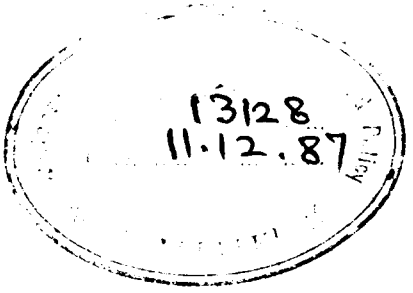
THE BUDGET, MONEY-SUPPLY AND INFLATION

by

Srinivasa Madhur



NATIONAL INSTITUTE OF PUBLIC FINANCE AND POLICY
12, RAJENDRA PLACE
NEW DELHI, INDIA

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One of the notable features of the Union Budget for 1979-80 is a record deficit estimated at Rs.1355 crore. Prognostications are already being hazarded regarding the inflationary potential of a budget deficit of this magnitude. The general view among industry and academic circles seems to be that a deficit of this magnitude would have a significant upward pressure on the general price level. The Government, however, feels otherwise. To quote the Finance Minister: "As regards the inflationary potential of a budget dificit of Rs.1355 crore, I am convinced that given our comfortable position with regard to food stocks and foreign exchange and pursuit of sensible import and monetary policies, the budget deficit I have left uncovered, does not involve unacceptable risks on the price front". (Hindustan Times, New Delhi, March 17, 1971; p.8). It is against this background of divergent views that we shall attempt to assess the inflationary potential of the budget deficit in terms of a simple model of inflation estimated by using Indian data for the period from 1961-62 to 1977-78.

In Section I, we shall discuss the a priori hypothesis behind our inflation-model. In Section II we shall present econometric results of estimating a few

versions of our inflation-model. Using the results of Section II we shall predict the likely impact of the budget deficit on inflation in Section III.

SECTION I

It is a basic economic principle that the percentage change in the price of a commodity is a positively sloped function of the percentage change in the excess-demand for that commodity. Applying this basic principle to the case of the general price level we hypothesise that the rate of inflation is a positively sloped function of the percentage change in the aggregate excess-demand in the commodity market. Symbolically,

$$\dot{P}_t = b\,\dot{E}_t \qquad \text{- (I.1)} \qquad b > 0$$

where

$\dot{P}_t$ denotes the percentage change in the general price level in period, t.

$\dot{E}_t$ denotes the percentage change in the aggregate excess-demand in the commodity market in period, t.

As a first approximation, we shall assume that the percentage change in the aggregate excess-demand, $\dot{E}_t$ is a positively sloped function of the percentage change

in the excess-supply in the money-market, $\dot{Me}_t$. Algebraically,

$$\dot{E}_t = k \dot{Me}_t \qquad - (I.2) \quad k > 0$$

We shall further assume that the percentage change in the demand for real money[1/] is a positive and proportionate function of the percentage change in real GNP. Additionally, since the empirical evidence in India suggests that the income elasticity of demand for money is close to unity,[2/] we shall hypothesise that $\dot{Me}_t$ is equal to the percentage change in the supply of money, $\dot{M}_t$, less the percentage change in real GNP, $\dot{Y}_t$, i.e.,

$$\dot{Me}_t = \dot{M}_t - \dot{Y}_t \qquad - (I.3)$$

Substituting (1.2) in (1.1) we have:

$$\dot{P}_t = bk \dot{Me}_t \qquad - (I.4)$$

1/ In this paper we shall stick to the narrower concept of money, viz., currency with the public plus demand deposits with the banks.

2/ Note the following money demand function fitted to the data for the period from 1960-61 to 1975-76;

Log M = -1.829 + 1.01 Log GNP (at factor cost);

t - value (37.07). R^2 = .989

Equation (I.4) is essentially a static model for atleast two reasons: First, it assumes an instantaneous adjustment of the price level to changes in excess-demand; Second, it assumes that price-expectations do not affect the rate of inflation. Needless to add, both these assumptions are drastic simplifications of reality. The relationship between inflation and excess-demand is hardly instantaneous; lags are, surely, important. Moreover, changes in price-expectations do affect the rate of inflation. Making allowance for these factors we can rewrite (I.4) as:

$$\dot{P}_t = \sum_{i=0}^{h} k_{t-i} b_{t-i} \dot{M}e_{t-i} + c\dot{P}^*_t \quad - (I.5)\ c > 0; \quad h < t.$$

where

$\dot{P}^*_t$ denotes change in expected inflation in period t.

i represents the length of the lag in the effect of changes in excess-demand on the rate of inflation.

Equation (I.5)is, basically, a monetarist explanation of inflation. As an explanation of inflation in a developing economy it neglects some of the structural factors emphasized by the Structuralists. According to the Structuralists (Argy, 1970; Felix, 1961; Mueller, 1965; Olivera, 1964; Raj, 1966; Seers, 1962; Sunkel, 1960;

Streeten, 1972 and Thorp, 1971) the most important structural factor affecting the rate of inflation in a developing economy is the growth-rate of agricultural production. Reduced to the minimum, the Structuralist justification for considering the growth-rate of agricultural production as an important factor determining the inflation-rate seems to run along the following lines:

A developing economy is charactorised by the existence of what can be called a modern organised industrial sector side by side a premitive agricultural sector. The market structures prevalent in the two sectors differ. The market structure of the agricultural sector is of the 'flex-price' type whereas that of the industrial sector is of the 'fix-price' variety.[3/] In addition, the supply curve of agricultural output is almost vertical.[4/] Consequently, the general price level (and its rate of change) which is a weighted average of the industrial and the agricultural prices depends, among other factors, on the rate of growth of agricultural output. To test whether this structural factor has any

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3/ For an illuminating discussion on the working of these two types of markets refer Hicks, 1965.

4/ The rationalization of this assumption is made, largely, in terms of the dependence of the agricultural output on the property structure prevalent in developing economies.

effect on inflation in India let us include one period lagged growth-rate of agricultural production in our model.[5/] With this modification equation (I.5) can be written as:

$$\dot{P}_t = \sum_{i=0}^{h} k_{ti} b_{t-i} \dot{M}e_{t-i} + c \dot{P}^*_t + d \dot{A}_{t-I} \quad - (I.6) \quad d < 0.$$

where

$\dot{A}_{t-1}$ represents one period lagged growth-rate of agricultural production.

In terms of equation (I.6) the budget deficit affects the rate of inflation by affecting the percentage change in money-supply. The relationship between budget deficit and money-supply is as follows: budget deficit affects the rate of change of reserve or high-powered money and given the marginal money-multiplier, the rate of change of reserve money affects the rate of change of money-supply.

SECTION II

An important difficulty in the empirical estimation of (I.6) is the selection of a proxy for changes in expected

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5/ Since the rabi crop is being harvested in April-May but is included in the agricultural year July-June we have used one period lagged growth-rate of agricultural output.

inflation, $\dot{P}_t^*$ because $\dot{P}_t^*$ is not quantifiable. The common proxies for changes in expected inflation could be:

i) change in the recent rates of inflation (Harberger, 1963 and Vogel, 1974)

ii) one period lagged inflation rate and

iii) a series of past rates of inflation.

In our empirical exercise we tried the above proxies for $\dot{P}_t^*$ and none of them turned out to be statistically significant. Hence, in our search for better proxies for $\dot{P}_t^*$ we experimented with two other variables:

i) stock of foodgrains with the Government, F and changes in it, both absolute, ΔF and percentage, $\dot{F}$.

ii) foreign-exchange reserves, R and changes in it, both absolute, ΔR and percentage, $\dot{R}$.

The a priori justification for using these variables as proxies for expected inflation may be noted thus: In an economy characterised by frequent shortages of a large number of essential commodities and where the Government does manage the supply-side of the commodity market through the Public Distribution System it seems reasonable to assume that expectations about prices are, largely, conditioned by the expectations about 'supply-

management'. If the expectations are that 'supply-management' would be better (worse) in the future, price-expectations are revised downwards (upwards). This applies not only to the final consumers but also to the traders; consequently, the speculative demand for commodities falls exerting a downward pressure on prices. Expectations about 'supply-management', in turn, depend crucially on the capacity of the Government to draw upon the stock of commodities for which there may arise a shortage in the future and/or the capacity to import these commodities within a reasonably short period of time. Accordingly, we hypothesise that expected inflation in India is a negatively sloped function of the buffer stock of foodgrains and the foreign-exchange reserves.

Table 1 presents our regression results of estimating a few versions of equation (I.6). The dependent variable in all the estimated equations is the percentage change in the Wholesale Price Index of All Commodities (1970-71 = 100) per annum.

As can be observed from the Table $\dot{M}e_t$ is the most important determinant of the rate of inflation; in all the estimated equations this variable is statistically

TABLE [illegible]

Estimated Equations of the [illegible]

([illegible] to 197[illegible])

Equation No.	Intercept	$\dot{M}_t$	$\dot{M}_{t-1}$	$\dot{M}_{t-2}$	[illegible]$_{t-1}$	[illegible]$_{t-1}$	[illegible]	[illegible]	ΔP	$\dot{P}$	[illegible]	ΔR	$\dot{R}$	R^2	SEE	F-value	D.W.
II.1	1.372	.8149 (3.83)*												.4546	5.27	14.68	2.1[illegible]
II.2	-.7206	.771 (3.84)*	.3395 (1.76)***											.5[illegible]	4.90	9.1[illegible]*	2.[illegible]
II.3	2.051	.8304 (4.34)*			-.2589 (-2.13)**									.6183	4.74	[illegible]*	[illegible]
II.4#	.9780	.8056 (4.06)*	.1624 (.6966)		-.1952 (-1.27)									.6320	4.[illegible]	[illegible].46*	[illegible]
II.5#	.0653	.8344 (4.55)*	-.06657 (-.27)	.3934 (1.82)**	-.3033 (-2.1[illegible])**									.7117	4.45	[illegible]*	[illegible].62
II.6	.7647	.8119 (4.06)*			-.2500 (2.01)**	.1307 (.4[illegible])								.621	4.[illegible]	9.[illegible]*	2.[illegible]
II.7	-.4497	.779 (4.37)*			-.2306 (2.00)**		.3[illegible] (1.60)***							.[illegible]	4.51	[illegible]*	[illegible]
II.8#	1.800	.6551 (3.56)*					.4695 (2.1[illegible])**	-.1256 (-2.13)**			.36977 (1.48)***			.73[illegible]	4.[illegible]	[illegible]*	-
II.9#	-.9230	.5916 (3.11)*					.7171 (2.66)*		-.0954 (-1.91)**			-.1886 (-.6786)		.7218	4.31	[illegible]*	[illegible]
II.10#	-.8597	.5595 (4.26)*					.8066 (4.68)*			-.0625 (4.[illegible])*			-.0643 (-.[illegible])	.86[illegible]	3.01	[illegible]*	1.90
II.11#	-.6163	.5517 (4.40)*					.8336 (5.22)*			-.0[illegible] (-4.[illegible])*		-.2016 (-.9[illegible])		.87[illegible]	[illegible]	11.29*	1.04
II.12	-.9043	.5609 (4.52)*					[illegible] ([illegible])*			-.0645 (-5.[illegible])*				.86[illegible]	[illegible]	25.[illegible]*	1.90
II.13#	-.6837	.5805 (4.47)*			-.0527 (.68)		.85[illegible] ([illegible])*			-.0620 (4.28)*				.87[illegible]	[illegible]	[illegible]*	1.[illegible]

Note: i) Figures in the brackets are t-values.

ii) *, ** and *** denotes significant at 1 per cent, 5 per cent and 10 per cent levels respectively.

iii) # indicates that the equation suffers from multicollinearity.

iv) ? indicates wrong sign.

significant even at the .05 per cent level. Taken alone, it explains around 50 per cent of the variations in the rate of inflation (Equation II.1).

Equations from (II.2) through (II.7) represent one version of our dynamic model - that with the lagged excess-demand effects supplemented by the Structuralist variable, $\dot{A}_{t-1}$. Except in equations (II.4) ~~and (II.5)~~ the Structuralist variable turns out to be significant with the expected sign. The statistical insignificance of $\dot{A}_{t-1}$ in (II.4) ~~and (II.5)~~ is, presumably, due to the multicollinearity between $\dot{A}_{t-1}$ and $\dot{Me}_{t-1}$. To overcome this problem of multicollinearity we substituted one period lagged percentage change in money-supply, $\dot{M}_{t-1}$, for $\dot{Me}_{t-1}$ (Equation (II.6). After this substitution, the significance of $\dot{A}_{t-1}$ increases; however, $\dot{M}_{t-1}$, turns out to be insignificant. Alternatively, instead of using $\dot{Me}_{t-1}$ and $\dot{Me}_{t-2}$ separately we used a simple average of these variables (Equation II.7). This improves the significance of the lagged excess-demand variable.

Equations from (II.8) through (II.13) introduce the two chosen proxies for expected inflation. These equations represent another version of our dynamic model- that version with both lags and expectations. In equation

(II.8) both the proxies for expected inflation are in the level form. The insignificance of the foreign-exchange reserves in (II.8) is, apparently, due to the multicollinearity between the foreign-exchange reserves and the buffer stocks with the Government (The simple correlation between these variables is as high as .94) and the higher correlation of buffer stocks with the dependent variable. In an effort to overcome this problem, in equations (II.9) and (II.10) we used the first differences and percentage changes in these variables respectively. Both these equations still suffer from multicollinearity but equation (II.10) is less so and is certainly preferable to (II.9) judged from the point of view of test-statistics. Equation (II.11) is a variant of (II.10); the only difference between these two equations is that the foreign-exchange reserve appears in the first difference form in the latter whereas it appears in the percentage change form in the former. There is a slight improvement in R^2, F-value and SEE from (II.10) to (II.11); however, in both the equations the foreign-exchange reserve continue to be insignificant. Finally, we dropped the foreign-exchange variable in equations (II.12) and (II.13). This move does not significantly alter R^2 and SEE but t-values are slightly higher in (II.12).

The selection of an equation from the four equations (II.10) through (II.13) as the most preferred variant of our inflation-model seems to be a difficult task. Except for the proxies used for expected inflation the first three of these equations are, largely, in the monetarist tradition;[6/] the growth-rate of money-supply relative to the growth of real income and inflation - expectations hold the centre of the stage here. The last of these equations represents a highly modified version of the Structuralist model.

As far as the explanatory power is concerned, there is very little difference among these equations. Table 2 presents the rates of inflation being estimated by these equations and the actual rates of inflation. As can be observed from the Table the major turning points in the

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6/ In this connection, it is interesting to note that we tested whether the sum of the coefficients of the excess-demand variables, $\sum b_{t-i}$, is significantly different from unity in our four equations (II.10) through (II.13). The calculated t-values for the four equations are 1.59, 1.69, 1.72 and 1.46 respectively. Applying a two tail test all these t-values are below the respective table-values even at the 10 per cent level. This result seems to support the simple quantity-theory hypothesis that for given expectations about inflation, the rate of growth of money-supply less the rate of growth of real income and the rate of inflation stand in a one-to-one relationship to each other; however, this relationship does not seem to be instantaneous but is spread over a period of approximately three years.

rate of inflation are the sharp decline in the rate of inflation in 1968-69, the acceleration of the rate of inflation in the years 1972-73 to 1974-75 and yet another sharp decline in the rate of inflation in 1975-76. All

TABLE 2

Rates of Inflation: Actual and as Estimated by the Model

(in percentage)

Year	Actual	Estimated by the four equations of our inflation-model			
		II.10	II.11	II.12	II.13
1961-62	0.16	1.84	2.07	1.78	1.27
1962-63	3.80	3.86	4.02	3.84	3.99
1963-64	6.16	5.93	6.13	5.89	6.31
1964-65	10.98	10.27	10.35	10.17	9.78
1965-66	7.61	4.71	5.19	4.65	4.76
1966-67	13.90	10.53	10.77	10.75	11.76
1967-68	11.61	9.16	9.37	9.11	8.81
1968-69	-1.14	-0.94	-0.05	-1.06	-1.76
1969-70	3.74	2.89	2.96	3.04	3.36
1970-71	5.54	5.11	5.48	4.99	4.54
1971-72	5.60	6.14	6.35	6.13	6.10
1972-73	10.04	17.60	17.61	17.60	17.52
1973-74	20.22	16.73	16.81	16.70	17.06
1974-75	25.20	24.77	24.83	24.72	24.18
1975-76	-1.09	1.13	1.16	1.14	1.64
1976-77	2.08	3.66	2.64	3.75	3.19
1977-78	5.10	6.13	4.22	6.32	7.00

the four equations estimate these turning points in the

rate of inflation reasonably well and almost identically. Moreever, the results of F-test do not indicate any significant difference among these equations. Therefore, for predicting the inflation-effect of the Union Budget we shall make use of all the four equations.

SECTION III

In this section we shall estimate the probable impact of the budget deficit envisaged in the Union Budget for 1979-80 on money-supply and prices in terms of the inflation-model presented in the previous section. The exercise here is subject to, atleast, two important limitations: one conceptual and the other analytical.

Conceptually, the concept of budget deficit relevant for assessing the impact of the budget on money-supply and inflation is that of 'deficit financing' used by the Planning Commission and not the concept of 'overall deficit' used in the Budget. The difference between the two concepts is that the former represents the net borrowings of the Central Government from the Reserve Bank of India (hereafter called RBI) whereas the latter only the short term borrowings of the Government through the issue of treasury bills. These two magnitudes may, and in fact do, differ in practice as can be seen from Table 3.

TABLE 3

'Overall Deficit' of and 'Deficit Financing' by the Central Government

(In Rs. crore)

Year	Overall deficit (-) or surplus (+) of the Central Government	Deficit financing (-) or surplus financing (+) by the Central Government
1960-61	+117	-125
1961-62	-115	-152
1962-63	-156	-216
1963-64	-166	-234
1964-65	-172	-200
1965-66	-173	-202
1966-67	-295	-209
1967-68	-206	-140
1968-69	-162	-199
1969-70	-46	-89
1970-71	-285	+225
1971-72	-519	-444
1972-73	-869@	-862@
1973-74	-328	-600
1974-75	-721	-624
1975-76	-366	+190
1976-77	-131	-337
1977-78	-975£	-321

Source: i) RBI Reports on currency and Finance (Annual)

ii) Government of India, Ministry of Finance. Indian Economic Statistics: Public Finance (October, 1978).

Notes: @ excludes book adjustment of Rs.421 crore on account of Centres assistance to States for clearing their overdrafts.

£ denotes revised figures.

Moreover, the two magnitudes do not show any rigid relationship between them. However, for want of data, we shall use the budgetary concept of 'overall deficit' in the place of the Planning Commission's concept. To the extent there may arise a diserepancy between the two magnitudes in 1979-80 our prediction of the effect of the Budget on money-supply would go astray.

Analytically, in addition to the Union Budget there are other factors affecting changes in reserve money such as the RBI lending to the State Governments, the RBI lending to the financial institutions including the commercial banks, changes in the net foreign-exchange reserves with the RBI and changes in the net non-monetary labilities of the RBI. In our exercise we shall not attempt to predict the likely changes in these factors and their effect on the supply of money and inflation; instead we shall confine our exercise to the prediction of the probable impact of the budget deficit planned for in the Union Budget on money-supply and the general price level. In other words, our exercise is based on the assumption that other things affecting changes in reserve money (those mentioned above) remain the same. To the extent those other factors change (and they would certainly change) they will have an independent impact

on the supply of money and hence on the rate of inflation.

Given the marginal money-multiplier of around 1.7 (Gupta, 1976, p.1840) a budget deficit of Rs.1355 crore would lead to an increase in money-supply of around Rs.2300 crore in 1979-80. The average stock of money in the first seven months of 1978-79 stood at Rs.19200 crore, it being Rs.20,580 crore on January 12, 1979. Accordingly, if we assume that the average stock of money in 1978-79 stood at around Rs.20,000 crore, the increase in money-supply during 1979-80 due exclusively to the budget deficit would be approximately 11 per cent. The targeted rate of growth of real national income in the Sixth Plan is 4.7 per cent per annum. Even if we assume, somewhat optimistically, that the rate of growth of real national income would be around 5 per cent in 1979-80, the budget deficit would lead to an increase in money - supply of around 6 per cent in excess of the increase in real GNP.

The Economic Survey for 1978-79 estimated the increase in real national income and agricultural production in 1978-79 at around 3.5 per cent and 2 per cent respectively. But the recent appraisal of the agricultural situation by the Ministry of Agriculture has led to an

upward revision in these estimates. Anticipations are that agricultural production would increase by around 4 per cent and real income by around 4.5 per cent. (Times of India, March 29, 1979, p.4 col.4). If we base our calculations on these recent estimates the average rate of growth of money-supply less the rate of growth of real national income for the two years 1977-78 and 1978-79 works out to be around 11.5 per cent.

The Economic Survey expects the stock of food grains with the Government to go up to 20 million tonnes by the end of the present agricultural year; hence, the increase in the buffer stock would be approximately 15 per cent in 1979-80. In the absence of any official estimates of the likely increase in the foreign-exchange reserves in the next year we shall assume that it would increase by around Rs.1000 crore; this figure is slightly less than the average per annum increase in this variable during the last three and a half years. In percentage terms it works out to be approximately 17 per cent.

We substituted the above values of the independent variables in the four equations of our inflation-model and calculated the confidence intervals of prediction at the 95 per cent level for each equation. The results

of this prediction exercise are given in Table 4. The predicted rate of inflation ranges from a minimum of 6.90 per cent to a maximum of 13.18 per cent. This is the total range of our prediction. Since we have already seen that the explanatory power of all the four equations

TABLE 4

Ranges of the Rate of Inflation Predicted for 1979-80 by the different Versions of the Inflation-Model

(In percentage)

Equation No	Range	
	Minimum	Maximum
II.10	9.01	13.17
II.11	6.90	13.18
II.12	9.16	12.94
II.13	8.51	12.93

is almost the same we would expect that the actual rate of inflation would fall in the confidence intervals given by each of the equations, i.e., it would fall in the common range. The common range is given by the highest of the minimum values and the lowest of the maximum values, viz., 9.16 per cent to 12.93 per cent. In short, stripped of all the statistical jargon, our empirical exercise indicates that, on an average, the impact of the budget deficit envisaged in the Union Budget on the general price level would be of the order of 9 to 13 per cent.

To conclude, we sound a note of caution. It is important to bear in mind that the above prediction is based on the two important limitations mentioned in the beginning of this Section, viz., the use of the budgetary concept of overall deficit in the place of the Planning Commission's concept and the exclusion of the likely effect of changes in the factors other than the Union Budget on reserve money and hence on the rate of inflation. Subject to these limitations, the above exercise seems to suggest that the inflationary potential of the budget deficit left uncovered in the Union Budget is quite significant.

A Note on the Sources of Data used in the Regressions:

For the period from 1961-62 to 1975-76 the data on money supply are averages of weekly figures taken from: A Vasudevan, 'Trends in money-supply components', Financial Express, January 14, 1978; for the years 1976-77 and 1977-78 money-supply figures are the averages of the monthly figures collected from the various issues of RBI Bullitin.

The data on GNP at factor cost are from the various issues of the National Accounts Statistics, published by the C.S.O.

The data on foreign-exchange reserves are from the Economic Survey for 1978-79 published by the Ministry of Finance; these figures are as on the end of the financial years.

For the period from 1961-62 to 1975-76 the data on the stock of food grains with the Government are from the Bulletin of Food Statistics (1977) published by the Directorate of Economics and Statistics, Ministry of Agriculture; for the two years 1976-77 and 1977-78 data are from the Ministry of Finance. We have used the calender year-end stocks of food grains with the Government.

The data on the agricultural production are from the various issues of the Report on Currency and Finance and the Economic Survey.

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