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MACRO SHOCKS AND THE INDIAN ECONOMY: SOME RESULTS FROM A MACRO MODEL

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Macro Shocks and the Indian Economy:

Some Results from a Macro Model

1. Introduction:

The last decade and a half has witnessed a considerable interest in studying the stabilization policy responses and macro-adjustments by developing countries to various macro shocks, both external and internal (e.g., see Behrman and Hansen (1979), Coats and Khatkate (1980, Hansen (1980) Leff and Sato (1980) Cline and Weintraub (1981), Crockett (1981), Khan and Knight (1981, 1982), Ahmad (1986) and Khan (1987). To a large extent, this interest could be attributed to the series of macro shocks suffered by the developing countries during this period, the consequent dependence of many of them on external finance from an international organization like the International Monetary Fund and the "conditionality" associated with such external finance. These macro shocks ranged from the twin oil shocks of the '70s, the general increase in interest rates in the international capital market in the early '80s along with the associated external debt problem in Latin America, to the more recent fall in primary commodity prices and the tendency towards more protectionist trade policies by the developed countries.

Needless to emphasize, what should constitute a package of short-to-medium term policy responses by these countries to a given

macro shock depends crucially on what is perceived to be the effect of the shock, which, in turn, depends on the structure of the economy. Attempts to approximate the structure of these economies through the development of macroeconometric models and the simulation of these models to get an idea of the broad magnitude of the effect of a specified shock has, therefore, been a natural response by researchers in this area. Majority of these attempts have, however, been confied to Latin American countries with relatively fewer attempts at developing structural models for the Asian developing economies. It is against this background that the present paper attempts to model the structure of one of the developing economies in Asia, India, and then analyze the effects of a few selected macro shocks by simulating the model.

What kind of a model constitutes a "prototype" for developing economies has been a subject of controversy (see, Rao (1952), Taylor, (1979, 1981, and 1983), Crockett (1981), Porter and Ranney, (1982) Klein (1967) and Gordon (1985, 1987). Without going into the finer aspects of this controversy, but drawing upon some of the major themes that have emerged from this, in Section 2, the basic ingredients of what would constitute a proto-type macro model for an economy like India are presented firt and the important features of the empirical counterpart of this analyical proto type are discussed next. Section 3 analyses the short-to-medium term effects of introducing a few, purely hypothetical shocks to the model; in the form of changes in the

time-path of government expenditure and its financing package.Results from such standard, "text book" macro shocks help a great deal in understanding the overall structural properties of the model much more than a perusal of its individual regression equations. In section 4 the model is simulated for more concrete, real world macro shocks: the twin oil shocks of the '70s; In section 5 drawing upon the results of the earlier sections, what constitutes an appropriate stalization policy response and macro adjustment in the Indian context is discussed.

Econometric simulations of this type have come in for citicism following the by now well known paper by Lucas (1976). This is the criticism that the parameters of the structural equations of amacroeconmetric model are not independent of changes in the exogenous variables. Consequently, the effects of changes in exogenous variables on the endogenous variables computed from a model conditional on parametrs that are estimated from past data are bound to be in error. In other words, if parameters that are taken to be constant do change when an exogenous variable is changed, the estimated effects of the change are clearly in error. However, as Ando (1981) and Fair (1984) have pointed out, the key question for any given experiment with an econmetric model is the relative size of this error. Without in any way diminishing the importance of the Lucas criticism, it may be maintained that the relative size of this error may be much smaller then, say, errors that result from aggregation

(Fair, 1984). For that matter, even the best econometric model is only an approximation to the structure of an economy. The model and the simulation results presented here are no exceptions to this.

2. A Macro Model for India:

To go into the finer aspects of the longstanding controversy on what constitutes an appropriate macro model for a developing economy and how relevant the developemnt in macroeconomics in advanced countries would be largely beyond the scope of this paper. Instead, what is attempted here is to spell out the basic features of a prototype macro model for a developing country characterized by a singificant share of agriculture in real GDP side side a modern non-agricultural sector, substantial share of public investment in total investment, the pressence of administered interest rates and credit rationing in the credit market and high tariffs and quota restrictions on imports in the foreign trade sector. The following would appear to be the basic ingredients of modelling such an economy:

(i) A minimal disaggregation of the producton sectors in the economy into agriculture and non-agriculture to allow for differences in price-quantity adjustment mechanisms between the two sectors. Since agricultural productin in such an economy depend to a significant extent on exogenous factors such as monsoon and also because of the longer time and

larger costs involved in adjusting "acreage" under cultivation to realtive price changes, the supply function in agriculture is bound to be fairly steep in the short-to-medium term, if not fully vertical on the P-Y space.

(ii) In general, therefore, agricultural prices may be more flexible than non-agricultural prices. Consequently, in the agricultural sector, the initial effect of an increase in aggregate demand is felt on prices and only subsequently would output start adjusting through the familiar "supply response mechanism".

(iii) In the non-agricultural sector, with a variable cost-plus mark-up pricing, the response pattern would be the opposite: output changes first, prices respond subsequently. Prices start adjusting upwards because the increase in agricultural prices (engineered by the overall demand shift) raises the money wage rate in the non-agricultural sector and hence the cost of production.[1] This upward adjustment of non-agricultural prices would be strengthened if the initial increase in production and the consequent increase in capacity utilization raises the mark-up rate too.

(iv) For aggregate demand shifts to have a permanent effect on non-agricultural output, therefore, non-agricultural prices should rise less than proportionately to agricultural

prices. This is another way of saying that changes in aggregate demand should affect some relative price in the economy if it has to have real effects

(v) In modeling aggregate demand side of the economy, the consumption function should allow for differences in the marginal propensities to consume between the agricultural and the non-agricultural sectors and the effect, if any, of fiscal deficits and public debt on private consumption.[2]

(vi) In modeling private investment, availability of funds may have a more important role than the administered interest rate. In countries with a large curb market, the rate of interest in the curb market could still be utilized to estimate the user cost of capital. Furthermore, given the importance of public investment in these economies, whether public investment "crowds-out" or "crowds-in" private investment would be crucial in evaluating alternative fiscal policy packages.

(vii) Depending on whether one has a curb market in the model or not, the role of money supply and money demand would differ. One way the supply of money can affect the economy is by affecting the curb market rate of interest. For such a channel to be operative, the curb market should be responsive to excess demand in the organized money market. Then a conventional LM specification can be obtained which

would define an equilibrium relationship between the curb market interest rate and the money supply for a given level of output (or sectoral outputs). If the curb market is not incorporated, one may use the money market equilibrium condition to determine the general price level but then one has to ensure that the general price level obtained from the monetary equation is consistent with the general price level that can be obtained from the two sectoral prices.

(viii) Regarding imports, some distinction between competitive and complementary imports may be relevant since the two components may have singificantly different effects on the economy. What component of imports constitute competitive and what component is complementary would differ significantly across countries depending on each country's endowment. Moreover, the extent of the foreign exchange constraint on imports and how the available foreign exchange is allocated across alternative imports could also differ substantially across economies. Hence the treatment of imports could be highly country specific. Similarly, the treatment of exports would be fairly country-specific, depending on each country's market share in world exports, the nature of the domestic market, etc.

In specifying and estimating the model that is used here, an attempt is made to keep the structure of the model as close as

possible to the prototype specification presented above. However, this does not mean that the model actually estimated is a replica of the prototype analytical model. It is well known that during this transition from a prototype analytical model to its actual empirical counterpart, several modifications are introduced.

Most of these modifications are forced upon the modelers by the sheer difficulties in getting estimated structural equations as close as possible to the ones in the theoretical prototype. Considerable "data mining" takes place at this stage because, however "tight" the theoretical model is, at best it only provides a broad guidance in the specification and estimation of the model. That is, the prototype model helps to choose the set of variables that should appear with non-zero coefficients in each equation and in certain cases the signs of these coefficients too. This has been the traditional role of theory in specification of empirical models; much less often is theory used to decide things like functional forms and the lengths of lag distributions (Fair 1984). Keeping these in mind, all that is attempted in estimating the model for India is to keep the central message of the prototype analytical model in its empirical counterpart. The complete model is given in Annexure 1, the estimated equations in Annnexure II and the notations in Annexure III.

Results of interest and importance in the estimated individual structural equations are many but the following deserve special mention.

(i) the effect of public investment on private investment

(ii) the effect of public savings on private savings, and

(iii) the role of credit availability in determining non-agricultural real GDP.

The effect of public investment on private investment has been a source of controversy in India. Some have argued that irrespective of its financing method, public investment crowds-in private investment because it increases the profitability of private investment (Sundarrajan and Takkur (1980), Krishnamurti (1983) and Bhattacharya (1984)).

Such a view of crowding-in effect implies two things: First, it means that the private sector views public investment to be complementary to its investment. Secondly, it implies the existence of considerable unrealized savings potential that could be exploited by increased public investment. Put together, it implies some type of a super-Keneysian effect of public investment on aggregate GDP: public investment as an "engine of growth". Since the issue is of considerable importance for analyzing fiscal policy effects, it is worth probing the issue a little further.

With this view, we disaggregate public investment into: investment in construction and machinery and equipment and include them as arguments in the two private investment functions in the model - one for construction and the other for machinery and equipment. The

rationale behind this disaggregation is that public investment in construction could be mostly "infrastructural" in nature and hence may be complementary to at least some private investment, whereas public investment in machinery would be mostly competitive to private investment.

The estimated private investment functions, which are versions of the modified Jorgenson-type investment function used by Sundarajan and Thakur (1980), indicate quite a substantial difference in the effect of the two types of public investment on private investment. First of all, public investment in machinery has a strong crowding-out effect on private investment: for every one rupee increase in real public investment in machinery, private machinery investment falls by about 0.45 rupee in the short-run and by about 0.71 rupee in the long run (i.e., when the adjustment is complete with a mean lag of about one and half years). However public investment in construction (a proxy for infrastructural investment), has two counterveiling effects: on the one hand, it has a strong crowding-out effect on private investment in construction: for every one rupee increase in real public investment in construction, private investment in construction would decrease by 0.5 rupee in the short run and by a full 1 rupee in the long run, the mean lag therefore being of about 2 years. On the other hand, it has significant crowding-in effects on private investment in machinery, of about 0.47 rupee in the short run and of about 0.75 rupee in the long run. On balance, therefore, a

rupee increase in public investment in construction has a long run crowdin-out effect of about 0.25 rupee on total private investment.

Thus the effect of public investment on private investment appears to depend crucially on the composition of public investment. At present roughly 55 percent of public investment goes for investment in construction and the rest for investment in machinery. Holding this ratio constant, for every one rupee increase in public investment, private investment would fall by about 0.22 rupee in the short run and by about 0.44 rupee in the long run.

To some extent, the croding-out effect of public investment in machinery could be due to the operation of the import control regime. Take an extreme case in which the capacity of the domestic capital goods industry is fully utilized. Let the total imports of capital goods (ie., public sector plus private sector) be constrained by the availability of foreign exchange and the imports of domestically produced capital goods are not allowed to be imported. Under these conditions, if the government imports more of capital goods and hence invests more in machinery and equipment, the private sector has to import less and hence reduce its investment in machinery and equipment. Consequently, crowding-out need not be complete but partial crowding-out could still take place, as is happening in the reported private machinery investment function.

Once again, the crowding-out effect in the case of construction investment could aslo be explained by a specific feature of the Indian

economy. Besides labor which is abundent in the economy, two most important phsycial imports required for investment in construction are steel and cement. Both these commodities were subject to extensive price controls and rationed quantity allocations by the government. Except for short periods of time, both these commodities were at short supply. The total investment in construction would, therefore, be mostly constrained by the availability of these imputs. Once again, under these circumstances, if the public sector invests more, the private sector is forced to invest less in construction -- an effect very similar to the one operating in the case of machinery investment.

The crowding-in effect of public investment in construction on private investment in machinery perhaps reflects the infrastructural nature of public construction investment. Note that under the extreme case of full capacity utilization in the domestic capital goods industry, such a complementarity effect of public construction investment on private machienry investment cannot be explained. For, afterall for such complementarity effects to be operative, private sector should be able to increase its investment in equipment without enchroaching upon public investment in machinery. Some slack in the domestic capital goods industry has to, therefore, exist for both the less than full crowding-out effect of public investment in machinery and the "crowding-in" effect of public investment in construction on private machinery investment.

Some crowding-out effects of public sector savings (consumption)

on private savings (consumption) is found in the estimated household savings function. Non-household savings (i.e., the sum of government, corporate sand foreign savings) appears to have a significant negative effect on private household savings (of about -0.6 rupee for a rupee of non-household savings). This indicates partial substitutability between household and non-household savings. However, the household savings function is not very robust to variations in the sample period as also the choice of independent variables. Hence, the results on household's perception of non-household savings should be treated as fairly tentative but does cast some doubts on the efficacy of fiscal policy in shifting aggregate demand in the typically Keynesian manner.[3]

That brings us to the effect of changes in government expenditure but accompanied by base money creation. Such a fiscal action is more expansionary in the model because, it is accompanied by an increase in the availability of commercial bank credit to the private sector. But how much would the response of real output to this expansionary policy would depend upon the movement of relative sectoral prices, in particular that of non-agricultural prices relative to agricultural price. The larger an aggregate demand shift depresses the relative price of non-agriculture to agriculture, the larger would such a shift be accompanied by changes in real output in the non-agricultural sector.

In contrast to a base money financed case, an increase in government expenditure financed by government borrowings from the

commercial banks (through, say, by raising the statutory liquidity requirements on commercial banks) has two off-setting effects on real output in the non-agricultural sector. On the one hand, the increase in aggregate demand generated by the government expenditure hike has an expansionary effect. But, on the other hand, more government borrowing from commercial banks leaves less commercial bank credit to the private sector, thus, adversely affecting availability of working capital and output. What would be the final effect on real output would depend upon which one of these two effects dominates the other.

Before the model is put to "work", ie., used to analyze the effects of exogenous shocks, a limitation of it may be worth mentioning. It does not explicitly model the labor market. The labor market adjustments, especially the response of nominal wages to prices and of non-agricultural prices to wages is implicit in the model. For the non-agricultural sector, this adjustment is implicit in the adjustment of non-agricultural prices to agricultural prices. In some sense, therefore, the adjustment of non-agricultural prices to agricultural prices in this model plays the same role as the adjustment of nominal wages to the price level in the conventional one-sector AD-AS models. This way of incorporating the wage-adjustment story is certainly less desirable than incorporating an explicit labor market, but unavoidable because of the paucity of reliable wage and employment data for the Indian economy. Moreover, since the bulk of private employment is in the form of self employment

the reward for which contains both a wage component and a profit component, the indirect way of capturing the wage-price adjustment story is almost unavoidable.

3. Fiscal Policy Simulations:

This section presents the results of simulating the model for a few hypothetical fiscal policy changes: a once-and-for all increase in the ratio of government nominal investment expenditure to nominal GDP, but financed by three methods, via, borrowings from the Reserve Bank of India (base money creation), borrowings from the commercial banks, and (iii) borrowings from the external sector. The increase in govnerment investment expenditure is of the order of 2 percent of base run GDP values. Over the last few years, the ratio of government investment to GDP has averaged about 13 percent per year. In effect, this shock basically implies that in the counterfactural simulation, government investment expenditure is about 15 percent above that in the base simulation.

3.1 Increased Government Investment, Financed by Reserve Bank Credit:

Table 1 presents the effects on selected macro variables of an increase in government investment, financed by borrowings from the Reserve Bank.

Table 1

Government Investment up by 2 percent of GDP
Financed by Reserve Bank Credit
(percentage deviations from the base run)

Year	First	Second	Third	Fourth	Average for Four Years
GDP					
Aggregate	0.5	1.0	1.2	1.4	1.03
Agriculture	0.0	0.2	0.5	0.7	0.35
Manufacturing	0.7	1.6	2.0	2.1	1.60
Transport	1.5	2.4	2.4	2.5	2.20
Others	0.8	1.2	1.4	1.5	1.22
Prices					
Overall	1.5	5.1	7.5	8.9	5.75
Agriculture	2.8	8.5	12.4	14.2	9.47
Manufacturing	0.7	3.0	5.3	7.0	4.00
Transport	0.6	1.8	1.5	1.0	1.20
Others	1.3	4.7	7.2	8.7	5.47
Foreign Trade					
Trade Deficit	0.3	0.4	0.2	0.2	0.27
Imports	0.4	1.2	2.0	2.7	1.57
Exports	0.5	1.9	3.7	5.2	2.80

On an average, under this fiscal scenario, aggregate GDP would be higher by about one percent per year but the general price level would be higher by about 6 percent per year. The sharp increase in the general price level is the result of financing the extra investment by base-money creation. During the four-year period after this shock is introduced, money supply is up by about 7.5 percent per year. Non-agricultural prices, on the whole, rise less than proportionately to the agricultural price. After about 4 years of the shock, the relative price of agriculture is up by about 5 percent and stabilizes there. The increase in domestic prices puts an upward pressure on the volume of imports. This is re-inforced by the upward pressure on imports exerted by the increase in non-agricultural production. The value of imports, therefore, goes up. The increase in domestic prices has a downward effect on the volume of exports but the nominal value of exports go up, because of the less than unitary price elasticity of Indian exports. The balance of trade, therefore, does not get much affected, since the increases in the value of imports and exports largely offset each other.

3.2 Increased Government Expenditure, Financed by Commercial Bank Credit

Under this fiscal expansion, money supply is held constant and the increased government investment is financed by additional

borrowings from the commercial banks. The increase in public investment leads to an increase in aggregate demand, which should have an expansionary effect on real GDP. But as mentioned in the previous section, since money supply and total domestic credit is held constant, the additional government borrowings from the commercial banks leaves less commercial bank credit to the private sector, adversely affecting availability of working capital and hence non-agricultural output. This shock, therefore, has the combined features of an expansionary aggregate demand shift and a contractionary supply shift in the non-agricultural sector. The latter effect seems to dominate the former. Consequently, non-agricultural output falls leading to a fall in real GDP; on an average, during the four years after the shock, real GDP would be lower by about 2 percent per year. (see table 2). Given the constancy of money supply, the fall in real GDP leads to an increase in prices.

Table 2

Government Investment up by 2 percent of GDP Financed by Commercial Bank Credit (percentage deviations from the base run)

Year	First	Second	Third	Fourth	Average for four years
GDP					
Aggregate	-0.29	-1.05	-2.25	-3.74	-1.83
Agriculture	0.00	0.03	0.08	0.14	0.06
Manufacturing	-0.25	-0.71	-2.20	-4.21	-1.84
Transport	-2.34	-5.49	-8.85	-12.53	-7.30
Others	0.18	-1.29	-3.04	-5.18	-2.42
Prices					
Overall	0.18	0.75	1.75	3.10	1.45
Agriculture	0.54	1.35	2.52	3.86	2.07
Manufacturing	-0.04	0.23	0.80	1.58	0.64
Transport	-0.02	0.29	0.81	1.41	0.62
Others	-0.03	0.58	1.71	3.29	1.40
Foreign Trade					
Trade Deficit	-0.32	-1.23	-3.14	-5.90	-2.65
Imports	-0.12	-0.44	-1.18	-2.23	-1.02
Exports	0.04	0.21	0.58	1.12	0.49

On imports, there are two offsetting effects: the increase in domestic prices should have an upward effect on the volume of imports, but the fall in real GDP in the non-agricultural sector puts a downward pressure. The latter effect dominates to yield a fall in imports. There is a marginal increase in the nominal value of exports reflecting the less than unitary volume response to a price change. The net effect of these is to yield a lower trade deficit.

The results of this simulation should be interpreted with a lot of caution. It is tempting to reverse the logic of this simulation and argue that if the government keeps its expenditure, total money supply and domestic credit constant but lets the commercial bank credit to the private sector expand at a fast rate, the economy would have the twin benefits of a higher real GDP and lower prices, followed of course by a worsening trade balance. Within a certain range, this result may follow but once the non-agricultural sector hits its full-capacity output, credit constraint would no more operate. Expanding credit supply to the private sector, then would not "buy" higher output but only lead to increased prices. These constraints are difficult to be included in the estimated equations of an econometric model but can be handled while simulating the model.

3.3 Increased Government Investment, Financed by External Borrowings

Increased government investment financed by external borrowings has a fairly straightforward effect on the economy. (see table 3). Real GDP is up by about 0.9 percent per year. Given that the supply of money is constant, this leads to a fall in prices. On the foreign trade front, since non-agricultural GDP goes up, the volume of imports goes up, which dominates the reduction in imports induced by the marginal reduction in domestic prices. The inelastic nature of exports is shown up by the fall in nominal exports accompanying a fall in domestic prices. Increased imports and reduced exports re-inforce each other to lead to a deterioration in the trade deficit.

3.4 Government Investment Simulations in a Nutshell:

Table 4 brings out the crucial differences in the short-to-medium term macro effects of the three alternative methods of financing increased government investment in India.

Table 3

Government Investment up by 2 percent of GDP Financed by External Borrowings (percentage deviations from the base run)

Year	First	Second	Third	Fourth	Average for four years
GDP					
Aggregate	0.48	0.84	1.01	1.10	0.86
Agriculture	0.00	0.00	-0.02	-0.01	-0.01
Manufacturing	0.68	1.67	2.03	2.13	1.63
Transport	0.90	1.08	1.17	1.25	1.10
Others	0.77	1.23	1.48	1.62	1.27
Prices					
Overall	-0.30	-0.66	-0.85	-0.96	-0.69
Agriculture	-0.04	-0.32	-0.42	-0.40	-0.29
Manufacturing	-0.29	-0.52	-0.69	-0.84	-0.58
Transport	-0.37	-0.58	-0.61	-0.61	-0.54
Others	-0.49	-1.02	-1.33	-2.55	-1.09
Foreign Trade					
Trade Deficit	0.71	1.82	2.70	3.28	2.13
Imports	0.25	0.69	1.08	1.37	0.85
Exports	-0.10	-0.24	-0.37	-0.47	-0.29

Table 4

Macro Effects of Increased Government Expenditure Under Alternative Financing Method (Percentage deviations from the base run) (Average of Four Years)

Variable	Financed By		
	Reserve Bank Credit	Commercial Bank Credit	External Borrowings
GDP	1.03	-1.83	0.86
The General Price Level	5.75	1.45	-0.69
Trade Deficit	0.27	-2.65	2.13

From the point of view of gain in real GDP, financing the additional government investment by base money creation appears to be most desirable; on an average, real GDP would be up by about 1 percent per year. However, this method of financing has the highest inflationary effect, raising the general price level by about 6 percent per year.

Financing the extra government investment by external borrowings has the least inflationary effect on the economy. In fact, under this mode of financing, prices would be marginally falling. Real GDP would also be up by approximately 0.9 percent per year. However, this mode of financing appears to be the least desirable from the point of view of balance of trade; trade deficit would be higher by about 2.1 percent per year.

The method of financing which has the largest favorable effect on the balance of trade is borrowings from the commercial banks: balance of trade improves by about 2.7 percent per year. However this favorable effect on trade balance would be bought at substantial reduction in real GDP: real GDP would be lower by slightly less than 2 percent per year.

Thus it appears that the government has to consider the various trade-offs between gain in real GDP, hike in prices and the effect on trade balance when it decides on how to finance increases in government investment. Base money creation, which has the largest

positive effect on real GDP has also got the highest inflationary pressure. External borrowing which has a deflationary effect on prices, has the largest adverse effect on trade balance. Borrowing from commercial banks which has the most favorable effect on balance of trade has the least desirable effect on real GDP. Stabilization policy adjustments to exogenous shocks have to consider these conflicting effects on macro variables of alternative methods of financing.

4. Simulations on Oil Shocks:

Two of the most important exogenous shocks experienced by the economy were the two well known oil shocks of the '70s. It is interesting to put the model to work to analyse the effects of these oil shocks and then drawing upon the fiscal simulations of the earlier section to see what fiscal adjustment appears to be most desirable, when the economy is faced with supply-shocks like the oil price changes.

First the oil shock simulations. The counterfactual simulations for the oil shocks are set up as follows. In these simulations, the international price of fuel imports is kept at its pre-shock level. Then, the domestic price index of fuel, power and light, which is the key price which gets affected by changes in the international price of oil is adjusted downwards to keep its proportionality with the international price of oil. One is still left with a number of other

prices, which are treated as exogenous in the model, say, for example, prices of fertilizer, cement and coal to name a few. Changes in the domestic price of oil has substantial "direct and indirect," input-output effects on these three basic input prices in the economy. To incorporate these direct and indirect effects of oil price changes on these basic input prices, we first computed the elasticity of these prices with respect to the domestic price of oil from an input-output table of the Indian economy given in Ahmed and Stern (1982). Applying these elasticities and the maintained reduction in the domestic price of oil these exogenous prices in the model were adjusted downwards. Nominal government expenditure remains the same both in the base simulation and the no-oil shock, counterfactural simulation. Given the structure of the model, this should contribute to the favourable effect of the no-oil shock scenario. Neither has any adjustment made to the external borrowings receipts of the government. Also, all import prices other than that of fuel imports, as well as the index of world export prices were kept unchanged from their historical values. Broadly speaking, therefore, the set up of the oil shock simulations that is reported here is comparable to the oil shock simulations through macroeconometric models reported in Mork (1981).

The effects of the first oil shock on the major macro variables are given in Table 5. Briefly, if the first oil shock had not occured, the Indian economy would have gained both in the form of a higher GDP and lower prices. Between 1973 and 1977, real GDP would

TABLE 5

EFFECT OF THE FIRST OIL SHOCK
(Percentage deviation from the base run)

VARIABLE	1973	1974	1975	1976	1977	AVERAGE 1973-77
GDP						
Aggregate	0.67	4.47	6.39	7.27	7.61	5.28
Agriculture	0.68	5.60	5.95	5.34	4.99	4.51
Manufacturing	0.42	3.61	9.17	12.02	12.74	7.59
Transport	2.55	10.37	12.32	13.64	13.66	10.51
Others	0.47	2.76	5.17	7.04	8.20	4.72
PRICES						
Overall	-1.55	-5.60	-6.99	-7.44	-8.12	-5.94
Agriculture	-0.73	-2.52	-2.04	-0.85	-0.91	-1.41
Manufacturing	-3.34	-11.21	-14.31	-15.23	-15.40	-11.30
Transport	-5.89	-20.28	-21.82	-23.18	-23.96	-19.03
Others	-1.50	-5.56	-8.47	-10.08	-11.52	-7.37
Balance of Trade	-46.17	-54.64	-49.99	-88.88	-90.34	-65.99
Imports	-9.21	-24.32	-24.42	-27.67	-25.11	-22.14

have been higher by approximately 5.3 percent per year and prices lower by about 5.8 percent per year. Not surprisingly, trade deficit would have been much lower. Note that before the first oil shock, Indian petroleum imports were a moderate sum of Rs. 200 crores, constituting about 10 percent of merchandise imports. In 1973-74 it more than doubled to Rs. 560 crores and by 1974-75 it reached about Rs. 1200 crores, constituting about 25 percent of imports.

Understandably, the oil shock re-inforced the adverse effects on real GDP originating from a modest monsoon-failure in 1974-75. Consequently, real GDP grew by less than a percent in 1974-75, down from about 5 percent growth achieved in 1973-74. In 1974-75, agricultural GDP fell by 1.7 percent.

Among the different sectors, the loss in real GDP due to the oil shock must have been the maximum for the transport sector. In India, roughly 29 percent of the total consumption of oil goes for final household consumption. The remaining 71 percent is shared by the three production sectors: transport sector (56 percent), agriculture (10 percent) and manufacturing (5 percent). Considering this pattern of oil-use, the result that the transport sector was the most hard hit by the oil shock appears highly plausible.

Most of the adverse effects of the first oil shock works itself out in the four years of 1973-1976. By 1976 the economy settles down with a lower real GDP and higher prices. During the next two years the Indian economy performed very well by historical standards; real

TABLE 6

EFFECT OF THE SECOND OIL SHOCK
(Percentage deviation from the base run)

VARIABLE	1979	1980	1981	1982	1983	AVERAGE 1979-83
GDP						
Aggregate	0.04	2.47	4.30	5.58	5.92	3.66
Agriculture	-0.36	2.55	3.34	3.62	3.14	2.46
Manufacturing	0.14	3.17	6.77	9.23	9.82	5.83
Transport	1.44	5.78	9.23	10.83	11.51	7.76
Others	0.15	1.64	3.59	5.37	6.59	3.47
PRICES						
Overall	-0.94	-4.22	-7.14	-8.68	-9.16	-6.03
Agriculture	0.22	-1.49	-2.15	-1.92	-0.50	-1.11
Manufacturing	-2.51	-8.04	-13.12	-15.78	-17.41	-11.37
Transport	-5.11	-15.69	-21.78	-22.55	-23.48	-17.72
Others	-0.92	-4.09	-7.77	-10.46	-12.26	-7.1
Balance of Trade	-57.45	-64.06	-56.04	-39.35	-20.00	-47.38
Imports	-14.25	-24.10	-24.48	-19.83	-13.22	-19.18

GDP grew by about 9 percent in 1977-78 and by another 6 percent in 1978-79. The inflation rate during these two years was one of the lowest in the full decade of the '70s. The current account deficit caused by the first oil shock had been wiped out and, in fact, due to the large (and perhaps unexpected) remittances from Indians abroad, the country had the luxury of running a modest current account surplus. However, once again, the economy was subject to the second oil shock. By the end of 1979, the international price of oil was more than doubled from about US $13 per barrel to US $30 per barrel at a time when the economy was already subject to another monsoon failure in mid 1979. Not only did this time the monsoon failure preceed the oil shock, (unlike in the case of the first oil shock where the oil shock preceded the monsoon failure) but the monsoon failure was of a larger intensity than in 1974-75. For example, in 1974-75, the index of rainfall fell by only about 11 percent but in 1979-80, it fell by about 31 percent. It is against this background that the effects of the second oil shock, given in Table 6, should be interpreted.

The effects of the second oil shock are broadly similar to that of the first. On an average, if the second oil shock had not occured, real GDP would have been higher by about 3.7 percent per year for the years 1979 to 1983 and overall prices would have been lower by about 6 percent. Once again, as in the case of the first oil shock, the percentage gain in GDP would have been the largest in the transport sector. On the trade front, trade deficit would have been

approximately 47 percent lower.

5. Appropriate Stabilization Policy Responses:

What would constitute the basic ingredients of a stabilization policy response in a developing country like India when the economy is hit by an external supply shock like the oil shock? Should the government respond by a contractionary fiscal and monetary policy? Or would such policies lead to worst of both worlds -- lower output and higher prices, as feared by some structuralist macroeconomists? The simulation results presented in the previous two sections help us address these issues.

First of all, it is fairly clear from the simulation results of the last two sections that the natural stabilization policy response to an external supply shock like the oil price hike of the '70s is one of cutting down government expenditure and the growth of base money. No doubt, such a fiscal response would reduce real GDP somewhat but the reduction in prices that it would achieve appears to be enough of a compensation for the loss in GDP. For example, if, following the oil shocks, the government cut down its expenditures by about 10 to 15 percent and let the growth of base money also fall, the adverse effect of the oil shock on inflation would have been almost wholly avoided, although some sectoral price inflation would have still persisted. The reduction in real GDP following such a policy would have been quite marginal: about 1 percent. Neither would it have aggravated

the trade deficit significantly. Fiscal-monetary contraction would, therefore, appear to be quite an appropriate stabilization policy response to an adverse external supply shock.

Care should, however, be taken to see that the fiscal-monetary contraction does not put too much brake on the availability of commercial bank credit to the private sector. For, quite often, in the name of measures to combat an adverse supply shock, governments may have a tendency to reduce the availability of bank credit to the private sector. A common way it is done in India is by raising the statutory liquidity ratio on commercial banks, i.e., the proportion of commercial bank funds that is statutorily required to be invested in government bonds. Mostly, the reason given for such an action is that it is "aimed at providing resources for public sector investment without excessive creation of reserve money" [Government of India (1987)]. The dangers of such policies are illustrated by the simulation results on commercial bank financed increases in government expenditure. By providing increased commercial bank credit for public investment, the availability of credit for the private sector is hit hard. The latter could have a contractionary effect on output which would more than offset the positive effect of the extra public investment on output.

Judged against our simulation results, it is interesting to note that immediately following the first oil shock, the government in fact reduced the rate of growth of base money substantially from about 12

percent and 21 percent in 1972-73 respectively to 4.6 percent in 1974-75 and further down to 2.7 percent in 1975-76. This was achieved partly by a reduced budgetary reliance on base money creation (deficit financing) and partly by other monetary policy measures such as an increase in the Bank Rate and the cash reserve ratio on commercial banks. Deficit financing as a percentage of the stock of base money was brought down from about 22 percent and 16 percent respectively in 1971-72 and 1972-73 to 13 percent in 1973-74 and further down to 9.5 percent in 1974-75 and -2 percent in 1975-76. The cash reserve ratio of commercial banks was raised from 3 percent in 1972-73 to 5 percent in 1973-74 and was maintained at this higher level in 1974-75 too. The fiscal-monetary response to the combined supply shocks of the 1974 monsoon failure and the first oil shock, therefore, was broadly in the right direction. In addition to these domestic fiscal-monetary responses, the real exchange rate also depreciated from 1974 onward, by about 7 percent in 1975 and by about 11 percent in 1976 (see Ahluwalia (1986).

The same cannot, however, be said about the fiscal-monetary response to the combined supply shocks of the 1979 monsoon failure and the second oil shock. In 1978-79, deficit financing as a percentage of the stock of base money was about 16 percent, which remained the same in 1979-80 and, in fact, increased to above 20 percent in the subsequent two years. Consequently, the rate of growth of base money was maintained at a fairly high level of about 18 percent per year

both in 1979-80 and 1980-81. Only in 1981-82 and 1982-83 was this rate brought down to about 8 percent and 10 percent respectively, along with an increase in the cash reserve ratio on commercial banks from 6 percent to 7 percent. Added to these, the real exchange rate, if anything, appreciated this time, by about 8 percent in 1980. It is, therefore, generally believed that India's stabilization policy adjustment to the second oil shock was not as smooth as it was to the first oil shock.

There are, however, certain less known aspects of India's policy response and macroeconomic adjustment to the second oil shock which need to be mentioned. First, the government's perception of the shock and secondly the discovery of substantial off shore oil reserves just about the time the second oil shock occurred. With the OPEC raising the oil price substantially for a second time within less than a decade, future hikes in the oil price were perhaps thought to be more a rule than an exception. After the second oil shock, oil shocks were, therefore, perceived to be a permanent feature than just temporary shocks. More than just stabilization policy adjustments, such permanent shocks would require adjustments aimed at making the economy less dependent on imported oil from a more long run perspective. Increasing investment in oil exploration was, therefore, given top priority. Substantial potential for off shore oil reserves were already discovered by the end of the '70s. India, therefore, concentrated more on longer-term adjustments than on stabilization

policy following the second oil shock. Between 1979-80 and 1984-85, domestic off shore oil production increased more than five-fold: from less than 5 million tonnes in 1979-80 to about 20 million tonnes in 1984-85. Consequently, imports of crude oil which constituted about 60 percent of the domestic consumption consistently fell to about 33 percent by 1986-87. But by 1985-86, with the international oil price plummeting, one was wondering whether the long-term adjustment of raising domestic oil production was somewhat misplaced. The answer to this question could very well be a "no" if the OPEC raises the international price of oil, which it is already threatening to do.

Notes

[1] Labor markets in developing countries are supposed to be more imperfect than their developed country counterparts (see Turnham and Jaeger (1970), Sen (1975), Ahmed and Stern (1985), Fields (1986), Lucas (1986) and Richardson (1986). For a number of reasons, the money wage in the modern sector, including the public sector in these economies may not be highly responsive to excess supply in the overall labor market (see Gordon (1987)). These labor market considerations would make one believe that the aggregate supply curve in the non-agricultural sector would be somewhat flatter than that in a developed economy like the U-S. As against this, the mark-up rate in the on-agricultural sector, especially in the manufacturing sector may be responsive to the rate at which the capital stock is utilized. Thus, in a developing economy, even if a wage rate induced trade-off between output and prices may be less important, a mark-up induced trade-off may be quite important (see Madhur and Roy (1986)). The pronounced procyclicalty of the mark-up rate in Indian Industry was in accord with such a characterization.

[2] Most time series evidence for the Asian developing economies appears to suggest that some version of the Keynesian absolute income hypothesis provides a better approximation to the consumption-savings behaviour than the life-cycle or the permanent income theory (see Mikesell and Zinzer (1973), Laumas and Laumas (1976), Fry (1978) and Krishnamuri and Saibaba (1983). To a large extent, the lack of a well developed capital market in some of these economies and hence the difficulty in adjusting present consumption to expected future incomes may explain this result. In a more recent study, employing a disaggregated version of the error-correction model of consumption, Dowling and Lahiri (1986) find some support to the presence of substantial differences in the marginal propensities to consume between the agricultural and the non-agricultural sectors in a set of Asian economies, the mpc of the agricultural sector being larger than that of the non-agricultural sector.

[3] More recently, I have tried to test whether the total fiscal deficit (rather than just public savings), defined as expenditure less tax and non-tax revenues, has any effect on private household savings. Regression results were quite sensitive to sample period selection. For example, when the savings functin is estimated from 1960 to 1985, fiscal deficit does not carry any significant effect on private savings. For more recent period, say, 1970 to 1985, it carries a signficant negative effect (lending support to the conventional Keynesian view (and against the debt-neutrality

hypothesis) that fiscal deficits lower private savings but do alter the coefficient values of the income variables substantially. Thus the effect of fiscal variables on private savings/consumption should be treated as highly tentative at the present stage.

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ANNEXURE I

THE MODEL

Monetary Sector

1. Bank Reserves to Deposit Ratio

BRADRA = 0.0231831 + 0.0027858 * SCRRA - 0.0026205 * SBVBNK + 0.0226462 * DM77 + 0.5912602 * BRADRA(-1)

2. Currency to Deposit Ratio

CURADR = 0.1821845 - 0.0214656 * TD12RA + 0.8743703 * CURADR(-1)

3. Money Supply

M3AM = (1 + CURADR)/(CURADR + BRADRA) * HPMAV

4. Aggregate Commercial Bank Credit

CBCTA = -25.315488 + 1.0821731 * (1/(CURADR + BRADRA)) * HPMAV

5. Commercial Bank Credit to the Comercial Sector

CBCCSA = CBCCTR * CBCTA

6. Commercial Bank Credit to the Government Sector

CBCGA = CBCTA - CBCCSA

7. High Powered Money

HPMAV = 331.19249 + 0.3944134 * HPM31 + 0.5664159 * HPM31(-1)

8. High Powered Money at the end of the Year

HPM31 = HPGOV + RBFE31 + HPOTH

9. RBI's Net Foreign Exchange Reserves

RBFE31 = FER + FERES

10. RBI's Net Credit to the Government

HPGOV = HPGOV(-1) + DFIN

Fiscal Sector

11. Deficit Financing

DFIN = GTOTCU - SGA - SGN - NEXMBT - DSMLR * IMPDPC - DBOR1 - JINK + STKPUC

12. Gross Capital Formation - Public Sector

```
GTOTCU = 366.62532 + 0.8012396 * PLOUT * (NGDPDE / NGDPDE(-1))
```

13. Nominal Public Investment in Construction

```
GDFCCU = 0.55 * GTOTCU
```

14. Nominal Public Investment in Machinery

```
GDFCMU = GTOTCU - GDFCCU
```

15. Savings of Government Administrative Departments

```
SGA = TD + TI + TPR + TM - GINT - GINTF - GSUB - TRD - TRTOF
      - GCCOM + GCWG * BETWG - J11
```

16. Government 's Wage Bill

```
GCWG = WGPUTT * (EMPPU/100)
```

17. Direct Tax Revenue

```
TD = TDPI + TDCORP + TDLR + TDOTH
```

18. Indirect Tax Revenue

```
TI = TIDOM + TIIMP + TIEXP + TIOTH
```

19. Implicit Indirect Tax Rate

```
TIRTE = (TI - GSUB) / (NGDPFC * NGDPDE)
```

20. Exice Tax Rate

```
TAXR = 0.0173248 + 0.3815368 * TIRTE
```

21. Personal Income Tax Revenue

```
TDPI = EXP(-3.6030934 + 0.3216827 * DMEMER + 0.8989368 *
       LOG(GDPSK2 * IMPSC2 + GDPMGK * IMPMFG + GINFK1 * PINF1)
       + 0.3316119 * LOG(WTPRAT))
```

22. Corporate Income Tax Revenue

```
TDCORP = EXP(-6.4343288 + 1.0334009 * LOG(GDPSK2 * IMPSC2 +
         GDPMGK * IMPMFG + GINFK1 * PINF1) + 0.6671954 * LOG(CORPRT)
```

23. Domestic Indirect tax Revenue

```
TIDOM = -635.82078 + 0.0297184 * (NGDPAG * PAG) + 0.1759608 *
        (GDPSK2 * IMPSC2 + GDPMGK * IMPMFG + GINFK1 * PINF1)
```

24. Import Tax Revenue

```
TIIMP = TIMFL + TIMRAW + TIMMTP + J5
```

25. Tax Revenue from Raw Materials Imports

```
TIMRAW = NMTRAW * MRAWK * FMRAWU
```

26. Tax Revenue from Machinery Imports

```
TIMMTP = NMTMTP * MMTPK * FMMTPU
```

27. Import Tax revenue from Oil Imports

```
TIMFL = TXFL * MMFLC * FMMFLU
```

28. Export Tax Revenue

```
TIEXP = 52.0257 + 0.0079358 * FXTOTV
```

29. Miscellaneous Revenue Receipts

```
TM = 10.500389 + 0.003313 * (NGDPFC * NGDPDE)
```

30. Government's Interest Payments on Domestic Debt

```
GINT = GINTR * GB(-1)
```

31. Government's Interest Payments on Foreign Debt

```
GINTF = GINTFR * GBF(-1)
```

32. Government's Domestic Borrowings (Other than Small Savings)

```
DBOR1 = (CBCGA - CBCGA(-1)) + DBRT1
```

33. Government's Domestic Stock of Debt

```
GB =  GB(-1) +  DBOR1 + DSMLR * IMPDPC + DGBO1
```

34. Government's Foreign Stock of Debt

```
GBF = GBF(-1) + NEXMBT + JF
```

35. Receipts from Small Savings

```
DSMLR = 87.458355 + 0.0365344* SVHHNK + 3922.7257 *
        (GINTR - (TD12RA/100)) + 0.73231022 * DSMLR(-1)
```

36. Wages from the Public Sector

```
WGPUTT= EXP(1.9045563 + 0.3234092 * LOG(IMPDPC) + 0.757798 *
        LOG(WGPUTT(-1)))
```

Real Sector : Outputs

37. Foodgrains Output

```
AQTFG = -73154.728  + 522.73532 * RAIN + 3481.7651 * AAIN +
        12305.521 * (PAG(-1)/WPIFLZ)
```

38. Sugarcane Output

```
AQSC = -26321.856 + 68.15348 * AISC + 171.94719 * RAIN
```

39. GDP from Agriculture

```
NGDPAG = 2106.8394 + 0.1128825 * AQTFG + 0.0149665 * AQSC
         + 0.0312625 * COTJUT
```

40. GDP from MAnufacturing

```
GDPMGK = 434.00168 + 0.0546181 * ETOTK + 0.0473350 * (CBCCSA/NGDPDE)
         - 10429.356 * (STKPVC(-1)/(NGDPDE(-1) * NGDPFC(-1)))
         + 1480.3005 * CUELL + 0.5147159 * GDPMGK(-1)
```

41. Potential GDP from Manufacturing Sector

```
GDMGKP = 2760.1727 + 0.0897663 * KSTKTT(-1)
```

42. GDP from Transport

```
GDTPTK = 1234.4539 + 0.0304568 * EDOMK + 0.1030714 * (CBCCSA / NGDPDE)
         + 945.84063 * CUCLZ - 968.46806 * (IMPTPT/NGDPDE)
```

43. GDP from Other Sectors

```
GDPSK2 = 1947.2012 + 0.1479979 * ETOTK + 0.1121740 * (CBCCSA / NGDPDE)
         - 2109.7704 * (IMPSC2/NGDPDE) + 0.4698444 * GDPSK2(-1)
```

44. Aggregate Real GDP

```
NGDPFC = NGDPAG + GDPMGK +  GINFK1 + GDTPTK + GDPSK2
```

Real Sector : Savings, Investment and Aggregate Demand

45. Household Savings Function

```
SVHHNK = -2418.6743 - 0.6401301 * (SAVOTK + SAVOTK(-1))/2 +
         0.1122547 * YADK + 0.3174396 * YNDK
```

46. Real Disposable Income, Agriculture

```
YADK = (NGDPAG * PAG - TDLR - DEPAGC) / IMPDPC
```

47. Real Disposable Income, Non-Agriculture

```
YNDK = YDMPK - YADK
```

Non-Household Savings

```
SAVOTK = ((SGA + SGN + SVPVN)/IMPDPC) + SFKCD
```

48. Aggregate Disposable Real Income

```
YDMPK = (NGDPFC * NGDPDE - DEPC + NFIFAB - TD - TPR - SGN - TM
        + GINT + TRD + TRF - (SVPVN - SVFCN)) / IMPDPC
```

49. Private Corporate Savings

```
SVPVN = - 316.1603 + 0.0237328 * (GDPSK2 * IMPSC2 + GDPMGK * IMPMFG
        + GINFK1 * PINF1) + 0.5351887 * SVPVN(-1)
```

50. Real Private Investment

```
NGDFKF = GDFKMV + GDFKCV
```

51. Investment in Machinery - Private Sector

```
GDFKMV = - 482.72843 + 0.0578338 * NGDPFC + 0.4739468 * (GDFCCU/CODEF)
         - 0.4527120 * (GDFCMU/MEDEF) - 1032.1918 * (MEDEF/NGDPDE)
         + 0.4030900 * MMTPK + 0.3647324 * GDFKMV(-1)
```

52. Investment in Construction - Private Sector

```
GDFKCV = 1632.4429 - 0.5 * (GDFCCU/CODEF) +0.0625011 * NGDPFC
         -1938.4426 * (CODEF/NGDPDE) + 0.4969351 * GDFKCV(-1)
```

53. Investment Deflator - Machinery

```
MEDEF = -0.0063905 + 0.7746101 * IMPMFG + 0.0596695 *
        (FMMTPU * (1 + NMTMTP)) + 0.1405362 * MEDEF(-1)
```

54. Investment Deflator - Construction

```
CODEF = -0.0503308 + 0.5363839 * WPISTL + 0.1529802 * WPICEM
        + 0.3736047 * CODEF(-1)
```

55. Cummulative Gross Fixed Investment

```
KSTKTT = KSTKTT(-1) + GDFKMV + (GDFCMU/MEDEF)
```

56. Aggregare Real Expenditure, Domestic

```
EDOMK =  ETOTK - ((FXTOTV - FXADJ) / NGDPDE)
```

57. Aggreagte Real Expenditure

```
ETOTK = (IMPDPC * (YDMPK - SVHHNK + PCJNK) + GCCOM + GCWG * BETWG
        + GDFKMV * MEDEF + GDFKCV * CODEF + GDFCMU + GDFCCU
        + FXTOTV + FXADJ)/NGDPDE
```

58. Change in Private Stocks

```
STKPVC = NGDPFC * NGDPDE +  TI-GSUB - ETOTK * NGDPDE + FMTOTV
         + FMAD - STKPUC - DISCR
```

Real Sector : Prices

59. GDP Deflator

```
NGDPDE = EXP(1.0436899 + 0.6234324 * LOG (M3AM) - 0.6234324
         * LOG (NGDPFC) - 0.0118323 * PNOCBO + 0.4068676 * INF
         + 0.5203214 * LOG(NGDPDE(-1)))
```

60. Relative Price of Agriculture

```
PA  = NGDPDE * (0.4433783 - 0.00002583 * NGDPAG + 0.000004336
      * EDOMK - 0.00006068 * RMCER(-1) + 0.8074325
      * (PAG(-1) / NGDPDE(-1)))
```

61. Implicit Price Deflator for Manufacturing

```
IMPMF  = - 0.8062221 + 0.2756484 * PAG(-1) + 0.1384781 * WPIMF
         + 0.9393631 * (((GDPMGK/GDMGKP) + (GDPMGK(-1)/GDMGKP(
         + 0.5761821 * IMPMFG(-1)
```

62. Implicit Price Deflator for Transport

```
IMPTP  = 0.5488544 + 0.2385703 * WPIMFL + 0.1292637 * WPICL
```

63. Implicit Price Deflator for Services

```
IMPS2 = -0.0078265 + 0.4100068 * IMPMFG + 0.1577081 * PAG +
        0.0507520 * WPIMFL + 0.4012461 * IMPSC2(-1)
```

64. Implicit Price Deflator, Agriculture (adjusted)

```
PAG = PA * (NGDPDE / GDDEFL)
```

65. Implicit Price Defaltor, Manufacturing (adjusted)

```
IMPMFG = IMPMF * (NGDPDE / GDDEFL)
```

66. Implicit Price Deflator, Transport (adjusted)

```
IMPTPT = IMPTP * (NGDPDE / GDDEFL)
```

67. Implicit Price Deflator, Services (adjusted)

```
IMPSC2 = IMPS2 * (NGDPDE / GDDEFL)
```

68. GDP Deflator (unadjusted)

```
GDDEFL = (GINFK1 * PINF1 + NGDPAG * PA + IMPMF * GDPMGK +
         GDTPTK * IMPTP + GDPSK2 * IMPS2) / NGDPFC
```

69. Implicit Price Deflator for Private Consumption

```
IMPDPC = EXP (-0.0673052 + 0.9434690 * LOG(NGDPDE * (1 + TIRTI
```

70. WPI Other Than Fuel

```
WPNFFL = -0.1099174 + 0.8212872 * IMPMFG + 0.2846058 * PAG
```

71. WPI Raw Materials

```
WPIRAW = - 0.1115802 + 0.7346003 * IMPMFG + 0.3539790 * PAG
```

72. Unit Value of Non-Mineral Exports

```
FXNMFU = 0.016974 + 0.5058333 * WPNFFL + 0.5315788 * FXNMFU(-1)
```

73. Wholesale Price Index

```
WPIALL = -0.0731245 + 0.36241 *PAG + 0.6037221 * IMPMFG
         + 0.0911611 * WPIMFL
```

74. Expected Inflation

```
INFZ = - 0.051609 - 0.0008638 * (LOG(NGDPDE(-1)) - LOG(NGDPDE(-2)))
       - 0.380806 *(LOG(NGDPDE(-2)) - LOG(NGDPDE(-3))) + 3.742509 * TAX
       - 0.412637 * (FSTOCK(-1) / (NPOP(-1)/10))
```

Foreign Trade Sector

75. Balance of Trade

```
BOT = FXTOTV - FMTOTV
```

76. Aggregated Merchandise Exports

```
FXTOTV = XTOTK * FXNMFU  + FXMFLV
```

77. Aggregated Merchandise Imports

```
FMTOTV = (RMCER * FMCERU) + (MMFLC * FMMFLU) + (MRAWK * FMRAWU)
         + (MMTPK * FMMTPU) + MFDJMP
```

78. Exports except Minerals

```
XTOTK = 526.21352 - 873.85829 * (FXNMFU/WLDXIN) + 24.40198 * GDPWLD
```

79. Fuel Imports

```
MMFLC = -43.997722 + 0.0112905 * CPP - 0.0084516 * QPETCR
        + 0.4111819 * MMFLC(-1)
```

80. Demand for Petroleum Products

```
CPP = -603506.60 + 0.1108574 * NGDPFC - 2388.2184 * (WPIMFL/WPICL)
      + 309.28088 * ZTIME + 0.6729556 * CPP(-1)
```

81. Raw Material Imports

```
MRAWK = 56.665707 + 0.1041792 * GDPMGK - 309.59477 *
        ((FMRAWU * (1+NMTRAW))/WPIRAW) + 0.8348948 * MRAWK(-1)
```

ANNEXURE II

ESTIMATED EQUATIONS

BANK RESERVES TO DEPOSIT RATIO

SMPL 1952 - 1984
33 Observations
LS // Dependent Variable is BRADRA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0231831	0.0066360	3.4935475	0.002
BCRRA	0.0027858	0.0015018	1.8550154	0.074
BBVBNK	-0.0026205	0.0010177	-2.5748811	0.016
DM77	0.0226462	0.0062905	3.6000723	0.001
BRADRA(-1)	0.5912602	0.0764220	7.7367765	0.000

R-squared	0.911960	Mean of dependent var	0.083478
Adjusted R-squared	0.899383	S.D. of dependent var	0.021173
S.E. of regression	0.006716	Sum of squared resid	0.001263
Durbin-Watson stat	1.995976	F-statistic	72.50975
Log likelihood	120.9831		

CURRENCY TO DEPOSIT RATIO

SMPL 1952 - 1984
33 Observations
LS // Dependent Variable is CURADR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1821845	0.0948377	1.9210142	0.064
TD12RA	-0.0214656	0.0101310	-2.1188038	0.042
CURADR(-1)	0.8743703	0.0516065	16.943010	0.000

R-squared	0.988632	Mean of dependent var	0.783521
Adjusted R-squared	0.987874	S.D. of dependent var	0.375432
S.E. of regression	0.041341	Sum of squared resid	0.051272
Durbin-Watson stat	1.407751	F-statistic	1304.533
Log likelihood	59.88234		

AGGREGATE COMMERCIAL BANK CREDIT

SMPL 1952 - 1984
33 Observations
LS // Dependent Variable is CBCTA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-25.315488	103.61329	-0.2443267	0.809
AGGDEP	1.0821731	0.0043328	249.76199	0.000

R-squared	0.999503	Mean of dependent var	15412.21
Adjusted R-squared	0.999487	S.D. of dependent var	21097.15
S.E. of regression	477.7103	Sum of squared resid	7074420.
Durbin-Watson stat	0.568620	F-statistic	62381.05
Log likelihood	-249.3705		

HIGH POWERED MONEY

SMPL 1971 - 1984
14 Observations
LS // Dependent Variable is HPMAV

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	331.19249	173.97334	1.9036968	0.083
HPM31	0.3944134	0.0818563	4.8183616	0.001
HPM31(-1)	0.5664159	0.0993535	5.7010162	0.000

R-squared	0.998721	Mean of dependent var	13737.86
Adjusted R-squared	0.998488	S.D. of dependent var	7953.436
S.E. of regression	309.2417	Sum of squared resid	1051934.
Durbin-Watson stat	1.554664	F-statistic	4294.089
Log likelihood	-98.45473		

GOVERNMENT EXPENDITURE
SMPL 1970 - 1984
15 Observations
LS // Dependent Variable is GTOTCU

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	366.62532	173.24640	2.1162075	0.054
PLOUT	0.8012396	0.0119987	66.777210	0.000

R-squared	0.997093	Mean of dependent var	9767.453
Adjusted R-squared	0.996870	S.D. of dependent var	6989.535
S.E. of regression	391.0677	Sum of squared resid	1988141.
Durbin-Watson stat	1.564531	F-statistic	4459.196
Log likelihood	-109.7440		

EXCISE TAX RATE
SMPL 1970 - 1984
15 Observations
LS // Dependent Variable is TAXR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0173248	0.0100202	1.7289745	0.107
TIRTE	0.3815367	0.0863360	4.4192056	0.001

R-squared	0.600361	Mean of dependent var	0.061371
Adjusted R-squared	0.569620	S.D. of dependent var	0.006090
S.E. of regression	0.003995	Sum of squared resid	0.000208
Durbin-Watson stat	1.569924	F-statistic	19.52938
Log likelihood	62.62910		

PERSONAL INCOME TAX REVENUE

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is LTDPI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.6030934	0.3832635	-9.4010865	0.000
LGPNAG	0.8989368	0.0245692	36.587888	0.000
DMEMER	0.3216827	0.0752245	4.2763043	0.000
LWTPRA	0.3816119	0.0937041	3.5389249	0.002

R-squared	0.986156	Mean of dependent var	6.415291
Adjusted R-squared	0.984179	S.D. of dependent var	0.800562
S.E. of regression	0.100697	Sum of squared resid	0.212937
Durbin-Watson stat	0.798716	F-statistic	498.6489
Log likelihood	24.09699		

CORPORATE INCOME TAX REVENUE

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is LTDCOR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-6.4343288	1.0459646	-6.1515742	0.000
LGPNAG	1.0334009	0.0362789	28.484864	0.000
LCORPR	0.6671954	0.2551567	2.6148462	0.017

R-squared	0.977296	Mean of dependent var	6.274407
Adjusted R-squared	0.975025	S.D. of dependent var	0.813889
S.E. of regression	0.128622	Sum of squared resid	0.330874
Durbin-Watson stat	1.065020	F-statistic	430.4437
Log likelihood	16.14181		

DOMESTIC INDIRECT TAX REVENUE

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is TIDOM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-635.82078	121.95437	-5.2135956	0.000
GDPAGC	0.0297184	0.0150077	1.9802141	0.060
GDPNAG	0.1759608	0.0066930	26.290252	0.000

R-squared	0.999109	Mean of dependent var	7147.960
Adjusted R-squared	0.999028	S.D. of dependent var	6687.020
S.E. of regression	208.4344	Sum of squared resid	955787.9
Durbin-Watson stat	1.618041	F-statistic	12340.16
Log likelihood	-167.3662		

EXPORT TAX REVENUE

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is TIEXP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	52.025700	13.953622	3.7284728	0.001
FXTOTV	0.0079358	0.0031634	2.5086615	0.020

R-squared	0.222433	Mean of dependent var	78.96667
Adjusted R-squared	0.187089	S.D. of dependent var	48.40856
S.E. of regression	43.64592	Sum of squared resid	41909.25
Durbin-Watson stat	0.512996	F-statistic	6.293882
Log likelihood	-123.6370		

MISCELLANEOUS REVENUE RECEIPTS

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is TM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	10.500389	18.742514	0.5602444	0.581
GDPFCC	0.0038130	0.0002295	14.433401	0.000

R-squared	0.900572	Mean of dependent var	224.5600
Adjusted R-squared	0.896249	S.D. of dependent var	177.8902
S.E. of regression	57.29915	Sum of squared resid	75513.43
Durbin-Watson stat	1.322219	F-statistic	208.3231
Log likelihood	-135.6383		

RECEIPTS FROM SMALL SAVINGS

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is DSMLR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	87.458355	52.867999	1.6542778	0.114
SVHHNK	0.0365344	0.0094551	3.8640001	0.001
INTDIF	3922.7257	1396.2378	2.8094967	0.011
DSMLR(-1)	0.7323022	0.1307155	5.6022618	0.000

R-squared	0.936686	Mean of dependent var	304.5027
Adjusted R-squared	0.926689	S.D. of dependent var	202.8528
S.E. of regression	54.92450	Sum of squared resid	57317.30
Durbin-Watson stat	2.256007	F-statistic	93.69693
Log likelihood	-122.5755		

WAGES FROM PUBLIC SECTOR

SMPL 1962 - 1983
22 Observations
LS // Dependent Variable is LWGPUT

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.9045563	0.4669065	4.0790955	0.001
LIMFDF	0.3234092	0.0730527	4.4270643	0.000
LWGPUT(-1)	0.7577980	0.0618859	12.245078	0.000

R-squared	0.998075	Mean of dependent var	7.942803
Adjusted R-squared	0.997873	S.D. of dependent var	0.563535
S.E. of regression	0.025991	Sum of squared resid	0.012835
Durbin-Watson stat	1.575829	F-statistic	4926.552
Log likelihood	50.69598		

FOODGRAINS OUTPUT

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is AQTFG

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-73154.728	12241.725	-5.9758514	0.000
RAIN	522.73532	71.758019	7.2846955	0.000
AAIN	3481.7651	157.76524	22.069278	0.000
RLPAGL	12305.521	6574.2200	1.8717842	0.077

R-squared	0.965824	Mean of dependent var	102510.3
Adjusted R-squared	0.960428	S.D. of dependent var	19316.47
S.E. of regression	3842.563	Sum of squared resid	2.81D+08
Durbin-Watson stat	2.417777	F-statistic	178.9836
Log likelihood	-220.2780		

SUGARCANE OUTPUT

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is AQSC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-26321.814	13066.979	-2.0143764	0.058
AISC	68.153462	3.4758014	19.607985	0.000
RAIN	171.94715	111.98312	1.5354738	0.140

R-squared	0.952173	Mean of dependent var	131961.0
Adjusted R-squared	0.947390	S.D. of dependent var	27867.16
S.E. of regression	6391.842	Sum of squared resid	8.17D+08
Durbin-Watson stat	1.695705	F-statistic	199.0865
Log likelihood	-232.5722		

GDP FROM AGRICULTURE

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is NGDPAG

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2106.8394	395.36042	5.3289082	0.000
AQTFG	0.1128825	0.0056204	20.084462	0.000
AQSC	0.0149665	0.0040942	3.6555256	0.001
CDTJUT	0.0312625	0.0201347	1.5526685	0.135

R-squared	0.992083	Mean of dependent var	16734.68
Adjusted R-squared	0.990953	S.D. of dependent var	2992.380
S.E. of regression	284.6297	Sum of squared resid	1701295.
Durbin-Watson stat	1.010340	F-statistic	877.2254
Log likelihood	-174.5738		

GDP FROM MANUFACTURING

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is GDPMGK

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	434.00200	422.71589	1.0266990	0.318
ETOTK	0.0546181	0.0174720	3.1260395	0.006
CRK	0.0473351	0.0356218	1.3288229	0.201
STKGDP(-1)	-10429.357	3867.3208	-2.6967912	0.015
CUELL	1480.3002	614.69603	2.4081824	0.027
GDPMGK(-1)	0.5147158	0.0946483	5.4381948	0.000

R-squared	0.995923	Mean of dependent var	6055.917
Adjusted R-squared	0.994791	S.D. of dependent var	1788.871
S.E. of regression	129.1130	Sum of squared resid	300062.9
Durbin-Watson stat	2.416049	F-statistic	879.4312
Log likelihood	-147.2588		

Potential GDP from the Manufacturing Sector

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is GDMGKP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2760.1727	115.04228	23.992679	0.000
KSTKTT(-1)	0.0897663	0.0023651	37.955250	0.000

R-squared	0.984285	Mean of dependent var	6605.794
Adjusted R-squared	0.983602	S.D. of dependent var	2127.558
S.E. of regression	272.4430	Sum of squared resid	1707180.
Durbin-Watson stat	0.840918	F-statistic	1440.601
Log likelihood	-174.6169		

GDP FROM TRANSPORT

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is GDTPTK

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1234.4539	333.98686	3.6961153	0.001
EDOMK	0.0304568	0.0069214	4.4003787	0.000
CRK	0.1030714	0.0136687	7.5407101	0.000
CUCLZ	945.84063	211.19798	4.4784550	0.000
RLTPT	-968.46806	186.66037	-5.1883968	0.000

R-squared	0.997529	Mean of dependent var	2360.320
Adjusted R-squared	0.997035	S.D. of dependent var	1005.673
S.E. of regression	54.76328	Sum of squared resid	59980.33
Durbin-Watson stat	1.890036	F-statistic	2018.422
Log likelihood	-1[illegible]		

GDP FROM OTHER SECTORS

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is GDPSK2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1947.2012	2403.4862	0.8101570	0.428
ETOTK	0.1479979	0.0320271	4.6210253	0.000
CRK	0.1121740	0.0752617	1.4904534	0.153
RLPSC2	-2109.7704	2005.3384	-1.0520770	0.306
GDPSK2(-1)	0.4698444	0.1519966	3.0911503	0.006

R-squared	0.998937	Mean of dependent var	14028.46
Adjusted R-squared	0.998713	S.D. of dependent var	4482.906
S.E. of regression	160.7923	Sum of squared resid	491229.0
Durbin-Watson stat	1.242290	F-statistic	4464.727
Log likelihood	-153.1739		

HOUSEHOLD SAVINGS FUNCTION

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is SVHHNK

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG
C	-2413.6751	1075.9092	-2.2430290	0.036
YADK	0.1122548	0.0866101	1.2960943	0.210
SAVDT2	-0.6401208	0.2776344	-2.3056576	0.032
YNDK	0.3174306	0.0329545	9.6326620	0.000

R-squared	0.974297	Mean of dependent var	4789.283
Adjusted R-squared	0.970441	S.D. of dependent var	2638.64[illegible]
S.E. of regression	453.6545	Sum of squared resid	4116049
Durbin-Watson stat	1.625650	F-statistic	252.7031
Log likelihood	-178.6827		

PRIVATE CORPORATE SAVINGS

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is SVPVN

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	38.325496	54.327346	0.6134203	0.546
GDPNAG	0.0049403	0.0022298	2.2155843	0.038
SVPVN(-1)	0.5426470	0.2048445	2.6490681	0.015

R-squared	0.841073	Mean of dependent var	468.9583
Adjusted R-squared	0.825937	S.D. of dependent var	407.9876
S.E. of regression	170.2161	Sum of squared resid	608443.9
Durbin-Watson stat	1.569665	F-statistic	55.56790
Log likelihood	-155.7418		

INVESTMENT I.. MACHINERY - PRIVATE SECTOR

SMPL 1957 - 1982
26 Observations
LS // Dependent Variable is GDFKMV

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-482.72852	422.26536	-1.1431876	0.267
NGDPFC	0.0578338	0.0116961	4.9447011	0.000
GDFKCU	0.4739468	0.1116310	4.2456557	0.000
GDFKMU	-0.4527120	0.1148560	-3.9415627	0.001
RLMEDF	-1032.1917	411.26112	-2.5098207	0.021
MMTFK	0.4030900	0.1622053	2.4850604	0.022
GDFKMV(-1)	0.3647324	0.0858890	4.2465553	0.000

R-squared	0.977840	Mean of dependent var	1784.490
Adjusted R-squared	0.970841	S.D. of dependent var	686.6081
S.E. of regression	117.2443	Sum of squared resid	261178.2
Durbin-Watson stat	1.967164	F-statistic	139.7304
Log likelihood	-156.6856		

INVESTMENT IN CONSTRUCTION - PRIVATE SECTOR

SMPL 1957 - 1982
26 Observations
LS // Dependent Variable is (GDFKCV - 0.5 * GDFKCU)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1632.4429	427.81010	3.8158120	0.001
NGDPFC	0.0625011	0.0115432	5.4145488	0.000
RLCODF	-1938.4426	580.13449	-3.3413677	0.003
GDFKCV(-1)	0.4969351	0.1213906	4.0936874	0.000

R-squared	0.948278	Mean of dependent var	2746.190
Adjusted R-squared	0.941225	S.D. of dependent var	801.1717
S.E. of regression	194.2321	Sum of squared resid	829974.6
Durbin-Watson stat	1.394774	F-statistic	134.4509
Log likelihood	-171.7161		

INVESTMENT DEFLATOR - MACHINERY

SMPL 1960 - 1983
23 Observations
LS // Dependent Variable is MEDEF

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0063905	0.0216549	-0.2951064	0.771
IMPMFG	0.7746101	0.0971479	7.9735098	0.000
MMTPUA	0.0596685	0.0163929	3.6399675	0.002
MEDEF(-1)	0.1405362	0.1001753	1.4029029	0.177

R-squared	0.996852	Mean of dependent var	1.332239
Adjusted R-squared	0.996355	S.D. of dependent var	0.704515
S.E. of regression	0.042536	Sum of squared resid	0.034378
Durbin-Watson stat	1.438755	F-statistic	2005.352
Log likelihood	42.18163		

INVESTMENT DEFLATOR - CONSTRUCTION

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is CODEF

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0503308	0.0121299	-4.1493023	0.000
WPISTL	0.5363839	0.0546312	9.8182769	0.000
WPICEM	0.1529802	0.0571684	2.6759577	0.015
CODEF(-1)	0.3736047	0.0832401	4.4882769	0.000

R-squared	0.999283	Mean of dependent var	1.553355
Adjusted R-squared	0.999176	S.D. of dependent var	1.044733
S.E. of regression	0.029993	Sum of squared resid	0.017992
Durbin-Watson stat	1.354393	F-statistic	9295.370
Log likelihood	52.29634		

GDP DEFLATOR

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is LGDPDE

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.0436899	0.1904285	5.4807458	0.000
LMNGNP	0.6234324	0.1084315	5.7495531	0.000
INFZ	0.4068676	0.1862473	2.1845562	0.041
PNOCBO	-0.0118323	0.0029504	-4.0103875	0.001
LGDPDE(-1)	0.5203214	0.0899662	5.7835184	0.000

R-squared	0.997008	Mean of dependent var	0.221879
Adjusted R-squared	0.996409	S.D. of dependent var	0.536340
S.E. of regression	0.032140	Sum of squared resid	0.020660
Durbin-Watson stat	2.123153	F-statistic	1665.847
Log likelihood	53.25708		

RELATIVE PRICE OF AGRICULTURE

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is RLPAG

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4433783	0.1273017	3.4828945	0.002
NGDPAG	-2.583D-05	9.647D-06	-2.6768856	0.014
EDOMK	4.336D-06	2.292D-06	1.8918133	0.073
RMCER(-1)	-6.068D-05	5.534D-05	-1.0965021	0.286
RLPAG(-1)	0.8074325	0.1229321	6.5681170	0.000

R-squared	0.799824	Mean of dependent var	0.969727
Adjusted R-squared	0.759788	S.D. of dependent var	0.070033
S.E. of regression	0.034324	Sum of squared resid	0.023563
Durbin-Watson stat	1.887746	F-statistic	19.97796
Log likelihood	51.61342		

IMPLICIT PRICE DEFLATOR FOR MANUFACTURING

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is IMPMF

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.8062221	1.3234850	-0.6091660	0.550
PAG(-1)	0.2756484	0.1164879	2.3663273	0.029
WPIMFL	0.1384781	0.0677869	2.0428449	0.055
IMCU2A	0.9390631	1.4043411	0.6688995	0.512
IMPMF(-1)	0.5761821	0.2046444	2.8155285	0.011

R-squared	0.994017	Mean of dependent var	1.524172
Adjusted R-squared	0.992757	S.D. of dependent var	0.820463
S.E. of regression	0.069825	Sum of squared resid	0.092636
Durbin-Watson stat	1.564059	F-statistic	789.1433
Log likelihood	32.63111		

IMPLICIT PRICE DEFLATOR FOR TRANSPORT

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is IMPTP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.5488544	0.0451951	12.144107	0.000
WPIMFL	0.2385703	0.0689068	3.4622163	0.002
WPICL	0.1292637	0.0685672	1.8852127	0.073

R-squared	0.958142	Mean of dependent var	1.313334
Adjusted R-squared	0.954337	S.D. of dependent var	0.625951
S.E. of regression	0.133759	Sum of squared resid	0.393614
Durbin-Watson stat	0.535388	F-statistic	251.7936
Log likelihood	16.41730		

IMPLICIT PRICE DEFLATOR FOR SERVICES

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is IMPS2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0078265	0.0102159	-0.7661036	0.453
IMPMFG	0.4100068	0.0473115	8.6661180	0.000
PAG	0.1577081	0.0228020	6.9164135	0.000
WPIMFL	0.0507520	0.0119104	4.2611704	0.000
IMPS2(-1)	0.4012461	0.0292737	13.706726	0.000

R-squared	0.999843	Mean of dependent var	1.511732
Adjusted R-squared	0.999810	S.D. of dependent var	0.823721
S.E. of regression	0.011365	Sum of squared resid	0.002454
Durbin-Watson stat	2.558614	F-statistic	30200.24
Log likelihood	76.20178		

IMPLICIT PRICE DEFLATOR FOR PRIVATE CONSUMPTION

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is LIMPDP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0673052	0.0045819	-14.689247	0.000
LPMARK	0.9434689	0.0072862	129.48631	0.000

R-squared	0.998630	Mean of dependent var	0.233971
Adjusted R-squared	0.998571	S.D. of dependent var	0.522009
S.E. of regression	0.019736	Sum of squared resid	0.008959
Durbin-Watson stat	1.246519	F-statistic	16766.70
Log likelihood	63.70141		

WPI OTHER THAN FUEL

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is WPNFFL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.1099174	0.0231669	-4.7445931	0.000
IMPMFG	0.8212872	0.0575242	14.277252	0.000
PAG	0.2846058	0.0717549	3.9663575	0.001

R-squared	0.997547	Mean of dependent var	1.500123
Adjusted R-squared	0.997324	S.D. of dependent var	0.861584
S.E. of regression	0.044570	Sum of squared resid	0.043703
Durbin-Watson stat	1.921603	F-statistic	4473.252
Log likelihood	43.89178		

WPI RAW MATERIALS

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is WPIRAW

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.1115802	0.0167350	-6.6674592	0.000
IMPMFG	0.7346003	0.0415537	17.678336	0.000
PAG	0.3539790	0.0518336	6.8291445	0.000

R-squared	0.998638	Mean of dependent var	1.463852
Adjusted R-squared	0.998514	S.D. of dependent var	0.835133
S.E. of regression	0.032196	Sum of squared resid	0.022805
Durbin-Watson stat	1.970773	F-statistic	8062.979
Log likelihood	52.02224		

UNIT VALUE INDEX OF NON-MINERAL EXPORTS

SMPL 1960 - 1981
22 Observations
LS // Dependent Variable is FXNMFU

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0169740	0.0799481	0.2123123	0.834
WPNFFL	0.5058333	0.1561217	3.2399948	0.004
FXNMFU(-1)	0.5315788	0.1693906	3.1381835	0.005

R-squared	0.945076	Mean of dependent var	1.313810
Adjusted R-squared	0.939295	S.D. of dependent var	0.662327
S.E. of regression	0.163187	Sum of squared resid	0.505970
Durbin-Watson stat	2.025713	F-statistic	163.4671
Log likelihood	10.27888		

WHOLESALE PRICE INDEX

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is WPIALL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0731245	0.0209257	-3.4944860	0.002
PAG	0.3624100	0.0463839	7.8122602	0.000
IMPMFG	0.6037221	0.0774203	7.7979792	0.000
WPIMFL	0.0911611	0.0252920	3.6043446	0.002

R-squared	0.999346	Mean of dependent var	1.514720
Adjusted R-squared	0.999253	S.D. of dependent var	0.883393
S.E. of regression	0.024152	Sum of squared resid	0.012250
Durbin-Watson stat	2.147511	F-statistic	10695.50
Log likelihood	59.79048		

EXPECTED INFLATION

SMPL 1953 - 1983
31 Observations
LS // Dependent Variable is INFZ

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0516090	0.0274780	-1.8781450	0.105
LNGDP1	-8.6380E-4	0.1805330	-4.7850E-3	0.911
LNGDP2	-0.3808060	0.1965870	-1.9370860	0.512
TAXR	3.7425090	1.1122350	3.3648520	0.002
PCFG(-1)	-0.4126370	0.1957530	-2.1079400	0.002

R-squared	0.427971	Mean of dependent var	0.044576
Adjusted R-squared	0.339966	S.D. of dependent var	0.048119
S.E. of regression	0.048159	Sum of squared resid	0.060303
Durbin-Watson stat	1.970502	F-statistic	4.863081
Log likelihood	61.68404		

EXPORTS EXCEPT MINERAL

SMPL 1957 - 1981
25 Observations
LS // Dependent Variable is XTOTK

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	526.21352	349.74484	1.5045641	0.147
RLXNMF	-873.85829	402.34278	-2.1719249	0.041
GDPWLD	24.401980	2.3212954	10.512225	0.000

R-squared	0.833973	Mean of dependent var	1762.283
Adjusted R-squared	0.818880	S.D. of dependent var	710.5885
S.E. of regression	302.4138	Sum of squared resid	2011990.
Durbin-Watson stat	1.824564	F-statistic	55.25436
Log likelihood	-176.6705		

FUEL IMPORTS

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is MMFLC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-43.514233	25.518047	-1.7052337	0.104
CPP	0.0111746	0.0032862	3.4004357	0.003
QPETCR	-0.0082253	0.0046063	-1.7856728	0.090
MMFLC(-1)	0.4128986	0.1562348	2.6428075	0.016

R-squared	0.900420	Mean of dependent var	208.3219
Adjusted R-squared	0.884697	S.D. of dependent var	99.61989
S.E. of regression	33.82728	Sum of squared resid	21741.41
Durbin-Watson stat	1.666779	F-statistic	57.26699
Log likelihood	-111.4276		

DEMAND FOR PETROLEUM PRODUCTS

SMPL 1958 - 1984
[illegible] observations
LS // Dependent Variable is CPP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-603506.60	230802.07	-2.6147552	0.017
NGDPFC	0.1106574	0.0525636	2.1090145	0.048
RMFLCL	-2380.2184	590.54272	-4.0441078	0.001
ZTIME	309.29088	118.21059	2.6163552	0.017
CPP(-1)	0.6729536	0.1017067	6.6166282	0.000

R-squared	0.998206	Mean of dependent var	22079.08
Adjusted R-squared	0.997847	S.D. of dependent var	9730.805
S.E. of regression	451.5152	Sum of squared resid	4077319.
Durbin-Watson stat	2.200063	F-statistic	2781.789
Log likelihood	-185.4994		

RAW MATERIAL IMPORTS

SMPL 1958 - 1981
24 Observations
LS // Dependent Variable is MRAWK

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	56.665707	191.93577	0.2952327	0.771
GDPMGK	0.1041792	0.0337732	3.0846703	0.006
RLRAW	-309.59477	156.97215	-1.9722911	0.063
MRAWK(-1)	0.8348948	0.1470738	5.6767077	0.000

R-squared	0.882735	Mean of dependent var	991.0500
Adjusted R-squared	0.865145	S.D. of dependent var	433.1969
S.E. of regression	159.0813	Sum of squared resid	506137.0
Durbin-Watson stat	1.408047	F-statistic	50.18446
Log likelihood	-153.5726		

ANNEXURE III

NOTATIONS

VARIABLE NAME	VARIABLE DESCRIPTION
AAIN	Net Area irrigated under all crops, million hectares.
AISC	Area irrigated under sugarcane, thousand hectares.
AQSC	Production of Sugarcane, 1000 tonnes.
AQTFG	Output of foodgrains, 1000 tonnes.
BETWG	Parameter to capture the 4th Pay Commission Recommendation.
BOT	Balance of Trade, (Exports-Imports), Rs. crores.
BRADRA	Ratio of reserves to aggregate deposits of commercial banks, averages of months.
CBCCSA	Commercial bank credit to the commercial sector, averages of months, Rs. crores.
CBCCTR	Commercial bank credit to the commercial sector as a ratio of total credit, averages of months.
CBCGA	Commercial bank credit to the government sector, averages of months, Rs. crores.
CBCTA	Aggregate commercial bank credit, averages of months, Rs. crores.
CODEF	Investment deflator - construction.
CORPRT	Effective corporate tax rate.
COTJUT	Output of cotton and jute, 1000 kgs.
CPP	Consumption of petroleum products, 1000 tonnes.
CUCLZ	Coal bottleneck index.
CUELL	Electricity bottleneck index.
CURADR	Currency to aggregate deposit ratio, averages of months.
DBOR1	Domestic borrowing receipts of the government other than small savings, Rs. crores.
DBRT1	DBOR1 minus domestic borrowings by the government from commercial banks, Rs. crores.

VARIABLE NAME	VARIABLE DESCRIPTION
DEPAGC	Consumption of fixed capital in agricultural sector, Rs. crores.
DEPC	Consumption of fixed capital, Rs. crores.
DFIN	Deficit financing by the government sector, Rs. crores.
DGBO1	Balancing item, Rs. crores.
DISCR	Statistical discrepancy in national income identity, Rs. crores.
DM77	Dummy variable, 1 for years since 1977 and 0 for other years.
DMEMER	Dummy variable, 1 for 1975-77 and 0 for other years.
DSMLR	Government receipts from small savings at 1970-71 prices, Rs. crores.
EDOMK	Aggregate domestic expenditure at 1970-71 prices, Rs. crores.
EMPPU	Employment in the public sector, lakhs.
ETOTK	Aggregate expenditure at 1970-71 prices, Rs. crores.
FER	Foreign exchange reserves, Rs. crores.
FERES	Residual foreign exchange, Rs. crores.
FMAD	Discrepancy between imports as in National Accounts and SITC, Rs. crores.
FMCERU	Unit value index of cereal imports, 1970-71=1.
FMMFLU	Unit value index of fuel imports, 1970-71=1.
FMMTPU	Unit value index of machinery and transport equipment imports, 1970-71=1.
FMRAWU	Unit value index of raw material imports, 1970-71=1.
FMTOTV	Value of aggregate imports as given in SITC, Rs. crores.
FSTOCK	Stock of foodgrains with the government, million tonnes.

VARIABLE NAME	VARIABLE DESCRIPTION
FXADJ	Discrepancy in the value of exports between National Accounts and SITC, Rs. crores.
FXMFLV	Value of fuel exports, Rs. crores.
FXNMFU	Unit value index of exports other than fuel exports, 1970-71 = 1.
FXTOTV	Value of aggregate exports as given in SITC, Rs. crores.
GB	Government's domestic borrowings, Rs. crores.
GBF	Government's foreign borrowings, Rs. crores.
GCCOM	Government's consumption expenditure on commodities, Rs. crores.
GCWG	Government's expenditure on wages & salaries, Rs. crores
GDDEFL	GDP deflator derived as a weighted average of sectoral prices, 1970-71=100.
GDFCCU	Public sector investment in construction, Rs. crores.
GDFCMU	Public sector investment in machinery, Rs. crores.
GDFKCV	Private investment in construction at 1970-71 prices, Rs. crores.
GDFKMV	Private investment in machinery at 1970-71 prices, Rs. crores.
GDMGKP	Potential GDP from the manufacturing sector at 1970-71 prices, Rs. crores.
GDPMGK	GDP from manufacturing at 1970-71 prices, Rs. crores.
GDPSK2	GDP at 1970-71 prices from sectors other than agriculture, manufacturing, transport, mining and quarrying and electricity gas and water supply, Rs. crores.
GDPWLD	Index of world GDP, 1970-71 = 100.
GTOTCU	Public sector total investment, Rs. crores.
GDTPTK	GDP from transport at 1970-71 prices, Rs. crores.

VARIABLE NAME	VARIABLE DESCRIPTION
GINFK1	GDP from infrastructure (mining and quarrying and electricity, gas and water supply) at 1970-71 prices, Rs. crores.
GINT	Government's domestic interest payments, Rs. crores.
GINTF	Government's foreign interest payments, Rs. crores.
GINTFR	Implicit interest rate on government's foreign debt.
GINTR	Implicit interest rate on government's domestic debt.
GSUB	Government subsidy expenditure, Rs. crores.
HPGOV	RBI net credit to the government sector, Rs. crores.
HPM31	High powered money as on 31st March, Rs. crores.
HPOTH	Residual high powered money, Rs. crores.
HPMAV	High powered money monthly averages, Rs. crores.
IMPDPC	Implicit price deflator for private consumption, 1970 - 71=1.
IMPMF	Implicit price deflator, manufacturing (unadjusted), 1970-71=1.
IMPMFG	Implicit price deflator, manufacturing (adjusted), 1970-71=1.
IMPTP	Implicit price deflator, transport (unadjusted), 1970-71=1.
IMPTPT	Implicit price deflator, transport (adjusted), 1970-71=1.
IMPS2	Implicit price deflator, services (unadjusted), 1970-71=1.
IMPSC2	Implicit price deflator, services (adjusted), 1970-71=1.
INFZ	Expected inflation rate.
J11	Discrepancy in government's current account, Rs. crores.
J5	Discrepancy in the import tax revenue identity, Rs. crores.
JF	Balancing item, Rs. crores.

VARIABLE NAME	VARIABLE DESCRIPTION
JINK	Discrepancy in government's capital account, Rs. crores
KSTKTT	Cummulative gross fixed investment, Rs. crores.
M3AM	Money supply(M3), averages of months, Rs. crores.
MEDEF	Investment deflator for machinery, 1970-71 = 1.
MFDJMP	Discrepancy in import identity, Rs. crores.
MMFLC	Fuel imports at 1970-71 prices, Rs. crores.
MMTPK	Machinery and transport equipment imports at 1970-71 prices, Rs. crores.
MRAWK	Raw materials imports at 1970-71 prices, Rs. crores
NEXMBT	Net external receipts in the government account, Rs. crores.
NFIFAB	Net factor income from abroad, Rs. crores.
NGDFKF	Real private fixed investment, Rs. crores.
NGDPAG	GDP from agriculture at 1970-71 prices, Rs. crores.
NGDPDE	Implicit price deflator for total GDP, 1970-71=1.
NGDPFC	Total GDP at 1970-71 prices, Rs. crores.
NMTMTP	Implicit rate of import duty for machinery and transport equipment imports.
NMTRAW	Implicit rate of import duty for raw material imports.
NPOP	Population, millions
PA	Implicit price deflator, agriculture (unadjusted), 1970-71=1.
PAG	Implicit price deflator, agricuture (adjusted), 1970-71=1.
PCJNK	Discrepancy in private final consumption expenditure, Rs. crores.
PLOUT	Public sector plan outlay, Rs. crores
PINF1	Implicit price deflator for GDP from infrastructure, 1970-71=1.
PNOCBO	Number of commercial banks per person.

VARIABLE NAME	VARIABLE DESCRIPTION
QPETCR	Output of petroleum crude, million tonnes.
RAIN	Rainfall, mm per month
RBFE31	RBI's net foreign exchange assets, Rs. crores.
RMCER	Cereal imports at 1970-71 prices, Rs. crores.
SBVBNK	Difference between the advance rate of commercial banks and the bank rate.
SCRRA	Statutory cash reserve ratio of commercial banks.
SFKCD	Net capital inflow from abroad (foreign savings) at 1970-71 prices, Rs. crores.
SGA	Savings of government administrative departments, Rs. crores.
SGN	Savings of non-departmental enterprises of the government, Rs. crores.
STKPUC	Change in government stocks, current prices, Rs. crores.
STKPVC	Change in private stocks, current prices, Rs. crores.
SVHHNK	Net household savings at 1970-71 prices, Rs. crores.
SVFCN	Retained earnings of foreign companies, Rs. crores.
SVPVN	Savings of private corporate sector, Rs. crores.
TAXR	Excise tax rate.
TD	Revenue from direct taxes, Rs. crores.
TD12RA	Rate of interest on 12 months fixed deposits with the commercial banks, percentage per annum.
TDCORP	Revenue from corporate income tax, Rs. crores.
TDLR	Land revenue, Rs. crores.
TDOTH	Adjusting item in the direct tax revenue identity, Rs. crores.
TDPI	Revenue from income tax other than corporate income tax, Rs. crores.

VARIABLE NAME	VARIABLE DESCRIPTION
TI	Revenue from indirect taxes, Rs. crores.
TIDOM	Revenue from domestic indirect taxes, Rs. crores.
TIEXP	Revenue from export duties, Rs. crores.
TIIMP	Revenue from Import duties, Rs. crores
TIMFL	Revenue from import duties on fuel imports, Rs. crores.
TIMMTP	Revenue from import duties on machinery and transpor equipment, Rs. crores.
TIMRAW	Revenue from import duties on raw materials, Rs. crores
TIOTH	Adjusting item in the indirect tax revenue identity, Rs crores.
TIRTE	(TI-GSUB)/(NGDPFC * NGDPDE)
TM	Miscellaneous revenue receipts of the government, Rs. crores.
TPR	Property income of the government, Rs. crores.
TRD	Current transfers from government administrative departments to the rest of the economy, Rs. crores.
TRF	Current transfers from the rest of the world, Rs. crores.
TRTOF	Current transfers from government administrative departments to the rest of the world, Rs. crores.
TXFL	Implicit rate of import duty on fuel imports.
WGPUTT	Wage rate in the public sector, Rs. per employee pe year.
WLDXIN	Unit value index of world exports, 1970-71=100.
WPIALL	Wholesale price index for all commodities, 1970-71=1.
WPICEM	Wholesale price index for cement, 1970-71=1.
WPICL	Wholesale price index for coal, 1970-71=1.
WPIFLZ	Wholesale price index for fertilisers, 1970-71=1.

VARIABLE NAME	VARIABLE DESCRIPTION
WPIMFL	Wholesale price index for fuel, 1970-71=1.
WPIRAW	Wholesale price index for raw materials, 1970-71=1.
WPISTL	Wholesale price index for steel, 1970-71=1.
WPNFFL	Wholesale price index for non-fuel items, 1970-71=1.
WTPRAT	Weighted average of the personal income tax rate.
XTOTK	Exports other than mineral fuel at 1970-71 prices, Rs. crores.
YADK	Disposable income of the agricultural sector at 1970-7 prices, Rs. crores.
YNDK	Disposable income of the non-agricultural sector at 1970-71 prices, Rs. crores.
YDMFK	Personal disposable income at 1970-71 prices, Rs. crores.
ZTIME	Time in calendar years.