}^k a_{ij}p_i + m_j PL_j + g_j PG_j + t_j PR_j$$

or in matrix notation

$$P = (I - A1)^{-1} (B \cdot P_k + M \cdot PL + G \cdot PG + T \cdot PR)$$

where $A1$ is a matrix of the order $(n-k)$, $(n-k)$ and B is a matrix of coefficients a_{ij} of the order k , $(n-k)$; t_j , m_j , g_j , are indirect taxes per unit of output, imports per unit of output and value added, by manufacture per unit of output of commodity j and PR_j , PL_j and PG_j are corresponding prices, tax rate, unit value of imports, and price per unit of value added respectively. The hypothetical increases in the all-India index of commodity prices in the individual years due to rise in the administered prices only are given in Appendix XI. The rise in the administered prices alone could have contributed substantially to the inflation rate in the last few years. In the case of commodity prices, the weights attached to individual commodities the prices of which are administered are the same as those given in the compilation of Wholesale Price Index of commodities. For studying the impact of an increase in administered prices on National Income Deflator, we have included the changes in prices of services like railway transport and communications, etc. The aggregation is done using the net value added by each industry to total gross value added as weights.

From Col. 2 (Appendix XIV) it may be seen that during 1975-76 to 1982-83 the rate of inflation that could have been contributed by changes in the administered prices of the selected commodities and services would have been of the order of 1.9% in an overall rate of 6.5% when inflation is measured in terms of income deflator. It could again be seen from the same table that the contribution of administered prices to inflation was much more for the period 1979-80 to 1982-83 than in the whole period. In view of the exogenous nature of those price changes it would be more appropriate to interpret that money supply would be building up to accommodate an increase in the price level rather than to say that the price rise is due to monetary factors. In assessing the role of monetary factors in accounting for inflation during a period, say a year, the rate of inflation is to be adjusted suitably for the impact of agricultural production shocks as well as rising imports costs.

The average annual percentage change in foodgrains production during the period 1975-76 to 1982-83 is 4.2%. The impact of this increase in foodgrains output on the national income deflator would be to bring down the latter by about 6.7% in the short run. The dynamic impact (i.e. the changes in the prices that are attributable to production changes in the previous years) would be to decrease the national income deflator by 2.7%. The total impact of changes in the foodgrains production on national income deflator during this period would be about 9.4%. A similar assessment of the impact of changes in non-foodgrains production indicates that the price rise attributable to this factor would be of the order of 0.6%. In fact, the changes in total agricultural output during 1975-76 to 1982-83 could have brought about a decline in the national income deflator by about 9%.

The Appendix at page 133 indicates the impact of a rise in import costs (other than the prices of these commodities which are administered). A general result we observe here is that, out of 9 commodity groups/services the prices of which are regulated, 5 commodity groups (omitting services like railways) would have experienced high rates of inflation had the import costs been fully passed on to their selling prices. These groups are crude oil, petroleum products like fertilisers, energy substitutes like coal, iron, steel and related metals. It would appear that, in general, a 10% rise in import cost would bring about 1% inflation in domestic prices. Adjusted for import prices of the above mentioned category of commodities, crude oil, petroleum products like fertilisers, etc., and the prices of other imported materials would have contributed about 0.12 per cent rise in the overall inflation of 6.5% as measured by national income deflator during the period 1975-76 to 1982-1983.¹⁹ Combining the contribution of three major factors towards inflation, viz., (1) due to fluctuations in agricultural production, (2) changes in the administered prices, (3) changes in the import prices, we would expect a decline in the national income deflator by about 6.7%.

However, as the annual average percentage increase in the national income was 6.5, we conclude the residual factors like increase in budget deficits attributable either to government investment programmes or excess increase in money supply in relation to total output, etc., would have brought about a price rise of 13.2% during the same period.

If we exclude the dynamic impact of changes in agricultural production on prices it would appear that the rate of inflation due to general demand factors mentioned earlier, that is, increasing fiscal deficits, monetary expansion, etc., could be of the order of 8.4% during the period 1975-76 to 1982-83. This general inflation was counter-balanced by the rise in foodgrains output to a substantial degree resulting in a mild inflation rate of 6.5% during this period.

19. *Vide*, for example, 'Impact of Administered Prices on Wholesale Price Level (1970-71 to 1983-84) by K. S. Ramachandra Rao, appearing elsewhere in this issue.

The Appendix also indicates similar figures for the years 1979-80 to 1982-83. The results in Col. 3 show that of the overall inflation rate of 11%, about 10.4% would be attributable to general demand inflation. The price rise that is brought about by the increase in the administered prices as well as import costs is, to a great extent, counterbalanced by the decline brought about by the increased foodgrains production which recorded an annual average 1% increase during the period.

The impact of various sources of inflation, when the latter is measured by wholesale prices index, is given in col. 4 and 5 of the same Appendix. The results mentioned in the case of national income deflator broadly hold when the inflation is measured by wholesale prices as well. In particular, changes in administered prices contribute substantially (about 63%) to the inflation-rate experienced during the period 1979-80 to 1982-83. The impact of agricultural production changes on inflation continues to be negative, though not of the same order as it was during the period 1975-76 to 1982-83. Consequently the contribution to the overall inflation is lower during the 4-year period 1979-80 to 1982-83 than during the seven years 1975-76 to 1982-83.

To summarise, the monetary theory of inflation does not hold well in the Indian context, as many of the critical comments which question the monetarist explanation of inflation are also valid here. Money supply is not completely exogenous as presumed by monetarists. It is closely linked with Government expenditure programmes and the result fiscal deficits. The central monetary authority may play a passive or less important active role in regulating the money supply. Similarly though prices of many goods are highly flexible and act as equilibrators of demand and supply in respect of many important goods, there are certain selected goods which are important in the production process but whose prices are regulated. Thirdly, monetary expansion towards meeting the exogenous shocks emanating from the external sector in the form of oil price hike and adverse terms of trade could be more fruitfully characterized as accommodative as also the expansion in money supply which arises in the context of inflation in agricultural prices following production failures.

Inflation from these sources can be inhibited by an increase in productivity in agriculture, by import substitution and so on. Increase in agricultural productivity would ward off the impact of fluctuations in weather conditions and the consequential rise in prices with the associated "ratchet effect". Import substitution could mitigate the transmission of external inflation to the economy and also take care of changes in the administered prices of selected goods. An alternative way to lessen the impact of international factors on domestic prices is to build a buffer of exchange reserves by increasing exports to absorb shortfalls in domestic output levels as well as the price increase of imported goods. Demand management in respect of public

sector could imply a deceleration of its investment expenditure as consumption expenditure may not readily respond or not respond in sufficient degree due to built-in clauses linking wages to cost of living and other cost-push phenomena inherent in the form of a given institutional system. Deceleration of investment in the public sector could create supply bottlenecks through inadequate provision for infrastructure (goods and services) and inadequate increase in the productive capacity in the crucial sectors of the industry, especially capital goods industry, with multiple effects on private investment and supply of consumer goods as well.

ANNEX

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Appendix I

Notations for Variables

- AFI : Index of Area under Foodgrains (End.).
- ANFI : Index of Area under Non-foodgrains (End.).
- B : Borrowings of Banks from Reserve Bank of India (Rs. in crores) (Ex.).
- BC : Bank Credit (Rs. in crores) (End.).
- BD : Budgetary Deficit (Rs. in crores) (End.).
- BR : Bank Reserves (Rs. in Crores) (End.).
- C : Currency with Public (Rs. in crores) (End.).
- ΔC : Change in Currency with Public (Rs. in crores) (End.).
- CCAR : Consumption of Fixed Capital at 1970-71 prices (Rs. in crores) (End.).
- CGN : Government Consumption Expenditure (at current prices) (Rs. in crores) (End.).
- CGN 1 : Central Government Consumption Expenditure (Rs. in crores) (End.).
- CPR : Private Consumption Expenditure (at 1970-71 prices) (Rs. in crores) (End.).
- D : Total Deposits of Banks, i.e., Demand Deposits + Time Deposits (Rs. in crores) (End.).
- DB : Net Domestic Borrowings of Government from Private Sector (Rs. in crores) (End.).
- DIMP : 0 from 1969-70 to 1974-75;
1 from 1975-76 onwards (Ex.).
- DISR : Statistical Discrepancy in real terms (Rs. in crores) (Ex.).
- DNFE : Change in Net Foreign Exchange Assets of Reserve Bank of India (Rs. in crores) (Ex.).
- DUMMY : Dummy = 1 for 1975-76 and 0 otherwise (Ex.).
- DUMMY 1 : Dummy = 0 for 1968-69 to 1977-78 & 1 for 1978-79 to 1981-82 (Ex.).
- EGOS : Excess Investment in Government and other securities (Rs. in crores) (Ex.).
- G : Central Government Expenditure (Current + Capital Expenditure) (Rs. in crores) (End.).

- GCE : Central Government Capital Expenditure excluding current transfers (Rs. in crores) (End.).
- GCT : Current transfers of Central Government (Rs. in crores) (Ex.).
- GC : Central Government Capital Expenditure including Current Transfers (Rs. in crores) (End.).
- GDER : Gross Domestic Expenditure in real terms (Rs. in crores) (End.).
- GE : Government Expenditure (Current + Capital Expenditure) (Rs. in crores) (End.).
- GNPM : Gross National Product at Market Prices (Rs. in crores) (End.).
- GNPN : Gross National Product at Current Prices (Rs. in crores) (End.).
- GR : Government Revenue (Revenue Receipts) (Rs. in crores) (End.).
- GS : Bank's Investment in Government Securities (Rs. in crores) (End.).
- IAGR : Gross Domestic Capital Formation in Agriculture (public Sector) at 1970-71 prices — (Rs. in crores) (Ex.).
- IAPR : IAR — IAGR (Rs. in crores) (End.).
- IAR : Gross Domestic Capital Formation in Agriculture (at 1970-71 prices) (Rs. in crores) (End.).
- ID : Impounded Deposits (Rs. in crores) (Ex.).
- IDTR : Indirect Taxes Net of Subsidies at 1970-71 prices (Rs. in crores) (End.).
- IF : Irrigated Area under Foodgrains (Million hectares) (End.).
- IGR : Investment in Government Sector (at 1970-71 prices) (Rs. in crores) (End.).
- IMGR : Gross Domestic Capital formation in Mining and Manufacturing Industry (Public Sector) (at 1970-71 prices) (Rs. in crores) (Ex.).
- IMPR : Gross Domestic Capital Formation in Mining and Manufacturing Industry (Private Sector) (at 1970-71 prices) (Rs. in crores) (End.).
- IMR : Gross Domestic Capital Formation in Mining and Manufacturing Industry (at 1970-71 prices) (Rs. in crores) (End.).
- IN : Irrigated Area under Non-Foodgrains (Million Hectares) (Ex.).
- IOGR : Gross Domestic Capital Formation in other Services (Public Sector) (at 1970-71 prices) (Rs. in crores) (Ex.).

- IOR : Gross Domestic Capital Formation in Other Services (at 1970-71 prices) (Rs. in crores) (End.).
- IR : Total Gross Domestic Capital Formation (at 1970-71 prices) (Rs. in crores) (End.).
- ITGR : Gross Domestic fixed capital Formation in Transport in Public Sector (at 1970-71 prices) (Rs. in crores) (Ex.).
- ITR : Gross Domestic Capital Formation in Transport and communications (at 1970-71 prices) (Rs. in crores) (End.).
- IUR : Gross Domestic Capital Formation in Unregistered Manufacturing (at 1970-71 prices) (Rs. in crores) (Ex.).
- JF : Stocks of Foodgrains with Government (Million tonnes) (Ex.).
- KAR : Index of Gross Capital Stock in Agriculture (Base 1970-71 = 100) (End.).
- KGR : Index of Total Gross Capital Stock in Public Sector (Base 1970-71 = 100) (End.).
- KMPR : Index of Gross Capital Stock in Manufacturing Industry (Private Sector) (Base 1970-71 = 100) (End.).
- KMGR : Index of Gross Capital Stock (Govt.) in Manufacturing Sector (Base 1970-71 = 100) (Ex.).
- KMR : Index of Gross Capital Stock in Manufacturing Industry (Base 1970-71 = 100) (End.).
- KOR : Index of Gross Capital Stock in Other Services (Base 1970-71 = 100) (End.).
- KR : Index of Total Gross Capital Stock (Base 1970-71 = 100) (End.).
- KTR : Index of Gross Capital Stock in Transport and Communications Industry (Base 1970-71 = 100) (End.).
- KUR : Index of Gross Capital Stock in Unregistered Manufacturing Industry (Base 1970-71 = 100) (End.).
- M3 : C + D + OD (Rs. in crores) (End.).
- MCR : Miscellaneous Capital Receipts (Rs. in crores) (End.).
- MFQ : Imports of Foodgrains (Million tonnes) (Ex.).
- MP : Unit Value Index of Total Imports (Ex.).
- MQ : Quantum Index of Total Imports (End.).
- MV : Value of Total Imports (Rs. in crores) (End.).
- NFA : Net Foreign Aid (Rs. in crores) (Ex.).

NFDB	: Net Domestic Borrowing + Net Foreign Aid — Change in RBI claims on Government (Rs. in crores) (End.).
NFEA	: Net Foreign Exchange Assets of Reserve Bank of India (Rs. in crores) (Ex.).
NIAR	: Net Income from Abroad at 1970-71 prices (Rs. in crores) (Ex.).
NID	: Price Deflator for Net National Product (End.).
NNPN	: Net National Product at Factor Cost (at current prices) (Rs. in crores) (End.).
NNPR	: Net National Product at factor cost (at 1970-71 prices) (Rs. in crores) (End.).
OD	: Other Deposits with R.B.I. (Rs. in crores) (Ex.).
OS	: Bank's Investment in other Approved Securities (Rs. in crores) (End.).
PCCA	: Deflator for Consumption of Fixed Capital (End.).
PCF	: Price Deflator for Gross Domestic Capital Formation (End.).
PCG	: Price Deflator for Government Consumption Expenditure (End.).
PCP	: Price Deflator for Private Consumption Expenditure (End.).
PDIR	: Personal Disposable Income (at 1970-71 prices) (Rs. in crores) (End.).
PID	: Deflator for Indirect Taxes Net of Subsidies (End.).
P * M	: Effective Import Prices (1968-69 = 100) (Ex.).
PNIA	: Deflator for Net Income from Abroad (End.).
QA	: Index of Agricultural Production (End.).
QF	: Index of Foodgrains Production (End.).
QF1	: Net Production of Foodgrains (Million tonnes) (End.).
QNF	: Index of Non-foodgrains Production (End.).
R	: Central Government Revenue (Rs. in crores) (End.).
RB	: Bank Rate (%) (Ex.).
SCBR	: Scheduled Commercial Banks' Reserves (Rs. in crores) (End.).
SCD	: Scheduled Commercial Banks' Deposits (Rs. in crores) (End.).
SFG	: Net Availability of Foodgrains (Million tonnes) (End.).
SLR	: Statutory Liquidity Ratio (%) (Ex.).
TCR	: Total consumption (at 1970-71 prices) (End.).

- WF : Weather (Rainfall) Index of Foodgrains (Ex.).
- WGDP : World Gross Domestic Product (1975 = 100) (Ex.).
- WN : Weather (Rainfall) Index of Non-foodgrains (Ex.).
- WN² : Square of WN.
- WP : Wholesale Price Index of All Commodities (End.).
- WPF : Wholesale Price Index of Foodgrains (End.).
- WPI : Potential Impact Index of changes in Administered Prices (Ex.).
- WPM : Wholesale Price Index of Manufactured Goods (End.).
- WPN : Wholesale price Index of Non-foodgrains (End.).
- XP : Unit Value Index of Total Exports of Merchandise (End.).
- XQ : Quantum Index of Total Exports (End.).
- XV : Value of Total Exports (Rs. in crores) (End.).
- YAR : Net Domestic Product at Factor Cost from Agriculture (at 1970-71 prices) (Rs. in crores) (End.).
- YMR : Net Domestic Product at Factor Cost from Manufacturing Industry (at 1970-71 prices) (Rs. in crores) (End.).
- YNAR : Net Domestic Product at Factor Cost from Non-Agriculture (at 1970-71 prices) (Rs. in crores) (End.).
- YNDN : Net Domestic Product at Factor Cost at Current Prices (Rs. in crores) (End.).
- YNDR : Net Domestic Product at Factor Cost (at 1970-71 prices) (Rs. in crores) (End.).
- YOR : Net Domestic Product at Factor Cost from Other Services (at 1970-71 prices) (Rs. in crores) (End.).
- YTR : Net Domestic Product at Factor Cost from Transport and Communications Industry (at 1970-71 prices) (Rs. in crores) (End.).
- YUR : Net Domestic Product at Factor Cost from Unregistered Manufacturing Industry (at 1970-71 prices) (Rs. in crores) (End.).

Appendix II
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	R ²		DW	SEE	Mean
		(4)	(5)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Output						
1.	Output of Foodgrains	$QF = -280.49624 + 208.96594 IF + 0.11320 WF + 3.04926 AFI + 0.84$ <p>(3.56) (3.52) (1.34) (3.41)</p> $0.58 \quad 0.15 \quad 2.62$	0.84	2.49	5.72	119.55
2.	Output of Non-foodgrains	$QNF = -157.15995 + 25.20814 IN + 0.57155 WN - 0.00164 VN^2 + 0.96$ <p>(2.81) (0.40) (0.97) (0.99)</p> $0.02 \quad 0.76 \quad -0.39$ $+ 2.10148 ANFI + 1.44130 KAR + (4.89) (1.13) ANFI$ $1.89 \quad 0.03$	0.96	1.55	2.66	120.16
3.	Agricultural Output	$QA = 0.6812 QF + 0.3188 QNF$				
4.	Net Domestic Product at Factor Cost from Agriculture	$YAR = 3690.90814 + 118.73349 QA + 0.99$ <p>(8.89) (34.43)</p> 0.79	0.99	1.49	161.60	17896.00
5.	Net Domestic Product at Factor Cost from Mining and Manufacturing	$YMR = -76.06061 + 0.68383 KMR + 14.94011 (GE-CGN) + 0.12333 (GDER-IGR)$ <p>(0.07) (0.72) (1.23) (3.25)</p> $0.04 \quad 0.17 \quad 0.98$ $0.28 \quad 0.60 \quad 0.80$ <p>(1.66) (1.41) (0.28)</p> $0.28 \quad 0.60 \quad 0.02$	0.97	1.88	167.80	6572.92

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	$\frac{2}{R}$		DW	SEE	Mean
		(4)	(5)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
6.	Net Domestic Product at Factor Cost from Unregistered Manufacturing	$YUR = 789.33691 + 0.15934 YMR + 1.25948 KUR$ (3.95) (3.61) (3.93) 0.47 0.17	0.99	1.12	41.52	2209.46
7.	Net Domestic Product at Factor Cost from Transport and Communications	$YTR = 902.85335 + 0.01799 (YAR + YMR) + 2.56448 KTR$ (2.50) (1.01) (9.75) 0.20 0.38	0.98	1.35	66.15	2173.31
8.	Net Domestic Product at Factor Cost from Other Services	$YOR = YNDR - (YAR + YMR + YTR + YUR)$				
B. Demand						
I. Consumption						
9.	Private Consumption Expenditure	$CPR = -2451.86460 + 0.09678 PDIR-1 + 14840.37900 YAR$ (0.30) (0.81) (1.14) $\frac{YNDR}{0.20}$ 0.11 +0.66715 PDIR (9.91) 0.77	0.99	2.12	334.49	33872.69
10.	Government Consumption Expenditure	$GGN = -601.41414 + 0.63788 CGN-1 + 1.20697 CGN 1$ (2.93) (3.90) (3.27) 0.56 0.52	0.99	0.84	244.79	7750.92

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	(1)	(2)	(3)	$\frac{2}{R}$	DW	SEE	Mean
					(4)	(5)	(6)	(7)
11.	Central Government Consumption Expenditure	$CGNI = 60.65412 + 0.38534 CGNI-1 + 0.20616 R + 3.31642 PCG$	(0.08) (1.00) 0.34	(1.51) (0.39) 0.14	0.98	0.90	205.40	33.1685
12.	Investment in Private Agricultural Sector	$IAPR = -2197.10203 + 0.19443 (YAR + YAR - 1)$	(3.40) (5.34) 2.77		0.69	1.91	184.45	1240.46
13.	Total Investment in Manufacturing Sector (Private + Government Sector)	$IMR = IMPR + IMGR$						
14.	Total investment in Transport Sector (Private + Government Sector)	$ITR = 273.48086 + 0.83966 ITGR + 0.08184 YTR-1$	(4.14) (5.11) 0.55	(1.56) 0.17	0.90	1.54	49.75	975.69
15.	Total investment in other Service Sector (Private + Government Sector)	$IOR = 159.67610 + 0.07831 (YAR + YMR + YTR) + 0.46413 IOGR$	(0.19) (2.30) 0.78	(1.02) 0.16	0.38	2.82	340.11	2658.77

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	R ²		DW	SEE	Mean
		(4)	(5)			
(1)	(2)	(3)	(6)	(7)		
C. Foreign Trade						
16.	Quantum of Exports	$XQ = -83.68104 + 2.26002 \text{ WGDP}$ (5.38) (15.36) 1.55	0.95	1.68	8.99	152.23
17.	Quantum of Imports	$MQ = -182.43678 + 0.00948 \text{ YNDR} - 25.34232 \text{ DIMP} - 45.97137 \text{ P*M}$ (2.62) (6.19) (1.18) (1.88) WP 2.07 -0.11 -0.49	0.90	1.36	12.70	124.00
18.	Unit Value Index of Exports	$XP = 15.14949 + 0.84449 \text{ WP-1} + 0.22031 \text{ WP}$ (0.83) (1.72) (0.51) 0.20	0.90	0.76	20.10	183.69
D. Government Operations						
19.	Central Government Revenue	$R = -620.80679 + 0.07098 \text{ YNIN} + 0.56104 \text{ R-1}$ (1.82) (3.67) (3.65) 0.49	0.98	2.09	409.48	8002.62
20.	Central Government Expenditure (Current + Capital)	$G = \text{CGN}_1 + \text{GC}$				

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	$\frac{2}{R}$		DW	SEE	Mean
		(4)	(5)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
26.	Scheduled Commercial Banks' Reserves (Stock)	SCBR = $-1298.04623 + 0.01584 \text{ NFEA} + 0.60334 \text{ C} - 200.61556 \text{ RB}$ (3.60) (0.32) (16.18) (3.16) 0.02 2.43 -0.80	0.98	1.88	223.02	1993.31
27.	Scheduled Commercial Banks' Deposits (Out-standing)	SCD = $1980.042817 + 0.38052 \text{ NFEA} + 10.82492 \text{ (SCBR-ID)}$ (3.31) (1.38) (21.54) 0.05 0.85	0.98	3.01	1271.81	18704.92
28.	Deposits (All Banks)	D = $117.01977 + 1.08928 \text{ SCD}$ (4.17) (869.48) 0.99	0.99	1.83	55.80	20492.00
29.	Bank Credit (All Banks)	BC = $-106.41575 + 1.91701 \text{ B} + 0.77596 \text{ D} - 0.22735 \text{ (BR+CS+CS)}$ (0.33) (3.10) (3.01) (0.45) 0.12 1.02 -0.13	0.99	1.43	247.50	15643.08
30.	Stock of Money Supply	$M_3 = \text{C} + \text{D} + \text{OD}$				
F. Prices						
31.	Wholesale Price Index of Foodgrains	WPF = $251.16954 - 2.91508 \text{ SFG}_{-1} + 0.01294 \text{ YNAR} + 3.60318 \text{ NF}$ (3.15) (3.39) (1.71) (4.93) -1.81 1.81 2.72 +31.39394 M_3 -5.57293 SFG (0.75) YNAR (5.04) 0.24 -3.53	0.94	2.16	10.59	159.28

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	$\frac{2}{R}$		DW	SEE	Mean
		(4)	(5)			
(1)	(2)	(3)	(6)	(7)		
32.	Wholesale Price Index of Non-foodgrains	$\begin{aligned} WPN = & 33.63067 - 1.05308 QNF_{-1} + 0.02939 YMR + 0.73047 WPF - 0.54318 QNF \\ & (0.53) \quad (1.79) \quad (3.83) \quad (0.89) \quad (0.82) \quad 0.96 \\ & -0.79 \quad 1.24 \quad 0.75 \quad -0.42 \end{aligned}$	3.00	9.92	155.27	
33.	Wholesale Price Index of Manufactured Goods	$\begin{aligned} WPM = & -11.55437 + 0.74651 WPN + 0.09156 MP + 0.27085 WPF \\ & (0.77) \quad (3.04) \quad (1.10) \quad (1.09) \\ & 0.69 \quad 0.12 \quad 0.26 \end{aligned}$	1.45	11.55	167.71	
34.	Wholesale Price Index of All Commodities	$\begin{aligned} WP = & -0.59753 + 0.54016 WPF + 0.27222 WP_{-1} + 37.58660 M3 \\ & (0.09) \quad (6.40) \quad (2.72) \quad (5.29) \quad YAR + YMR \\ & 0.51 \quad 0.25 \quad 0.25 \quad 0.25 \end{aligned}$	2.04	5.01	169.83	
		OR				
		$\begin{aligned} WP = & -374.26283 + 0.43889 WPF + 4.21375 WPI + 18.22418 M^3 \\ & (3.74) \quad (5.18) \quad (3.79) \quad (1.89) \quad YAR + YMR \\ & 0.41 \quad 2.67 \quad 0.12 \end{aligned}$	2.13	4.20	169.83	
G. Others						
35.	Personal Disposable Income	$\begin{aligned} PDIR = & -3434.07621 + 1.05722 YNDR \\ & (5.10) \quad (63.60) \\ & 1.09 \end{aligned}$	0.99	326.94	39015.38	

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	$\frac{2}{R}$		SEE	Mean	
		(4)	(5)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
36.	Index of Area under Foodgrains	$AFI = 77.64773 + 4.59330 \frac{(WPF)}{(WPN)_{-1}} + 0.06392 WF + 0.09614 AFI_{-1}$ $(2.19) \quad (0.61) \quad (2.05) \quad (0.32)$ $0.05 \quad 0.10 \quad 0.10$	0.10	2.03	2.31	102.55
37.	Index of Area under Non-foodgrains	$ANFI = 28.24267 - 8.52443 \frac{(WPF)}{(WPN)_{-1}} + 0.13445 WN + 0.53955 ANFI_{-1}$ $(2.05) \quad (1.32) \quad (4.81) \quad (4.08)$ $-0.08 \quad 0.20 \quad 0.53$	0.82	1.70	2.07	103.18
38.	Deflator for Net National Product	$NID = -69.78470 + 0.3701 WPN + 0.98843 WPI + 37.49469 M \frac{Y}{N}$ $(1.22) \quad (4.78) \quad (1.54) \quad (3.17)$ $0.36 \quad 0.67 \quad 0.16$ $+ 0.24656 WPF$ $(3.96) \quad 0.25$	0.99	1.50	2.41	158.48
39.	Deflator for Indirect Taxes	$PID = -58.67533 + 157.72353 NID$ $(4.10) \quad (18.15)$	0.96	0.98	13.96	191.28

Statistical Constructs and Identities

1.31

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	(3)	$\frac{2}{R}$	DW	SEE	Mean
(1)	(2)	(3)	(4)	(5)	(6)	(7)
40.	Net Production of Food-grains	$QF1 = 3.36434 + 0.80371 QF$ (2.49) (71.56) 0.97	0.99	1.79	0.55	99.44
41.	Capital Consumption	$CCAR = 1890.26619 + 2.40921 KR$ (36.72) (17.13) 0.29	0.96	0.98	89.52	2662.77
42.	Indirect Taxes	$IDTR = -3856.1976 + 37719.2208 IDTR + 0.10213 YNDR$ (22.10) (25.56) $\frac{YDTR}{0.94}$ (6.74) 0.99	0.98	2.12	32.73	4109.54
43.	Deflator for net Income from Abroad	$PNIA = -15.49545 + 1.10421 MP$ (1.37) (23.49) 1.07	0.98	0.84	16.55	228.28
44.	Deflator for capital consumption	$PCCA = 5.04284 + 0.94122 PCF - 0.18659 \Delta PCF$ (1.90) (48.19) (1.71) 0.99 -0.02	0.99	1.29	3.01	162.71
45.	Deflator for Government Consumption Expenditure	$PCG = 20.82088 + 0.53708 PCP_{-1} + 0.27287 PCP$ (5.61) (5.03) (2.88) 0.55 0.30	0.98	2.58	3.53	143.71

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	(3)	$\frac{R^2}{(4)}$	DW (5)	SEE (6)	Mean (7)
46.	Deflator for Capital Formation	$PCF = -12.12905 + 0.51279 PCF_{-1} + 0.61541 WPM$ <p style="margin-left: 20px;">(2.61) (4.27) (5.30) 0.46 0.60</p>	0.98	2.07	5.10	170.59
47.	Bank Reserves (All Banks)	$BR = -12.35814 + 1.11549 SCBR$ <p style="margin-left: 20px;">(0.26) (62.08) 1.01</p>	0.98	3.56	116.87	2211.15
48.	Gross Domestic Expenditure	$GDER = CPR + \frac{CGN}{PCG} \times 100 + IR - \frac{MV}{MP} \times 100 + \frac{XV}{XP} \times 100 - DISR$				
49.	Net Domestic Product at Factor Cost at constant prices	$YNDR = GDER - IDTR - CCAR$				
50.	Net National Product at Factor cost at constant prices	$NNPR = YNDR + NIAR$				
51.	Non-Agricultural Income	$YNAR = YNDR - YAR$				
52.	Total Investment in Agriculture (Private + Govt. Sector)	$IAR = IAPR + IAGR$				

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

Sr. No.	Dependent Variable	$\frac{2}{R}$	DW	SEE	Mean
(1)	(2)	(4)	(5)	(6)	(7)
53.	Gross Capital Stock in Agriculture	$KAR = KAR_{-1} + 0.0267 IAR$			
54.	Gross Capital Stock in Mining and Manufacturing	$KMR = KMR_{-1} + 0.0178 IMR$			
55.	Gross Capital Stock in Transport and Communication	$KTR = KTR_{-1} + 0.0467 ITR$			
56.	Gross Capital Stock in Other Services	$KOR = KOR_{-1} + 0.0148 IOR$			
57.	Gross Capital Stock in Unregistered Manufacturing Industry	$KUR = KUR_{-1} + 0.0608 IUR$			
58.	Gross Domestic Capital Stock in Public Sector	$KGR = KGR_{-1} + 0.0132 IGR$			
59.	Total Capital Stock	$KR = KR_{-1} + 0.0050 IR$			
60.	Total Gross Domestic Capital Formation at 1970-71 Prices	$IR = IAGR + IAPR + IMR + ITR + IOR + IUR$			

Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

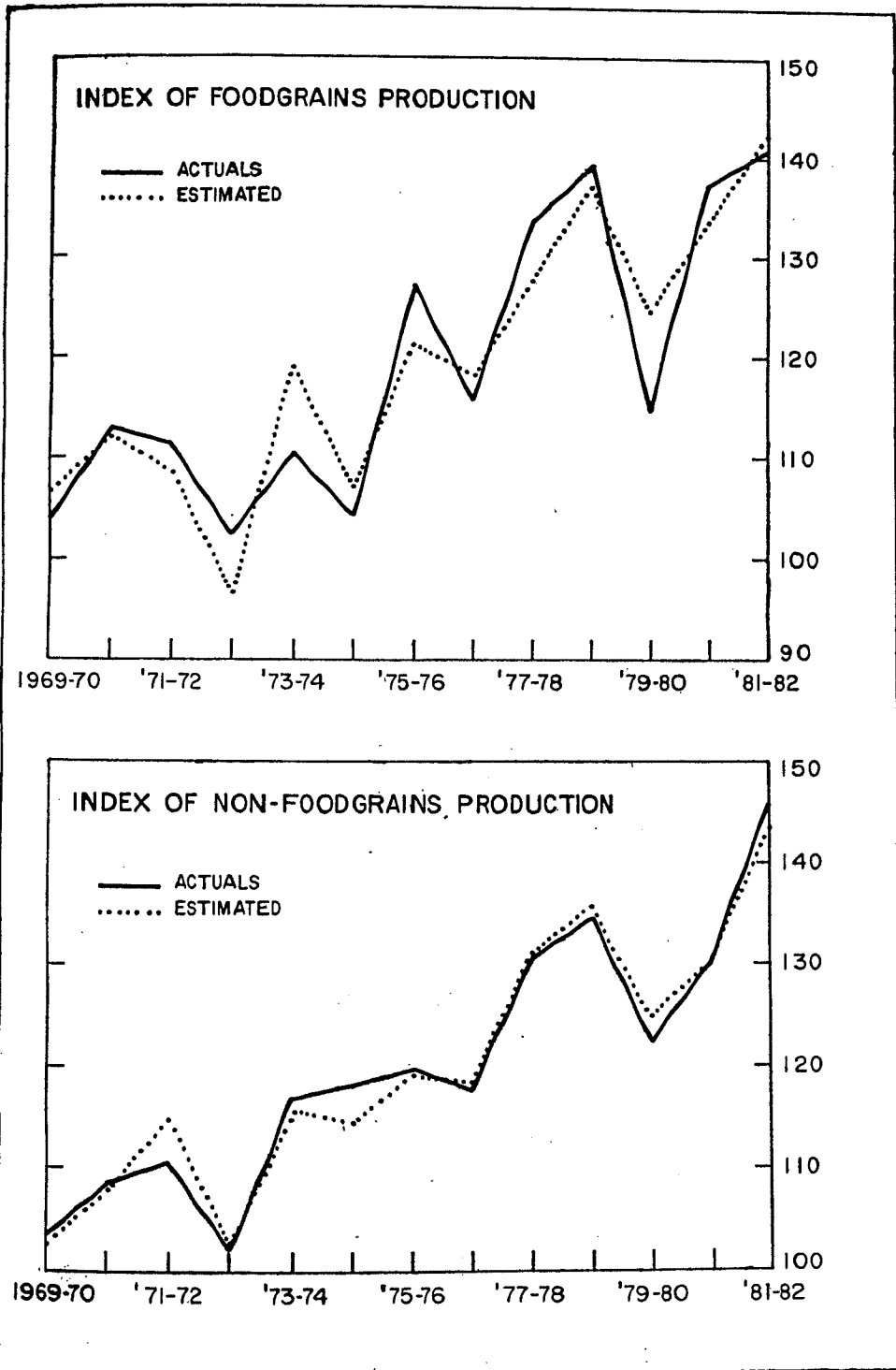
Sr. No.	Dependent Variable	(3)	$\frac{R}{2}$	DW	SEE	Mean
(1)	(2)	(3)	(4)	(5)	(6)	(7)
61.	Investment in Government Sector	$\text{IGR} = \text{IAGR} + \text{IMGR} + \text{ITGR} + \text{IOGR}$ <p style="text-align: center;">OR</p> $\text{IGR} = -1217.62510 + 134.85278 \frac{\text{GCE}}{\text{PCF}}$ <p style="text-align: center;">(0.95) (4.19) 1.30</p>	0.58	1.49	719.36	4066.85
62.	Government Securities + Other Securities	$(\text{GS} + \text{OS}) = \text{D} * \text{SLR} + \text{EGOS}$				
63.	Net Availability of Foodgrains	$\text{SFG} = \text{QF1} + \text{MFQ} + \text{JF}_{-1} - \text{JF}$				
64.	Value of Exports	$0.0736 \times \text{XV} = \frac{\text{XQ} \times \text{XP}}{100}$				
65.	Value of Imports	$0.0524 \times \text{MV} = \frac{\text{MQ} \times \text{MP}}{100}$				
66.	Net Domestic Product at current prices	$\text{YNDN} = \text{YNDR} \times \frac{\text{NID}}{100}$				
67.	Net National Product at Current prices	$\text{NNPN} = \text{YNDN} + \frac{\text{NIAR} \times \text{PNIA}}{100}$				
68.	Gross National Product Current Prices	$\text{GNPN} = \text{NNPN} + \frac{\text{CCAR} + \text{PGCA}}{100}$				

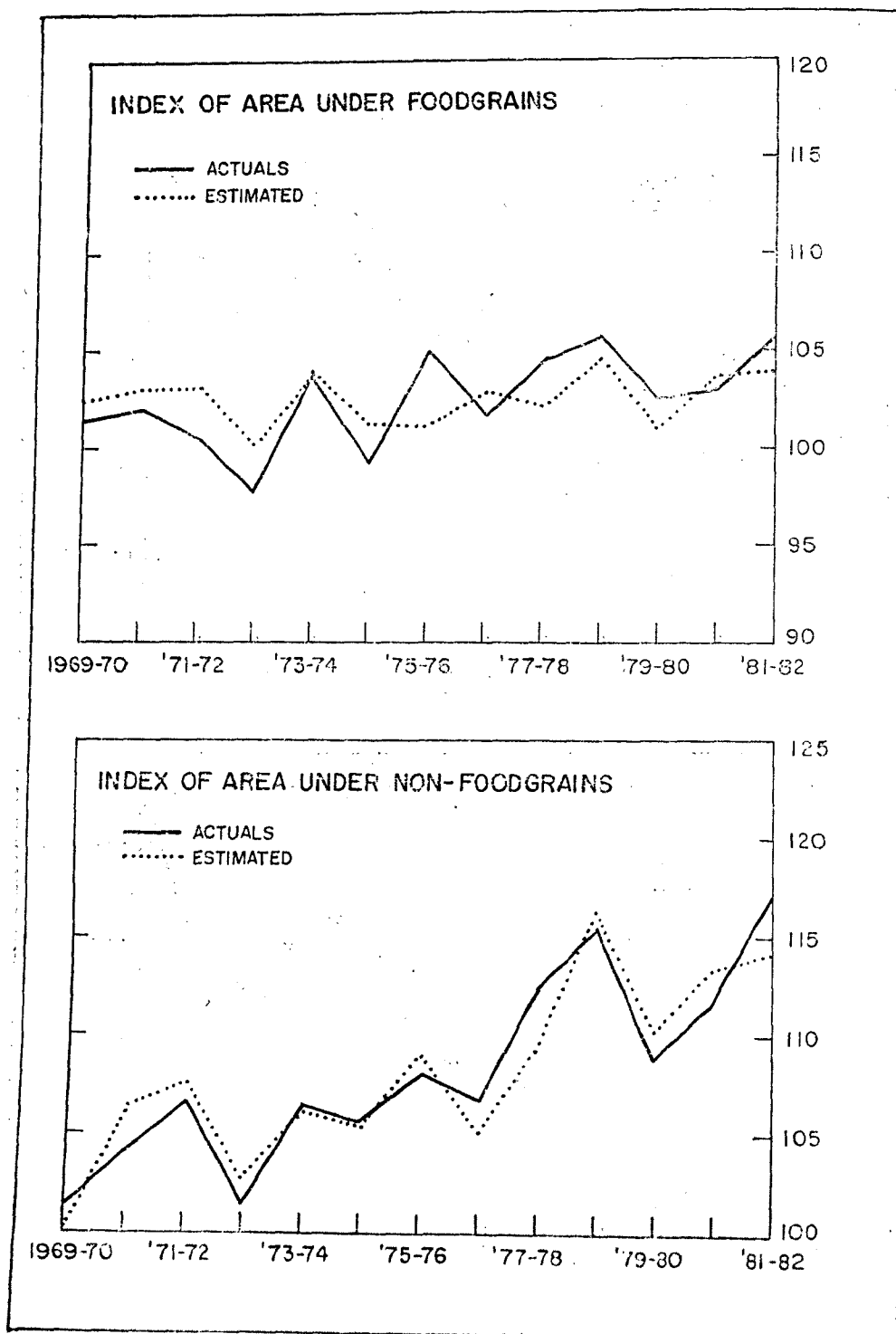
Appendix II—(Contd.)
 An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

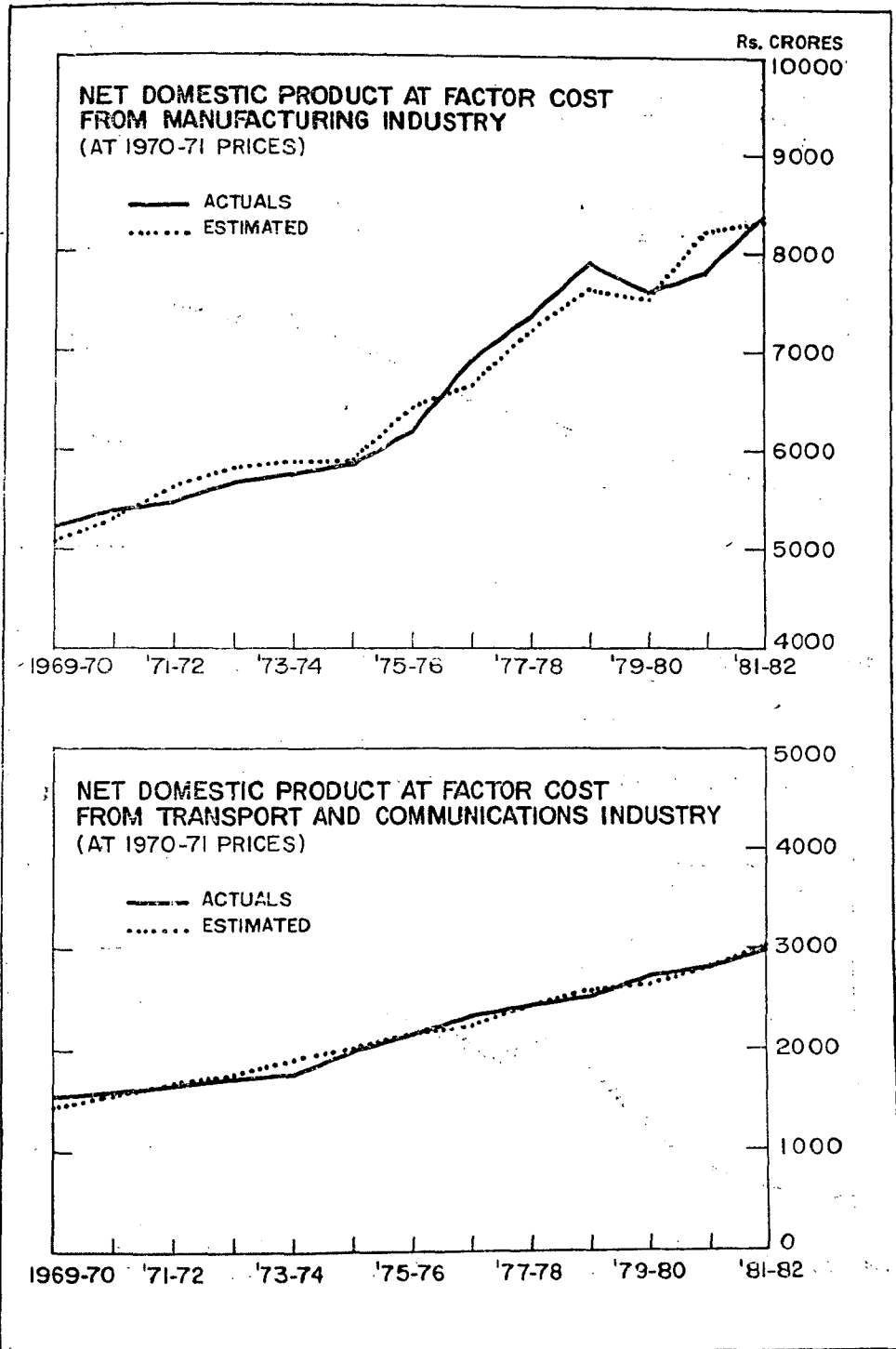
Sr. No.	Dependent Variable	(3)	$\frac{2}{R}$	DW	SEE	Mean
(1)	(2)	(3)	(4)	(5)	(6)	(7)
69.	Gross National Product at Market Prices	$GNPM = GNP_N + \frac{IDTR \times PID}{100}$				
70.	Deflator for Private Consumption Expenditure	$PCP = 131.27657 - 0.00405 CIPR + 0.00339 (NNPN - IR \times PCF) \frac{100}{(3.60)}$ $(4.94) \quad (13.53) \quad 1.04 \quad -0.86$	0.99	1.94	4.38	159.61
71.	Private Capital Stock in Manufacturing Sector	$KMPR = 2.3297 KMR - 1.3297 KMGR$				
72.	Private Investment in Manufacturing Sector	$IMPR = -1139.98920 - 3.14983 KMPR_{-1} + 0.02942 YNDR + (0.48) \quad (0.96) \quad (0.47)$ $+ 712.65201 DUMY_1 + 0.45618 IGR - 0.72 \quad 0.96$ $(2.25) \quad (1.10)$ $0.18 \quad 1.51$	0.63	2.19	294.87	1231.38
73.	Irrigated area under Foodgrains	$\frac{IF}{AFI} = 0.27670 + 0.01749 \frac{KAR}{AFI} \quad (83.81) \quad (18.73) \quad AFI$ 0.16	0.97	2.73	0.006	0.33
74.	Government Capital Expenditure	$GC = GCE + GCT$				

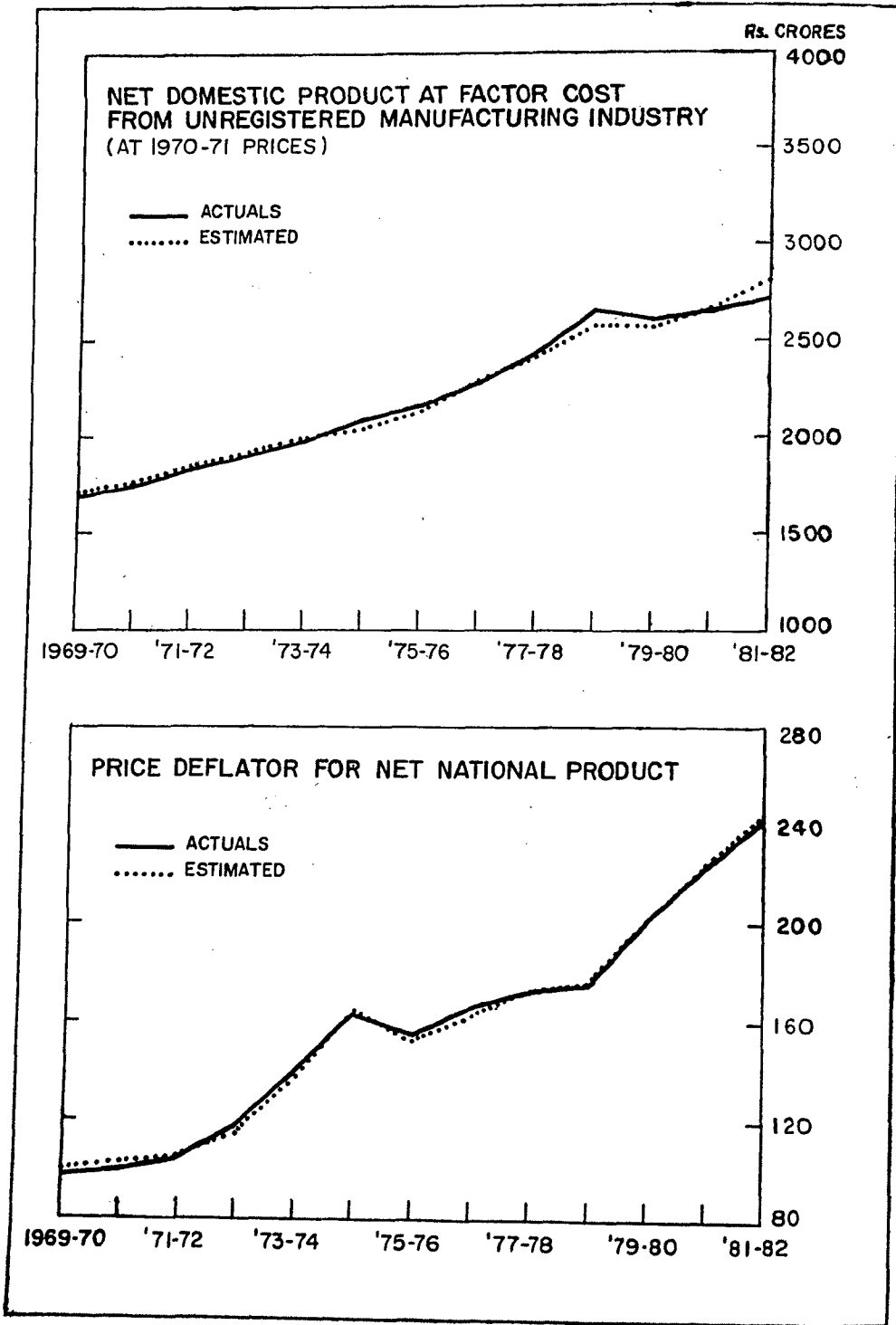
Appendix II—(Contd.)
An Econometric Model of Indian Economy — 1969-70 to 1981-82 — Equations

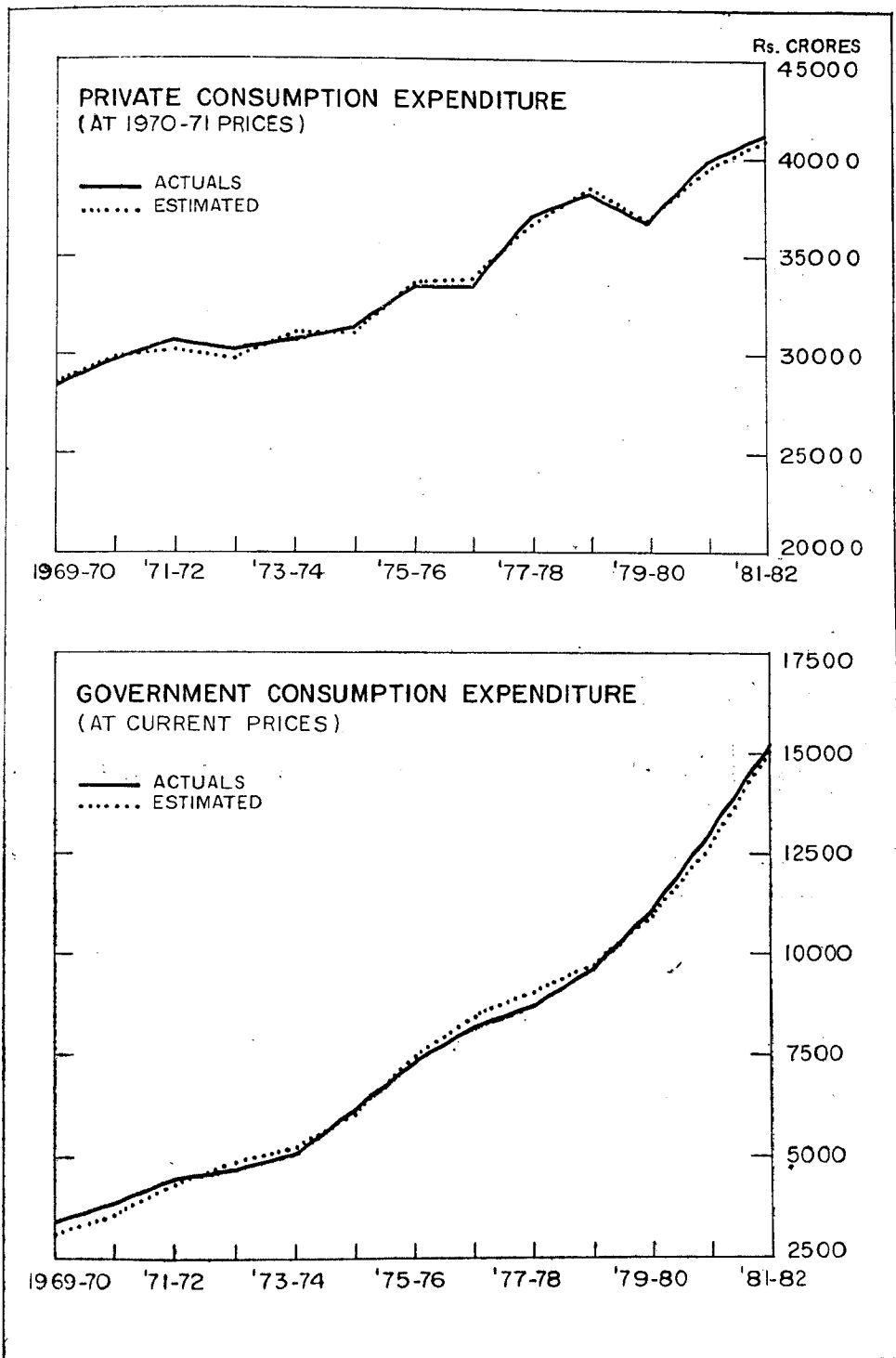
Sr. No.	Dependent Variable	(2)	(3)	$\frac{2}{R}$	DW	SEE	Mean
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7)
75.	Government Capital Expenditure net of current transfer	$GCE = 20.63627 + 0.00456 IGR$ $PCF = (4.51) (4.19)$ 0.47		0.58	2.12	4.18	39.19
		OR					
		$GCE = 1448.25960 + 0.00730 IGR \times PCF$ (3.19) (14.10) 0.79		0.94	2.42	834.41	6967.17
76.	Domestic Borrowings	$DB = 4922.61660 - 4759.68930 NID$ (2.56) (2.66) $\frac{NID-1}{NID-1}$ -2.11	$+ 0.00296 (PDIR - CPR) \times NID$ (13.61) 1.09	0.94	3.15	414.65	2430.85
77.	Total Consumption	$TCR = CPR + \frac{CGN \times 100}{PCG}$					
78.	Budgetary Deficit	$BD = GE - GR - MCR - DB - NFA$					
79.	Miscellaneous Capital Receipts	$MCR = 1505.48710 - 1.07524 DB + 0.43500 GC$ (1.99) (1.94) (2.75) -1.06 1.89	$- 0.46299 MCR_{-1}$ (2.13) -0.44	0.52	2.12	908.59	2475.08

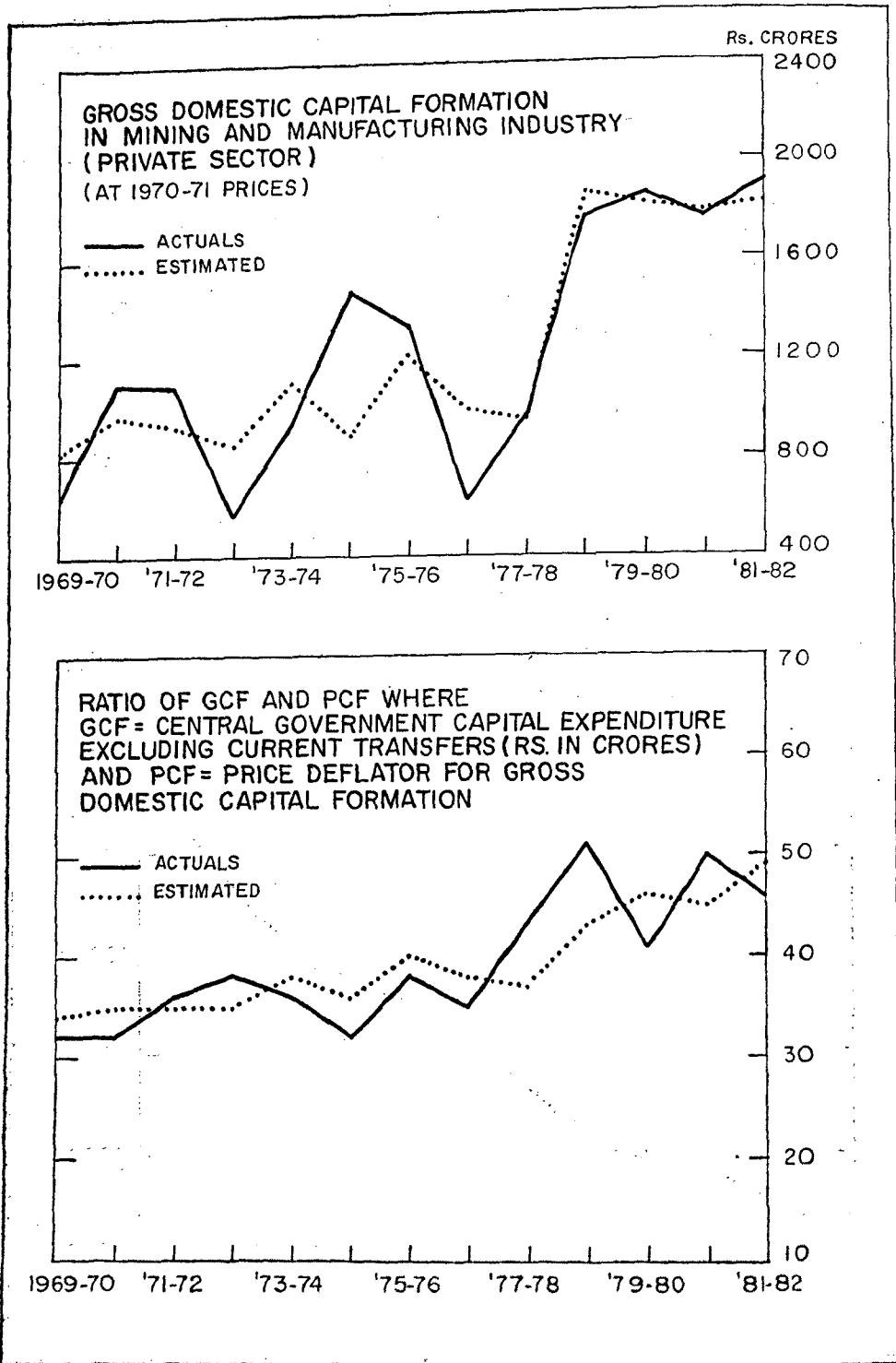


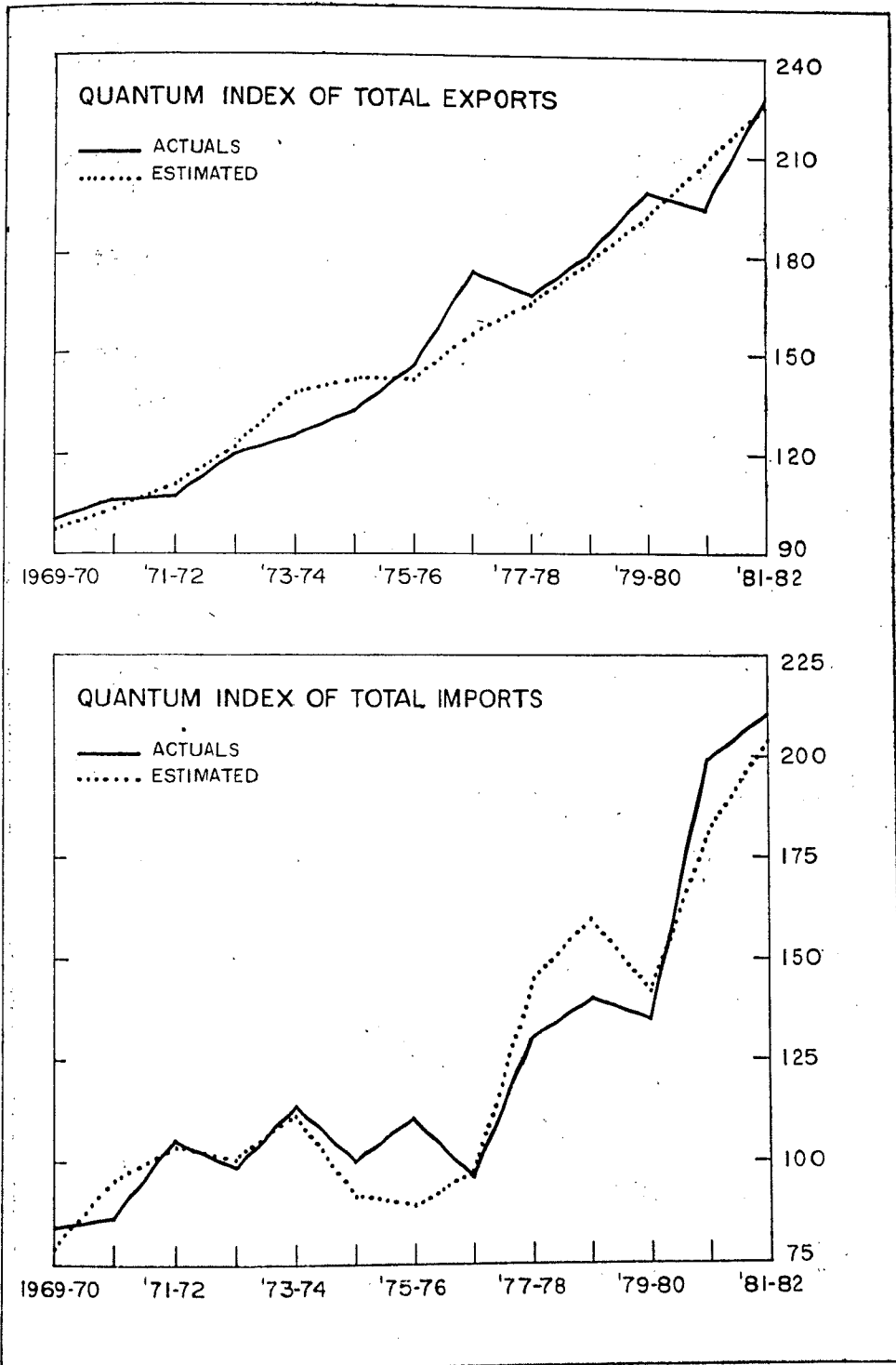


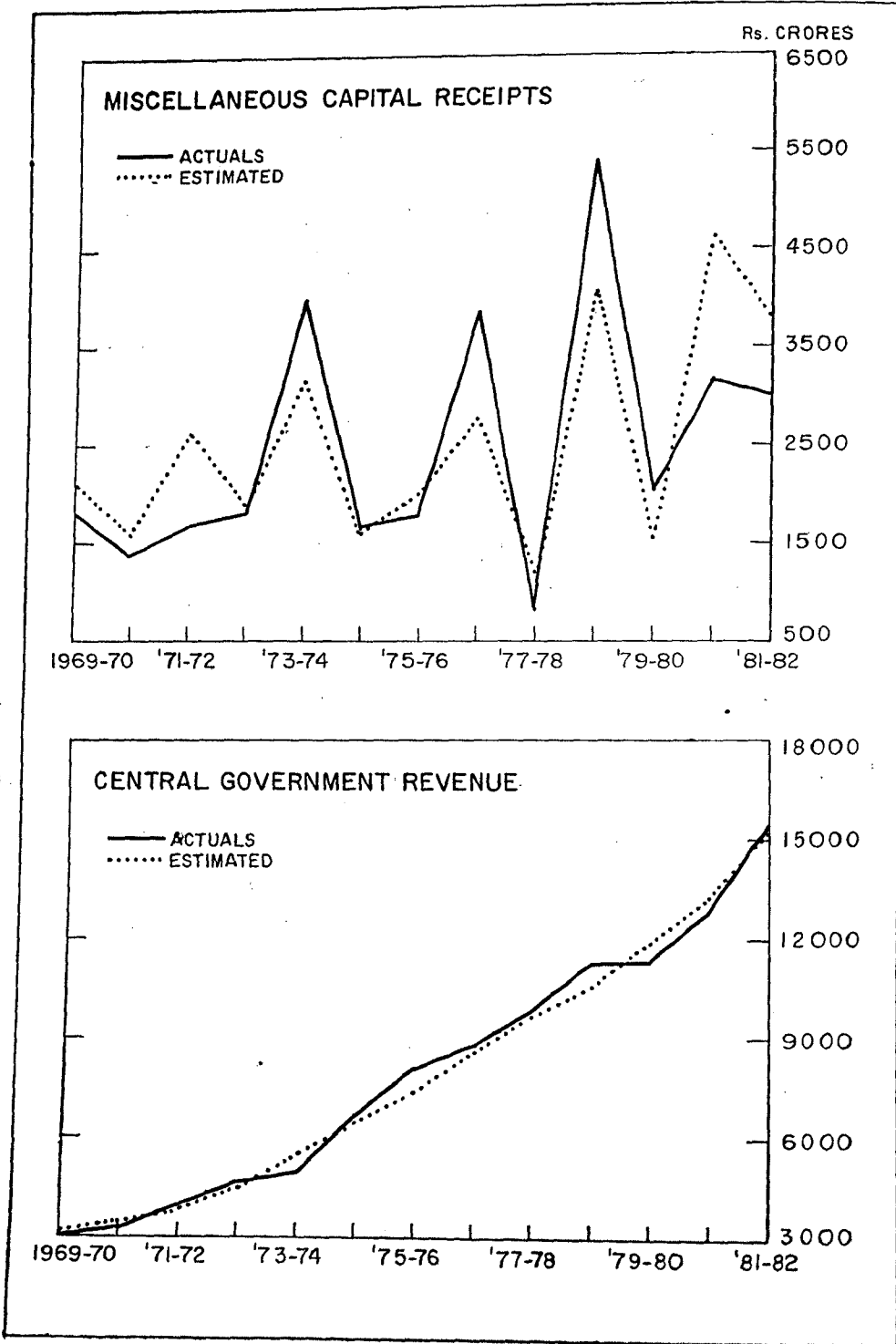


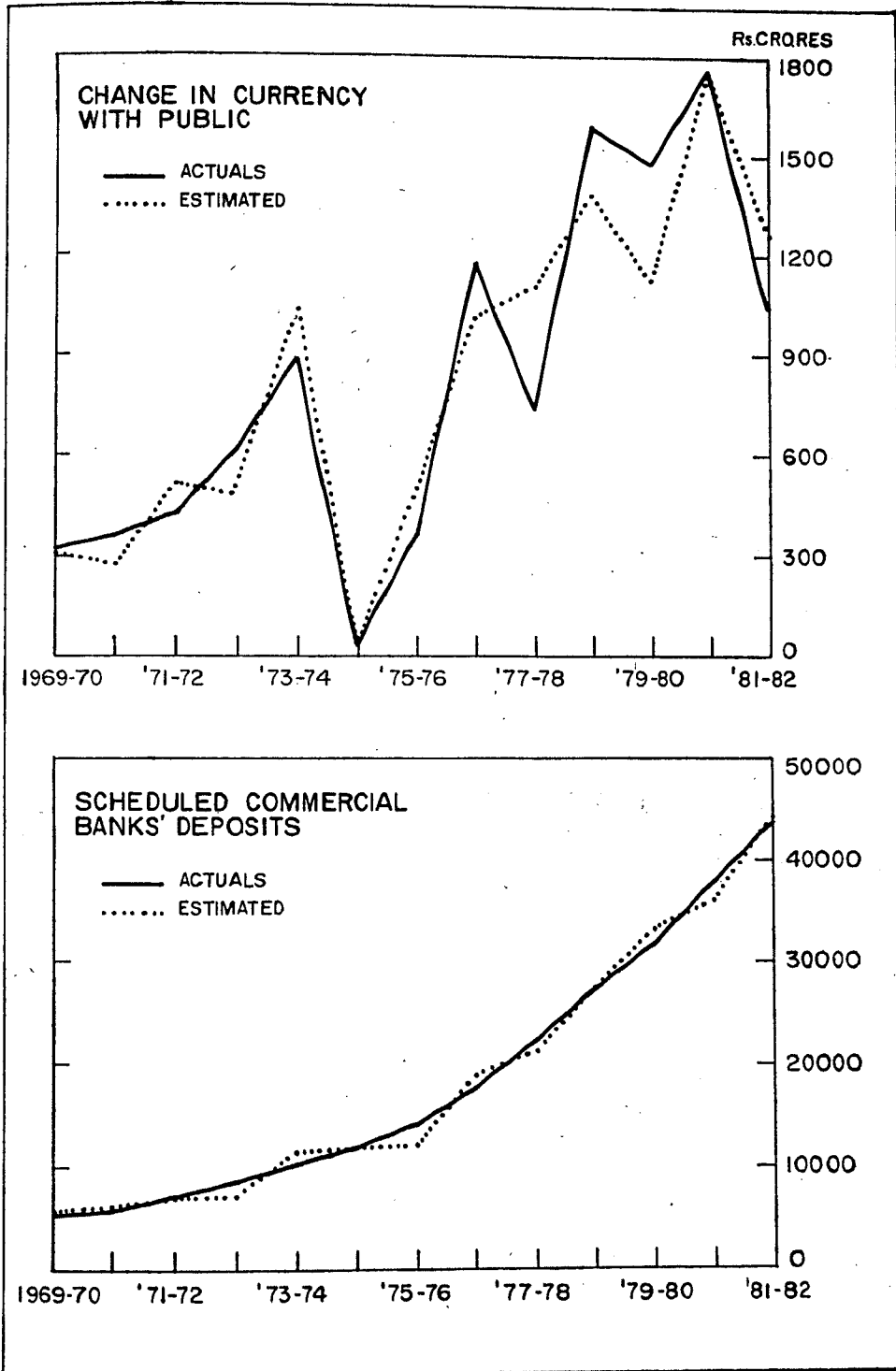


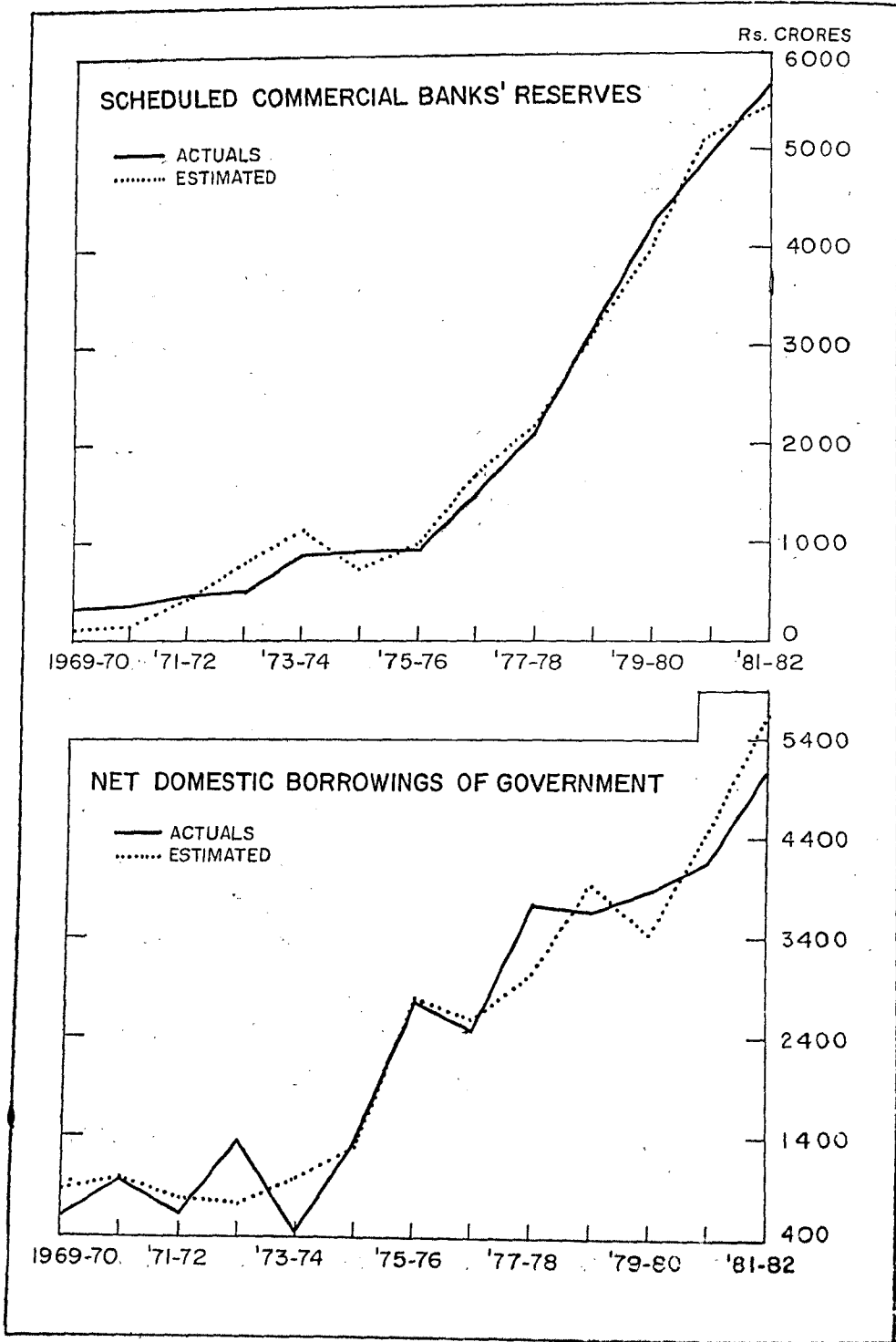


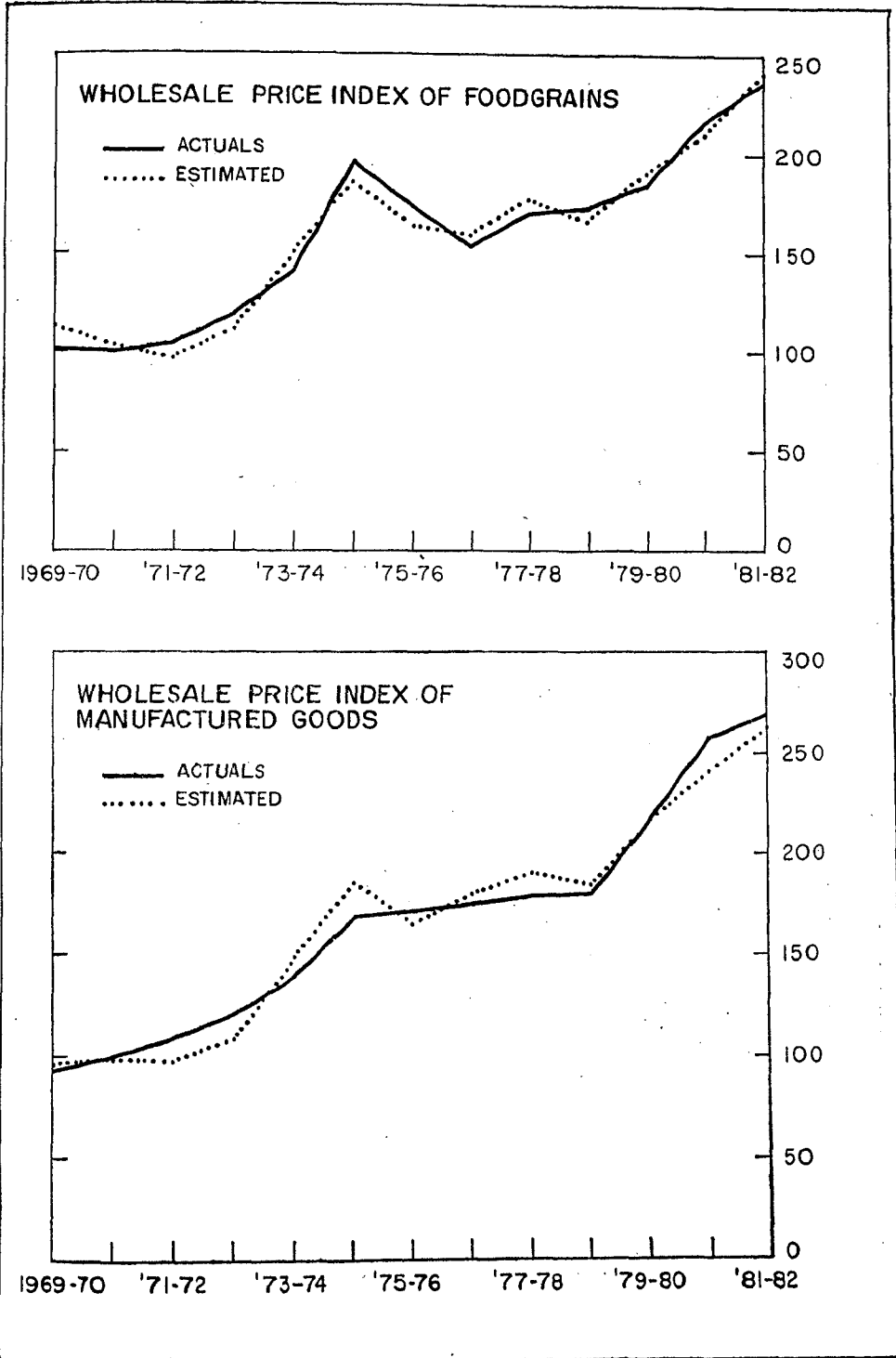


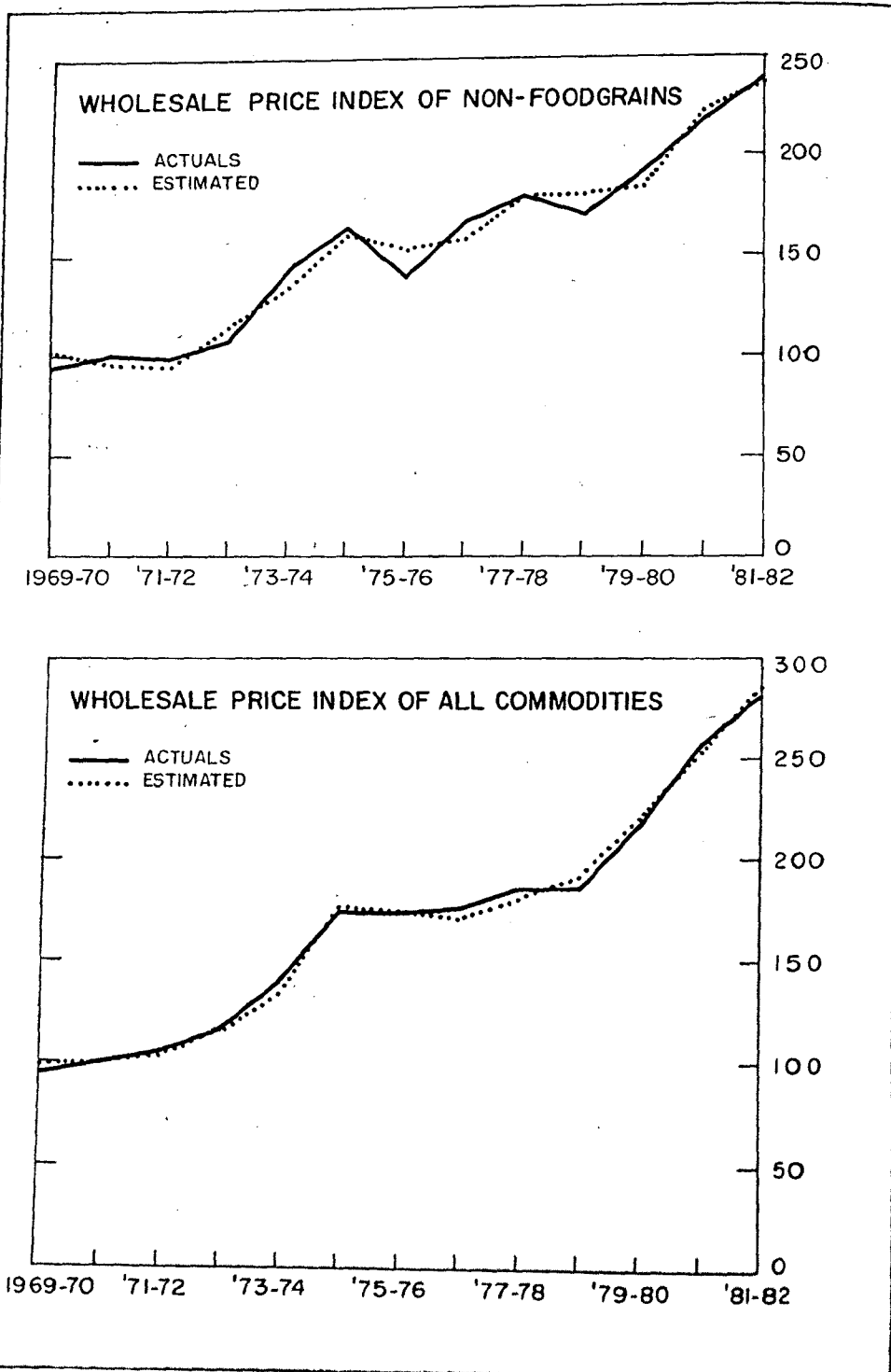












Appendix IV**List of Variables****Endogenous Variables**

QF, QNF, QA YAR, YMR, YUR, YTR, YOR, CPR, CGN, CGN1, IAPR, IMR, ITR, IOR, XQ, MQ, XP, R, G, GE, GR, NFDB, ΔC , C, SCBR, SCD, BC, M3, WPF, WPN, WPM, WP, PDIR, AFI, ANFI, NID, PID, QF1, CCAR, IDTR, PNIA, PCCA, PCG, PCF, BR, GDER, YNDR, NNPR, YNAR, IAR, KAR, KMR, KTR, KOR, KUR, KGR, KR, IR, IGR, GS, + OS, SFG, XV, MV, YNDN, NNPN, GNP, GNPM, PCP, KMPR, IMPR, IF/AFI, GC, GCE/PCF, DB, TCR, BD, MCR.

Exogenous Variables

WF, IN/ANFI, ITGR, IOGR, WGDG, DIMP, P*M, NFA, WPI, DNFE, NFEA, RB, B, ID, OD, MP, NIAR, SLR, IAGR, EGOS, MFQ JF, JF-1, IUR IMGR, IDTR/YNDR, KMGR, WN, WN², DUMY, DISR, DUMY1, GCT.

Appendix V

Mean Absolute % Error and Root Mean Square
% Error of Prediction

Sr. No.	Endogenous Variable	Mean Absolute % Error			Root Mean Square % Error		
		OLS	Static Simulation	Dynamic Simulation	OLS	Static Simulation	Dynamic Simulation
1.	QF	1.91	2.90	2.43	3.14	4.80	4.31
2.	QNF	0.48	1.88	1.72	0.80	2.81	2.95
3.	QA	0.04	2.16	2.05	0.07	3.58	3.43
4.	YAR	0.42	1.88	1.79	0.74	3.35	3.23
5.	YMR	1.13	1.28	1.81	1.84	1.95	2.75
6.	YUR	0.71	0.90	1.17	1.29	1.62	2.00
7.	YTR	0.67	0.66	0.65	1.27	1.18	0.99
8.	YOR	0.09	3.02	1.71	0.25	4.68	2.86
9.	CPR	0.37	1.17	0.96	0.56	1.94	1.58
10.	CGN	1.10	2.22	7.72	1.80	3.78	11.98
11.	CGNI	2.36	2.47	6.57	3.85	4.37	10.76
12.	IAPR	7.71	6.68	6.41	14.27	10.84	10.95
13.	IMR	0.00	1.85	1.83	0.00	4.03	3.83
14.	ITR	2.08	2.08	2.15	3.59	3.59	3.58
15.	IOR	4.55	3.98	4.06	7.24	6.85	6.97
16.	XQ	2.15	2.15	2.15	5.84	3.79	3.79
17.	MQ	4.58	5.83	5.84	7.21	8.49	8.31
18.	XP	4.00	3.77	6.54	6.65	6.02	9.33
19.	R	1.90	2.14	5.06	3.13	3.13	7.67
20.	G	0.00	3.31	4.54	0.00	5.15	7.73
21.	GE	1.32	3.32	5.58	2.59	5.57	8.74
22.	GR	1.08	1.78	6.37	2.07	3.49	9.55
23.	NFDB	0.00	4.90	5.40	0.00	8.56	8.30
24.	DELC	12.41	25.99	25.27	20.37	55.29	33.72
25.	C	0.00	2.02	3.85	0.00	3.65	6.28
26.	SCBR	2.66	7.61	12.11	4.54	15.07	21.04
27.	SCD	2.84	6.16	11.02	4.86	9.86	18.66
28.	D	0.10	6.14	10.98	0.17	9.82	18.59
29.	BC	0.37	5.27	9.97	0.82	8.40	16.66
30.	M3	0.00	4.95	8.97	0.00	7.88	15.01
31.	WPF	2.03	6.76	8.39	2.93	11.75	14.25
32.	WPN	2.33	5.91	6.20	3.86	12.55	12.73
33.	WPM	1.98	6.83	7.62	3.05	11.53	12.04
34.	WP	1.10	4.74	9.10	2.03	8.40	14.29

Appendix—V (Contd.)

Mean Absolute % Error and Root Mean Square
% Error of Prediction

Sr. No.	Endogenous Variable	Mean Absolute % Error			Root Mean Square % Error		
		OLS	Static Simulation	Dynamic Simulation	OLS	Static Simulation	Dynamic Simulation
35.	PDIR	0.41	1.27	0.91	0.64	2.02	1.51
36.	AFI	0.93	0.93	0.82	1.45	1.45	1.35
37.	ANFI	0.90	0.90	0.90	1.34	1.34	1.58
38.	NID	1.00	3.95	7.29	20.0	7.98	11.39
39.	PID	1.31	4.97	8.95	2.11	9.33	13.92
40.	QFI	0.18	2.68	2.23	0.32	4.59	4.16
41.	CCAR	1.24	0.31	1.32	1.93	0.03	2.05
42.	IDTR	0.35	0.05	0.88	0.62	1.55	1.51
43.	PNIA	3.05	3.05	3.05	4.28	4.28	4.28
44.	PCCA	0.81	4.08	7.48	1.33	6.92	12.05
45.	PCG	2.05	2.50	7.18	3.41	3.90	10.01
46.	PCF	1.32	4.56	7.82	1.88	7.74	12.30
47.	BR	2.12	7.55	11.73	3.33	15.28	20.63
48.	GDER	0.00	1.13	0.88	0.00	1.69	1.40
49.	YNDR	0.07	1.17	1.02	0.17	1.76	1.57
50.	NNPR	0.00	1.17	1.02	0.00	1.76	1.58
51.	YNAR	0.00	1.62	1.34	0.00	2.56	2.09
52.	IAR	0.00	4.54	4.40	0.00	7.32	7.52
53.	KAR	0.00	0.55	0.70	0.00	0.88	1.03
54.	KMR	0.00	0.26	0.30	0.00	0.56	0.47
55.	KTR	0.21	0.45	0.76	0.52	0.84	1.20
56.	KOR	0.02	0.44	0.42	0.05	0.78	0.75
57.	KUR	0.05	0.05	0.03	0.13	0.13	0.10
58.	KGR	0.01	0.01	0.04	0.01	0.02	0.05
59.	KR	0.00	0.24	0.26	0.00	0.37	0.40
60.	IR	0.01	1.91	1.77	0.02	2.95	2.01
61.	IGR	0.01	0.01	0.01	0.03	0.03	0.03
62.	GS+OS	0.00	6.28	11.25	0.00	10.03	19.11
63.	SFG	0.97	2.05	1.89	2.04	3.33	3.00
64.	XV	0.57	5.24	4.79	1.24	8.02	8.42
65.	MV	1.74	6.23	6.23	3.72	8.92	9.02
66.	YNDN	0.06	3.88	6.38	0.09	7.18	10.01
67.	NNPN	0.00	3.88	6.39	0.00	7.20	10.03

Appendix—V. (Contd.)

Mean Absolute % Error and Root Mean Square
% Error of Prediction

Sr. No.	Endogenous Various	Mean absolute % Error			Root Mean Square % Error		
		OLS	Static Simulation	Dynamic Simulation	OLS	Static Simulation	Dynamic Simulation
68.	GNPN	0.07	3.85	6.45	0.13	7.20	10.12
69.	GNPM	0.00	3.96	6.62	0.00	7.33	10.34
70.	PCP	1.18	3.94	6.91	1.93	7.99	10.70
71.	KMPR	0.00	0.66	0.76	0.00	1.43	1.21
72.	IMPR	6.33	7.12	7.02	17.07	18.35	17.33
73.	IFAF	0.64	0.75	0.74	0.92	1.10	1.09
74.	GC	0.52	3.90	4.84	1.87	6.56	8.45
75.	GCE	5.39	6.97	8.68	8.06	11.52	15.98
76.	DB	4.88	5.41	6.40	7.62	9.12	9.77
77.	TCR	0.00	1.26	0.81	0.01	2.17	1.31
78.	BD	1.41	291.54	435.35	4.55	815.76	1297.04
79.	MCR	16.32	29.56	31.57	23.86	58.47	58.02

Appendix VI

An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

	AFI	ANFI	B	BC	BR	C	CCAR	CGN	CGNI	EGOS	GPR
1	2	3	4	5	6	7	8	9	10	11	12
1968-69	98.90	97.10	353	4000	322	3682	1898	3050	1385	132	27491
1969-70	101.40	101.40	514	4713	338	4010	2035	3417	1476	221	28401
1970-71	102.00	104.10	642	5614	392	4371	2217	3801	1669	140	29838
1971-72	100.40	106.70	531	6359	501	4800	2285	4458	2054	146	30704
1972-73	97.80	101.50	460	7588	544	5420	2408	4745	2262	289	30070
1973-74	103.70	106.50	726	9037	907	6308	2443	5100	2312	5	30880
1974-75	99.20	105.70	914	10736	963	6347	2355	6143	2866	55	31143
1975-76	105.00	108.00	1315	13110	1021	6710	2507	7351	3449	148	33467
1976-77	101.90	106.80	1404	15738	1784	7893	2643	8206	3605	399	33422
1977-78	104.50	112.50	926	17943	2240	8631	2792	8667	3678	420	36800
1978-79	105.70	115.50	1117	21291	3696	10220	3037	9624	3976	390	3806
1979-80	102.60	108.70	1200	25535	4482	11699	3080	11041	4502	554	36769
1980-81	103.00	111.70	1276	30188	5578	13463	3277	13029	5174	246	39757
1981-82	105.70	117.29	1673	35508	6299	14512	3537	15180	6096	864	41008

Appendix—VI (Cont.)

An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	D	DB	DIMP	DISR	DNFE	DUMY	DUMYI	G	GC	GCE	GCT
1	13	14	15	16	17	18	19	20	21	22	23
1968-69	4646	339	0	302	151	0	0	5023	3638	2590.00	1048.1
1969-70	5586	592	0	445	272	0	0	5621	4145	2982.00	1163.0
1970-71	6547	966	0	267	-36	0	0	6151	4482	3242.90	1239.1
1971-72	7811	621	0	842	70	0	0	7578	5524	3801.30	1722.7
1972-73	9562	1372	0	301	-45	0	0	8422	6160	4308.50	1851.5
1973-74	11218	411	0	1511	109	0	0	9047	6735	4675.50	2059.5
1974-75	13033	1343	0	1189	-281	1	0	10575	7709	5259.20	2449.8
1975-76	15528	2756	1	372	687	0	0	13139	9690	6672.30	2017.7
1976-77	19307	2451	1	1354	1464	0	0	14477	10872	6194.10	3944.7
1977-78	24205	3725	1	766	1990	0	0	16312	12634	7956.10	4677.9
1978-79	29475	3653	1	1647	899	0	1	19684	15708	10025.40	5682.6
1979-80	34702	3887	1	2682	-43	0	1	19899	15397	9333.20	6063.8
1980-81	41577	4178	1	2685	-613	0	1	24838	19664	12752.40	6911.6
1981-82	47845	5072	1	2243	-2069	0	1	27267	21171	13370.30	7800.7

Appendix VI—(Contd.)
 An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	GDER	GE	GNPM	GNPN	GR	GS	IAGR	IAPR	IAR	ID	IDTR
1	24	25	26	27	28	29	30	31	32	33	34
1968-69	35756	7373	33024	30293	4846	1104	371	765	1136	—	2925
1969-70	38039	8098	36580	33521	5273	1256	385	905	1251	—	3156
1970-71	40263	8847	39979	36452	5810	1457	348	1017	1365	—	3527
1971-72	41196	10511	43065	38972	6810	1655	369	1022	1391	—	3883
1972-73	40901	12319	47563	42939	8233	2281	436	1077	1513	—	3991
1973-74	42370	13482	58615	53447	9286	2492	432	1162	1594	—	3724
1974-75	42437	16255	69304	62972	11616	2963	372	924	1296	—	3458
1975-76	46574	19912	73907	66193	14344	3415	424	854	1278	—	3912
1976-77	47124	22298	80359	71826	15858	4093	585	1269	1854	20	4138
1977-78	51052	24422	89992	81105	17257	6083	674	1309	1983	509	4238
1978-79	54391	28194	97503	86927	19762	6823	704	1872	2576	1034	4973
1979-80	51711	31670	107226	95023	22188	7696	719	1301	2020	1552	4751
1980-81	55281	39160	128524	114601	25591	9503	719	1643	2362	1880	4599
1981-82	58413	43660	147681	130795	30086	10463	775	1771	2546	1880	5074

Appendix VI—(Contd.)
 An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	IF	IMPR	IGR	IMGR	IMR	IN	IOGR	IOR	MCR	IR	ITGR
1	35	36	37	38	39	40	41	42	43	44	45
1968-69	28.05	647	2422	1028	1675	7.43	643	1985	1312	5917	377
1969-70	29.56	650	2391	1039	1657	7.37	659	2608	1757	6898	308
1970-71	30.12	1108	2773	1163	2271	3.89	751	2171	1356	7177	511
1971-72	30.08	1091	2957	1251	2342	8.83	792	2354	1671	7547	545
1972-73	30.76	558	3135	1347	1905	10.06	662	2044	1814	7075	690
1973-74	31.17	938	3738	1601	2539	11.00	1108	3113	3959	9072	597
1974-75	32.31	1469	3517	1736	3205	11.26	798	2200	1631	8205	611
1975-76	34.11	1328	4433	2053	3382	11.22	1337	2527	1783	8422	619
1976-77	34.25	619	4298	2326	2943	11.61	777	2885	3849	9134	614
1977-78	35.21	958	4141	2343	3301	12.24	515	2562	820	9668	611
1978-79	36.87	1769	4714	2280	4049	12.77	1051	3533	5408	12108	679
1979-80	37.50 ^(a)	1854	5301	2772	4626	13.05	1087	2553	2049	10814	723
1980-81	39.39 ^(a)	1764	5520	2972	4736	13.60	981	2894	3151	11890	848
1981-82	40.27 ^(a)	1902	5951	3204	5106	14.70	1058	3120	3018	12819	914

^(a) Estimated.

Appendix VI—(Contd.)

An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	ITR	IUR	JF	KAR	KGR	KMR	KMGR	KMPR	KOR	KR	KTR
1	46	47	48	49	50	51	52	53	54	55	56
1968-69	672	344	4.10	30.28	31.93	29.90	32.15	26.90	29.35	29.60	29.27
1969-70	701	405	4.40	63.62	63.45	59.47	63.63	53.93	67.90	64.10	62.00
1970-71	814	556	5.60	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	845	615	7.90	137.07	138.98	141.80	139.12	145.36	134.80	137.75	139.45
1972-73	984	629	3.20	177.40	180.30	175.80	181.24	168.57	165.02	173.14	185.39
1973-74	995	831	2.90	219.88	229.58	221.12	231.30	207.57	211.04	218.52	231.84
1974-75	922	582	2.50	254.42	275.94	278.32	285.58	268.65	243.57	259.56	274.88
1975-76	891	345	8.06	188.49	334.38	338.68	349.78	323.87	280.93	301.69	316.48
1976-77	885	567	17.30	337.90	391.04	391.21	422.51	349.61	323.58	347.37	357.84
1977-78	985	837	17.10	390.75	445.62	450.13	495.78	389.44	361.45	395.73	403.83
1978-79	1067	883	17.40	459.41	507.76	522.39	567.07	462.99	413.69	456.30	653.64
1979-80	1015	564	11.80	513.25	577.64	615.02	653.75	540.08	451.43	510.39	502.66
1980-81	1224	674	11.30	576.20	650.41	711.58	746.69	613.43	494.21	569.86	559.80
1981-82	1320	727	11.60	644.06	728.86	780.62	846.87	692.52	540.34	633.98	621.42

Appendix VI—(Contd.)

An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	KUR	M ₃	MFO	MP	MQ	MV	NFDB	NFA	NFEA	NIAR	NID
1	57	58	59	60	61	62	63	64	65	66	67
1968-69	21.45	8306	5.67	100	100	1909	856	517	302	-266	93.75
1969-70	66.22	9639	3.82	100	84	1582	1061	469	574	-285	97.53
1970-71	100.00	10978	3.55	100	87	1634	1287	321	538	-284	100.00
1971-72	137.36	12690	2.01	93	105	1825	1186	565	608	-313	105.35
1972-73	175.58	15033	-0.50	97	99	1867	1622	250	563	-311	117.78
1973-74	226.06	17571	3.59	138	114	2955	-599	-1010	672	-236	140.20
1974-75	261.42	19457	5.16	239	100	4519	2291	948	391	-122	162.86
1975-76	282.38	22315	7.54	280	111	5265	3534	778	1078	-91	154.92
1976-77	316.83	27279	6.92	278	97	5074	2645	194	2542	-84	165.71
1977-78	367.68	32906	0.49	249	130	6020	3560	-165	4532	-94	172.34
1978-79	421.32	39861	-0.63	260	140	6814	3892	239	5431	-60	174.91
1979-80	455.59	46792	-0.86	360	135	9142	4480	593	5388	42	201.20
1980-81	496.53	55451	-0.35	338	199	12524	5477	1299	4775	85	224.34
1981-82	540.70	62551	0.45	338	211	13589	6452	1380	2706	85	243.04

Appendix VI—(Contd.)
 An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	NNPN	NNPR	OD	OS	PCCA	PCF	PCG	PCP	PDIR	PID	PNIA
1	68	69	70	71	72	73	74	75	76	77	78
1968-69	28607	30513	-22	190	88.94	88.81	95.00	93.37	29696	95.86	95.86
1969-70	31606	32408	43	417	93.32	94.13	100.26	100.21	31495	125.44	95.09
1970-71	34235	34235	60	516	100.00	100.00	100.00	100.00	33062	100.00	100.00
1971-72	36573	34715	79	678	104.99	105.68	104.65	104.54	33444	105.41	92.97
1972-73	40270	34191	51	877	110.84	114.00	109.36	161.83	33265	115.86	97.11
1973-74	50424	35967	45	1103	123.74	129.90	117.46	139.03	35011	138.78	137.71
1974-75	59446	36502	77	1283	149.72	162.17	141.22	167.10	35093	183.11	238.52
1975-76	62069	40064	77	1561	161.39	174.80	150.48	158.34	38691	197.19	280.22
1976-77	67083	40481	121	1879	169.96	197.92	154.92	163.02	39016	206.21	277.32
1977-78	75935	44062	70	2325	179.48	184.93	158.27	171.87	42807	210.41	247.87
1978-79	80992	46306	166	2809	189.73	197.95	169.92	177.31	45528	211.82	260.00
1979-80	88372	43922	391	3549	215.94	228.21	166.53	201.50	43479	256.85	304.29
1980-81	106539	47490	411	4387	246.02	256.99	176.50	225.32	47116	302.74	388.24
1981-82	121243	49887	168	5419	270.62	290.80	194.62	249.80	49193	332.79	388.24

Appendix VI—(Contd.)

An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	P*M	QA	QF	QF1	QNF	R	RB	SCBR	SCD	SFG	SLR
1	79	80	81	82	83	84	85	86	87	88	89
1968-69	96.30	97.30	97.30	82.26	97.40	2760	5.00	275	4338	85.62	25
1969-70	100.9	102.80	104.00	87.06	103.60	3067	5.00	322	5028	89.49	26
1970-71	105.30	111.50	112.90	94.87	108.70	3342	6.00	364	5906	94.31	28
1971-72	105.1	111.20	111.40	92.02	110.90	4028	6.00	447	7106	96.22	28
1972-73	110.6	102.30	102.30	84.90	102.20	4578	6.00	487	8643	88.79	28
1973-74	147.8	112.40	110.30	91.58	117.00	5073	7.00	856	10139	97.14	30
1974-75	257.1	108.80	104.30	87.35	118.30	6558	9.00	908	11827	89.33	32
1975-76	292.6	124.80	127.20	105.90	119.80	8075	9.00	912	14155	102.08	33
1976-77	299.1	116.40	115.70	97.27	117.80	8739	9.00	1500	17566	99.39	33
1977-78	265.2	132.70	188.60	110.61	130.90	9792	9.00	2143	22211	110.22	33
1978-79	287.6	137.80	139.30	115.41	134.60	11240	9.00	3191	27016	114.20	34
1979-80	311.9	117.10	114.80	95.99	122.30	11340	9.00	4250	31759	101.42	34
1980-81	338.20	134.90	137.50	113.39	130.10	12829	9.00	4858	37988	114.08	34
1981-82	366.7	142.60	140.80	116.43	145.90	15373	10.00	5675	43820	116.73	35

Appendix VI—(Contd.)

An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	WF	WGDP	WN	WP	WPF	WN ²	WPM	WPN	TCR	XP	XQ
1	90	91	92	93	94	95	96	97	98	99	100
1968-69	135.02	78	135.17	91.30	96.30	18270.93	92.80	83.00	30692	100	100
1969-70	154.82	80	146.49	94.75	100.70	21459.32	92.60	94.80	31809	104	100
1970-71	167.40	83	167.72	100.00	100.00	28130.00	100.00	100.00	33639	106	106
1971-72	173.78	86	161.55	105.60	103.40	26078.40	109.50	98.80	34964	108	107
1972-73	124.28	91	118.10	116.20	119.50	13947.61	121.90	107.40	34409	120	120
1973-74	183.78	98	168.09	139.70	141.90	28254.25	139.50	146.60	35222	146	125
1974-75	144.18	100	134.28	174.90	195.80	18031.12	168.80	163.70	35493	183	133
1975-76	131.03	100	178.08	173.00	174.10	31712.49	171.20	139.80	38352	197	147
1976-77	149.66	106	142.62	176.60	152.70	20340.46	175.20	267.40	38719	210	174
1977-78	164.60	110	157.42	185.80	170.40	24781.06	179.20	178.00	42276	236	168
1978-79	195.25	116	189.91	185.80	172.60	36065.81	179.50	170.40	44104	234	180
1979-80	131.92	122	136.87	217.60	185.40	18733.40	215.80	194.60	43399	236	199
1980-81	183.83	129	182.59	257.30	216.70	33339.11	257.30	217.70	47139	254	194
1981-82	185.00	136	180.00	280.60	237.40	32400.00	269.70	239.50	48788	254	236

Appendix VI—(Contd.)
An Econometric Model of Indian Economy (1968-69 to 1981-82)—Data

Year	XV	YAR	YMR	YNAR	YNDN	YNDR	YOR	YTR	YUR	Δ C	BD	WPI
1	101	102	103	104	105	106	107	108	109	110	111	112
1968-69	1358	14713	4907	16065	28862	30778	7950	1496	1712	306	359	100.0000
1969-70	4113	15869	5238	16904	32041	32773	8431	1537	1698	328	7	100.0000
1970-71	1535	16980	5372	17539	34519	34519	8848	1574	1745	361	394	100.0000
1971-72	1608	16867	5466	18161	36864	35028	9218	1650	1827	429	844	100.4320
1972-73	1971	15780	5656	18722	40572	34052	9432	1729	1905	620	650	100.9750
1973-74	2523	16955	5749	19248	50749	36203	9764	1760	1975	888	836	102.5638
1974-75	3329	16618	5841	20006	59737	36624	10100	1985	2080	39	717	106.6659
1975-76	4043	18777	6187	21378	62224	40155	10865	2165	2161	363	251	108.2023
1976-77	5146	17532	6904	23033	67316	40565	11543	2329	2257	1183	—54	108.3432
1977-78	5408	19743	7351	14413	76168	44156	12207	2432	2423	738	2845	109.0471
1978-79	5726	20057	7888	26309	81148	46366	13220	2547	2654	1589	—868	110.1976
1979-80	6418	17466	7598	26414	88219	43880	13502	2714	2600	1479	2953	113.6563
1980-81	6711	19692	7824	27713	106209	47405	14408	2827	2654	1764	4941	117.6370
1981-82	7796	20312	8387	29490	120913	49802	15392	2992	2719	1049	3530	121.7096

Sources: Various issues of Report on Currency and Finance, National Accounts Statistics and Economic Survey.

Appendix VII

Tentative Elasticities of Imports and Exports (at Constant Prices) with Respect to Explanatory Variables

A. Demand for imports into India

Item of Import		Explanatory Variables		Remarks	
(1)		(2)		(3)	
		Domestic price	Domestic output		
1.	Food	Period I	2.8	-1.1	—
		Period II	2.0	-7.4	—
		Import price	Domestic non-agricultural output		
2.	Raw materials	Period I	-1.1	2.1	—
		Period II	-0.5*	3.6	*Relative prices of domestic and foreign raw materials have a negative impact on imports.
		Relative prices	Gross domestic capital formation		
3.	Capital goods	Period I	-1.3	0.7	Relative price is import price to domestic price. Domestic output of capital goods has a high negative impact on imports (-1.5).
		Period II	-1.3	2.5	
		Import price	National Income		
4.	Mineral fuel	Period I	-0.5	1.7	
		Period II	-0.8	5.9	
		Import price	National Income		
5.	Other imports	Period I	-1.1	0.5	
		Period II	-0.7	1.6	Net foreign aid has an in significant effect on imports.
			National Income		
6.	Service Imports	Period I		0.4	
		Period II		3.4	

B. Demand for Exports from India

Destination of exports		Explanatory Variables		Remarks
(1)		(2)		(3)
		Unit value of Exports (Weight)	National Product of USA	
1. Dollar Area	Period I	-1.8	1.2	—
	Period II	-1.1	1.3	
		Price	Net National Product of U.K.	
2. Sterling Area	Period I	-1.8*	1.2	*Domestic price in U.K.
	Period II	-1.5**	1.8	**Export unit values to domestic price in U.K.
		Price	Net National Product of W. Germany	
3. OECD Area	Period I	-2.4*	0.5	*Domestic price in W. Germany
	Period II	-1.3	0.8	—do—
		Price	National Product of USSR	
4. EEC	Period I	4.1*	3.9	*Domestic price in USSR
	Period II	1.1*	1.9	*Unit value Index of Exports to USSR
		Price	National Product of Iran	
5. OPEC	Period I	-0.3*	1.7	*Export unit values to domestic price in Iran
	Period II	-0.3**	1.6	**Domestic price in Iran
		Price	National Product of Japan	
6. Others	Period I	-0.4*	0.9	*Domestic price in Japan
	Period II	-0.9**	1.5	**Export unit values to domestic prices in Japan

(Based on a study entitled 'An Econometric Model of India's Foreign Sector (1956-57 -- 1979-80)' by R. Kannan).

Period I : 1956-57 — 1965-66.

Period II : 1966-67 — 1979-80.

Appendix VIII

POLICY SIMULATIONS

Explanatory notes to Appendix VIII(A to J)

M = Multiplier = $(X_{pi} - X_{ci}) / (Z_{pi} - Z_{ci})$

E = Elasticity = $\frac{Z_o M}{X_o}$

X = Endogenous impact variable

Z = Policy Variable

Z_o, X_o are the Mean values of control observations (sample).

Subscript c = Control observations

Subscript p = Policy values

* In real terms at 1970-71 prices (Rs. crores)

@ Base : 1970-71 = 100

† Rs. Crores.

\$ Due to large errors, these estimates are unstable and hence unreliable.

Appendix VIII—(Contd.)

POLICY SIMULATIONS

A — Increase (1%) in Food Production

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	108.54	0.31	144.21	0.40
(ii) Output from Agriculture and associated activities (YAR)*	80.98	0.55	93.12	0.63
(iii) Non-agricultural Output at factor cost (YNAR)*	27.56	0.14	51.09	0.34
(iv) Total Consumption (TCR)*	104.84	0.31	133.83	0.38
(v) Total Capital Formations (IR)*	18.86	0.22	30.63	0.33
II. Money Supply and Prices				
(i) Money Supply (M3)*	-143.23	-0.44	-662.98	-1.46
(ii) Wholesale Prices (WV)@	-2.78	-1.58	-5.70	-2.79
(iii) National Income Deflator (NID)@	-2.55	-1.61	-4.09	-2.33
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	15.37	0.32	-49.27	-0.79
(ii) Net Domestic Borrowings (DB)†	34.98	1.29	-60.74	-1.42
(iii) Budget deficit (BD)†	-19.56	-1.17	45.50	4.69

Appendix VIII—(Contd.)

POLICY SIMULATIONS

B — Increase (1%) in Non-Food Production

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	-0.23\$	-0.01\$	73.54	0.16
(ii) Output from Agriculture and associated activities (YAR)*	38.14\$	0.26\$	52.11	0.27
(iii) Non-agricultural output at factor cost (YNAR)*	-38.37\$	-0.20\$	21.43	0.08
(iv) Total Consumption (TCR)*	2.99	0.01	84.33	-0.19
(v) Total Capital Formations (IR)*	6.60	0.08	16.09	0.14
II. Money Supply and Prices				
(i) Money Supply (M ₃)†	79.17	0.24	-206.13	-0.36
(ii) Wholesale Prices (WP)@	1.79	1.04	1.16	0.44
(iii) National Income Deflator (NID)@	1.73	1.11	0.69	0.31
III. Fiscal aggregates (Public Sector)				
(i) Resource gap (RG)†	-18.29	-0.38	-30.90	-0.39
(ii) Net Domestic Borrowings (DB)†	-21.46	-0.80	23.85	0.44
(iii) Budget deficit (BD)†	2.85	0.17	-54.79	-4.41

Appendix VIII—(Contd.)

POLICY SIMULATIONS

C — Increase (1%) in total Agricultural Production

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	106.33	0.31	181.16	0.56
(ii) Output from Agriculture and associated activities (YAR)*	118.73\$	0.81\$	118.73	0.90
(iii) Non-agricultural Output at factor cost (YNAR)*	-12.40\$	-0.06\$	62.43	0.33
(iv) Total Consumption (TCR)*	106.06	0.32	180.79	0.57
(v) Total Capital Formations (IR)*	25.35	0.30	38.26	0.47
II. Money Supply and Prices				
(i) Money Supply (M3)†	-63.00	-0.19	-703.69	-1.75
(ii) Wholesale Prices (WP)@	-0.95	-0.55	-4.16	-2.30
(iii) National Income Deflator (NID)@	-0.79	-0.50	-3.09	-1.99
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	-3.33	-0.07	-64.05	-1.15
(ii) Net Domestic Borrowings (DB)†	13.39	0.50	-35.02	-0.93
(iii) Budget deficit (BD)†	-16.68	-1.00	1.13	0.13

Appendix VIII—(Contd.)

POLICY SIMULATIONS

D — Increase (5%) in total Real Government Investment

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	1.85	0.21	1.69	0.20
(ii) Output from Agriculture and associated activities (YAR)*	0.01	0.03	0.08	0.02
(iii) Non-agricultural Output at factor cost (YNAR)*	1.84	0.36	1.61	0.33
(iv) Total Consumption (TCR)*	1.06	0.12	1.41	0.17
(v) Total Capital Formations (IR)*	1.40	0.64	0.96	0.45
II. Money Supply and Prices				
(i) Money Supply (M ₃)†	1.77	0.21	8.30	0.81
(ii) Wholesale Prices (WP)@	0.01	0.30	0.03	0.64
(iii) National Income Deflator (NID)@	0.01	0.26	0.02	0.52
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	1.72	1.37	1.23	0.87
(ii) Net Domestic Borrowings (DB)†	0.47	0.66	0.92	0.95
(iii) Budget deficit (BD)†	1.24	2.88	0.31	1.41
IV. Trade — off Indicators				
(i) Ratio of Non-Agricultural Output to Prices		58:42		39:61
(ii) Ratio of NDP to Prices		45:55		28:72

Appendix VIII—(Contd.)

POLICY SIMULATIONS

E - Increase (5%) in Real Government Investment in Agriculture

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	2.11	0.03	3.12	0.05
(ii) Output from Agriculture and associated activities (YAR)*	0.09	0.03	0.56	0.02
(iii) Non-agricultural Output at factor cost (YNAR)*	2.02	0.05	2.56	0.07
(iv) Total Consumption (TCR)*	1.24	0.02	2.69	0.04
(v) Total Capital Formations (IR)*	1.56	0.10	1.47	0.09
II. Money Supply and Prices				
(i) Money Supply (M ₃)†	1.63	0.03	5.60	0.07
(ii) Wholesale Prices (WP)@	0.01	0.04	0.01	0.04
(iii) National Income Deflator (NID)@	0.01	0.03	0.01	0.02
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	1.77	0.19	1.12	0.10
(ii) Net Domestic Borrowings (DB)†	0.54	0.10	0.90	0.12
(iii) Budget deficit (BD)†	1.21	0.38	0.21	0.12
IV. Trade — off Indicators				
(i) Ratio of non-Agricultural Output to Prices		63:37		78:22
(ii) Ratio of NDP to Prices		50:50		71:29

Appendix—VIII (Contd.)

POLICY SIMULATIONS

F — Increase (5%) in Real Government Investment in Mining and Manufacturing

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	2.01	0.12	1.36	0.09
(ii) Output from Agriculture and associated activities (YAR)*	—	—	0.002	0.0003
(iii) Non-agricultural Output at factor cost (YNAR)*	2.01	0.20	1.36	0.15
(iv) Total Consumption (TCR)*	1.14	0.07	1.12	0.07
(v) Total Capital Formations (IR)*	1.54	0.37	0.84	0.21
II. Money Supply and Prices				
(i) Money Supply (M3)†	1.77	0.11	8.58	0.45
(ii) Wholesale Prices (WP)@	0.02	0.17	0.03	0.37
(iii) National Income Deflator (NID)@	0.01	0.15	0.02	0.31
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	1.79	0.75	1.26	0.48
(ii) Net Domestic Borrowings (DB)†	0.53	0.39	0.87	0.49
(iii) Budget deficit (BD)†	1.29	1.56	0.38	0.93
IV. Trade — off Indicators				
(i) Ratio of Non-Agricultural Output to Prices		57:43		33:67
(ii) Ratio of NDP to Prices		44:56		23:77

Appendix—VIII (Contd.)

POLICY SIMULATIONS

G.—Increase (5%) in Real Government investment in Transport

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	1.79	0.03	1.98	0.04
(ii) Output from Agriculture and associated Activities (YAR)*	—	—	—	—
(iii) Non-agricultural Output at factor cost (YNAR)*	1.79	0.05	1.98	0.06
(iv) Total Consumption (TCR)*	1.01	0.02	1.53	0.03
(v) Total Capital Formations (IR)*	1.37	0.09	1.32	0.09
II. Money Supply and Prices				
(i) Money Supply (M3)†	1.80	0.03	6.95	0.10
(ii) Wholesale Prices (WP)@	0.01	0.04	0.03	0.11
(iii) National Income Deflator (NID)@	0.01	0.04	0.02	0.08
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	1.70	0.20	1.56	-0.17
(ii) Net Domestic Borrowings (DB)†	0.46	0.10	1.22	0.19
(iii) Budget deficit (BD)†	1.22	0.41	0.54	0.37
IV. Trade-off Indicators				
(i) Ratio of Non-Agricultural Output to Prices		56:44		43:57
(ii) Ratio of NDP to Prices		43:57		33:67

Appendix VIII—(Contd.)

POLICY SIMULATIONS

H — Increase (1%) in total agriculture production and increase 4% in total Real Government Investment

Impact Variable	STATIC		DYNAMIC	
	Annual average change	% change	Annual average change	% change
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	497.00	1.13	671.33	1.36
(ii) Output from agriculture and associated activities (YAR)*	153.69	0.82	199.08	0.99
(iii) Non-agricultural Output at factor cost (YNAR)*	343.30	1.36	472.27	1.62
(iv) Total Consumption (TCR)*	341.72	0.80	500.03	1.25
(v) Total Capital Formations (IR)*	307.83	2.88	285.29	2.28
II. Money Supply and Prices				
(i) Money Supply (M3)†	267.99	0.64	814.91	1.33
(ii) Wholesale Prices (WP)@	1.48	0.67	0.34	0.12
(iii) National Income Deflator (NID)@	1.07	0.53	-0.02	-0.008
III. Fiscal aggregates (Public Sector)				
(i) Resource gap (RG)†	331.55	5.38	184.15	2.17
(ii) Net Domestic Borrowings (DB)†	108.75	3.17	133.94	2.32
(iii) Budget deficit (BD)†	222.55	10.52	50.17	3.77
IV. Trade-off Indicators				
(i) Ratio of Non-Agricultural Output to Prices		72:28		—
(ii) Ratio of NDP to Prices		68:32		—

Appendix VIII—(Contd.)

POLICY SIMULATIONS

I — Change (2%) in Government Capital expenditure

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	0.39	0.13	0.02	0.04
(ii) Output from Agriculture and associated activities (YAR)*	0.003	0.003	0.003	0.01
(iii) Non-agricultural Output at factor cost (YNAR)*	0.44	0.27	0.02	0.06
(iv) Total Consumption (TCR)*	0.24	0.08	0.01	0.02
(v) Total Capital Formations (IR)*	0.36	0.53	0.03	0.25
II. Money Supply and Prices				
(i) Money Supply (M3)†	1.63	0.58	1.01	1.72
(ii) Wholesale Prices (WP)@	0.006	0.38	0.003	0.97
(iii) National Income Deflator (NID)@	0.005	0.40	0.002	0.96
III. Fiscal aggregates (Public Sector)				
(i) Resource gap (RG)†	0.96	2.40	0.09	0.95
(ii) Net Domestic Borrowings (DB)†	0.06	0.29	0.04	0.85
(iii) Budget deficit (BD)†	0.86	6.18	0.03	1.08
IV. Trade-off Indicators				
(i) Ratio of Non-Agricultural Output to Prices		40:60		4:96
(ii) Ratio of NDP to Prices		25:75		6:94

Appendix—VIII (Contd.)

POLICY SIMULATIONS

J — Increase (1%) in Administered Prices

Impact Variable	STATIC		DYNAMIC	
	M	E	M	E
I. Output and Related Aggregates				
(i) Net Domestic Product at factor cost (YNDR)*	-24.58	-0.06	-4.29	-0.07
(ii) Output from Agriculture and associated activities (YAR)*	—	—	—	—
(iii) Non-agricultural Output at factor cost (YNAR)*	-24.58	-0.11	-4.29	-0.12
(iv) Total Consumption (TCR)*	-13.23	-0.04	-119.28	-1.93
(v) Total Capital Formations (IR)*	-0.97	-0.01	-0.09	-0.01
II. Money Supply and Prices				
(i) Money Supply (M3)†	4.83	0.01	0.07	—
(ii) Wholesale Prices (WP)@	4.08	1.81	0.62	1.49
(iii) National Income Deflator (NID)@	-12.75	-6.72	0.53	1.80
III. Fiscal Aggregates (Public Sector)				
(i) Resource gap (RG)†	-8.61	-0.16	-1.04	-0.10
(ii) Net Domestic Borrowings (DB)†	-6.43	-0.22	-1.45	-0.20
(iii) Budget deficit (BD)†	-1.99	-0.11	0.40	0.24
IV. Trade-off Indicators				
(i) Ratio of Non-Agricultural Output to Prices		2:98		
(ii) Ratio of NDP to Prices		1:99		

Appendix IXA

Alternative Scenario

Comparative long-term Elasticities (7 years)

Target Variable	Government Investment (IGR)	Government Investment in Agriculture (IAGR)	Government Investment in Manufacturing Sector (IMGR)	Index of Agricultural Production (QA)	Index of Foodgrains Production (QF)
	1	2	3	4	5
I. Net Domestic Product at factor cost (YNDR)*	S 0.21	0.03	0.12	0.31	0.31
	D 0.20	0.05	0.09	0.56	0.40
II. Non-agricultural Output at factor cost (INAR)*	S 0.36	0.05	0.20	-0.06	0.14
	D 0.33	0.07	0.15	0.33	0.24
III. Total Capital Formation (IR)*	S 0.64	0.10	0.37	0.30	0.22
	D 0.45	0.09	0.21	0.47	0.33
IV. Money Supply (M ₃)†	S 0.21	0.03	0.11	-0.19	-0.44
	D 0.81	0.07	0.45	-1.75	-1.46
V. National Income Deflator (NID)@	S 0.26	0.03	0.15	-0.50	-1.61
	D 0.52	0.02	0.31	-1.99	-2.33
VI. Budget Deficit (BD)†	S 2.88	0.38	1.56	-1.00	-1.17
	D 1.41	0.12	0.93	0.13	4.69
VII. Trade-off (YNAR : NID)	S 58:42	63:37	57:43		
	D 39:61	78:22	33:67		

* In real terms at 1970-71 prices.

S Short-term Elasticity.

@ Base : 1970-71 = 100.

D Long-term (7 years) Elasticity.

† Rs. Crores.

Appendix IXB
Alternative Scenario
Comparative Elasticities (Dynamic Averages)

Target Variable	Government Investment (IGR)	Government Investment in Agriculture (IAGR)	Government Investment in Manufacturing Sector (IMGR)	Index of Agricultural Production (QA)	Index of Foodgrains Production (QF)
	1	2	3	4	5
I. Net Domestic Product at factor cost (YNDR)*	S 0.21 D 0.20	0.03 0.04	0.12 0.10	0.31 0.56	0.31 0.43
II. Non-agricultural Output at factor cost (INAR)*	S 0.36 D 0.34	0.05 0.06	0.20 0.17	-0.06 0.34	0.14 0.32
III. Total Capital Formation (IR)*	S 0.64 D 0.52	0.10 0.09	0.37 0.26	0.30 0.47	0.22 0.32
IV. Money Supply (M ₃) †	S 0.21 D 0.62	0.03 0.06	0.11 0.33	-0.19 -1.30	-0.44 -1.22
V. National Income Deflator (NID)@	S 0.26 D 0.43	0.03 0.03	0.15 0.24	-0.50 -1.56	-1.61 -2.09
VI. Budget Deficit (BD) †	S 2.88 D 2.22	0.38 0.27	1.56 1.23	-1.00 -3.65	-1.17 -0.96
VII. Trade-off (YNAR : NID)	S 58:42 D 44:56	63:37 67:33	57:43 41:59		

* In real terms at 1970-71 prices. † Rs. Crores.
S Short-term Elasticity. D Long-term (7 years) Elasticity.
@ Base : 1970-71 = 100.

Appendix X

Sectoral Weights in Wholesale Prices and Gross Domestic Product

(Percentages)

Sector	Sectoral Weight in	
	WPI	GDP
(1)	(2)	(3)
1. All Crops	32.373	43.635
2. Animal husbandry	8.047	6.169
3. Coal & lignite	1.072	0.444
4. Crude petroleum and natural gas	0.602	0.166
5. Iron ore	0.156	0.076
6. Other minerals	0.489	0.232
7. Sugar & Other Processing	16.030	1.509
8. Textiles	11.026	3.068
9. Wood & furniture	0.174	0.562
10. Paper	0.851	0.557
11. Leather	0.385	0.279
12. Plastic	1.207	0.259
13. Petroleum products	4.912	0.112
14. Coaltar products	0.075	0.060
15. Heavy chemicals	0.726	0.193
16. Fertilizers	1.252	0.175
17. Paints & other chemicals	3.570	1.028
18. Cement	0.703	0.079
19. Other non-metallic mineral products	0.712	1.005
20. Iron & Steel	3.473	0.895
21. Other basic metals	1.178	0.112
22. Machinery	6.368	2.373
23. Transport equipment	1.673	0.937
24. Miscellaneous manufacturing industries	0.546	0.737
25. Construction	—	4.477
26. Electricity	2.400	0.880
27. Gas & Water supply	—	0.098
28. Railway transport service	—	1.087
29. Other transport services	—	2.988
30. Storage, etc.	—	11.295
31. Communication	—	0.584
32. Finance & real estate	—	5.314
33. Public administration	—	8.615
All Commodities	100.000	100.000

WPI : Wholesale Price Index.

GDP : Gross Domestic Product.

Appendix XI
Wholesale Price Indices for All Commodities

Year	Wholesale Prices		Hypothetical Series I		GDP Deflator \pounds		Hypothetical Series II	
	Index	% Increase	Index	% Increase	Index	% Increase	Index	% Increase
I	2	3	4	5	6	7	8	9
1970-71	100.0	—	100.00	—	100.0	—	100.00	—
1971-72	105.6	5.6	101.08	1.08	105.2	5.2	100.43	0.43
1972-73	116.2	10.0	102.40	1.29	117.1	11.3	100.98	0.54
1973-74	139.7	20.2	107.64	5.12	139.1	18.8	102.56	1.57
1974-75	174.9	25.2	120.69	12.13	164.0	17.9	106.65	3.99
1975-76	173.0	-1.1	124.19	2.90	159.1	-3.0	108.19	1.45
1976-77	176.6	2.1	125.47	1.04	169.8	6.7	108.84	0.59
1977-78	185.8	5.2	126.09	0.49	175.6	3.4	109.04	0.19
1978-79	185.8	—	128.68	2.06	179.3	2.1	110.19	1.06
1979-80	217.6	17.1	139.12	8.11	207.7	15.5	113.66	3.16
1980-81	257.3	18.2	153.16	10.09	231.4	11.7	117.66	3.51
1981-82	281.3	9.3	165.30	7.93	254.9	10.2	122.25	3.90
1982-83	288.3	2.5	170.55	3.18	274.8	7.8	124.89	2.16
1983-84	315.5 ^(a)	9.4	174.36	2.23	301.1	9.6	127.74	2.29
Average annual percentage increase								
(a) 1971-72 to 1983-84		9.5		4.43		9.0		1.91
(b) 1979-80 to 1983-84		11.3		6.31		11.0		3.00

Notes : Series I. Weighted index of hypothetical sectoral price indices, weights being proportional to aggregate wholesale price index.
 II. Weighted index of hypothetical sectoral price indices, weights being proportional to GDP.
^(a) Provisional.
 \pounds at market prices.

Appendix XII
Impact Multipliers of Changes in Administered Prices on Sectoral Prices

(Excluding the Commodities with Administered Prices)

Sr. No.	Sector	1	2	3	4	5	6	7	8
1.	All Crops	1.097200	0.456086	0.006410	0.003076	0.601779	0.339427	0.091825	0.055039
2.	Animal husbandry	0.088599	1.030620	0.003370	0.001407	0.079106	0.053730	0.170288	0.046431
3.	Iron Ore	0.000001	0.000001	1.000013	0.000006	0.000006	0.000006	0.000006	0.000009
4.	Other minerals	0.000179	0.000248	0.000635	1.000200	0.000832	0.000726	0.000343	0.001394
5.	Sugar and other Processing	0.004222	0.064237	0.001206	0.000762	1.099101	0.011992	0.014304	0.011636
6.	Textiles	0.002778	0.038611	0.001433	0.000806	0.027687	1.182471	0.013278	0.023069
7.	Wood and Furniture	0.000379	0.001036	0.001166	0.000480	0.006332	0.004684	1.086656	0.008278
8.	Paper	0.000475	0.001937	0.001189	0.000723	0.010033	0.011155	0.010575	1.262443
9.	Leather	0.000005	0.000020	0.000010	0.000006	0.000065	0.000373	0.000181	0.001024
10.	Plastic	0.000313	0.001209	0.000753	0.000396	0.006126	0.004494	0.005809	0.003852
11.	Coal-tar Products	0.000087	0.000119	0.000363	0.000122	0.000377	0.000362	0.000243	0.000493
12.	Heavy Chemicals	0.000711	0.001616	0.002279	0.001551	0.007110	0.018351	0.005848	0.038718
13.	Paints and other Chemicals	0.006647	0.008691	0.019475	0.014451	0.015325	0.057112	0.019232	0.047246
14.	Cement	0.000212	0.000235	0.007726	0.000161	0.000227	0.000197	0.000111	0.000368
15.	Other Non-metallic mineral products	0.000824	0.001085	0.002914	0.000797	0.003419	0.001660	0.002034	0.008411

Appendix XII—(Contd.)
Impact Multipliers of Changes in Administered Prices on Sectoral Prices
 (Excluding the Commodities with Administered Prices)

Sr. No.	Sector	1	2	3	4	5	6	7	8
16.	Machinery	0.002431	0.003518	0.054622	0.027390	0.018145	0.021760	0.025207	0.032002
17.	Transport Equipment	0.000461	0.002963	0.000700	0.000337	0.003590	0.003810	0.003457	0.004723
18.	Miscellaneous Manufacturing Industries	0.000090	0.000380	0.000229	0.000107	0.000953	0.003378	0.000969	0.002516
19.	Construction	0.006444	0.007064	0.022069	0.004830	0.005898	0.005249	0.002732	0.006492
20.	Gas and Water Supply	0.000022	0.000070	0.000055	0.000033	0.000273	0.000768	0.000109	0.000676
21.	Other Transport Services	0.003349	0.011989	0.005174	0.002445	0.026778	0.029503	0.018424	0.030294
22.	Storage, etc.	0.011310	0.038523	0.016689	0.007719	0.095952	0.078061	0.094103	0.109207
23.	Finance and real estate	0.004410	0.004064	0.011231	0.006177	0.013812	0.018750	0.008244	0.027704
24.	Public administration	0.000557	0.002376	0.001737	0.000962	0.015802	0.024979	0.013356	0.043635

Appendix XII—(Contd.)
Impact Multipliers of Changes in Administered Prices on Sectoral Prices
 (Excluding the Commodities with Administered Prices)

Sr. No.	Sector	9	10	11	12	13	14	15	16
1.	All Crops	0.171924	0.200960	0.018114	0.044859	0.148636	0.058206	0.022390	0.017295
2.	Animal husbandry	0.920572	0.030571	0.014886	0.015297	0.036264	0.019599	0.028111	0.015249
3.	Iron Ore	0.000007	0.000010	0.004996	0.000034	0.000016	0.000108	0.000016	0.000257
4.	Other minerals	0.000944	0.002872	0.012955	0.022496	0.005099	0.094991	0.041909	0.001425
5.	Sugar and other Processing	0.027952	0.017826	0.004022	0.026585	0.048588	0.004239	0.003814	0.003306
6.	Textiles	0.046376	0.048608	0.005670	0.018714	0.036886	0.160223	0.010077	0.011702
7.	Wood and Furniture	0.005039	0.008478	0.008080	0.005685	0.010158	0.009653	0.009141	0.009945
8.	Paper	0.010409	0.017769	0.007516	0.011750	0.034990	0.008995	0.009923	0.009092
9.	Leather	1.247311	0.007142	0.000024	0.000037	0.000210	0.000072	0.000025	0.000131
10.	Plastic	0.034141	1.150752	0.005118	0.006354	0.010638	0.003734	0.003306	0.006710
11.	Coaltar Products	0.000327	0.000634	1.068442	0.005698	0.001883	0.000896	0.002017	0.002117
12.	Heavy Chemicals	0.024525	0.042311	0.021907	1.085200	0.104246	0.004226	0.017506	0.011387
13.	Paints and other Chemicals	0.060085	0.190397	0.015545	0.049673	1.153277	0.014711	0.011367	0.016702
14.	Cement	0.000177	0.000314	0.000208	0.000293	0.000321	1.002220	0.012534	0.000202
15.	Other Non-metallic mineral products	0.003030	0.004565	0.005808	0.007325	0.011517	0.001201	1.033911	0.005365

Appendix XII—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

(Excluding the Commodities with Administered Prices)

Sr. No.	Sector	9	10	11	12	13	14	15	16
16.	Machinery	0.025924	0.030938	0.033505	0.035848	0.034641	0.039313	0.026275	1.171412
17.	Transport Equipment	0.004197	0.005583	0.000153	0.002947	0.003703	0.012227	0.003620	0.005544
18.	Miscellaneous Manufacturing Industries	0.001577	0.001455	0.001337	0.001526	0.001984	0.002044	0.001368	0.002351
19.	Construction	0.004397	0.007540	0.004380	0.005694	0.005665	0.005229	0.003797	0.003862
20.	Gas and Water Supply	0.000256	0.000696	0.001140	0.002104	0.001352	0.000559	0.000489	0.000348
21.	Other Transport Services	0.093699	0.035551	0.068245	0.017033	0.026925	0.045515	0.021906	0.019203
22.	Storage, etc.	0.108838	0.115400	0.126364	0.073136	0.097276	0.124192	0.062715	0.108641
23.	Finance and real estate	0.011725	0.024488	0.024857	0.025787	0.028708	0.036768	0.014528	0.025870
24.	Public administration	0.015220	0.017463	0.024460	0.027630	0.032208	0.041256	0.030755	0.020906

Appendix XII—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices
(Excluding the Commodities with Administered Prices)

Sr. No.	Sector	17	18	19	20	21	22	23	24
1.	All Crops	0.025002	0.045778	0.115609	0.012448	0.071249	0.076007	0.006795	0.023225
2.	Animal husbandry	0.023388	0.034131	0.004501	0.008322	0.011302	0.092514	0.003958	0.011062
3.	Iron Ore	0.000045	0.000045	0.000062	0.000035	0.000006	0.000002	0.000003	0.000004
4.	Other minerals	0.000600	0.003236	0.022430	0.001812	0.000325	0.000318	0.001127	0.000686
5.	Sugar and other Processing	0.004513	0.009843	0.005950	0.001468	0.010436	0.016907	0.000515	0.007071
6.	Textiles	0.008010	0.028308	0.009899	0.002830	0.009372	0.009863	0.000828	0.006887
7.	Wood and Furniture	0.023065	0.023460	0.023485	0.003273	0.003519	0.004244	0.001651	0.002468
8.	Paper	0.007519	0.013805	0.003116	0.003552	0.010282	0.006254	0.008378	0.061901
9.	Leather	0.000128	0.004849	0.000028	0.000165	0.000068	0.000030	0.000012	0.000183
10.	Plastic	0.031571	0.008375	0.003090	0.001650	0.066205	0.003939	0.000482	0.003204
11.	Coal tar Products	0.001078	0.000810	0.010855	0.002319	0.000189	0.000146	0.000546	0.000254
12.	Heavy Chemicals	0.011388	0.019582	0.003651	0.007030	0.003976	0.000886	0.000551	0.012023
13.	Paints and other Chemicals	0.029580	0.037217	0.011188	0.003806	0.015520	0.003007	0.001655	0.109740
14.	Cement	0.000138	0.000225	0.032743	0.002163	0.000148	0.000358	0.001625	0.000137
15.	Other Non-metallic mineral products	0.001949	0.006245	0.114044	0.008140	0.000973	0.002030	0.005725	0.002212

Appendix XII—(Contd.)
Impact Multipliers of Changes in Administered Prices on Sectoral Prices
 (Excluding the Commodities with Administered Prices)

Sr. No.	Sector	17	18	19	20	21	22	23	24
16.	Machinery	0.123774	0.195564	0.039380	0.101801	0.017474	0.007189	0.002596	0.013348
17.	Transport Equipment	1.108194	0.025473	0.003193	0.006513	0.100797	0.005342	0.001024	0.009636
18.	Miscellaneous Manufacturing Industries	0.001738	1.012244	0.002485	0.031760	0.001762	0.003557	0.000862	0.024079
19.	Construction	0.003557	0.003455	0.002816	0.065916	0.004275	0.010638	0.049720	0.003402
20.	Gas and Water Supply	0.000591	0.000323	0.000155	1.000071	0.000856	0.000172	0.001182	0.000717
21.	Other Transport Services	0.020153	0.021316	0.024720	0.011911	1.069983	0.053084	0.005624	0.019041
22.	Storage, etc.	0.124071	0.117519	0.112372	0.038561	0.059687	1.052300	0.009932	0.050046
23.	Finance and real estate	0.023617	0.014348	0.010356	0.004003	0.023609	0.023872	1.021512	0.007961
24.	Public Administration	0.017456	0.013981	0.007220	0.003113	0.011146	0.003998	0.007007	1.012095

Appendix—XIII

Percentage Increase in Sectoral Prices Due to A Rise of
10 per cent in Import Prices of All Commodities

(Percentages)

Sector	Weights in gross value added		Weights in wholesale price index	
	Assumption	Assumption	Assumption	Assumption
	I	II	I	II
1	2	3	4	5
1. All Crops	0.341186	0.231325	0.341186	0.231325
2. Animal Husbandry	0.224045	0.161638	0.224045	0.161638
3. Coal and Lignite*	0.170553	—	0.170553	—
4. Crude Petroleum and Natural Gas*	8.105039	—	8.105039	—
5. Iron Ore	0.343618	0.090734	0.343618	0.090734
6. Other Minerals	4.812981	4.750208	4.812981	4.750208
7. Sugar and Other Processing	0.518537	0.407290	0.518537	0.407290
8. Textiles	0.334598	0.215000	0.334598	0.215000
9. Wood and Furniture	0.213726	0.132583	0.213726	0.132583
10. Paper	0.896463	0.754224	0.896463	0.754224
11. Leather	0.284858	0.202184	0.284858	0.202184
12. Plastic	0.653590	0.452457	0.653590	0.452457
13. Petroleum Products*	6.998977	—	6.998977	—
14. Coaltar Products	0.738360	0.294313	0.738360	0.294313
15. Heavy Chemicals	3.309865	2.911849	3.309865	2.911849
16. Fertilizers*	4.185749	—	4.185749	—
17. Paints and Other Chemicals	1.264898	1.020081	1.264898	1.020081
18. Cement	0.812856	0.547775	0.812856	0.547775
19. Other Non-Metallic Mineral Products	0.584753	0.441650	0.584753	0.441650
20. Iron and Steel*	2.208968	—	2.208968	—
21. Other Basic Metals*	4.325878	—	4.325878	—
22. Machinery	1.948554	1.288320	1.948554	1.288320
23. Transport Equipment	1.345857	0.809369	1.345857	0.809369

Appendix XIII—(Contd.)

Percentage Increase in Sectoral Prices Due to A Rise of
10 per cent in Import Prices of All Commodities

(Percentages)

Sector	Weights in gross value added		Weights in wholesale price index	
	Assumption I	Assumption II	Assumption I	Assumption II
	1	2	3	4
24. Miscellaneous Manufacturing Industries	1.239775	0.901112	1.239775	0.901112
25. Construction	0.519106	0.218070	0.519106	0.218070
26. Electricity*	0.280308	—	0.280308	—
27. Gas and Water Supply	0.413109	0.165576	0.413109	0.165576
28. Railway Transport Service*	0.486561	—	0.486561	—
29. Other Transport Services	0.858271	0.404725	0.858271	0.404725
30. Storage, etc.	0.100097	0.057473	0.100097	0.057473
31. Communication*	0.114261	—	0.114261	—
32. Finance and Real Estate	0.043101	0.019423	0.043101	0.019423
33. Public Administration	0.222840	0.162562	0.222840	0.162562
All Commodities	0.439774	0.250930	1.103865	0.378449

Assumption I : The rise in import prices are fully passed on to the output prices of all individual commodities.

Assumption II : The rise in import prices are passed on to output prices except the administered prices which will have zero increase and are exogenised.

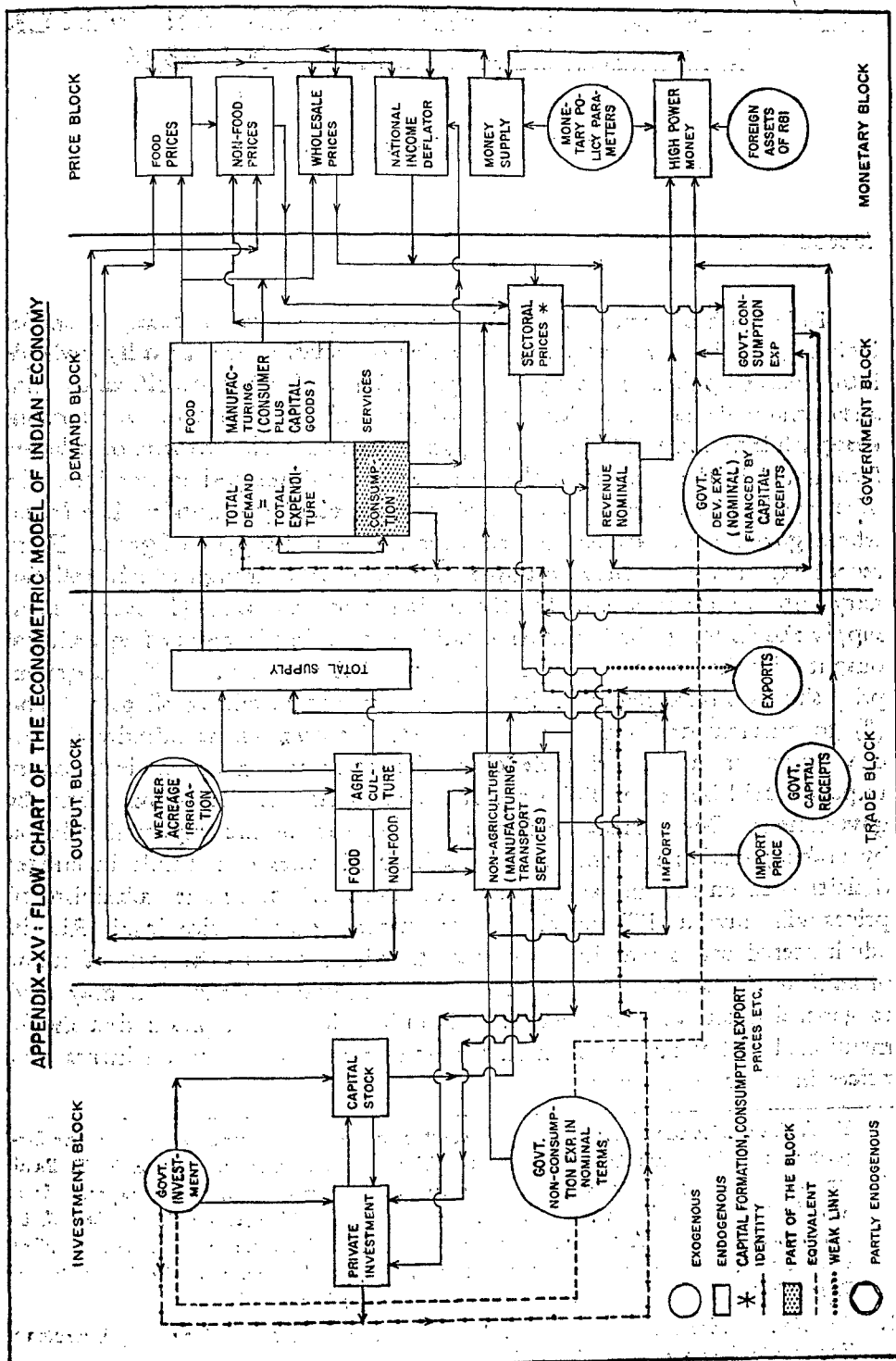
Note : Sectors No. 25, 27 to 33 are services sectors and have zero weight in the wholesale price index.

* With administered prices.

Appendix XIV
Sources of Inflation (1975-76 to 1982-83)

	National Income Deflator (NID)		Wholesale Price Index (WPI)	
	1975-76 to 1982-83	1979-80 to 1982-83	1975-76 to 1982-83	1979-80 to 1982-83
(1)	(2)	(3)	(4)	(5)
I. Average Annual Percentage Increase				
A. Impact due to Foodgrains Production (QF)				
1. Average Annual Percentage Change	6.46	11.03	6.66	11.78
2. Static Impact	4.15	1.00	4.15	1.00
3. Dynamic Impact	-6.68	-1.61	-6.56	-1.58
Total Impact (2+3)	-2.71	-0.50	-2.35	-0.91
B. Impact due to Non-Foodgrains Production (QNF)				
1. Average Annual Percentage Change	-9.39	-2.11	-8.91	-2.49
2. Static Impact	2.40	1.43	2.40	1.43
3. Dynamic Impact	2.66	1.59	2.50	1.49
Total Impact (2+3)	-2.02	-1.99	-1.60	-1.56
Total Impact of Agricultural Production A+B	0.64	-0.40	0.90	-0.07
C. Impact due to Administered Prices	-8.75	-2.51	-8.01	-2.56
D. Impact due to Import Prices	1.91	2.99	4.52	7.34
Total Impact (A+B+C+D)	0.12	0.17	0.18	0.25
III. Residual (I-II)	-6.72	0.65	-3.31	-5.03
	13.18	10.38	9.97	6.75

Note : In interpreting the table it is to be noted that the figures in Row I are actuals. Those in Rows A & B are based on the impact and dynamic multipliers (elasticities) obtained from the Macro Model, Multiplied by average annual change in the output of foodgrains & non-foodgrains during the period. Those in Row C are based on input — output Multipliers discussed in Section C(I) of the paper. The assumptions and hypothesis under the Macro Model could be different from and conflicting with those relating to the Input — Output Tables. To that extent the combination of influences of Rows A and B with C and D may not be justified. In considering the long-term impact, we have approximated the cumulative impact only upto two years, assuming that the impact after three years is negligible.



IMPACT OF ADMINISTERED PRICES ON WHOLE-SALE PRICE LEVEL (1970-71 TO 1983-84)

K. S. Ramachandra Rao*

Introduction

Inflation has been one of the persistent problems of many countries including India in recent years. Theories of inflation are broadly divisible into demand-pull and cost-push types with a further classification into autonomous demand inflation, induced demand-pull inflation, autonomous cost-push inflation and induced cost-push inflation.¹ The theories of inflation formulated in the context of the free markets of developed economies of the West need to be modified when applied to developing countries, like India, where government exercises control over prices and supply of goods. From recent experience one may postulate three channels through which inflationary impulses are transmitted to the Indian economy, viz., (1) Autonomous supply shocks (e. g., bad weather conditions resulting in reduced agricultural output with its consequences for the rest of the economy), (2) exogenous price shocks originating from the external sector (e.g, hike in oil prices) and (3) government draft on resources through the creation of additional purchasing power (e. g., budget deficit)². The transmission of the inflationary impulse could be either full or partial depending on the action taken by government. Government's efforts to absorb part of the imported inflation by making available commodities at subsidised rates can result in budget deficits with an inflationary impact. Autonomous changes in administered prices will have a differential impact on the general price level. Rise in administered prices may have counteracting influence in the form of inflow of additional resources to government reducing budget deficit but may lead to general inflation. Such sources of inflation along with production shocks mentioned earlier may arise in particular sectors but lead to an increase in prices in other sectors also.

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1. **Bronfenbrenner M.** and **Holzman F. D.** "A Survey of Inflation Theory", **American Economic Review**, September 1963.
2. A detailed account of the channels of inflationary impulses is given by **Pani P. K.** in "A Macro-Model of Indian Economy with special reference to Output, Demand and Prices (1969-70 to 1981-82)" published elsewhere in this issue.

While the direct impact of the rise in price of a commodity on the Wholesale Price Index (WPI) can be gauged from its weight in the aggregate WPI along with its input content in the gross output of other commodities, its indirect effect as well as the direct effect can be measured with the help of Input-Output Transactions Table (I-O Table).³ The latest I-O table, published by the Central Statistical Organisation (CSO), relates to 1973-74.⁴ Rangarajan *et al* measured the impact of a rise in prices of coal and petroleum products on other sectors.⁵ Similarly, Sastry studied the impact of the rise in prices of crude petroleum and natural gas, and petroleum products.⁶ It is the purpose of this paper to assess the importance of administered prices in the general price structure of India through the input-output technique.

Administered Prices

The commodities and services, the prices of which are fully administered by Government, are : (i) coal and lignite, (ii) crude petroleum and natural gas, (iii) petroleum products, (iv) fertilisers, (v) iron and steel, (vi) other basic metals (non-ferrous metals), (vii) electricity, (viii) railway transport service and (ix) communication services. There are a few more commodities like cement, sugar and rubber, the prices of which are partially administered. Besides, there are support prices for selected agricultural commodities which have an impact on the general price level if issue prices (of fair price shops) are also changed consequent to changes in support prices. However, the present study is confined to the above-mentioned nine commodities where the control is full. These commodities play an important role in production process and the rise in general prices in recent years could have been steeper if these prices had not been administered. The services administered by the government, viz., railway transport service and communication, do not figure in the WPI but their shares are around 1.1 per cent and 0.6 per cent, respectively, in the gross domestic product for 1973-74 (according to the I-O Table). All the administered prices together have a weight of 14.89 per cent (with zero weight for services) in the WPI and 4.45 per cent in the GDP Deflator.

During 1970-71 to 1982-83 the rise in administered prices constituted 29.8 per cent of the increase in wholesale prices (Table 1). Of the admini-

3. United Nations, **Input-Output Tables and Analysis**, Studies in methods, Series F, No. 14, Rev. 1, New York, 1973.
4. Central Statistical Organisation, Ministry of Planning, Government of India, **Input-Output Transactions Table, 1973-74**, 1981. Similar Table for a subsequent year is not yet published by the CSO.
5. Rangarajan C, Raaj Kumar Sah and Reddy K. S., "Impact of hike in prices of coal and petroleum products on the other sectors of the economy — An application of input-output technique", *Artha Vijnana*, Vol. 23(2), 1981.
6. Sastry D. V. S., "Impact of the rise in the prices of petroleum products on the general price level—1970-71 to 1980-81", *RBI Occasional Papers* Vol. 3, No. 1, June 1982.

stered prices, those of petroleum products, iron and steel, and electricity which have weights of 4.9 per cent, 3.5 per cent and 2.4 per cent, respectively, in the WPI, contributed 10.9 per cent, 5.3 per cent and 2.7 per cent, respectively, to the increase in prices of all commodities. However, their total impact in relation to the rise in prices in 1983-84 over 1970-71 was lower at 27.1 per cent of the total increase of 215.5 per cent. Thus, the effect of general rise in administered prices is known through the weights in the aggregate price index.

The rise in administered prices of inputs can influence the prices of the output of commodities which use them. The rise may either be passed on completely by the producers to the consumers or the former may absorb it either fully or partly through a reduction in profit margin. But the study assumes that producers of the commodities increase the prices of their products *pari passu* with a rise in input prices. The consequential rise in output prices depends on the proportions constituted by those commodities which have administered prices in the totality of the gross output of the sector.

Data

The I-O Table for 1973-74 forms the basic source to estimate the impact of administered prices on wholesale prices. The column-wise totals of the I-O Table present the gross output of a commodity segregated into total inputs, indirect taxes net of subsidies and gross value added (net value added + depreciation) while the figures in the rows represent total intermediate consumption and final use in the form of private and public final consumption expenditure, gross fixed capital formation, change in inventories and exports less imports (Statement 1). The I-O Table prepared by the CSO is recast and presented in Statement 1 to include imports as inputs which are shown under gross output (column totals) and, therefore, are excluded from row totals. Thus, we get the gross output of a commodity as the sum of total inputs (equal to the total of the inputs drawn from various commodities), indirect taxes (net), imports and gross value added. The CSO has published a 60 × 60 matrix for 60 commodity sectors. But, for the purpose of the study the sectors have been regrouped into 33 sectors through the merger of homogenous sectors as indicated in Annexe.

While the data on WPI for the commodities with administered prices are available, the price indices for the service sectors are not available. Railway transport and communication services have administered prices. The price indices for these two sectors are represented by the price deflators, worked out as the ratio of gross earnings at current prices to gross earnings at constant (1970-71) prices. These data, published by the CSO in National Accounts Statistics, are available up to 1981-82. For the years 1982-83 and 1983-84, data on gross earnings of railway transport and communications

are available at current prices in the railway budget and Union Government budget, respectively. The figures at constant prices for railway transport service are estimated on the basis of the volume of passenger traffic (in passenger kilometers) and goods traffic (in net tonne kilometers). The weighted average percentage increase in passenger and goods traffic (volume) is assumed to represent the growth of earnings at constant prices. In the case of communication services, gross earnings at constant prices are estimated on the basis of the average growth in gross value added and gross earnings of communication services at constant prices during 1975-76 to 1981-82. It is found that the rise in gross earnings (at 1970-71 prices) formed about 92 per cent of the rise in gross value added (at 1970-71 prices).

Prices of the final demand categories, viz., private final consumption expenditure, public final consumption expenditure, gross fixed capital formation and change in stocks are represented by their respective price deflators worked out from the data given in National Accounts Statistics. Prices of exports are measured from the unit value index of all commodities.

Methodology

Suppose x_{ij} is the input required by the j th commodity from the i th commodity, T_j , M_j and G_j be the indirect taxes (net), the imports and the gross value added of the j th commodity, respectively, and n the number of sectors, then the value of the gross output, O_j , is given by

$$O_j = \sum_{i=1}^n x_{ij} + T_j + M_j + G_j, \text{ for } j = 1, \dots, n \dots \dots (1).$$

In matrix notation, we can write

$$O = X + T + M + G$$

Where O is the vector of gross outputs, X , the input-output transactions table, T , M and G — the vectors of indirect taxes, imports, and gross value added, respectively.

Let $a_{ij} = \frac{x_{ij}}{O_j}$ for $j = 1, 2, \dots, n$ and $i = 1, 2, \dots, n$ represent the proportion of input of the i th commodity required to produce one unit of the j th commodity and similarly,

$$t_j = \frac{T_j}{O_j}; m_j = \frac{M_j}{O_j} \text{ and } g_j = \frac{G_j}{O_j}$$

represent the proportions of indirect taxes, imports and gross value added, respectively, to produce one unit of the j th commodity. Let P_j be the price per unit of the j th commodity, PR_j , PL_j and PG_j the prices per unit of

indirect taxes (i. e., tax rate), imports and gross value added, respectively, of the j th commodity. We can rewrite the equation (1) as

$$P_j = \sum_{i=1}^n a_{ij} \cdot P_i + t_j \cdot PR_j + m_j \cdot PL_j + g_j \cdot PG_j \dots \dots (2)$$

In matrix notation, it is

$$P = A' \cdot P + T_1 \cdot PR + M_1 \cdot PL + G_1 \cdot PG$$

$$\text{or } P = (I - A')^{-1} (T_1 \cdot PR + M_1 \cdot PL + G_1 \cdot PG) \dots \dots (3)$$

where I is a unit matrix of the same order as that of A ; T_1 , M_1 and G_1 are the vectors of t_j , m_j and g_j , respectively.

The effect of change in the prices of imports or indirect taxes or the wage bill on the prices (P_j) can be estimated from equation (3). When the prices of certain commodities (P_j) are changed then the output prices (P) on the left hand side of the equation (3) are also changed. But the prices of certain important commodities as stated earlier are administered by the government. To study the impact of these prices, equation (2) can be rewritten as

$$P_j = \sum_{i=1}^{n-k} a_{ij} \cdot P_i + \sum_{l=1}^k a_{lj} \cdot P_l + t_j \cdot PR_j + m_j \cdot PL_j + g_j \cdot PG_j \dots \dots (4)$$

In matrix notation, it is

$$P = (I - A'_1)^{-1} (B \cdot P_k + T_1 \cdot PR + M_1 \cdot PL + G_1 \cdot PG) \dots \dots (5)$$

where A'_1 is a matrix of the order $(n-k, n-k)$ and B is a matrix of coefficients a_{kj} of the order $(k, n-k)$. Changing the value of P_k from P (1) to P (2) and keeping the other prices at the same level, we can work out the output prices of other commodities. Thus, the output prices of other commodities are estimated using the above formula for a given level of administered prices at two points of time from which the percentage increase in output prices of other commodities is derived.

Results

The commodity X commodity inter-industry transactions table for 33 sectors is presented in Statement 1 while the input-output coefficient matrix is in Statement 2. The coefficients in Statement-2, when read column-wise, give the proportion of inputs from other commodity sectors going into the gross output of the sector given in the column. Thus, the total of the elements under each column gives the total input from other commodities while the rest of the gross output is in the form of indirect taxes, gross value added (i. e., net value added plus depreciation) and imports.

The administered prices which account for 14.9 per cent of the total weight of the WPI of all commodities have a weight of only 4.5 per cent in the GDP deflator (Statement 4). However, as stated earlier, the service sector, the prices of which are administered, viz., railway transport service and communication, do not have any weight in the WPI for all commodities.

Prices of petroleum products, iron and steel, non-ferrous metals and electricity have a total weight of 80.3 per cent in administered prices. During 1970-71 to 1983-84, administered prices rose at an average annual rate of 13.7 per cent compared with a rise of 9.5 per cent in the aggregate WPI. The annual rise is higher in administered prices than that observed in the price index for all commodities throughout the period 1970-71 to 1983-84 with the exception of three years (Statement 3). However, the rise in administered prices forms only 27.1 per cent of the total rise in the all-commodities price index between 1970-71 and 1983-84. Among the administered prices, crude petroleum and natural gas showed a significant rise in their prices (average annual rise of 30.8 per cent) followed by petroleum products (15.1 per cent), coal and lignite (14.3 per cent), electricity (10.7 per cent), railway transport service (10.5 per cent) and iron and steel (10.2 per cent).

The impact multipliers which indicate the direct and indirect effects of imports, indirect taxes and other factor services on the prices of all 33 sectors are presented in Statement 5. The assumptions underlying such estimation are that (i) the input-output coefficients are stable and (ii) the rise in prices of inputs are passed on completely to the output prices. The prices of commodities with administered prices are taken to be exogenous and their likely impact on the prices of other commodities and the aggregate price index is estimated. In other words, it is assumed that administered prices of commodities affect the prices of outputs for which they constitute inputs while, in turn, the former are not affected by the rise in their own input prices. The relative impact multipliers are presented in Statement 6.

The direct and indirect effects of the administered prices on the aggregate price index as also on the GDP deflator and the corresponding hypothetical indices are given in Table 2.⁷ While the wholesale prices rose by 9.5 per cent per annum during the period 1970-71 to 1983-84, the rise in wholesale prices due to the increase in the administered prices is around 4.4 per cent per annum (given by hypothetical series-I). It indicates that nearly a half of the rise in wholesale prices could have been due to the rise in administered prices. This proportion is, however, more than a half of the rise in wholesale prices during the later part of the period, viz., 1979-80 to 1983-84 (i. e., 6.3 per cent rise in administered prices compared with 11.3 per cent rise per annum in wholesale prices).⁸ The rise in wholesale prices attributable to

7. There are two series of hypothetical price indices. One is based on the weights in the Wholesale Price Index. The other is compiled with reference to the weights in the GDP deflator. In the construction of the series the increases in administered prices only are reckoned with. The prices of other commodities which are not administered remain constant.
8. Similar results, using an updated version of the 1968-69 Table computed for 1979-80, were obtained by **Gupta S. P.** and **Srinivasan T. G.** in their study on 'Inflation and the Role of Administered Prices', published in **Economic and Political Weekly**, September 8, 1981.

administered price rise was higher in 1973-74 (5.1 per cent), 1974-75 (12.1 per cent), 1979-80 (8.1 per cent), 1980-81 (10.1 per cent) and 1981-82 (7.9 per cent). These were the years in which the prices of crude petroleum and natural gas soared to high levels.

The GDP deflator increased by 9.0 per cent per annum, during 1970-71 to 1983-84. However, the rise due to administered prices was only 1.9 per cent per annum. Thus, the effect of administered prices on GDP deflator was less than that on the aggregate Wholesale Price Index. The GDP deflator accounts for the service sector also. The lower impact is to be seen from the standpoint of their weight in the GDP deflator which is lower than that in the Wholesale Price Index. The contribution of the administered prices towards the rise in the GDP deflator was higher at 3.0 per cent during the period 1979-80 to 1983-84 as against 1.9 per cent during the entire period 1971-72 to 1983-84.

The direct and indirect effects of administered prices on the prices of different commodity sectors indicated by the hypothetical price indices are given in Statement 7. The hypothetical indices of selected sectors and the average annual rise in their prices during the period 1970-71 to 1983-84 are given in Table 3. The increase of 13.7 per cent per annum during the period of study in the combined index of all administered prices induced the prices of different sectors to rise significantly. The impact was noticeable on the prices of coaltar products which rose by 6.5 per cent due to rise in administered prices followed by machinery (4.6 per cent), cement (4.5 per cent), transport equipment (4.3 per cent) and heavy chemicals (3.5 per cent).

Among the final demand categories, viz., private and public final consumption expenditures, gross fixed capital formation, change in stocks and exports, the impact of administered prices was maximum on gross fixed capital formation at 3.3 per cent compared with the actual increase of 10.6 per cent and on change in inventories at 3.3 per cent compared with the actual rise of 9.1 per cent (Statement-8).⁹ The impact on public final consumption expenditure was also high at 2.1 per cent in the total rise of 6.1 per cent. However, the rise in prices of private final consumption expenditure was lower at 1.1 per cent compared with the actual rise of 9.4 per cent. The contribution of administered prices to the rise in prices of exports was at 2.2 per cent in a total rise of 9.6 per cent (measured only for the period 1970-71 to 1980-81 due to non-availability of data for 1981-82 and 1982-83).

Summary and Conclusions

It is observed that while wholesale prices rose by 9.5 per cent per annum during the reference period, the administered prices, with a weight of 14.9

9. The actual rise is worked out as the average of annual percentage increase for 13 years.

per cent in Wholesale Price Index, rose by 13.7 per cent. Of the administered prices, those of crude petroleum and natural gas, petroleum products, and coal and lignite rose significantly. It is estimated that nearly a half (46.6 per cent) of the rise in wholesale prices could have been due to the rise in administered prices during the period of study. However, this proportion was higher at 55.8 per cent after 1979-80, the year of the second oil shock. While the weighted contribution of the administered prices on wholesale prices is 27.1 per cent, the total of direct and indirect effects is around 46.6 per cent, thus indicating that a sizeable rise in wholesale prices is attributable to the direct and indirect effects. The effect of the rise in the administered prices on the national income (GDP) deflator appears to be less than that on wholesale prices. This is due to the weight of administered prices in GDP deflator being lower than that in the WPI. There is, therefore, a need to take into account the total effect on the general price level whenever changes in administered prices are contemplated.

It may be added that the prices of inputs that go into these commodities with administered prices, the prices of imports, international market prices (e. g., crude petroleum and natural gas) and the various costs relating to infrastructure might have forced the government to some extent to increase the prices of the commodities administered by them. However, the rise in wholesale prices could have been steeper had the entire rise in input price been completely passed on to output prices. For example, a rise in the prices of coal which is administered by the government, pushes up the prices of commodities and services, such as coaltar products, railway transport service, electricity, etc., since they use coal as their input.

Aggregated Sector Classification of Input-Output Table, 1973-74

No.	Sector description	Coverage of 60 Sectors
1.	All crops	Food crops, cash crops, plantation crops, and other crops (1 to 4)
2.	Animal husbandry, etc.	Animal husbandry, forestry and logging, and fishing (5, 6, 7)
3.	Coal & lignite*	Coal and lignite (8)
4.	Crude petroleum and natural gas*	Crude petroleum and natural gas (9)
5.	Iron ore	Iron ore (10)
6.	Other minerals	Other minerals (11)
7.	Sugar, etc.	Sugar, food, beverages and tobacco products (12, 13, 14, 15)
8.	Textiles	Cotton textiles, wool, silk and synthetic fibre textiles, jute, hemp and mesta textiles, textile products including wearing apparel. (16, 17, 18, 19)
9.	Wood and furniture	Wood and wood products, furniture and fixtures (20, 21)
10.	Paper	Paper and paper products, printing, publishing and allied activities (22, 23)
11.	Leather	Leather and leather products (24)
12.	Plastic	Plastic and rubber products (25)
13.	Petroleum products*	Petroleum products (26)
14.	Coaltar products	Coaltar products (27)
15.	Heavy chemicals	Inorganic and organic heavy chemicals (28, 29)
16.	Fertilizers*	Fertilizers (30)
17.	Paints, etc.	Paints, varnishes and lacquers, other chemicals and chemical products including pesticides (31, 32)
18.	Cement	Cement (33)
19.	Other non-metallic mineral products	Non-metallic mineral products (other than cement) (34)
20.	Iron and steel*	Iron and steel industries and foundries (35)
21.	Non-ferrous metals*	Other basic metal industry (36)
22.	Machinery	Metal products, agricultural machinery, industrial machinery for food and textile industries, other machinery, electrical machinery, apparatus and appliances (37, 38, 39, 40, 41)

ANNEX—(Concl.)

No.	Sector description	Coverage of 60 Sectors
23.	Transport equipment	Railway transport and other transport equipment (42, 43)
24.	Miscellaneous manufacturing industries	Miscellaneous manufacturing industries (44)
25.	Construction	Construction (45)
26.	Electricity*	Electricity (46)
27.	Gas and water supply	Gas and water supply (47)
28.	Railway transport service*	Railway transport service (48)
29.	Other transport services	Other transport services (49)
30.	Storage, etc.	Storage and warehousing, trade, hotels and restaurants (50, 52, 53)
31.	Communication*	Communication (51)
32.	Finance and real estate	Banking, insurance and ownership of dwellings (54, 55, 56)
33.	Public administration	Education and research, medical and health, other services, and public administration and defence (57, 58, 59, 60)

* Commodities/services with administered prices.

Figures in brackets are the sector numbers of the 60-sector classification.

Table 1
Index Numbers of Wholesale Prices

(Base : 1970-71 = 100)

Item	Weight	1970-71	1982-83	1983-84	Change over base year		Weighted Contribution		Percentage Weighted Contribution	
					1982-83	1983-84	1982-83	1983-84	1982-83	1983-84
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Wholesale Price Index of all Commodities	1000.0	100.0	288.3	315.5	188.3	215.5	188.3	215.5	100.0	100.0
2. Gross Domestic Product (GDP) Deflator@	1000.0	100.0	274.8	301.1	174.8	201.1	174.8	201.1	100.0	100.0
3. Price Index of Administered Prices	148.89 (44.50)	100.0	476.4 (390.1)	491.5 (422.3)	376.4 (290.1)	391.5 (322.2)	56.04 (12.91)	58.29 (14.34)	29.76 (7.39)	27.05 (7.13)
3.1 Coal and Lignite	10.72 (4.40)	100.0	486.1	537.1	386.1	437.1	4.13 (1.70)	4.69 (1.92)	2.19 (0.97)	2.18 (0.95)
3.2 Crude Petroleum & Natural Gas	6.02 (1.07)	100.0	2021.0	1739.5	1921.0	1639.5	11.56 (3.27)	9.87 (2.79)	6.14 (1.87)	4.58 (1.39)
3.3 Petroleum Products	49.12 (1.01)	100.0	517.8	537.7	417.8	437.7	20.52 (0.46)	21.49 (0.48)	10.90 (0.26)	9.97 (0.24)
3.4 Iron and Steel	34.73 (8.09)	100.0	386.0	415.7	286.0	315.7	9.93 (2.56)	10.96 (2.81)	5.27 (1.46)	5.09 (1.40)

Table 1—(Concl.)
Index Numbers of Wholesale Prices

(Base : 1970-71 = 100)

Item	Weight	1970-71	1982-83	1983-84	Change over base year		Weighted Contribution		Percentage Weighted Contribution	
					1982-83	1983-84	1982-83	1983-84	1982-83	1983-84
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
3.5 Non-ferrous Metals	11.78 (1.01)	100.0	316.0	337.9	216.0	237.9	2.54 (0.22)	2.80 (0.26)	1.35 (0.12)	1.30 (0.13)
3.6 Fertilizers	12.52 (1.08)	100.0	277.7	267.7	177.7	167.7	2.22 (0.32)	2.10 (0.30)	1.18 (0.18)	0.97 (0.15)
3.7 Electricity	24.00 (8.08)	100.0	313.4	365.5	213.4	265.5	5.12 (1.88)	6.37 (2.34)	2.72 (1.07)	2.96 (1.16)
3.8 Railway Transport Service	— (10.9)	100.0	264.3*	350.0*	164.3	250.0	— (1.79)	— (2.73)	— (1.02)	— (1.36)
3.9 Communication Service	— (5.08)	100.0	223.3*	237.5*	123.3	137.5	— (0.72)	— (0.80)	— (0.41)	— (0.40)

* Estimated @ At Market Prices.

Note : (1) Price indices for 1982-83 and 1983-84 are provisional; (2) Figures in brackets in column (2) are weights with respect to GDP; those in brackets under columns 4 and 5 are the GDP deflators; those in brackets under columns 6 and 7 are the absolute increases in these deflators over 1970-71; and those under columns 8 to 11 are the shares in weighted contribution to the increase in the deflator.

Table 2
Wholesale Price Indices for All Commodities

Year	Wholesale Prices			Hypothetical Series I			GDP Deflator [£]			Hypothetical Series II		
	Index	% Increase	Index	% Increase	Index	% Increase	Index	% Increase	Index	% Increase	Index	% Increase
1	2	3	4	5	6	7	8	9	10	11	12	13
1970-71	100.0	—	100.00	—	100.0	—	100.00	—	100.00	—	100.00	—
1971-72	105.6	5.6	101.09	1.09	105.2	5.2	100.43	0.43	100.43	5.2	100.43	0.43
1972-73	116.2	10.0	102.40	1.29	117.1	11.3	100.98	0.54	100.98	11.3	100.98	0.54
1973-74	139.7	20.2	107.64	5.12	139.1	18.8	102.56	1.57	102.56	18.8	102.56	1.57
1974-75	174.9	25.2	120.69	12.13	164.0	17.9	106.65	3.99	106.65	17.9	106.65	3.99
1975-76	173.0	-1.1	124.19	2.90	159.1	-3.0	108.19	1.45	108.19	-3.0	108.19	1.45
1976-77	176.6	2.1	125.47	1.04	169.8	6.7	108.84	0.59	108.84	6.7	108.84	0.59
1977-78	185.8	5.2	126.09	0.49	175.6	3.4	109.04	0.19	109.04	3.4	109.04	0.19
1978-79	185.8	—	128.68	2.05	179.3	2.1	110.19	1.06	110.19	2.1	110.19	1.06
1979-80	217.6	17.1	139.12	8.11	207.7	15.5	113.66	3.16	113.66	15.5	113.66	3.16
1980-81	257.3	18.2	153.16	10.09	231.4	11.7	117.66	3.51	117.66	11.7	117.66	3.51
1981-82	281.3	9.3	165.30	7.93	254.9	10.2	122.25	3.90	122.25	10.2	122.25	3.90
1982-83 [Ⓐ]	288.3	2.5	170.55	3.18	274.8	7.8	124.89	2.16	124.89	7.8	124.89	2.16
1983-84 [Ⓐ]	315.5	9.4	174.36	2.23	301.1	9.6	127.74	2.29	127.74	9.6	127.74	2.29
Average annual percentage increase												
(a) 1971-72 to 1983-84		9.5		4.43		9.0		1.91				1.91
(b) 1979-80 to 1983-84		11.3		6.31		11.0		3.00				3.00

Notes : Series I : Weighted index of hypothetical sectoral price indices, weights being proportional to aggregate wholesale price index.

Series II : Weighted index of hypothetical sectoral price indices, weights being proportional to GDP.

[Ⓐ] Provisional. £ At Market Prices.

Table 3

**Hypothetical Price Indices of Selected Sectors : Rise in
Sectoral Prices due to Increase in Administred Prices**

Sector	Weight [£]	1970-71	1982-83	1983-84	Average annual percentage increase @
(1)	(2)	(3)	(4)	(5)	(6)
1. Coal & lignite*	1.072	100.0	486.1	537.1	14.28
2. Crude petroleum and natural gas*	0.602	100.0	2021.0	1739.5	30.80
3. Iron ore	0.156	100.0	121.2	123.1	1.62
4. Sugar, etc.	16.030	100.0	109.9	110.5	0.77
5. Textiles	11.026	100.0	114.3	115.7	1.13
6. Paper	0.851	100.0	121.2	123.3	1.63
7. Plastic	1.207	100.0	121.1	122.7	1.59
8. Petroleum products*	4.912	100.0	517.8	537.7	15.11
9. Coaltar products	0.075	100.0	211.6	224.1	6.49
10. Heavy chemicals	0.726	100.0	156.0	155.9	3.46
11. Fertilizers*	1.252	100.0	277.7	267.7	9.95
12. Paints, etc.	3.570	100.0	128.6	129.3	2.01
13. Cement	0.703	100.0	167.0	175.2	4.45
14. Other non-metallic mineral products	0.712	100.0	122.6	126.0	1.80
15. Iron and steel*	3.473	100.0	386.0	415.7	10.16
16. Non-ferrous metals*	1.178	100.0	316.0	337.9	10.25
17. Machinery	6.368	100.0	170.5	177.0	4.56
18. Transport equipment	1.673	100.0	163.6	172.8	4.33
19. Miscellaneous manufacturing industries	0.546	100.0	141.4	145.5	2.92
20. Construction	—	100.0	138.5	142.1	2.75
21. Electricity*	2.400	100.0	313.4	365.5	10.65
22. Gas and water supply	—	100.0	134.1	138.4	2.54
23. Railway transport service*	—	100.0	264.3	350.0	10.53
24. Other transport services	—	100.0	133.0	134.9	2.45
25. Communication*	—	100.0	223.3	237.5	7.02

£ In Wholesale Price Index. @ For 1983-84 over 1970-71.

* Commodities/Services with administered prices.

Statement I
Input-Output Transactions Table (Commodity × Commodity)—1973-74

Sector	(Rs. lakhs)								
	1	2	3	4	5	6	7	8	9
1. All crops	188793	250775	1	—	—	—	256936	120279	343
2. Animal husbandry, etc.	150977	5	—	—	—	—	18503	11483	7527
3. Coal and lignite	29	41	96	—	2	6	613	1183	39
4. Crude petroleum and natural gas	—	—	—	—	—	—	—	—	—
5. Iron ore	—	—	—	—	—	—	—	—	—
6. Other minerals	—	—	—	—	—	—	—	—	—
7. Sugar, etc.	523	37746	—	—	—	—	192	18	1
8. Textiles	612	20233	97	—	—	—	45696	1952	79
9. Wood and furniture	182	70	—	—	—	—	9627	75625	210
10. Paper	100	269	—	—	—	—	2389	1296	4130
11. Leather	4	—	95	—	—	—	2923	2361	312
12. Plastic	20	—	—	—	—	—	14	114	6
13. Petroleum products	14222	374	—	—	—	—	1755	712	177
14. Coal-tar products	3	—	26	96	150	149	1183	1635	128
15. Heavy chemicals	43	—	—	—	—	—	101	42	5
16. Fertilizers	40438	—	—	5	—	—	2193	4943	146
17. Paints, etc.	14106	1943	527	—	82	341	2995	18669	603
18. Cement	—	—	—	8	—	—	—	5	—
19. Other non-metallic mineral products	8	—	—	39	—	—	1129	93	59
20. Iron and steel	4	14	—	—	—	—	256	572	267

Statement 1—(Contd.)
Input-Output Transactions Table (Commodity × Commodity)—1973-74
(Rs. lakhs)

Sector	1	2	3	4	5	6	7	8	9
21. Non-ferrous metals	2	3	—	—	—	—	228	925	46
22. Machinery	3987	106	1621	430	233	642	6046	6150	928
23. Transport equipment	53	1016	—	—	—	—	339	258	55
24. Misc. manufacturing industries	14	47	22	—	—	—	56	1003	11
25. Construction	15570	2588	459	23	109	123	333	556	10
26. Electricity	12248	20	1098	12	94	512	2011	7510	340
27. Gas and water supply	5	5	—	—	—	—	83	258	1
28. Railway transport service	5066	1115	61	12	15	21	1718	1260	459
29. Other transport services	4948	4310	101	14	14	36	8662	8939	490
30. Storage, etc.	19776	16125	275	65	37	92	38352	25391	3731
31. Communication	227	56	—	—	—	—	—	—	—
32. Finance and real estate	9870	120	58	3	46	140	3741	5442	191
33. Public administration	249	129	1418	130	—	—	6544	9155	529
A. Total	482079	337110	5955	837	782	2062	414668	307775	20823
B. Indirect Taxes (net)	21919	1964	533	181	246	355	35632	28773	1180
C. Gross Value Added	2344145	331390	23868	8934	4106	12471	81056	164833	30190
D. Total Output	2848143	670464	30356	9952	5134	14888	531356	501381	52193
E. Imports	+57719	+2458	—	+41709	+5	+13238	+10848	+952	+188
F. Gross Output	2905862	672922	30356	51661	5139	28126	542204	502333	52381

Statement I—(Contd.)
Input-Output Transactions Table (Commodity × Commodity)—1973-74

Sector	10	11	12	13	14	15	16	17	18
21. Non-ferrous metals	202	13	80	67	318	927	73	2383	8
22. Machinery	1468	654	880	1185	332	1047	842	4032	553
23. Transport equipment	85	6	78	17	30	36	75	105	144
24. Misc. manufacturing industries	59	23	15	3	2	16	85	108	4
25. Construction	213	11	168	9	19	118	136	311	24
26. Electricity	1630	106	690	303	320	1803	2323	2359	1564
27. Gas and water supply	29	2	16	52	13	77	108	180	7
28. Railway transport service	739	109	243	203	1190	374	689	1028	1498
29. Other transport services	1289	790	1067	245	758	367	393	2787	676
30. Storage, etc.	5691	2998	3999	901	1465	2182	2365	12270	2986
31. Communication	—	—	—	—	—	—	—	—	—
32. Finance and real estate	1365	175	688	486	249	811	1018	3617	604
33. Public administration	2518	393	434	250	285	935	1045	4470	749
A. Total	42203	31198	34430	58180	9906	18519	18406	115838	15005
B. Indirect Taxes (net)	5187	1769	6282	1797	1069	3052	3836	19352	1892
C. Gross Value Added	29909	14994	13899	5987	3238	10377	9405	55215	4238
D. Total Output	77299	47961	54611	65964	14213	31948	3647	190405	21135
E. Imports	+3604	+12	+621	+14367	+136	+10642	+16220	+10983	—
F. Gross Output	80903	47973	55232	80331	14349	42590	47867	201368	21135

(Rs. lakhs)

Statement 1—(Contd.)
Input-Output Transactions Table (Commodity × Commodity) — 1973-74

Sector	(Rs. Lakhs)										
	19	20	21	22	23	24	25	26	27		
1. All crops	172	10	6	124	67	1138	43782	—	—		
2. Animal husbandry, etc.	1617	197	38	1042	1032	1592	25476	7	—		
3. Coal and lignite	1155	1181	100	919	174	212	1081	7625	76		
4. Crude petroleum & natural gas	3	—	—	567	—	—	—	—	—		
5. Iron ore	—	2017	10	94	2	—	—	—	—		
6. Other minerals	3362	4565	1295	319	4	246	8690	—	—		
7. Sugar, etc.	27	3	—	37	5	425	—	—	—		
8. Textiles	388	729	58	2996	377	2056	—	505	—		
9. Wood and furniture	627	2070	112	3145	2861	2016	11626	48	—		
10. Paper	449	836	171	1878	413	803	51	131	13		
11. Leather	—	1	—	31	9	414	—	—	—		
12. Plastic	110	40	23	1692	3781	457	471	—	—		
13. Petroleum products	743	1515	265	1586	1003	232	2937	202	164		
14. Coal-tar products	142	3436	455	707	101	27	5851	—	15		
15. Heavy chemicals	1217	804	736	3234	915	1343	—	—	40		
16. Fertilizers	—	—	—	1	—	18	—	—	—		
17. Paints, etc.	356	109	93	3897	2570	2701	3444	—	—		
18. Cement	1035	1	—	6	—	4	18588	—	—		
19. Other non-metallic mineral products	2763	1599	19	1677	77	462	65274	—	—		
20. Iron and steel	863	28539	443	63691	22330	7928	50431	676	10		

Statement I—(Contd.)
Input-Output Transactions Table (Commodity × Commodity) — 1973-74

Sector	19	20	21	22	23	24	25	26	27
21. Non-ferrous metals	56	10010	6808	19206	1720	202	—	—	—
22. Machinery	1574	6570	763	64123	15173	17393	16402	5586	669
23. Transport equipment	91	699	54	1222	15632	2206	59	115	33
24. Misc. manufacturing industries	26	40	7	532	98	1200	1052	12	263
25. Construction	157	212	140	508	106	93	—	2406	553
26. Electricity	752	4969	1626	3869	1658	766	165	21235	445
27. Gas and water supply	31	133	15	88	65	14	10	360	—
28. Railway transport service	1416	6993	230	4322	2683	662	9026	3701	53
29. Other transport services	1281	1917	535	4320	1443	1058	7614	3020	55
30. Storage, etc.	4109	18558	3126	36800	14554	8870	51625	3701	141
31. Communication	—	—	—	—	—	—	95	371	2
32. Finance and real estate	865	4294	1612	8202	2409	556	1933	353	—
33. Public administration	2332	3611	109	7096	1901	765	344	262	1
A. Total	27719	105658	18849	237931	93163	53859	326027	50526	2533
B. Indirect Taxes (net)	3468	13383	4040	33988	11011	7343	28853	1626	693
C. Gross Value Added	53963	48072	6036	127493	50345	39594	240497	47264	5274
D. Total Output	85150	167113	28925	399412	154519	102796	595377	99416	8500
E. Imports	+1226	+25453	+14167	+46588	+9023	+6145	—	—	—
F. Gross Output	86376	192566	43092	446000	163542	108941	595377	99416	8500

(Rs. lakhs)

Statement 1—(Contd.)
Input-Output Transactions Table (Commodity × Commodity) — 1973-74

Sector	(Rs. Lakhs)									
	28	29	30	31	32	33	Total Intermediate use	Total Final use (excl. of imports)	Total Output	
1. All crops	—	13736	17727	—	—	432	917646	1988216	2905862	
2. Animal husbandry, etc.	2	—	68372	—	—	—	305235	367687	672922	
3. Coal and lignite	2618	—	2831	—	—	—	25626	4730	30356	
4. Crude petroleum and natural gas	—	—	—	—	—	—	51614	47	51661	
5. Iron ore	—	—	—	—	—	—	2199	2940	5139	
6. Other minerals	—	—	—	—	—	—	24454	3672	28126	
7. Sugar, etc.	—	2271	7675	—	—	—	105405	436799	542204	
8. Textiles	—	1316	3636	1	15	612	131832	370501	502333	
9. Wood and furniture	—	153	2577	85	107	178	36321	16060	52381	
10. Paper	319	1867	3137	781	2046	28211	68917	11986	80903	
11. Leather	—	—	—	—	—	—	10208	37765	47973	
12. Plastic	—	17079	325	—	—	—	36768	18464	55232	
13. Petroleum products	2403	16757	29	147	112	863	52336	27995	80331	
14. Coal tar products	—	—	—	—	—	—	12441	1908	14349	
15. Heavy chemicals	—	—	6	—	—	3	41979	611	42590	
16. Fertilizers	—	—	—	—	—	—	42395	5472	47867	
17. Paints, etc.	—	106	44	—	—	—	148731	52657	201388	
18. Cement	—	—	—	—	—	—	19696	1439	21135	
19. Other non-metallic mineral products	4	—	510	—	—	—	76381	9995	86376	
20. Iron and steel	64	—	—	—	—	—	178159	14407	192566	

Statement 1—(Contd.)
Input-Output Transactions Table (Commodity × Commodity) — 1973-74

Sector	(Rs. lakhs)						Total Intermediate use	Total Final use (excl. of imports)	Total Output
	28	29	30	31	32	33			
21. Non-ferrous metals	—	—	—	—	—	—	43232	-140	43092
22. Machinery	5397	873	3021	213	—	1767	170660	275340	446000
23. Transport equipment	8222	28104	28	198	110	594	59714	103828	163542
24. Misc. manufacturing industries	28	345	2601	130	160	14339	22301	86640	108941
25. Construction	12325	550	6759	644	15437	1181	61851	533526	595377
26. Electricity	2846	486	398	209	591	1224	76182	23234	99416
27. Gas and water supply	5	224	68	17	363	327	2776	5724	8500
28. Railway transport service	4015	2393	3980	1132	625	2668	59699	54215	113914
29. Other transport services	7507	19711	38028	645	1197	7370	131587	199922	331509
30. Storage, etc.	4371	11460	33390	268	877	18444	348095	485252	833347
31. Communication	1	3353	3009	—	2608	1794	11516	25109	36625
32. Finance and real estate	—	5657	16977	—	6435	1523	79440	239546	318986
33. Public administration	212	2380	1905	285	1942	3917	56296	562263	618559
A. Total	50344	128881	217033	4755	32625	144013	3411692	5967810	9379502
B. Indirect Taxes (net)	5162	33426	9816	531	877	11735	300671	—	—
C. Gross Value Added	58408	160502	606798	31339	285484	462811	5372135	—	—
D. Total Output	113914	322809	833347	36625	318986	618559	9084498	—	—
E. Imports	—	+8700	—	—	—	—	+295004	—	—
F. Gross Output	113914	331509	833347	36625	318986	618559	9379502	—	—

Statement 2
Share of Inputs of Different Sectors in Gross Output of Other Sectors

Commodity / Inputs	(Percentages)										
	1	2	3	4	5	6	7	8	9	10	11
1. All crops	6.4970	37.2666	0.0033	—	—	—	47.3873	3.9441	0.6548	1.1471	0.3085
2. Animal husbandry, etc.	5.1956	0.0007	—	—	—	—	3.4126	2.2859	14.3697	2.4461	3.9218
3. Coal and lignite	0.0010	0.0061	0.3162	—	0.0389	0.0213	0.1131	0.2355	0.0745	0.6848	0.0292
4. Crude petroleum and natural gas	—	—	—	—	—	—	—	—	—	—	—
5. Iron ore	—	—	—	—	—	—	—	—	—	—	—
6. Other minerals	—	—	—	—	—	—	—	—	—	—	—
7. Sugar, etc.	0.0180	5.6093	—	—	—	—	0.0354	0.0036	0.0019	0.0012	0.0042
8. Textiles	0.0211	3.0067	0.3195	—	—	—	8.4278	0.3886	0.1508	0.3411	0.2752
9. Wood and furniture	0.0063	0.0104	—	—	—	—	1.7755	15.0548	0.4009	1.2101	2.0470
10. Paper	0.0034	0.0400	0.3130	—	—	—	0.4406	0.2580	7.8845	0.4845	0.2335
11. Leather	0.0001	—	—	—	—	—	0.5391	0.4700	0.5956	0.4368	0.3690
12. Plastic	0.0007	—	—	—	—	—	0.0026	0.0227	0.0115	0.0630	9.8237
13. Petroleum products	0.4894	0.0556	0.0857	0.1858	2.9189	0.5298	0.3237	0.1417	0.3379	0.0729	2.1762
14. Coal tar products	0.0001	—	—	—	—	—	0.2182	0.3255	0.2444	0.5599	0.0875
15. Heavy chemicals	0.0015	—	—	0.0097	—	—	0.0186	0.0084	0.0096	0.0074	0.0021
16. Fertilizers	1.3916	—	—	—	—	—	0.4045	0.9840	0.2787	2.4709	1.2841
17. Paints, etc.	0.4854	0.2887	1.7361	—	1.5956	1.2124	0.0092	0.0010	—	—	—
18. Cement	—	—	—	0.0155	—	—	0.5524	3.7165	1.1512	2.6624	3.3164
								0.0010		0.0049	

Statement 2—(Contd.)
Share of Inputs of Different Sectors in Gross Output of Other Sectors

Commodity / Inputs	(Percentages)										
	1	2	3	4	5	6	7	8	9	10	11
19. Other non-metallic mineral products	0.0003	—	—	0.0755	—	—	0.2082	0.0185	0.1126	0.5216	0.1188
20. Iron and steel	0.0001	0.0021	—	—	—	—	0.0472	0.1019	0.5097	0.1533	0.0292
21. Non-ferrous metals	0.0001	0.0004	—	—	—	—	0.0421	0.1841	0.0878	0.2497	0.0271
22. Machinery	0.1372	0.0158	5.3400	0.8323	4.5340	2.2826	1.1151	1.2243	1.7716	1.8145	1.3633
23. Transport equipment	0.0018	0.1510	—	—	—	—	0.0625	0.0514	0.1050	0.1051	0.0125
24. Miscellaneous manufacturing industries	0.0005	0.0070	0.0725	—	—	—	0.0103	0.1997	0.0210	0.0724	0.0479
25. Construction	0.5358	0.3846	1.5121	0.0445	2.1210	0.4373	0.0614	0.1107	0.0191	0.2633	0.0229
26. Electricity	0.4215	0.0030	3.6171	0.0232	1.8291	1.8204	0.3709	1.4950	0.6491	2.0148	0.2210
27. Gas and water supply	0.0002	0.0007	—	—	—	—	0.0153	0.0514	0.0019	0.0358	0.0042
28. Railway transport service	0.1743	0.1657	0.2009	0.0232	0.2919	0.0747	0.3160	0.2508	0.8763	0.9134	0.2272
29. Other transport services	0.1703	0.6405	0.3327	0.0271	0.2724	0.1280	1.5976	1.7795	0.9355	1.5933	1.6468
30. Storage, etc.	0.6806	2.3963	0.9059	0.1258	0.7200	0.3271	7.0734	5.0546	7.1228	7.0343	6.2493
31. Communication	0.0078	0.0083	—	—	—	—	—	—	—	—	—
32. Finance and real estate	0.3397	0.0178	0.1911	0.0058	0.8951	0.4978	0.6900	1.0833	0.3646	1.6872	0.3648
33. Public administration	0.0086	0.0192	4.6712	0.2516	—	—	1.2069	1.8227	1.0099	3.1124	0.8192

Statement 2—Contd.

Share of Inputs of Different Sectors in Gross Output of Other Sectors

Commodity / Inputs	Percentage																	
	12	13	14	15	16	17	18	19	20	21	22							
1. All crops	11.8880	0.0212	0.0070	1.0824	—	7.5196	—	0.1991	0.0052	0.0139	0.0278							
2. Animal husbandry, etc.	0.3476	0.0112	0.1115	0.3052	0.2841	1.2747	0.0237	1.8720	0.1073	0.0832	0.2336							
3. Coal and lignite	0.1865	0.3635	5.1579	0.4602	0.7145	0.2572	6.2654	1.3372	0.6133	0.2321	0.2061							
4. Crude petroleum and natural gas	—	62.0906	—	0.2185	0.0710	0.3044	—	0.0035	—	—	0.1271							
5. Iron ore	—	—	0.4669	—	0.0146	—	0.0095	—	1.0174	0.0232	0.0211							
6. Other minerals	0.1104	0.0037	1.1360	2.0169	4.7319	0.2041	9.4483	3.8923	2.3706	3.0052	0.0715							
7. Sugar, etc.	0.4979	0.0149	0.0139	1.9183	0.1170	3.5795	—	0.0313	0.0016	—	0.0083							
8. Textiles	2.9476	0.0647	0.2091	1.1693	2.3816	2.2896	13.3381	0.4492	0.3786	0.1346	0.6717							
9. Wood and furniture	0.4508	0.1083	0.5784	0.3569	0.2131	0.6555	0.7192	0.7259	1.0750	0.2590	0.7052							
10. Paper	0.6717	0.0660	0.2857	0.5494	0.0877	2.1044	0.2886	0.5198	0.4341	0.3963	0.4211							
11. Leather	0.0453	—	—	—	0.0167	0.0101	—	—	0.0005	—	0.0070							
12. Plastic	12.7843	0.0050	0.0279	0.3639	0.2611	0.6069	—	0.1274	0.0208	0.0534	0.3794							
13. Petroleum products	1.0139	0.5925	0.6830	1.4463	2.9833	0.7051	1.4999	0.8602	0.7867	0.6150	0.3556							
14. Coal-tar products	0.0054	0.1145	6.3837	0.4743	0.2653	0.0968	0.0662	0.1644	1.7843	1.0559	0.1585							
15. Heavy chemicals	1.9319	1.6644	1.7074	7.3632	3.0439	8.1862	0.0379	1.4090	0.4175	1.7480	0.7251							
16. Fertilizers	—	—	0.0139	0.2563	3.3990	0.0616	0.0946	—	—	—	0.0002							
17. Paints, etc.	3.8996	2.1573	0.7945	3.4938	0.4387	12.2356	—	0.4122	0.0546	0.2158	0.0738							
18. Cement	0.0018	—	—	0.0023	—	—	0.2035	1.1982	0.0005	—	0.0013							

Statement 2—(Contd.)
Share of Inputs of Different Sectors in Gross Output of Other Sectors

Commodity / Input share Inputs / in Sector	(Percentage)											
	12	13	14	15	16	17	18	19	20	21	22	
19. Other non-metallic mineral products	0.1267	0.0050	0.4321	0.5259	0.1719	0.3193	0.0095	3.1938	0.3304	0.0441	0.3760	
20. Iron and steel	0.2951	0.5104	6.3140	0.0637	0.1901	0.0983	0.9321	0.9921	14.8204	1.0280	14.2305	
21. Non-ferrous metals	0.1448	0.0834	2.2162	2.1766	0.1525	1.1609	0.0379	0.0648	5.1982	15.7988	4.3053	
22. Machinery	1.5933	1.4751	2.3138	2.4583	1.7590	2.0021	2.6165	1.8233	3.4118	1.7706	14.3774	
23. Transport equipment	0.1412	0.0212	0.2091	0.0845	0.1567	0.0321	0.6813	0.1054	0.3630	0.1253	0.2740	
24. Miscellaneous manufacturing industries	0.0272	0.0037	0.0139	0.0376	0.1776	0.0536	0.0189	0.0301	0.0208	0.0162	0.1193	
25. Construction	0.3042	0.0112	0.1324	0.2771	0.2841	0.1344	0.1136	0.1818	0.1101	0.3249	0.1139	
26. Electricity	1.2493	0.3772	2.2301	4.2334	4.8530	1.1714	7.4000	0.8706	2.5804	3.7733	0.8675	
27. Gas and water supply	0.0290	0.0647	0.0906	0.1808	0.2256	0.0894	0.0331	0.0359	0.0691	0.0348	0.0197	
28. Railway transport service	0.4400	0.2527	8.2933	0.8781	1.4394	0.5105	7.0678	1.6393	3.6315	0.5337	0.9691	
29. Other transport services	1.9319	0.3050	5.2826	0.8617	0.8210	1.3839	3.1985	1.4831	0.9955	1.2415	0.9846	
30. Storage, etc.	7.2404	1.1216	10.2098	5.1233	4.9408	6.0927	9.8929	4.7571	9.6372	7.2542	8.2511	
31. Communication	—	—	—	—	—	—	—	—	—	—	—	
32. Finance and real estate	1.2457	0.6050	1.7353	1.9042	2.1267	1.7900	2.8578	1.0014	2.2299	3.7408	1.0390	
33. Public administration	0.7858	0.3112	1.9862	2.1954	2.1831	2.2196	3.5459	2.6928	1.8752	0.2529	1.5910	

Statement 2—(Concl'd.)

Share of Inputs of Different Sectors in Gross Output of Other Sectors

Commodity / Inputs	Share of Inputs of Different Sectors in Gross Output of Other Sectors												
	23	24	25	26	27	28	29	30	31	32	33	(Percentages)	
19. Other non-metallic mineral products	0.0471	0.4241	10.9635	—	—	0.0035	—	0.0612	—	—	—	0.0194	
20. Iron and steel	13.6540	7.2773	8.4704	0.6800	0.1176	0.0562	—	—	—	—	—	—	
21. Non-ferrous metals	0.1052	0.1854	—	—	—	—	—	—	—	—	—	—	
22. Machinery	9.2777	15.9655	2.7549	5.6188	7.8706	4.7378	0.2633	0.3625	0.5816	—	—	0.2857	
23. Transport equipment	9.5584	2.0249	0.0099	0.1056	0.3882	7.2177	8.4957	0.0034	0.5406	0.0345	—	0.0960	
24. Miscellaneous manufacturing industries	0.0599	1.1015	0.1767	0.0121	3.0941	0.0246	0.1041	0.3121	0.3549	0.0502	—	2.3181	
25. Construction	0.0648	0.0854	—	2.4201	6.5059	10.8196	0.1659	0.8111	1.7584	4.8394	—	0.1909	
26. Electricity	1.0138	0.7031	0.0277	21.3597	5.2353	2.4984	0.1466	0.0478	0.5706	0.1853	—	0.1979	
27. Gas and water supply	0.0397	0.0129	0.0017	0.5834	—	0.0044	0.0676	0.0082	0.0464	0.1138	—	0.0529	
28. Railway transport service	1.6406	0.6077	1.5160	3.7227	0.6235	3.5246	0.7219	0.4776	3.0908	0.1959	—	0.4313	
29. Other transport services	0.8823	0.9712	1.2789	3.0377	0.6471	6.5901	5.9458	4.5633	1.7611	0.3753	—	1.1915	
30. Storage, etc.	8.8992	8.1420	8.6710	3.7227	1.6588	3.8371	3.4567	4.0067	0.7317	0.2749	—	2.9818	
31. Communication	—	—	0.0160	0.3732	0.0235	0.0009	1.0114	0.3611	—	0.8176	—	0.2900	
32. Finance and real estate	1.4730	0.5104	0.3247	0.3551	—	—	1.7064	2.0372	—	2.0173	—	0.2462	
33. Public administration	1.1624	0.7022	0.0578	0.2635	0.0118	0.1861	0.7179	0.2286	0.7782	0.6088	—	0.6332	

Statement 3
Index Numbers of Wholesale Prices : All Commodities & Administered Prices

Year	All Commodities	Coal & lignite	Crude petroleum & natural gas	Petroleum products	Fertilizers	Iron & steel	Non-ferrous metals	Electricity	Railway transport service	Communication	Administered prices*
1	2	3	4	5	6	7	8	9	10	11	12
1970-71	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971-72	105.6(5.6)	102.6	130.2	108.2	100.6	105.8	99.3	102.5	103.6	108.2	105.9(5.9)
1972-73	116.2(10.0)	111.0	142.0	111.6	105.7	117.6	105.2	105.7	106.8	108.8	112.2(6.0)
1973-74	139.7(20.2)	122.0	317.1	141.7	113.9	142.6	141.9	111.3	112.2	111.2	140.4(25.1)
1974-75	174.9(25.2)	143.6	686.5	240.2	203.0	171.3	180.8	137.2	137.4	120.5	210.8(50.1)
1975-76	173.0(-1.1)	183.6	700.3	257.2	214.7	183.5	198.7	158.1	152.5	138.7	228.5(8.4)
1976-77	176.6(2.1)	196.5	740.3	267.5	186.5	186.9	208.9	171.6	161.9	165.9	235.1(2.9)
1977-78	185.8(5.2)	197.2	787.6	268.0	177.4	188.2	211.1	182.5	160.0	169.4	239.4(1.8)
1978-79	185.8(—)	210.4	802.9	269.9	175.2	212.5	218.2	209.1	160.3	180.8	251.9(5.2)
1979-80	217.6(17.1)	295.7	1384.0	308.8	167.2	258.5	251.6	225.6	173.8	182.5	309.8(23.0)
1980-81	257.3(18.2)	344.0	2041.8	413.6	242.7	272.4	284.4	239.7	189.4	185.3	388.9(25.6)
1981-82	281.3(9.3)	427.2	2130.7	500.5	273.6	331.6	309.9	279.6	239.3	201.3	452.0(16.2)
1982-83 [†]	288.3(2.5)	486.1	2021.0	517.8	277.7	386.0	316.0	313.4	264.3 [†]	223.3 [†]	476.5(5.4)
1983-84 [‡]	315.5(9.4)	537.1	1739.5	537.7	267.7	415.7	337.9	365.5	350.0 [†]	237.5 [†]	491.5(3.2)
Average annual percentage increase	9.5	14.28	30.79	15.11	9.95	10.16	10.25	10.65	10.53	7.02	13.7

* Estimated Composite Index. † Provisional. ‡ Estimated.

Figures in brackets are percentage increases over previous year.

Statement 4

Sectoral Weights in Wholesale Prices and Gross Domestic Product

(Percentages)

Sector	Sectoral Weight in	
	WPI	GDP
1. All crops	32.373	43.635
2. Animal husbandry, etc.	8.047	6.169
3. Coal and lignite	1.072	0.444
4. Crude petroleum and natural gas	0.602	0.166
5. Iron ore	0.156	0.076
6. Other minerals	0.489	0.232
7. Sugar, etc.	16.030	1.509
8. Textiles	11.026	3.068
9. Wood and furniture	0.174	0.562
10. Paper	0.851	0.557
11. Leather	0.385	0.279
12. Plastic	1.207	0.259
13. Petroleum products	4.912	0.112
14. Coaltar products	0.075	0.060
15. Heavy chemicals	0.726	0.193
16. Fertilizers	1.252	0.175
17. Paints, etc.	3.570	1.028
18. Cement	0.703	0.079
19. Other non-metallic mineral products	0.712	1.005
20. Iron and steel	3.473	0.895
21. Non-ferrous metals	1.178	0.112
22. Machinery	6.368	2.373
23. Transport equipment	1.673	0.937
24. Miscellaneous manufacturing industries	0.546	0.737
25. Construction	—	4.477
26. Electricity	2.400	0.880
27. Gas and water supply	—	0.098
28. Railway transport service	—	1.087
29. Other transport services	—	2.988
30. Storage, etc.	—	11.295
31. Communication	—	0.584
32. Finance and real estate	—	5.314
33. Public administration	—	8.615
All Commodities	100.000	100.000

WPI : Wholesale Price Index

GDP : Gross Domestic Product

Statement 5
Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	1	2	3	4	5	6	7	8
1. All Crops	1.097722	0.456434	0.009631	0.000465	0.007283	0.009570	0.602439	0.340289
2. Animal Husbandry, etc.	0.058924	1.030841	0.004891	0.000380	0.003965	0.001747	0.079540	0.054310
3. Coal and Lignite	0.000988	0.001054	1.007881	0.000155	0.003267	0.002466	0.003273	0.000173
4. Crude Petroleum and Natural gas	0.004038	0.002724	0.001855	1.001268	0.019268	0.003853	0.005183	0.005890
5. Iron Ore	0.000022	0.000028	0.000173	0.000021	1.000153	0.000072	0.000072	0.000095
6. Other Minerals	0.001018	0.000665	0.001132	0.000141	0.001145	1.000447	0.001519	0.001392
7. Sugar, etc.	0.004326	0.064299	0.001867	0.000091	0.001371	0.000841	1.099217	0.012137
8. Textiles	0.003360	0.038896	0.006303	0.000195	0.001850	0.001081	0.028158	1.182999
9. Wood and Furniture	0.000502	0.001133	0.001650	0.000149	0.001497	0.000645	0.006534	0.004951
10. Paper	0.000631	0.002060	0.008572	0.000286	0.001556	0.000921	0.010290	0.011514
11. Leather	0.000009	0.000022	0.000030	0.000002	0.000012	0.000007	0.000068	0.000376
12. Plastic	0.000438	0.001293	0.001263	0.000105	0.000934	0.000507	0.006282	0.004693
13. Petroleum Products	0.006414	0.004287	0.002639	0.002013	0.030750	0.006035	0.008066	0.008773
14. Coal-tar Products	0.000192	0.000208	0.000705	0.000072	0.000726	0.000287	0.000578	0.000636
15. Heavy Chemicals	0.001435	0.001983	0.003600	0.000317	0.003142	0.001801	0.007715	0.018943
16. Fertilizers	0.015823	0.006593	0.000167	0.000008	0.000128	0.000066	0.008815	0.005004
17. Paints, etc.	0.007092	0.008969	0.027206	0.000521	0.020587	0.014802	0.015861	0.057769
18. Cement	0.000236	0.000257	0.000602	0.000185	0.000781	0.000196	0.000271	0.000258
19. Other Non-Metallic Mineral Products	0.000954	0.001200	0.002798	0.000916	0.003255	0.000987	0.003656	0.001975
20. Iron and Steel	0.001703	0.002375	0.014683	0.001831	0.013013	0.006048	0.005977	0.008044

Statement 5—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	1	2	3	4	5	6	7	8
21. Non-Ferrous Metals	0.000505	0.000755	0.005054	0.000653	0.004245	0.002184	0.002593	0.005832
22. Machinery	0.003892	0.004604	0.070033	0.010084	0.058510	0.029896	0.020470	0.025523
23. Transport Equipment	0.000846	0.003386	0.001951	0.000162	0.001499	0.000746	0.004395	0.004711
24. Miscellaneous Manufacturing Industries	0.000151	0.000416	0.002202	0.000093	0.000294	0.000146	0.001018	0.003456
25. Construction	0.007104	0.007708	0.018095	0.006601	0.023591	0.005842	0.007190	0.007029
26. Electricity	0.007573	0.004806	0.049516	0.000623	0.025939	0.024521	0.011947	0.028848
27. Gas and Water Supply	0.000112	0.000120	0.000401	0.000013	0.000245	0.000189	0.000379	0.000969
28. Railway Transport Service	0.003124	0.004015	0.006583	0.000540	0.006202	0.002678	0.007477	0.007452
29. Other Transport Services	0.004186	0.012672	0.009795	0.000727	0.007139	0.003763	0.028174	0.031587
30. Storage, etc.	0.013292	0.039920	0.027269	0.002869	0.020950	0.010201	0.098776	0.082090
31. Communication	0.000255	0.000457	0.000581	0.000032	0.000357	0.000227	0.000908	0.000992
32. Finance and Real Estate	0.005018	0.004434	0.005893	0.000459	0.012270	0.006693	0.014532	0.019705
33. Public Administration	0.001132	0.002726	0.050410	0.002835	0.002570	0.001401	0.016488	0.025860

Statement 5—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	9	10	11	12	13	14	15	16
1. All Crops	0.092567	0.056315	0.172453	0.202037	0.006927	0.024311	0.046749	0.021408
2. Animal Husbandry, etc.	0.170820	0.047286	0.320943	0.031313	0.003397	0.019146	0.016609	0.012733
3. Coal and Lignite	0.002974	0.013424	0.002589	0.006566	0.005139	0.171087	0.012538	0.014989
4. Crude Petroleum and Natural Gas	0.003518	0.007686	0.004202	0.012296	0.626547	0.010827	0.025464	0.022702
5. Iron Ore	0.000145	0.000137	0.000085	0.000153	0.000134	0.006031	0.000173	0.000301
6. Other Minerals	0.000894	0.002068	0.001401	0.003678	0.001066	0.016935	0.024061	0.050630
7. Sugar, etc.	0.014420	0.011834	0.028041	0.018011	0.002136	0.005021	0.026899	0.004561
8. Textiles	0.013590	0.023667	0.046648	0.049161	0.002594	0.008215	0.019690	0.032285
9. Wood and Furniture	1.086951	0.008674	0.005231	0.008854	0.002043	0.010360	0.006246	0.004030
10. Paper	0.010889	1.262995	0.010644	0.018236	0.002706	0.010828	0.012562	0.005055
11. Leather	0.000182	0.001027	1.247312	0.000717	0.000012	0.000036	0.000041	0.000253
12. Plastic	0.005989	0.004156	0.034265	1.150996	0.000938	0.006487	0.006793	0.005026
13. Petroleum Products	0.005389	0.011289	0.005923	0.017942	1.008486	0.016723	0.019339	0.034503
14. Coal-tar Products	0.000373	0.000877	0.000543	0.001052	0.001708	1.070930	0.006391	0.003660
15. Heavy Chemicals	0.006220	0.039349	0.024900	0.043127	0.021148	0.024479	1.086591	0.037209
16. Fertilizers	0.001365	0.000950	0.002593	0.003151	0.000175	0.000586	0.003616	1.035605
17. Paints, etc.	0.019676	0.048229	0.060477	0.191354	0.027297	0.022028	0.051080	0.014629
18. Cement	0.000176	0.000477	0.000217	0.000392	0.000181	0.000744	0.000430	0.000361
19. Other Non-Metallic Mineral Products	0.002392	0.008937	0.003253	0.004991	0.001380	0.008708	0.007989	0.003151
20. Iron and Steel	0.012881	0.011714	0.007196	0.013150	0.011421	0.096201	0.011968	0.011802

Statement 5—(Contd.)
Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	9	10	11	12	13	14	15	16
21. Non-Ferrous Metals	0.003962	0.008290	0.004059	0.008684	0.004103	0.038525	0.032176	0.005901
22. Machinery	0.028035	0.037817	0.027944	0.035482	0.027205	0.066947	0.044328	0.035567
23. Transport Equipment	0.004771	0.006548	0.004954	0.006857	0.001471	0.018265	0.004918	0.005860
24. Miscellaneous Manufacturing Industries	0.001026	0.002625	0.001623	0.001545	0.000592	0.002006	0.001879	0.003056
25. Construction	0.004640	0.009730	0.005579	0.009783	0.002112	0.020309	0.003673	0.018150
26. Electricity	0.012716	0.039336	0.010254	0.028921	0.008287	0.051209	0.065689	0.071605
27. Gas and Water Supply	0.000206	0.000938	0.000337	0.000906	0.000805	0.001588	0.002545	0.002970
28. Railway Transport Service	0.013034	0.017086	0.007139	0.011190	0.004737	0.102147	0.016160	0.021314
29. Other Transport Services	0.020309	0.033640	0.034954	0.038113	0.006656	0.081974	0.021815	0.019787
30. Storage, etc.	0.097728	0.115034	0.111370	0.120387	0.021819	0.154460	0.082603	0.072860
31. Communication	0.000743	0.001280	0.000982	0.001213	0.000273	0.001946	0.001088	0.001046
32. Finance and Real Estate	0.009039	0.028955	0.012345	0.025761	0.008957	0.031158	0.028303	0.028200
33. Public Administration	0.014016	0.044992	0.015729	0.018529	0.007203	0.036174	0.029335	0.027461

Statement 5—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	17	18	19	20	21	22	23	24
1. All Crops	0.149827	0.062651	0.023863	0.018846	0.013885	0.021804	0.029331	0.048491
2. Animal Husbandry, etc.	0.037111	0.022393	0.028988	0.018595	0.012640	0.019409	0.027304	0.036582
3. Coal and Lignite	0.007646	0.081319	0.017839	0.017355	0.011051	0.008561	0.007644	0.006966
4. Crude Petroleum and Natural Gas	0.013353	0.014357	0.007978	0.009209	0.006937	0.007595	0.008391	0.005287
5. Iron Ore	0.000140	0.000411	0.000230	0.012625	0.000605	0.002432	0.002216	0.001398
6. Other Minerals	0.006256	0.096317	0.042646	0.031868	0.037406	0.008819	0.006823	0.007161
7. Sugar, etc.	0.048793	0.004886	0.004016	0.003569	0.002936	0.004144	0.005292	0.010334
8. Textiles	0.037473	0.162132	0.010588	0.008981	0.004846	0.013698	0.009920	0.029553
9. Wood and Furniture	0.010554	0.010848	0.009618	0.016203	0.005077	0.013083	0.026113	0.025361
10. Paper	0.035531	0.010884	0.010508	0.011174	0.008618	0.011649	0.009871	0.015297
11. Leather	0.000213	0.000080	0.000027	0.000039	0.000020	0.000140	0.000137	0.004854
12. Plastic	0.010911	0.004836	0.003602	0.003069	0.002910	0.007544	0.032388	0.008882
13. Petroleum Products	0.013697	0.022796	0.012308	0.014471	0.010590	0.009425	0.012804	0.007490
14. Coal-tar Products	0.002405	0.001735	0.002516	0.023947	0.014242	0.006950	0.005486	0.003587
15. Heavy Chemicals	0.105225	0.005642	0.018120	0.009586	0.023961	0.014452	0.013770	0.021097
16. Fertilizers	0.003182	0.001915	0.000411	0.000307	0.000272	0.000370	0.000482	0.000955
17. Paints, etc.	1.153116	0.018458	0.012490	0.008493	0.007510	0.018963	0.031745	0.038618
18. Cement	0.000404	1.002668	0.012648	0.000557	0.000379	0.000385	0.000343	0.000348
19. Other Non-Metallic Mineral Products	0.011956	0.003145	1.034517	0.012393	0.002545	0.007861	0.004502	0.007822
20. Iron and Steel	0.010989	0.028021	0.019956	1.191586	0.024284	0.203513	0.204252	0.127240

Statement 5—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	17	18	19	20	21	22	23	24
21. Non-Ferrous Metals	0.021734	0.006395	0.004519	0.078066	1.192207	0.074303	0.034701	0.022272
22. Machinery	0.039495	0.060049	0.031605	0.063477	0.036067	1.186657	0.138795	0.205164
23. Transport Equipment	0.005077	0.020371	0.005327	0.012450	0.005707	0.009303	1.112557	0.027986
24. Miscellaneous Manufacturing Industries	0.002082	0.002450	0.001481	0.001666	0.000921	0.002726	0.002098	1.012476
25. Construction	0.008096	0.018711	0.007137	0.012742	0.011031	0.008630	0.009059	0.006735
26. Electricity	0.029473	0.110443	0.018800	0.049984	0.063056	0.027615	0.029100	0.021918
27. Gas and Water Supply	0.001567	0.001282	0.000835	0.001324	0.000978	0.000725	0.000963	0.000578
28. Railway Transport Service	0.011974	0.083271	0.022176	0.052442	0.013352	0.023950	0.032221	0.017415
29. Other Transport Services	0.029763	0.057446	0.025001	0.030379	0.026918	0.027532	0.028445	0.026453
30. Storage, etc.	0.103352	0.141802	0.068545	0.147985	0.107517	0.141368	0.154268	0.136473
31. Communication	0.001146	0.001978	0.000799	0.001419	0.001341	0.001261	0.001282	0.001058
32. Finance and Real Estate	0.030448	0.039785	0.015751	0.037186	0.051335	0.035108	0.031306	0.019199
33. Public Administration	0.033332	0.047145	0.032411	0.027777	0.007223	0.026465	0.022875	0.017487

Statement 5—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	25	26	27	28	29	30	31	32	33
1. All Crops	0.118251	0.016630	0.014385	0.025568	0.072452	0.076377	0.006901	0.007091	0.023683
2. Animal Husbandry, etc.	0.066775	0.010509	0.009693	0.015665	0.012125	0.092758	0.004514	0.004176	0.011384
3. Coal and Lignite	0.010891	0.101306	0.016713	0.029334	0.002165	0.004297	0.002199	0.000956	0.002065
4. Crude Petroleum and Natural Gas	0.007101	0.005208	0.014182	0.018281	0.035771	0.002424	0.004196	0.000895	0.003271
5. Iron Ore	0.001260	0.000380	0.000381	0.000470	0.000238	0.000046	0.000079	0.000069	0.000072
6. Other Minerals	0.005700	0.002129	0.002982	0.004059	0.001126	0.000527	0.000786	0.001324	0.000995
7. Sugar, etc.	0.006411	0.002232	0.001786	0.002926	0.010682	0.016965	0.000969	0.000561	0.007143
8. Textiles	0.011039	0.010850	0.003835	0.004307	0.009834	0.010013	0.001510	0.000937	0.007069
9. Wood and Furniture	0.005209	0.003487	0.004011	0.006095	0.004052	0.004375	0.003801	0.001797	0.002642
10. Paper	0.004497	0.005610	0.004404	0.007037	0.011075	0.006522	0.028202	0.009219	0.062171
11. Leather	0.000033	0.000027	0.000168	0.000033	0.000071	0.000031	0.000046	0.000013	0.000184
12. Plastic	0.003616	0.004066	0.002073	0.008077	0.066450	0.004030	0.001920	0.000553	0.003316
13. Petroleum Products	0.011168	0.008102	0.022429	0.029168	0.057371	0.003848	0.006680	0.001411	0.004455
14. Coal-tar Products	0.013216	0.001387	0.003684	0.002405	0.000767	0.000257	0.000445	0.000685	0.000436
15. Heavy Chemicals	0.004975	0.002428	0.008040	0.003478	0.005488	0.001087	0.001585	0.000664	0.012274
16. Fertilizers	0.001760	0.000253	0.000241	0.000387	0.001071	0.001108	0.000107	0.000107	0.000449
17. Paints, etc.	0.012699	0.006692	0.005350	0.007839	0.017402	0.003327	0.003298	0.001815	0.110047
18. Cement	0.032896	0.001344	0.002299	0.003821	0.000225	0.000393	0.000730	0.001650	0.000177
19. Other Non-Metallic Mineral Products	0.115599	0.005487	0.008955	0.014193	0.001485	0.002201	0.002867	0.005876	0.002342
20. Iron and Steel	0.112816	0.033483	0.032308	0.041814	0.021707	0.004067	0.007008	0.006171	0.006251

Statement 5—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

Sector	25	26	27	28	29	30	31	32	33
21. Non-Ferrous Metals	0.010385	0.007596	0.008289	0.008234	0.004375	0.000922	0.001495	0.000687	0.003332
22. Machinery	0.048671	0.100235	0.111091	0.081039	0.021763	0.008543	0.013909	0.003624	0.015105
23. Transport Equipment	0.006534	0.011445	0.008409	0.090070	0.102286	0.006059	0.011235	0.001519	0.004431
24. Miscellaneous Manufacturing Industries	0.002709	0.001339	0.031925	0.001277	0.001885	0.003604	0.004038	0.000914	0.024125
25. Construction	1.007068	0.010753	0.069960	0.011653	0.006361	0.011681	0.022158	0.050474	0.004601
26. Electricity	0.014092	1.282614	0.072509	0.040540	0.008290	0.002895	0.010383	0.003752	0.008250
27. Gas and Water Supply	0.000354	0.007629	1.000551	0.000498	0.000978	0.000230	0.000590	0.001216	0.000780
28. Railway Transport Service	0.028670	0.054524	0.014500	1.046292	0.013142	0.007155	0.034293	0.004171	0.007633
29. Other Transport Services	0.030004	0.052743	0.016728	0.084156	1.072396	0.054004	0.024070	0.006609	0.020237
30. Storage, etc.	0.129309	0.076104	0.018452	0.083015	0.065248	1.063800	0.019473	0.011369	0.052207
31. Communication	0.001147	0.005734	0.000929	0.001434	0.011362	0.004388	1.000406	0.008507	0.003433
32. Finance and Real Estate	0.014398	0.011341	0.006133	0.009114	0.025073	0.024181	0.002403	1.021801	0.008448
33. Public Administration	0.010623	0.012306	0.005273	0.009008	0.012372	0.004456	0.010029	0.007327	1.012507

Statement 6
Impact Multipliers of Changes in Administered Prices on Sectoral Prices
 (Excluding Commodities with Administered Prices)

Sector	1	2	3	4	5	6	7	8
1. All Crops	1.097200	0.450086	0.006410	0.003076	0.601779	0.339427	0.091825	0.055039
2. Animal Husbandry, etc.	0.038599	1.030620	0.003370	0.001407	0.079106	0.053730	0.170288	0.046431
3. Iron Ore	0.000001	0.000001	1.000013	0.000006	0.000006	0.000006	0.000006	0.000009
4. Other Minerals	0.000179	0.000248	0.000635	1.000200	0.000832	0.000726	0.000340	0.001394
5. Sugar, etc.	0.004222	0.064237	0.001206	0.000762	1.099101	0.011992	0.014304	0.011636
6. Textiles	0.002778	0.038611	0.001433	0.000806	0.027687	1.182471	0.013278	0.023069
7. Wood and Furniture	0.000379	0.001036	0.001166	0.000480	0.006332	0.004684	1.036656	0.003278
8. Paper	0.000475	0.001937	0.001189	0.000723	0.010033	0.011155	0.010575	1.262443
9. Leather	0.000005	0.000020	0.000010	0.000006	0.000065	0.000373	0.000181	0.001024
10. Plastic	0.000313	0.001029	0.000753	0.000396	0.006126	0.004494	0.005809	0.003852
11. Coal tar Products	0.000087	0.000119	0.000363	0.000122	0.000377	0.000362	0.000243	0.000493
12. Heavy Chemicals	0.000711	0.001616	0.002279	0.001551	0.007110	0.018351	0.005848	0.038718
13. Paints, etc.	0.006647	0.008691	0.019475	0.014451	0.015325	0.057112	0.019232	0.047246
14. Cement	0.000212	0.000235	0.000726	0.000161	0.000227	0.000197	0.000111	0.000368

Statement 6—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices
(Excluding Commodities with Administered Prices)

Sector	1	2	3	4	5	6	7	8
15. Other Non-Metallic Mineral Products	0.000824	0.001085	0.002914	0.000797	0.003419	0.001660	0.002034	0.008411
16. Machinery	0.002431	0.003518	0.054622	0.027390	0.018145	0.021760	0.025207	0.032002
17. Transport Equipment	0.000461	0.002963	0.000700	0.000337	0.003590	0.003810	0.003457	0.004723
18. Miscellaneous Manufacturing Industries	0.000090	0.000380	0.000229	0.000107	0.000953	0.003378	0.000969	0.002516
19. Construction	0.006444	0.007064	0.022069	0.004830	0.005898	0.005249	0.002732	0.006492
20. Gas and Water Supply	0.000022	0.000070	0.000055	0.000033	0.000273	0.000768	0.000109	0.000676
21. Other Transport Services	0.003349	0.011989	0.005174	0.002445	0.026778	0.029503	0.018424	0.030294
22. Storage, etc.	0.011310	0.038533	0.016689	0.007719	0.095952	0.078061	0.094103	0.109207
23. Finance and Real Estate	0.004410	0.004064	0.011231	0.006177	0.013812	0.018750	0.008244	0.027704
24. Public Administration	0.000551	0.002376	0.000174	0.000962	0.015802	0.024979	0.013356	0.043635

Statement 6—(Contd.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices

(Excluding Commodities with Administered Prices)

Sector	9	10	11	12	13	14	15	16
1. All crops	0.171924	0.200960	0.018114	0.044859	0.148636	0.058206	0.022390	0.017295
2. Animal husbandry, etc.	0.320572	0.030371	0.014886	0.013297	0.036254	0.019599	0.028111	0.015249
3. Iron etc.	0.000007	0.000010	0.004996	0.000024	0.000016	0.000108	0.000016	0.000257
4. Other minerals	0.000944	0.002872	0.012955	0.022496	0.005039	0.094991	0.041909	0.001425
5. Sugar, etc.	0.027952	0.017826	0.004022	0.026585	0.048588	0.004239	0.003814	0.003306
6. Textiles	0.046376	0.048668	0.003670	0.018714	0.036886	0.160223	0.010077	0.011762
7. Wood and furniture	0.005039	0.008478	0.008080	0.003685	0.010158	0.009653	0.009141	0.009945
8. Paper	0.010409	0.017769	0.007516	0.011750	0.349900	0.008935	0.009923	0.009092
9. Leather	1.247311	0.007142	0.000024	0.000057	0.000210	0.000072	0.000025	0.000131
10. Plastic	0.034141	1.150752	0.005118	0.006354	0.010638	0.003794	0.003306	0.006710
11. Coal tar products	0.000327	0.000634	1.068442	0.005698	0.001883	0.000896	0.002017	0.003117
12. Heavy chemicals	0.024325	0.042311	0.021907	1.085200	0.104246	0.004226	0.017506	0.011387
13. Paints, etc.	0.060085	0.190397	0.015545	0.049673	1.132277	0.014711	0.011367	0.016702
14. Cement	0.000177	0.000314	0.000208	0.000293	0.000321	1.002220	0.012534	0.000202

Statement 6—(Contd.)
Impact Multipliers of Changes in Administered Prices on Sectoral Prices
 (Excluding Commodities with Administered Prices)

Sector	9	10	11	12	13	14	15	16
15. Other non-metallic mineral products	0.003030	0.004565	0.005808	0.007325	0.011517	0.001201	1.033911	0.005365
16. Machinery	0.025924	0.030938	0.033505	0.035848	0.034641	0.039313	0.026275	1.171412
17. Transport equipment	0.004197	0.005583	0.009153	0.002947	0.003703	0.012227	0.003620	0.005544
18. Miscellaneous manufacturing industries	0.001577	0.001455	0.001337	0.001526	0.001984	0.002044	0.001368	0.002251
19. Construction	0.004397	0.007540	0.004380	0.005694	0.005665	0.005229	0.003797	0.003862
20. Gas & water supply	0.009256	0.009696	0.001140	0.002104	0.001352	0.000559	0.000489	0.000348
21. Other transport services	0.033699	0.035551	0.068245	0.017033	0.026925	0.045515	0.021906	0.019203
22. Storage, etc.	0.108838	0.115400	0.126364	0.073136	0.097276	0.124192	0.062715	0.108641
23. Finance & real estate	0.011725	0.024488	0.024857	0.025787	0.028708	0.036768	0.014528	0.025870
24. Public administration	0.015220	0.017463	0.024460	0.027630	0.032208	0.041256	0.030755	0.020906

Statement 6—(Contd.)
Impact Multipliers of Changes in Administered Prices on Sectoral Prices
 (Excluding Commodities with Administered Prices)

Sector	17	18	19	20	21	22	23	24
1. All crops	0.025002	0.045778	0.115609	0.012448	0.071249	0.076007	0.006795	0.023225
2. Animal husbandry, etc.	0.023388	0.034131	0.064501	0.008322	0.011302	0.092514	0.003958	0.011062
3. Iron ore	0.000045	0.000045	0.000062	0.000035	0.000006	0.000002	0.000003	0.000004
4. Other minerals	0.000600	0.003236	0.022430	0.001812	0.000325	0.000318	0.001127	0.000686
5. Sugar, etc.	0.004513	0.009843	0.005950	0.001468	0.010436	0.016907	0.000515	0.007071
6. Textiles	0.008010	0.028308	0.009899	0.002830	0.009372	0.009863	0.000828	0.006887
7. Wood and furniture	0.023065	0.023460	0.023485	0.003273	0.003519	0.004244	0.001651	0.002462
8. Paper	0.007519	0.013805	0.003116	0.003552	0.010282	0.006254	0.008878	0.061901
9. Leather	0.000128	0.004849	0.000028	0.000165	0.000068	0.000030	0.000012	0.000183
10. Plastic	0.031571	0.008375	0.003090	0.001650	0.066205	0.003939	0.000482	0.003204
11. Coal tar products	0.001078	0.000810	0.010855	0.002819	0.000189	0.000146	0.000546	0.000254
12. Heavy chemicals	0.011388	0.019582	0.003651	0.007030	0.003976	0.000886	0.000561	0.012023
13. Paints, etc.	0.029580	0.037217	0.011188	0.003806	0.015520	0.003007	0.001655	0.109740
14. Cement	0.000138	0.000225	0.032743	0.002163	0.000148	0.000358	0.001625	0.000137

Statement 6—(Concl.)

Impact Multipliers of Changes in Administered Prices on Sectoral Prices
(Excluding Commodities with Administered Prices)

Sector	17	18	19	20	21	22	23	24
15. Other non-metallic mineral products	0.001949	0.006245	0.114044	0.008140	0.000973	0.002030	0.005725	0.002132
16. Machinery	0.123774	0.195564	0.039380	0.101801	0.017474	0.007189	0.002596	0.013348
17. Transport equipment	1.108194	0.025473	0.003193	0.006513	0.100797	0.005342	0.001024	0.003637
18. Miscellaneous manufacturing industries	0.001738	1.012244	0.002485	0.031760	0.001762	0.003557	0.000862	0.024079
19. Construction	0.003557	0.003455	1.002816	0.065916	0.004275	0.010638	0.049720	0.003402
20. Gas & water supply	0.000591	0.000323	0.000155	1.000071	0.000856	0.000172	0.001182	0.000717
21. Other transport services	0.020153	0.021316	0.024720	0.011911	1.069983	0.053084	0.005824	0.019041
22. Storage, etc.	0.124071	0.117519	0.112372	0.038561	0.059687	1.052300	0.009942	0.050046
23. Finance & real estate	0.023617	0.014348	0.010356	0.004003	0.023609	0.023872	1.021512	0.007961
24. Public administration	0.017456	0.013981	0.007220	0.003113	0.011146	0.003998	0.007007	1.012095

Statement 7
Hypothetical Sectoral Price Indices on the Assumption that Administered Prices have increased as Observed in Wholesale Prices[@]
During the Period

Year	All crops			Animal husbandry, etc.			Coal & lignite			Crude petroleum and natural gas			Iron ore			Other minerals		
	Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase	
1	2	3	4	5	6	7	8	9	10	11	12	13						
1970-71	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—
1971-72	100.09	0.09	100.07	0.07	102.60	2.60	130.20	30.20	100.37	0.37	100.13	0.13	100.13	0.13	100.13	0.13	100.13	0.13
1972-73	100.22	0.14	100.17	0.09	111.00	8.20	142.00	9.06	100.69	0.32	100.28	0.15	100.28	0.15	100.28	0.15	100.28	0.15
1973-74	100.60	0.38	100.44	0.28	122.00	9.90	317.10	123.31	102.11	1.41	100.75	0.47	100.75	0.47	100.75	0.47	100.75	0.47
1974-75	102.76	2.15	101.66	1.21	143.60	17.70	686.50	116.49	106.15	3.96	102.06	1.30	102.06	1.30	102.06	1.30	102.06	1.30
1975-76	103.20	0.43	101.97	0.31	183.60	27.85	700.30	2.01	107.34	1.12	102.67	0.60	102.67	0.60	102.67	0.60	102.67	0.60
1976-77	102.93	-0.26	101.94	-0.03	196.50	7.02	740.30	5.71	108.03	0.64	103.03	0.35	103.03	0.35	103.03	0.35	103.03	0.35
1977-78	102.85	-0.08	101.92	-0.02	197.20	0.35	787.60	6.39	108.27	0.23	103.25	0.21	103.25	0.21	103.25	0.21	103.25	0.21
1978-79	102.99	0.13	102.05	0.13	210.40	6.69	802.90	1.94	109.12	0.78	103.89	0.62	103.89	0.62	103.89	0.62	103.89	0.62
1979-80	103.28	0.29	102.41	0.35	295.70	40.54	1384.00	72.38	111.37	2.06	104.77	0.86	104.77	0.86	104.77	0.86	104.77	0.86
1980-81	105.19	1.85	103.49	1.05	344.00	16.33	2041.80	47.53	115.23	3.47	105.85	1.03	105.85	1.03	105.85	1.03	105.85	1.03
1981-82	106.55	1.29	104.48	0.95	427.20	24.19	2130.70	4.35	119.56	3.76	107.51	1.56	107.51	1.56	107.51	1.56	107.51	1.56
1982-83	107.00	0.42	104.89	0.39	486.10	13.78	2021.00	-5.15	121.20	1.37	108.54	0.95	108.54	0.95	108.54	0.95	108.54	0.95
1983-84	107.45	0.42	105.44	0.52	537.10	10.49	1739.50	-13.93	123.10	1.56	109.90	1.25	109.90	1.25	109.90	1.25	109.90	1.25
Average annual percentage increase	—	0.56	—	0.41	—	14.28	—	30.79	—	1.62	—	0.73	—	1.62	—	—	—	0.73

[@] In respect of services sectors, the prices are measured as reflected in the national income.

Statement 7—(Contd.)
Hypothetical Sectoral Price Indices on the Assumption that Administered Prices have increased as Observed in Wholesale Prices[@] During the Period

Year	Sugar, etc.		Textiles		Wood & furniture		Paper		Leather		Plastic	
	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase
1970-71	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—
1971-72	100.15	0.15	100.20	0.20	100.17	0.17	100.31	0.31	100.14	0.14	100.33	0.33
1972-73	100.35	0.20	100.47	0.27	100.41	0.23	100.72	0.40	100.32	0.17	100.70	0.37
1973-74	100.94	0.59	101.32	0.84	101.06	0.65	101.92	1.19	100.93	0.61	102.13	1.41
1974-75	103.10	2.14	103.81	2.46	102.65	1.57	105.07	3.09	102.53	1.58	105.89	3.68
1975-76	103.77	0.65	104.84	0.99	103.34	0.67	106.70	1.55	103.09	0.55	107.20	1.24
1976-77	103.86	0.09	105.28	0.42	103.68	0.33	107.57	0.82	103.34	0.24	107.88	0.63
1977-78	103.89	0.02	105.50	0.21	103.77	0.09	107.92	0.33	103.43	0.09	108.16	0.26
1978-79	104.26	0.36	106.31	0.76	104.31	0.52	109.11	1.10	103.82	0.38	109.11	0.88
1979-80	105.21	0.91	107.96	1.56	105.55	1.18	111.95	2.60	104.98	1.12	111.85	2.51
1980-81	107.15	1.85	110.23	2.10	106.84	1.23	114.95	2.67	106.52	1.46	115.58	3.33
1981-82	109.19	1.90	113.00	2.52	109.02	2.04	119.26	3.75	108.24	1.61	119.61	3.48
1982-83	109.94	0.69	114.30	1.15	110.34	1.21	121.30	1.71	109.11	0.80	121.10	1.25
1983-84	110.50	0.51	115.70	1.22	112.25	1.73	123.30	1.65	110.25	1.04	122.70	1.32
Average annual percentage increase	—	0.77	—	1.13	—	0.89	—	1.63	—	0.75	—	1.59

[@] In respect of services sectors, the prices are measured as reflected in the national income.

Statement 7—(Contd.)
Hypothetical Sectoral Price Indices on the Assumption that Administered Prices have increased as Observed in Wholesale Prices[@]
During the Period

Year	Petroleum products			Coal/tar products			Heavy chemicals			Fertilizers			Paints, etc.			Cement		
	Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase	
1	26	27	28	29	30	31	32	33	34	35	36	37						
1970-71	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—						
1971-72	108.20	8.20	101.35	1.35	100.77	0.77	100.60	0.60	100.39	0.39	100.92	0.92						
1972-73	111.60	3.14	104.17	2.78	100.50	-0.27	105.70	5.07	100.84	0.45	102.30	1.37						
1973-74	141.70	26.97	109.83	5.42	105.96	4.46	113.90	7.76	103.15	2.29	105.09	2.73						
1974-75	240.20	69.51	120.83	10.01	115.93	9.41	203.00	78.23	108.25	4.95	113.27	7.78						
1975-76	257.20	7.07	130.88	8.32	118.50	2.22	214.70	5.76	109.77	1.40	119.50	5.50						
1976-77	267.50	4.00	134.87	3.05	120.28	1.50	186.50	-13.14	110.68	0.83	122.46	2.48						
1977-78	268.00	0.18	135.28	0.30	121.48	1.00	177.40	-4.88	111.15	0.42	123.27	0.66						
1978-79	269.90	0.71	140.19	3.63	123.47	1.64	175.20	-1.24	112.19	0.93	126.85	2.90						
1979-80	308.80	14.41	160.69	14.62	134.68	9.08	167.20	-4.57	117.28	4.54	136.86	7.90						
1980-81	413.60	33.94	173.76	8.13	147.79	9.73	242.70	45.16	123.38	5.20	145.12	6.03						
1981-82	500.50	21.00	199.06	14.56	154.85	4.78	273.60	12.73	127.64	3.45	160.70	10.73						
1982-83	517.80	3.46	211.60	6.30	156.00	0.74	277.70	1.50	128.60	0.75	167.00	3.92						
1983-84	537.70	3.84	224.10	5.91	155.90	-0.06	267.70	-3.60	129.30	0.54	175.20	4.91						
Average annual percentage increase	—	15.11	—	6.49	—	3.46	—	9.95	—	2.01	—	4.45						

[@] In respect of services sectors, the prices are measured as reflected in the national income.

Statement 7—(Contd.)
Hypothetical Sectoral Price Indices on the Assumption that Administered Prices have increased as Observed in Wholesale Prices[@] During the Period

Year	Other non-metallic mineral products			Iron and steel			Non-ferrous metals			Machinery			Transport equipment			Misc. manufacturing industries				
	Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase		Price Index	Percentage Increase			
	38	39	40	41	42	43	44	45	46	47	48	49	38	39	40	41	42	43	44	
1970-71	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—
1971-72	100.34	0.34	105.80	5.80	99.30	-0.70	101.14	1.14	101.19	1.19	101.19	1.19	101.19	1.19	100.75	0.75	100.75	0.75	100.75	0.75
1972-73	100.81	0.47	117.60	11.15	105.20	5.94	103.58	2.42	103.47	2.25	103.47	2.25	103.47	2.25	102.20	1.44	102.20	1.44	102.20	1.44
1973-74	102.03	1.21	142.60	21.26	141.90	34.89	110.33	6.51	108.94	5.28	108.94	5.28	108.94	5.28	105.70	3.43	105.70	3.43	105.70	3.43
1974-75	104.98	2.89	171.30	20.13	180.80	27.41	119.16	7.95	116.56	7.00	116.56	7.00	116.56	7.00	110.67	4.70	110.67	4.70	110.67	4.70
1975-76	106.61	1.55	183.50	7.12	198.70	9.90	122.80	3.10	119.85	2.82	119.85	2.82	119.85	2.82	112.83	1.95	112.83	1.95	112.83	1.95
1976-77	107.37	0.71	186.90	1.85	208.90	5.13	124.36	1.27	121.15	1.09	121.15	1.09	121.15	1.09	113.69	0.76	113.69	0.76	113.69	0.76
1977-78	107.53	0.15	188.20	0.69	211.10	1.05	124.88	0.42	121.55	0.33	121.55	0.33	121.55	0.33	113.99	0.26	113.99	0.26	113.99	0.26
1978-79	108.50	0.90	212.50	12.91	218.20	3.36	129.76	3.90	126.25	3.87	126.25	3.87	126.25	3.87	117.03	2.67	117.03	2.67	117.03	2.67
1979-80	111.70	2.95	258.50	21.65	251.60	15.31	141.09	8.74	135.96	7.69	135.96	7.69	135.96	7.69	123.46	5.49	123.46	5.49	123.46	5.49
1980-81	114.64	2.63	272.40	5.38	284.40	13.04	147.40	4.47	140.82	3.57	140.82	3.57	140.82	3.57	126.83	2.73	126.83	2.73	126.83	2.73
1981-82	119.41	4.15	331.60	21.73	309.90	8.97	160.79	9.08	154.02	9.37	154.02	9.37	154.02	9.37	135.22	6.61	135.22	6.61	135.22	6.61
1982-83	122.67	2.73	386.00	16.41	316.00	1.97	170.50	6.44	163.60	6.22	163.60	6.22	163.60	6.22	141.40	4.57	141.40	4.57	141.40	4.57
1983-84	126.04	2.75	415.70	7.69	337.90	6.93	177.00	3.81	172.85	5.65	172.85	5.65	172.85	5.65	145.50	2.90	145.50	2.90	145.50	2.90
Average annual percentage increase	—	1.80	—	10.16	—	10.25	—	4.56	—	4.33	—	4.33	—	4.33	—	2.92	—	2.92	—	2.92

[@] In respect of services sectors, the prices are measured as reflected in the national income.

Statement 7—(Contd.)
Hypothetical Sectoral Price Indices on the Assumption that Administered Prices have increased as Observed in Wholesale Prices[@]
During the Period

Year	Construction			Electricity			Gas & water supply			Railway transport service [@]			Other transport services		
	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	
	50	51	52	53	54	55	56	57	58	59					
1970-71	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	
1971-72	100.74	0.74	102.50	2.50	100.52	0.52	103.60	3.60	100.71	0.71	103.60	3.60	100.71	0.71	
1972-73	102.06	1.31	105.70	3.12	101.21	0.69	106.80	3.09	101.18	0.47	106.80	3.09	101.18	0.47	
1973-74	105.03	2.91	111.30	5.30	103.15	1.91	112.20	5.06	103.53	2.32	112.20	5.06	103.53	2.32	
1974-75	109.77	4.52	137.20	23.27	108.11	4.80	137.40	22.46	110.29	6.53	137.40	22.46	110.29	6.53	
1975-76	111.92	1.95	158.10	15.23	110.56	2.27	152.50	10.99	112.00	1.55	152.50	10.99	112.00	1.55	
1976-77	112.73	0.72	171.60	8.54	111.89	1.20	161.90	6.16	113.12	1.00	161.90	6.16	113.12	1.00	
1977-78	112.88	0.14	182.50	6.35	112.54	0.58	160.00	—1.17	113.24	0.11	160.00	—1.17	113.24	0.11	
1978-79	115.47	2.29	209.10	14.58	114.81	2.02	160.30	0.19	114.05	0.71	160.30	0.19	114.05	0.71	
1979-80	121.33	5.07	225.60	7.89	118.96	3.62	173.80	8.42	117.45	2.99	173.80	8.42	117.45	2.99	
1980-81	124.67	2.75	239.70	6.25	123.25	3.60	189.40	8.98	124.10	5.66	189.40	8.98	124.10	5.66	
1981-82	133.12	6.77	279.60	16.65	130.21	5.64	239.30	26.30	131.06	5.60	239.30	26.30	131.06	5.60	
1982-83	138.50	4.04	313.40	12.09	134.10	2.99	264.30*	10.44	133.00	3.00	264.30*	10.44	133.00	3.00	
1983-84	142.10	2.60	365.50	16.62	138.40	3.21	350.00*	32.43	134.90	2.24	350.00*	32.43	134.90	2.24	
Average annual percentage increase	—	2.75	—	10.65	—	2.54	—	10.53	—	2.45	—	10.53	—	2.45	

[@] In respect of services sectors, the prices are measured as reflected in the national income.

* Estimated.

Statement 7—(Cont'd.)
Hypothetical Sectoral Price Indices on the Assumption that Administered Prices have increased as Observed in Wholesale Prices^(a) During the Period

Year	Storage, etc.			Communication ^(a)			Finance & real estate			Public administration			All commodities		
	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	Price Index	Percentage Increase	
1	60	61	62	63	64	65	66	67	68	69					
1970-71	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	100.00	—	
1971-72	100.12	0.12	108.20	8.20	100.13	0.13	100.14	0.14	101.09	0.14	101.09	0.14	101.09	1.09	
1972-73	100.24	0.12	108.80	0.55	100.22	0.09	100.29	0.14	102.40	0.14	102.40	0.14	102.40	1.29	
1973-74	100.55	0.31	111.20	2.21	100.45	0.23	100.79	0.50	107.64	0.50	107.64	0.50	107.64	5.12	
1974-75	101.43	0.88	120.50	8.36	100.96	0.51	102.02	1.21	120.69	1.21	120.69	1.21	120.69	12.13	
1975-76	101.91	0.47	138.70	15.10	101.32	0.36	102.52	0.50	124.19	0.50	124.19	0.50	124.19	2.90	
1976-77	102.19	0.27	165.90	19.61	101.65	0.33	102.86	0.33	125.47	0.33	125.47	0.33	125.47	1.04	
1977-78	102.22	0.02	169.40	2.11	101.71	0.06	103.95	1.06	126.09	1.06	126.09	1.06	126.09	0.49	
1978-79	102.45	0.22	180.80	6.73	102.00	0.29	103.31	-0.62	128.68	-0.62	128.68	-0.62	128.68	2.05	
1979-80	103.19	0.72	182.50	0.94	102.43	0.42	104.33	0.99	139.12	0.99	139.12	0.99	139.12	8.11	
1980-81	104.03	0.81	185.30	1.53	102.78	0.34	105.51	1.13	153.16	1.13	153.16	1.13	153.16	10.09	
1981-82	103.34	-0.66	201.30	8.63	103.62	0.82	106.97	1.38	165.30	1.38	165.30	1.38	165.30	7.93	
1982-83	106.11	2.68	223.30*	10.93	104.29	0.64	107.76	0.74	170.55	0.74	170.55	0.74	170.55	3.18	
1983-84	107.15	0.98	237.50*	6.36	105.02	0.70	108.86	1.02	174.36	1.02	174.36	1.02	174.36	2.23	
Average annual percentage increase	—	0.53	—	7.02	—	0.38	—	0.65	—	0.65	—	0.65	—	4.43	

^(a) In respect of services sectors, the prices are measured as reflected in the national income.

* Estimated.

Statement 8
Changes in Prices of Final Demand Categories due to Administered Prices

Year	(Percentages)											
	Private final consumption expenditure			Public final consumption expenditure			Gross fixed capital formation			Change in stocks		Exports
	Actual increase	Due to administrative red prices	Actual increase	Due to administrative red prices	Actual increase	Due to administrative red prices	Actual increase	Due to administrative red prices	Actual increase	Due to administrative red prices	Actual increase*	Due to administrative red prices
1	2	3	4	5	6	7	8	9	10	11		
1971-72	4.51	0.26	4.65	0.61	5.80	0.84	8.17	0.74	1.89	0.51		
1972-73	11.65	0.25	4.50	0.52	8.00	1.58	1.25	1.29	11.10	0.74		
1973-74	-8.60	0.80	7.41	1.55	11.92	3.85	26.33	3.10	21.67	2.13		
1974-75	56.67	2.85	20.23	3.96	24.66	5.48	23.71	7.81	25.34	4.45		
1975-76	-5.24	0.92	6.56	1.89	10.59	2.27	-1.17	2.34	7.65	1.63		
1976-77	3.25	0.32	2.95	1.39	2.05	0.90	4.26	0.02	6.60	0.70		
1977-78	4.96	0.04	1.65	0.35	2.30	0.22	1.79	-0.03	12.38	0.12		
1978-79	4.07	0.46	0.87	1.42	8.81	2.72	3.50	1.94	-0.85	1.25		
1979-80	13.73	1.20	4.87	2.60	15.47	6.04	16.96	5.11	0.85	3.33		
1980-81	10.28	2.39	6.07	2.90	12.09	3.26	16.28	5.87	9.00	3.29		
1981-82	10.82	2.68	7.11	4.65	14.18	7.43	12.22	7.13	..	5.11		
1982-83	6.36	1.24	6.65 ^(a)	2.82	10.90	5.29	4.93	4.17	..	2.92		
Average annual percentage increase	9.37	1.12	6.13	2.06	10.56	3.32	9.09	3.29	9.56	2.18		

Note : Data for 1983-84 are not available to work out the actual increase in the price deflators.

* Based on the unit value of index for exports. Data after 1980-81 are not available.

.. Not available.

(a) Estimated.

DEBT-EQUITY RATIO

Much debate has taken place in recent years in India on the question of availability of resources both for working capital and investment, particularly in respect of private sector. As is the case with any controversy, two extreme positions have emerged from this debate. At one end is the view that there is no 'resources crunch' at all, that there is excess liquidity in the lending system and that it is up to the industry and trade to pick up these funds¹. At the other end is the argument (which is regarded as the view of the private sector) that given the state of the capital market and the inability of the corporate sector to generate internal resources to the extent required, there is a paucity of resources particularly for investment and that the corporate sector has no choice but to depend on institutional debt to a large extent. Essentially, the debate boils down to the important question : what should be the role of external funds or debt *vis-a-vis* the role of owned funds or equity, in investment or capital formation in the private sector ?

The relative roles of external and internal funds in financing investment of business enterprises differ from country to country depending upon the state of the capital markets, ability to generate internal surpluses, investor preferences, availability of institutional finance, Government policies and the level of savings and their investment in financial assets. This is well illustrated by two books on the subject of debt and equity, which became available recently and which form the theme of this review. The first entitled 'The Changing Role of Debt and Equity in Financing US Capital Formation' is a publication by the National Bureau of Economic Research (NBER), one of the leading American institutions undertaking policy research and the other entitled 'Report on A Study of the Debt-Equity Ratio Norms', published by the Management Development Institute (MDI), New Delhi. It is a coincidence that both the publications happen to be reports undertaken by the respective organisations. The NBER study is a project report edited by Benjamin M. Friedman and published in 1982 by the University of Chicago Press. The MDI study, published in 1978, is an enquiry undertaken by Dr. B. K. Madan, (the then Chairman of MDI) at the request of the Government of India, Ministry of Finance, Department of Economic Affairs.

The American Experience

The NBER study should be placed in proper perspective so that the reasons for the choice of a specific subject like the role of debt-equity ratio

¹ P. K. Kaul, former Secretary, Ministry of Finance, in his address to the Conference of Company Secretaries, New Delhi. Reported in **Financial Express**, August 19, 1984.

become clear. Economic thinking in the U.S. has always emphasised the central role of the fixed capital in the production process and for this reason public policy discussions in U.S. centred round the need for increased rate of capital formation. Even in advanced economies like the U.S., with highly developed financial markets, capital formation is not just the allocation of physical resources but the allocation of financial resources also; because, every physical investment decision has its financial counterpart. It needs to be recognised that financial and physical aspects of capital formation are interrelated and that a given financial environment affects in an important way the volume and composition of capital formation that takes place in the economy. In the American context, the financial influences on capital formation are so many, so varied and so pervasive that it is necessary to focus attention on a specific aspect of financial capital formation. Hence the particular interest in debt-equity ratio.

The NBER study, which comprises six research papers, adopts completely a market perspective in the sense that it focuses attention on market mechanism and relationships between expectations, risks, returns and market prices. This approach is natural in the context of the American free market philosophy. The first paper entitled "Inflation, Resource Utilisation and Debt-Equity Returns" by Patric H. Hendershott, provides a background for portfolio decisions concerning investment of funds as between equities, short-term debt and long-term debt. He analyses the effects of inflation on the relationships among returns on securities, particularly equities versus bonds, and comes to the conclusion that increased inflation and the accompanying uncertainties in the economy contributed to the modest rise in yields on new debt issues relative to those on equities.

The second and third papers by Burton G. Malkiel and Zvi Bodie deal respectively with "Risk and Return : A New Look" and "Investment Strategy in an Inflationary Environment". In the view of the reviewer, the third paper should have followed the first, because of the interrelated nature of the two papers. Under the present arrangement, the second paper seems to interrupt the thought sequence of the first and third papers. The paper by Zvi Bodie is based on the basic premise that what is of concern to an investor (whether a household, institution, insurance company or pension fund) is the real value of investments in terms of purchasing power. From this point of view, Bodie presents the analytical framework for formulating investment decisions in the context of inflation, examines the historical record of rates of return and derives estimates of alternative risk-return trade-offs. The second chapter (paper by Malkiel), which deals with risk and return, also draws on the historical evidence, explains the fundamentals of asset-pricing theory and takes a fresh look at the relationship between risk and return, using some unexplored measures of risk; for instance, the Capital-Asset Pricing Model (CAPM), which focuses attention directly on what part

of a security's risk could be eliminated by diversification and what part could not.

The impact of inflationary environment, the performance of U. S. non-financial corporations, the market's valuation of their securities and relative rates of return are all reflected in the changing balance sheet relationships in the U. S. manufacturing sector, which is the theme of the fourth paper by John H. Ciccolo. This paper documents the trends in the sources and uses of funds, market valuations and rates of return for a sample of U. S. manufacturing companies during 1926-77. In the fifth chapter, Martin Feldstein deals with private pensions as a form of corporate debt. In the U. S. pension benefits of employees represent a greater liability of the corporations than their conventional debts like bonds, bank loans and commercial paper. For this reason, Feldstein focuses attention on pensions as a corporate liability and its effect on equity values. The final chapter which is contributed by the editor, Benjamin M. Friedman, brings out the relationship between debt and economic activity in the American context. The interesting conclusions of Friedman's paper are that the total U. S. debt has borne a stable relationship to economic activity while the two components of debt, i.e., private sector debt and public sector debt, have not and that the stability of debt-to-income relationship has several implications for policy. In fact, Friedman's paper coming at the end is a summing-up of the role of debt in American economic activity.

American Experience : Policy Aspects

The six papers making up the NBER report have attempted to look, from various angles, at the role of debt and equity in capital formation of the U. S. corporate sector. It would, therefore, be useful to bring them together to form a coherent whole so that the policy aspects of the American experience become clear. The essential point to note, as mentioned earlier, is the free market framework in which allocation of resources, both physical and financial, take place and in which debt and equity securities are issued, traded and priced. In this framework, the NBER report attempts to answer two important questions and these are : how have the markets priced corporate debt and equity and how has the corporations financing pattern responded in this environment, i.e., the interaction between the market mechanism and corporate financing decisions.

The American experience shows that market pricing of debt and equity is influenced by inflation and inflationary expectations and uncertainty and risk including inflation risk. Generally, debt securities offer a guaranteed nominal return but an uncertain real rate. If the future rate of inflation were known, the expected real rate can be estimated. However, in an environment of inflation and of uncertainty about future inflation, real rates are highly uncertain and sometimes negative. In this situation, debt instru-

ments become riskier and less attractive to the investors, leading to greater reliance on equities by the American Corporate Sector. This affects market pricing of bonds *vis-a-vis* equities, resulting in a premium on the latter.

The investment strategy in an inflationary environment has necessarily to be different. The central concern of the new investment strategy is the real rate of return. While inflation-hedging assets are a good alternative, a proper balancing of risk and return in a given portfolio should prove effective. This means a movement along the risk-return trade-off curve ranging between minimum-risk investment and maximum-risk strategy. This would, also mean that risk-reduction techniques should go well beyond the time-honoured maxim of diversification of the portfolio. It is worth referring here to the risk model called Capital Asset Pricing Model (CAPM) which classifies the risks into two : systematic risk and unsystematic risk — the former, also called market risk, not being amenable to diversification. Perhaps, the quest for better risk measures will continue.

The historical data relating to the balance sheets of U. S. non-financial corporate sector for the period 1926-77 shows that (a) during the war and pre-war periods, debt financing represented an adjustment towards more normal pre-depression levels; (b) the post-war trend was towards external sources of funds and (c) the increasing importance of debt in the capital structure of an 'average' corporation. While the inflationary environment in recent years may have provided a strong incentive for those with taxable income to increase their indebtedness, the available data suggest that the increase in reliance on external sources of funds reflects the decline in undistributed profits and that debt increased primarily at the expense of preferred stock. Notwithstanding these developments the debt-equity ratio of the U. S. corporate sector is between 1:1 and 1:2, which is much lower than in Europe, U. K. and Japan.

The relatively low debt-equity ratio in the U. S. corporate sector has to be viewed in the context of the role of debt in the economic activity of the U. S. It has been mentioned earlier that the total U. S. debt has borne a stable relationship to economic activity while those of private and public sector have not. In fact, the stability of the relationship in the aggregate seems to be the result of contrary movements in the two debt components. For instance, the increase in corporate indebtedness relative to income is accompanied by a decline in federal government's indebtedness relative to income. This seems to raise the question whether there is "crowding out" of private investment by debt-financed government spending. While the "crowding out" effect cannot be ruled out, two other factors also seem to have contributed to the low debt-equity ratio of the U. S. corporate sector. The first is that in a situation of increasing debt, both public and private, debt and equity securities become less substitutable and that this causes the private sector to shift from debt to equity financing. The second is that

though the U. S. corporate sector has raised funds from external sources, in doing so it has increasingly relied on short-term instruments. In short, lenders or investors' preferences influence the debt-equity ratio of the U. S. corporate sector.

The Indian Situation

In contrast to the American experience that market forces considerably influence the relative proportions of debt and equity in the capital structure of U. S. corporations, debt-equity ratio in India is determined in a highly regulated financial framework. In fact, like many other indicators in the Indian economy, the debt-equity ratio is also highly 'administered'. What is more important is that the ratio is administered by different authorities, with different definitions and for different purposes. Thus, while the legal and operational basis of the debt-equity ratio in India is provided by the Capital Issues (Control) Act of 1947 and the rules and regulations framed thereunder, the financial institutions at the national and state level have been applying their own norms for determining the debt-equity ratio. Consequently, there is no one debt-equity ratio which could be a guide to the overall position of debt relative to equity. On the other hand, there are several debt-equity ratios which differ from one industry to another and from one unit to another within the same industry group, depending upon whether or not the unit is capital-intensive, or large-sized or new. While a number of debt-equity ratios reflects the flexibility with which these are administered, this has also resulted from exceptions made to the general ratio of 2:1 laid down by the Capital Issues Control, too many refinements and interpretations of the concept of debt and equity and the variety of industries coming into existence as part of the development process. The position is further complicated by the role of public sector in industrial development, which added a new dimension to the problem. Another important aspect of the Indian situation is the predominance of the institutional debt in the debt-equity ratio of the Indian corporate sector; and this is primarily due to the institutionalisation of industrial finance, particularly term-finance. In short, the complex range of debt-equity ratios prevailing in the country is indeed a maze.

MDI Report

The MDI Report on the debt-equity ratio prepared by Dr. B. K. Madan is a journey through this maze. Requested by the Government to carry out a detailed study of the debt-equity ratio norms followed by the financial institutions, Government agencies and others and to make suitable recommendations, the MDI Report, though a one-man-show, has attempted a comprehensive analysis of the existing position in order to arrive at some recommendations. The MDI Report deals with the problem of debt-equity ratios as prevailing in the private sector of industry and as applied by the various authorities while considering the applications of entrepreneurs for

approval of the capital structure and pattern of financing. The method of enquiry followed is the questionnaire method supplemented by meetings for clarifications of points and issues, with various agencies. In the absence of any indication about the number of institutions, individuals, associations and Government agencies addressed by the MDI, it is difficult to know how complete is the coverage of the enquiry or the information received. This is, however, taken care of by the comprehensive data on company finances published by the Reserve Bank and other national level financial institutions, on which MDI Report draws heavily for its analysis.

The MDI Report consists of six chapters, the first is introductory and the last summarises the main conclusions and makes recommendations. The remaining four chapters deal with the subject of debt-equity ratio as such. Chapter 2 of the Report sets out the legal and operational basis of the debt-equity norm as indicated by the Capital Issues Control and as applied in a flexible and pragmatic manner by the financial institutions. It also deals with the evolution of these norms over the years since the late fifties and the impact of the second Five Year Plan and the MRTTP Act on the ratio. The over-all objective of the norm, as the Report points out, is to ensure a proper balance between borrowed funds and owned funds of an enterprise and to avoid the erosion of profitability due to disproportionate debt burden and thus enable the concern to service both the share capital and debt. Chapter 3 reviews and analyses the actual experience of the national and State level financial institutions in regard to the debt-equity ratio of the projects financed by them, so as to bring out the factors underlying the variations in the debt-equity ratio. This chapter of the Report gives a detailed account of debt-equity norms, as applied by the financial institutions, with reference to the industry, size of the project, whether the project is new or in the nature of expansion, diversification or modernisation or whether the project is located in a backward area. This is a factual analysis and is informative, though highly descriptive.

The Report surveys in chapter 4 the practice of industry generally with regard to debt-equity ratio as a relevant background for Chapter 5 which addresses itself to the major issues relating to debt-equity norm. As part of the background, Chapter 4 also reviews the developments in other related activity i.e. capital issues and the capital market. Accordingly, this chapter presents, in the first three sections, analyses of the trends in debt-equity ratio, trends in capital issues, project costs and sources of finance and the trends in the capital market. In the final section of this chapter the experience abroad in regard to debt-equity ratio is briefly indicated. In Chapter 5, the case for debt-equity ratio norms is considered in detail. The chapter starts with the rationale of the debt-equity ratio and, after considering the relative advantages of debt and equity, attempts to deal with such questions as : should there be a debt-equity norm ? Should the present norm be

altered? Could there be a multiple (i.e. industry-wise) debt-equity norm? Could we think in terms of such devices as moving debt-equity norm or gross debt-equity ratio? These various questions are discussed in depth so as to point out the difficulties in arriving at simple and straightforward answers. Towards the end of Chapter 5, the Report makes the important and interesting observation that no study dealing with debt-equity relationship should omit a reference to the long-term factors operating on the ratio and to the elements of climate for debt and equity which are relevant to the capital structure of an enterprise.

In the final chapter, i.e., Chapter 6, the main conclusions of the study together with the recommendations are presented in 29 paragraphs running over six pages. Considering that many of the points are interrelated, we present here only the more important ones. (i) The study has disclosed that the general debt-equity ratio norm of 2:1 has been in operation as a general guideline rather than as a rigid or inflexible rule, for assessing the capital structure of companies for purposes of increasing capital or for financial assistance. (ii) On the basis of facts there is hardly a case for upward shift of the norm. It is also not practicable or desirable to formulate a multiple norm varying according to industry. Nor is there any necessity at this stage to introduce new norms such as gross debt-equity etc. (iii) More attention to various inhibiting factors over and above the debt-equity norm, is desirable to achieve the same objective of affording a higher ratio. Thus, for instance, it is more difficult to comply with requirements of promoter's contribution than with the debt-equity ratio. In this situation a change in the debt-equity norm would be of no avail. Again, in the case of small-scale industries, their problems go well beyond the scope of debt-equity ratio. (iv) It is desirable, for the sake of uniformity of operation of the ratio and avoidance of differential treatment of a project by different agencies, that the definition and method of classification of debt followed by various agencies, are the same. (v) The Government should not look upon the problem of debt-equity ratio in isolation but in the context of totality of policies which aim at improving the methods of financing new investment in the private sector. Thus, for instance, an increase in institutional debt of the corporate sector should necessitate the initiation of remedial measures for the capital market. (vi) Finally, an in-depth study of the interest rate structure and also the corporate tax system can help in developing the market, rather than the institutions, into a more effective source of funds of the kind required.

MDI Report and After

Much water has flown under the bridge since the appearance of the MDI Report on debt-equity ratio in January 1978. The Indian capital market underwent significant changes since 1974-75 as a result of a series of policy measures taken by the Government and also due to the necessity for the capital market to adjust itself to challenges from its growing size and diversification.

The Government has, from time to time, taken steps to encourage new issue activity. It has also initiated measures to bring about a diversification in the availability of a range of financial assets both by improving the yield and other facilities. A variety of measures were instituted to widen the share ownership, such as issue of guidelines for listing of shares on stock exchanges and prescription of procedures for allotment in a public issue of shares. Starting with guidelines for issues of rights debentures in 1978, the Government has tried to make investments in debentures attractive in terms of yield, maturity and liquidity. Other important developments contributing to significant changes in the capital market have been : a considerable rise in the operations of financial institutions, tapping of non-resident funds for investment in shares and securities, dilution of equity under FERA and market innovations such as convertible debentures, etc.

The impact on the Indian capital market of the Government measures and the market innovations has been impressive. The role of the capital market has been both widened and strengthened. Capital raised by companies through issue of shares and debentures, which was stagnant around Rs. 100 crores a year during the sixties and up to late seventies has shown a spurt—the annual average for 1981 and 1982 being Rs. 340 crores. This quantitative growth is accompanied by qualitative changes in the capital market. Thus, for instance, the enlarged activity in the primary market encouraged the development of the secondary market as well. The quantitative growth of the capital market also reflects the increase in the capacity of investors to absorb large issues of securities of the private corporate sector. The over-all effect of the incentives to and innovations in the capital market has thus been to enhance the ability of the investors to bear risk.

There have also been interesting trends in the capital structure of the private corporate sector, as epitomised by the debt-equity ratio, since the publication of the MDI Report. Subsequent to 1974-75, up to which the MDI Report presents the data, there has been an upward shift in the debt-equity ratio. Computations based on RBI studies of company finances indicate that the debt-equity ratio in respect of 18 industry groups in the private sector, has been rising over the years in the case of many industry groups. Thus, the over-all debt-equity ratio for the 18 industry groups, which was 2.13 : 1 in 1974-75 rose to 2.84 : 1 in 1977-78 and remained around that level in 1980-81. The number of industry-groups in respect of which the debt-equity ratio was above the norm of 2 : 1 rose from 7 in 1974-75 to 8 in 1977-78 and further to 10 in 1980-81. This trend of general upward shift in debt-equity ratio has probably continued beyond 1980-81 (as the ratios could not be computed for want of time). The general upward shift in the debt-equity ratio since 1974-75 seems to have resulted from a combination of factors operating in the economy, particularly the industrial sector—the more important of these being inflation pushing up project cost, shift

towards capital-intensive projects and also projects involving high-level technology, policy changes move favourable to debentures and also the popularity of convertible debentures with the investing public.

Policy Issues

The MDI Report is good as far as it goes. But how relevant is it to the developments that have taken place and are taking place in the capital market and in the financing of industrial investment? The Report is well-documented and provides a good historical perspective but it contains little by way of prognosis. After a detailed discussion spread over four chapters, of the various aspects of debt-equity ratio, the Report ends up in making out a case for **status quo**, with some relaxations here and there. Thus, the Report could not mentally get out of the regulatory framework built over the decades in respect of the ratio; nor could it envisage a situation when we may have to do away with any ceiling on the ratio. The whole approach of the Report has been to take the ratio of 2 : 1 as given and build around this a case for a variety of considerations to be kept in view while dealing with the adjustments in the norm.

The norm of 2:1 was fixed some decades ago and it was fixed **only as a broad guideline**. To insist on strict adherence to this is neither desirable nor practicable. In reality, industry-wise or unit-wise debt-equity ratios far exceed the norms fixed and this is unavoidable, given the project costs, kind of technology used, the size as well as the capital intensive nature of the project and the availability of risk capital. Besides, a given debt-equity ratio is not a fixed quantity and it tends to decline over time as, otherwise, the project financed may not be regarded as viable. The financial viability of a project is reflected in the cash surpluses it generates and in the progressive liquidation of its debt obligations. It must be noted that debt ratio analysis is essentially a **static** analysis based on balance sheet, which itself is a static presentation of the financial conditions of an enterprise. These ratios do not indicate the "debt-worthiness" of a firm which lies in its ability to repay both principal and interest. In other words, a given debt-equity ratio, to be meaningful, should be viewed **not as a norm per se** but in relation to its debt-servicing ability.

The question is whether the debt-equity norm should operate as a constraint or as a supplement to risk capital. No doubt, the present norm is being applied in a flexible manner. However, given the need to step up investment for rapid industrialisation, the debt-equity norm should facilitate capital formation. The experience of quite a few leading companies shows that the current debt-equity norm is operating more as a constraint. Thus, Tata Steel, Gwalior Rayon, TELCO, ITC, ACC and other leading companies are unable to borrow, beyond a limit, purely on the basis of their present debt-equity ratios. This presents problems to growth-oriented com-

panies which have expansion and diversification plans. In the present context of the need to speed up industrialisation, a more liberal approach could be taken as regards the role of debt particularly in a situation where the flow of risk capital is not adequate in relation to requirement. On the basis of the facts, past experience and future needs of industrial investment, therefore, there is a case for a fresh approach to the problem of debt-equity ratio. The Seventh Plan targets for the private sector of industry call for substantial investment and this cannot be achieved entirely by internal accruals of the corporate sector. Again, the corporate sector cannot take advantage of the liberal economic and industrial policies initiated by the new Government recently, unless adequate financial resources become available.

The new approach to the question of debt-equity ratio should be in the direction of greater liberalisation of the ratio. This may be achieved not by relaxing or modifying the present norm but by evolving a new approach. The new approach indicated here has two aspects. The first is to have different debt-equity ratios for different industry groups, based on the type of technology generally used, the quantum of capital normally required, the gestation lag, its position in the industry (i.e. priority rating) and the viability of the project. Thus viewed there would be different norms for different industries, i.e., iron and steel, chemicals, paper, cement, shipping, cotton textiles, edible oils, sugar etc. There should be no difficulty in operating multiple ratios, as, in actual practice, there will be only one norm for each industry-group. These group norms could be suitably adjusted, if necessary, in the case of individual units within the industry-group. This is much better than having one norm on paper and making several exceptions.

The second aspect of the new approach suggested here is : should we have a ceiling at all ? This may sound radical but is more in line with the economic liberalism that is being enunciated by the new Government. Given the view that efficiency, productivity and economic costs and prices should characterise the production process, we are fully justified in extending these concepts to allocation of financial resources which is only a counterpart of the allocation of physical resources. Once this freedom is given, the performance of the corporate sector and its financial viability, both actual and potential, will be the major influences determining not only the balance between debt and equity but also the relative prices of debt and equity securities. Once this process comes into being, debt-equity would no longer be an administered ratio. In this context, the experience of U. S. and Japan is worth noting.

Liberalisation of the debt-equity ratio either in the form of higher ratios or in its radical aspect need not necessarily mean a lowering of promoters' stake or a greater demand for institutional debt. The capital market seems to have developed sufficient resilience to provide not only debt capital but

equity capital as well. The capacity of the Indian corporate sector to absorb large amounts of debt and equity also seems to be rising.

Some Minor Comments

It would have been much more enlightening and useful if the NBER Report had included all the 14 papers forming the project, instead of only the six selected papers. In that case we would have had a full picture of the role of debt in capital formation in the U. S. corporate sector. It is true that the introductory chapter by the editor refers to these 14 papers; but that is only a summary. Surprisingly, there is a printing error on page 16 in the second line of paragraph 1.2. The word "inflation" should have been "deflation", as every one knows that during 1930-32 there was no inflation at all.

The MDI Report makes a heavy reading as the drafting of the entire Report is too involved. Probably this could not be helped as the entire Report seems to be the work of one individual. In this Report also there is a printing error on page 52, paragraph 4.36 in the sixth sentence. It should be "over-loaning", and not "over-loading" as printed here, though it adds a sense of humour to the Japanese ratio ! It is a pity that the MDI Report fails to make a reference to three pioneering articles on debt-equity ratio. The first is the article entitled "Rationale of Debt-Equity Ratio" by M. J. Panicker published in *Industrial Researcher*, Vol. I. No. 1, April 1974, the second "Debt-Equity Mix" (two articles) published in the *Economic Times* (September, 1975) by R. M. Srivastava and the third entitled "Debt-Equity Ratio" published by the reviewer in the *Reserve Bank Staff Occasional Papers* Vol. I, No. 2, December 1976. This is pointed out just to remove the likely erroneous impression that the MDI Report is the first study of this subject.

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