Foodgrains Availability, Money Supply and the Price Level in East Pakistan :

Some Simple Econometrics on Short-Term Stabilisation Policies

by

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INTRODUCTION

The stabilisation of prices within reasonable limits is unquestionably a necessary element of short-term planning. Wide fluctuations can upset longer-term growth plans, and have adverse repercussions on welfare and efficiency. In East Pakistan, the problem of short-term stabilisation revolves around the agricultural sector, which is the major source of income, wage goods, export earnings, and industrial raw materials. The agricultural sector, which so dominates the economy, is subject to considerable supply fluctuations caused by variable weather conditions, the uncertain effects of flood and drought. Annual swings in production of major crops can easily amount to 10 or 15 per cent, enough to determine conditions of scarcity or abundance for the East Pakistan economy as a whole. Moreover, pending the completion of massive investment to reduce the influence of the monsoon on water supplies and the completion of much more work by agriculturists, hydrologists and meteorologists with weather models to forecast agricultural production, these fluctuations are both uncontrollable and unpredictable. Therefore, attention must

be paid in short-term planning to the problem of agricultural instability and to the appropriate corrective policies.

This note concentrates on rice production and prices, and on overall foodgrains availability in East Pakistan, in presenting some simple macro-econometrics relevant to the stabilisation problem. Since rice is the province's major crop and its cultivation is ubiquitous, it can easily stand for all agricultural crop supply in response to weather conditions.

On the demand side, the typical consumer budget is weighted heavily with consumption of rice and closely related substitute foodgrains.

II. THE IMPACT OF MONEY SUPPLY ON RICE PRICES

One possible approach to the stabilisation problem is to offset declines in agricultural supply with reductions in monetary demand, through the operation of monetary policy. Another possible approach is to offset declines in agricultural production by increases in supply from imports or releases from stock. A relevant consideration in comparing these two is the efficacy of each, the possibility that the policy instrument can be wielded within feasible limits to accomplish the desired change in the price level.

During the period from 1959-60 to 1967-68, the level of average retail prices of coarse rice in East Pakistan can be well explained by two factors: the availability of total foodgrains per capita which summarises the supply position, and the estimated level of the provincial money supply. A simple formula involving these two factors successfully approximates actual prices to within 1.50 rupees per maund in eight of the past nine years, and exactly duplicates the direction of annual change. This formula, derived from single equation, least squares regression analysis, is given below:

$$1) \quad P_t = 98.37 - 0.233 \, (A/H)_t + 0.0575 \, M_t$$
$$\qquad\qquad (.037) \qquad\qquad (.0077)$$
$$\qquad\qquad\quad R^2 = .93$$

Here, P_t is the average annual retail price of coarse rice in rupees per maund; $(A/H)_t$ is the annual availability of total foodgrains, measured in pounds/person/ year, and equals total production less a 10-per-cent allowance for seed, feed, and wastage, plus imports, plus net releases from government stocks; and M_t is estimated provincial money supply in crore rupees at calendar year's end. Data entering the regression are given in Table I below. An element of approximation enters the data on availability through the standard 10-per-cent deduction from production on account of seed, feed, and wastage, which may not be altogether correct. Similarly, estimates of provincial money supply are imperfect, reflecting in part the lack of information about interprovincial

currency transfers. Nonetheless, it is doubtful whether these possible errors in the variables seriously damage the validity of the estimated relationship.

TABLE I

Year	Average retail coarse rice price (*Rs./md.*)	Availability per capita (*lbs./head/yr.*)	Estimated year-end money supply (*Rs. crore*)
1959-60	26.6	338	143
1960-61	24.5	367	169
1961-62	25.4	360	184
1962-63	27.1	352	195
1963-64	23.8	374	235
1964-65	25.1	368	260
1965-66	29.1	365	289
1966-67	38.7	337	311
1967-68	36.0	348	306

This relationship suggests that historically a reduction of one pound per capita per year in total foodgrains availability would push up that year's average retail price of coarse rice by 0.23 rupee per maund. On the other hand, a reduction of the money supply by one crore rupees, measured from year's end to year's end, would restrain retail rice prices during the associated fiscal year by less than 0.06 rupee per maund. The related elasticity concepts have been evaluated at the mean of the sample: the elasticity of coarse rice prices with respect to per capita availability is (—) 2.92; the elasticity with respect to the money supply is only 0.47. Thus, during 1968-69 a 10-per-cent fall in availability would raise average prices by 10.51 rupees to 46.5 rupees per maund, and a 10-per-cent fall in the money supply would result in a price reduction of only 1.70 rupees per maund.

It would seem that monetary policy operating on the general level of credit availability is not very efficacious in combating inflationary (or deflationary) pressures arising from agricultural fluctuations. Agricultural fluctuations arising from production changes can easily amount to almost 10 per cent. Since the percentage change in the money supply required to offset supply fluctuations are six times as large, impossibly wide swings in credit availability would be necessary. Monetary policy impinges on a fairly small sector of the economy in its initial effects—primarily on investment in the organised sector. Broad swings in credit availability would disrupt progress in the implementation of investment plans, particularly in the private sector, while accomplishing little in terms of price stabilisation, when agriculture is the destabilising sector. Remedies for such problems are probably better sought in the area of buffer stock and import management.

III. STABILISATION OF RICE PRICES THROUGH SUPPLY

One recent proposal for the conduct of monetary management suggests that the rate of monetary expansion in the economy as a whole be limited to 2 per cent more than the estimated percentage increase in real national income. This recommendation implies a less aggressive stabilisation role for monetary policy. Assuming that the provincial money supply would be governed in the same manner as the national, this would mean in practice that monetary expansion would be governed largely by fluctuations in rice production, due to the extremely close short-run relationship between changes in provincial GNP and changes in rice production. A simple regression covering the years 1959-60 to 1967 68 demonstrates a very high correlation between these two variables:

2) $(dY/Y)_t = 0.03162 + 0.338 (dR/R)_t$
$$R^2 = .92$$

Here, dY/Y is the relative change in the CSO estimate of East Pakistan GNP in constant 1959-60 prices; and, dR/R is the relative change in provincial rice production, according to official estimates. The equation states that East Pakistan income rises by 3.16 per cent per year plus 0.338 times the percentage change in rice production.

Such a relationship, of course, is highly suspect as a realistic representation of long-term development: should there be continued stagnation in rice production, it is very doubtful whether a growth rate over 3 per cent per year could be sustained. Even as a short-run relationship, the equation probably reflects the CSO's methods of national income estimation as strongly as it does the real functioning of the economy. The sectors for which adequate annual production data are available — crop production, large and medium industry, and organised transport, in the main — are for the most part strongly correlated with agricultural output. Output in other important sectors, like trade, is estimated primarily by the use of commodity production as benchmark, and so would be also correlated. Other sectors, including livestock and agriculture other than crop production, small-scale industry, services, much of construction, and so on, about which very little current information is available, are assumed to expand according to smooth trends. Therefore, on purely statistical grounds, one would expect provincial income to be explainable in terms of a trend effect and another strongly associated with agricultural production. This reinforces the real structural significance of fluctuations in rice production. For purposes of describing the path of money supply under the recommended guideline discussed above, it implies that changes in provincial money supply would be related to changes in rice production by

3) $(dM/M)_t = 0.05162 + 0.338 (dR/R)_t.$

These income and monetary effects of production changes have themselves a significant stabilising effect on prices: higher real incomes and money incomes arising in good agricultural years stimulate the demand for foodgrains and limit the tendency for prices to fall; in poor years, lower incomes reduce the demand for foodgrains to some extent. These simple macro-economics, can be taken into account in devising stabilisation policies based on supply management.

If the monetary guidelines discussed above are put into effect for the province, the price level will be ultimately determined largely by foodgrain imports, by rice production, and by changes in food stocks. From equations 1) and 3) it follows that the change in price, in rupees per maund, is given by[1]

$$4) \quad dP = -0.233 \, (A/H)_t \, \frac{x - 0.03}{1.03} + 0.0575 M_t \, (0.05162 + 0.338 \, (dR/R)_t$$

where the rate of population increase is assumed to be approximately 3 per cent per year, and x represents the rate of growth of total foodgrains availability. Ignoring stock changes momentarily, the change in total availability is a weighted average of the increase in imports and the increase in production, and it becomes relatively simple to estimate what combinations of imports and domestic production are compatible with specified changes in rice prices. For example, for no change from the current years prices,[2]

$$5) \quad dI/I_t = 0.468 - 9.51 \, (dR/R)_t$$

where I is the level of imports into East Pakistan of all foodgrains, in million tons. That is, should price stability during 1968-69 be the target, additional

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[1]If equation 1) is differenced, then

$$dP = -0.233 d \, (\frac{A}{H})_t + 0.0575 \, dM_t$$

and since from equation 3)

$$dM_t = (0.05612 + 0.338 \, \frac{dR}{R_t}) M_t$$

while

$$d \, (\frac{A}{H})_t = \frac{A_{t+1}}{H_{t+1}} - \frac{A_t}{H_t} = \frac{A_t}{H_t} \left(\frac{1 + x}{1 + p} - 1 \right)$$

$$\therefore dP = -0.233 \, \frac{A_t}{H_t} \left(\frac{x - p}{1 + p} \right) + 0.0575 \, M_t \, (0.05612 + 0.338 \, \frac{dR}{R_t})$$

[2]This relationship is derived from 4) by specifying $dP = 0$, substituting the actual values for the year 1967 $\left(\frac{A_t}{H_t} = 348, \, p = .03, \text{ and } M = 306 \right)$. This yields a relationship between x, the rate of growth of overall availability, and the rate of growth of rice production. Since the former is a weighted average of growth in domestic production and imports, with weights given approximately by $\frac{dI}{I_t} (.09) + \frac{dP}{R_t} (.91) = x$, the relationship given in equation 5) follows. The same procedure with $dP = -4$ leads to equation 6).

imports can be avoided if production increases by about 5 per cent [1].   Should production fail to increase at all over the level of 1967-68, then a 47-per-cent increase in imports would be required. (*see* Table II).

TABLE II

PERCENTAGE CHANGES IN FOODGRAINS IMPORTS FOR 1968-69 COMPATIBLE WITH ALTERNATIVE CHANGE IN RETAIL RICE PRICES AND WITH ALTERNATIVE PERCENTAGE CHANGES IN DOMESTIC RICE OUTPUT

Change in rice production %	Change in rice prices in rupees per maund						
	— 6	— 4	— 2	0	2	+4	+6
— 8				123	94	66	38
— 6				104	75	46	18
— 4		142	114	85	56	27	— 102
— 2	152	123	95	66	36	7	— 22
0	133	104	76	47	18	— 11	— 40
+2	114	85	57	28	— 10	— 30	— 52
+4	95	66	38	9	— 20	— 49	— 78
+6	76	47	19	— 10	— 39	— 68	
+8	57	28	00	— 29	— 58		
+10	38	9	—19	— 48			

To take another example, suppose a decline in prices of 4 rupees per maund during 1968-69 were desired.   Then, the associated changes in production and imports would be

6) $dI/I_t = 1.04 - 9.51 (dR/R)_t$

that is, if production were expected to increase by 4 per cent, then a 66-per-cent increase in imports over current levels would be needed to achieve price objectives.   Only if production were expected to increase by 10 per cent could the additional imports be dispensed with.   Similar relationships can be derived for other targeted price changes, or for relationships between import and price levels with production expectations pre-determined.   It is obvious that relatively small shifts in home production require relatively large changes in compensating imports.

The dilemma of short-term planning is obvious: much depends on the harvest, about which little can be known in advance until such time as the

dominant influences of monsoon and flood are reduced. Moreover, the lead-times for importing foodgrains, from foreign sources at least, are such that import decisions must be taken largely before reliable forecasts of domestic production are available. Therefore, it seems necessary that there continue to be flexibility in price targets, as there certainly has been in the past, and that there be adequate buffer stocks on hand in the country. These should be sufficient to cover probable deficits over the time interval required to place import orders and receive import deliveries, taking into account likely errors in forecasting domestic production and the costs of unplanned price changes. The investigation of rational buffer stock policy and operations, along fairly standard conceptual lines, would be a useful area for further research. Since releases from stock or imports in urban, market-oriented areas probably have more influence on price determination than does production in general, this more detailed analysis would be strengthened if better information were available on the behaviour of the marketed surplus over time. This would allow considerable refinement of the simple analysis presented in this paper.

REFERENCES

1. East Pakistan, Planning Department, *Annual Plan for East Pakistan for 1968-69*. (Dacca: Planning Department, 1968).