A MONETARY INTERPRETATION OF THE 1974 BANGLADESH FAMINE*

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ABSTRACT

This Paper examines aspects of the Chadha-Teja thesis that expansionary macroeconomic policies, rather than floods, might have caused the 1974 Bangladesh Famine. Although empirical findings are broadly consistent with the thesis, they are suggestive rather than conclusive. Nevertheless, one major conclusion is drawn that random natural disasters, such as floods .and droughts, may cause sectoral economic dislocation and misery but they are unlikely to cause a full-blown famine, unless they are accompanied by such 'loose macroeconomic policies, that destroy the credibility of the government to 'food stockholders' in its ability to stabilise the economy.

1. INTRODUCTION

..............expansionary macroeconomic policies can lead to sharp increases in the relative price of food, which reduces people's ability to purchase food both directly through the standard price effect and indirectly by generating greater unemployment.[1]

It may sound odd, but the fact remains that the ruling elite of Bangladesh in 1974 was no less indifferent to the suffering of the people than the British government was in 1943.[2]

Wars and natural disasters, such as cyclones, droughts, and floods, have been the precursors to famines in South Asian Countries over the past few centuries.[3] The close association between natural disasters and famines has often been interpreted as a causal relationship running from natural disasters to famines. The causal sequence of any natural disaster-induced famine may broadly take the following form. Floods and/or droughts destroy the staple food crops and lower the availability of food. Food shortage thus created may increase the relative price of food, which in turn may lower the intake of per-capita food and cause excess mortality.[4]

Such a causal sequence of famine has appeal because it is easy to follow and can be validated with historical evidence. I-lowover die past decade or so the food availability theory of famine has come under challenge from prominent economists, including Amartya Sea and Martin Ravallion.[5] In his Food Entitlements Approach[6] to famine, Sen (1977,1981) showed that it was not per-capita food availability, but food entitlements of different occupational groups that declined during. the major famines in the twentieth century, including the 1943 Bengal Famine and the 1974 Bangladesh fatnine[7]. The Food entitlements Approach to famine has appeal because it can provide an explanation of the apparent paradox of famine

amidst feast. The general applicability of this approach comes from the idea that contemporary famines may be linked with factors other than wars and natural disasters. This is done by two IMF economists: Bankim Chadha and Ranjit Teja. They argue that the genesis of the 1974 Bangladesh famine may be traced in the macroeconomic policies that the Mujib government (1972-75) had implemented since 1972 with redistributive goals (Chadha and Teja, 1989)[8]. As their theoretical model is an application of Sen's Food Entitlements Approach, it fits well the Bangladesh Famine[9].

The schematic representation of the Chadha-Teja thesis reveals a structural model in which at least four sub-models are embedded: the monetarist model of inflation, the Cagan (1956) model of money demand during hyperinflation, a portfolio shift model of the relative price of food under financial repression, and an efficiency wage model (Akerlof and Yellen, 1986).

The main objective of this paper is to examine the Chadha-Teja thesis both analytically and empirically. However, for lack of data all the relevant relationships cannot be examined. The paper focuses on four aspects of the model: the relationship between money supply growth and inflation, the relationship between inflation and real money balances, the relationship between money supply growth and the relative price of food, and the determination of agricultural wages and employment under economic distress. Because of the analytical complexity of the Chadha-Teja model, it is not reported here. Instead, two simple models of the relative price of food and the agricultural wage rate under economic distress are developed to highlight the analytical issues within a macroeconomic perspective. The model of the relative price of food shows that, contrary to the classical view, in an inflationary economy, caused by excess money supply, there can be a causal relationship between the general price level and the relative price of food. Such a theoretical relationship implies that any monetary expansion which increases the price level may increase the relative price of food[10]. The agricultural wage model under economic distress shows that an increase in the relative price of food by natural disasters and/or macroeconomic policies may **cause** a decline in both the real wage rate and employment and thereby may lower the food entitlements of the rural poor.

II. MONEY SUPPLY GROWTH AND INFLATION
Did Crop Loss by Floods and Droughts Cause Inflation?

The 1974 Bangladesh famine was associated with high inflation and an acute balance-of-payments problem(Islam, 1977). There is however no consensus on the causes of these problems. As in the case of famine, inflation and balance-of-payments problems were believed to had been caused by both natural disasters and the OPEC oil price shock. Although there was an element of truth in it, it was not the full story.

Floods and droughts are common in Bangladesh agriculture. On the average about 5 per cent of annual food crop output is lost by natural disasters (Table 1). On some occasions in the 1950s and 1960s natural disasters caused a sharp decline in agricultural output and

increased the relative price of food. However, subsequent good harvests moderated or reversed the price increase within a year or so and there were not even two year in a row with high inflation. It was because on the one hand inflationary expectations were not built in the minds of the people and, on the other, the government maintained conservative monetary and fiscal policies (Papanek , 1981). Therefore, it was unlikely that the annual food crop output loss of less than 5 per cent was behind the sharp increase in the general price level since 1972[11]. Table 1 indeed reveals that the size of flood and drought loss of rice output was unusual only in 1971 and in 1975. The 1971 rice crop output loss was in fact mitigated by a large inflow of foreign food aid in 1971 and in 1973 (Alamgir, 1980). It indicates that during the first two years after liberation Bangladesh did not have to spend its foreign resources in order to import food grains from the commercial market. Therefore, any suggestion that food crop output loss by natural disasters was the cause of inflation in Bangladesh during 1972-75 was an exaggeration. Again, although the OPEC oil price rise during late-1973 might have some positive effect on Bangladesh' inflation in 1974, it certainly did not start the inflationary process in 1972.

Table 1   Loss of rice crop output by floods and droughts

Year	Rice Production	Flood and drought Loss	
	(Million Tons)	(Million Tons)	% of potential rice output
1970	11.82	0.22	1.83
1971	**10.97**	**1.95**	**15.09**
1972	9.79	0.31	3.07
1973	9.93	0.25	2.46
1974	11.72	0.65	5.25
1975	**11.11**	**1.54**	**12.17**
1976	12.56	0.16	1.26
1977	11.57	0.95	7.59
Average	11.18	0.75	6.09

Source : Statistical Pocket Book of Bangladesh, 1979:246

Note : Potential rice output = rice production + flood and drought loss.

Did Money Supply Growth Cause Inflation ?

Lifschultz (1974a) identified three schools of thought which offered explanations of inflation in Bangladesh during 1972-74: The 'smuggler school', the 'hoarder school' and the

'money printing school.' The government blessed the first two explanations of inflation because they were politically convenient[12]. However, the idea that excessive monetary expansion caused inflation was popular among academics, journalists, and even senior government officials (Rahim, 1973). Lifschultz (1974a:50) expressed the sentiment as follows:

> *One need not be a follower of Milton Friedman....in order to believe that an extraordinary expansion in Bangladesh's money supply, during a period when the economy had not yet recovered to 1970 production levels, is one very substantial cause of the country's rampaging inflation... The Government's monetary policy has served to finance enormous and unplanned budgetary deficits.... Monetary and fiscal policies have not been used as tools of 'scientific' economic management, but rather as weapons in the Government's burgeoning arsenal of 'last resorts'. When asked recently why the Bangladesh Bank [the central bank of Bangladesh] had pursued such a course, one highly-placed Bank Official explained: 'It was just to keep the show going'.*

Table 2 shows that during the 1972 calendar year the narrow money supply growth was 71 per cent and the size of budget deficit in the fiscal year of 1973 was about 16 per cent of GDP. Although the growth rates of the money supply in 1973 and in 1974 were relatively low, they were significantly higher than the growth rate of the real economy. The rapid expansion of money supply during 1972-74 was caused by both the monetisation of budget deficits and the borrowing of the nationalised industries from the banking system (Hossain, 1989).

Table 2 Budget deficit, public sector borrowing, and money growth, 1972-74

Money supply growth[a] (%)		Budget deficit[b] (% of GDP)	Deficit financing from the Banking System (Millions of Taka)	
			Government	**public Sector**
1972	71	n.a.	839[c]	676[c]
1973	18	-16	1316	1713
1974	16	-6	1441	1053

Source :   Basic data are taken from various issues of the Bangladesh Bank Bulletin, Economic Indicators of Bangladesh, and the Statistical Yearbook of Bangladesh.

Notes : + a = calendar year; b = fiscal year; c = 17 December 1971 to 30 June 1972; and n.a. = not available.

Thus it is plausible to suggest that expansionary fiscal and monetary policies in a war ravaged economy might have generated inflation. However, it took some time to accelerate the rate of inflation because of large inflows of foreign aid. By 1973 inflationary pressure built up and 1974 it reached a **crisis** point.

Money Supply Growth and Inflation : An Econometric Investigation

An econometric approach is adopted here to test for any causal relationship between money supply growth and inflation in Bangladesh during 1972-75. As monthly data for money and prices are available for this period[13], they are used for econometric investigation. However, before conducting the formal test, for visual inspection data for monthly inflation and one period lagged monthly money growth rate for 1972-75 are plotted in Chart 1. It shows that although there is a relationship between inflation and money supply growth, any precise relationship between them cannot be determined without a test

The Granger Causality Test

The Granger causality test is used here to examine the proposition that excess money supply growth caused inflation in Bangladesh during 1972-75. This test is widely used in the literature because of its simplicity and better performance over alternative tests. The basic model is taken from Granger (1969), who specified it in the following form.

Let X_t and Y_t be two stationary time series. The causal model is then given by

$$X_t = \Sigma ai\, X_{t-i} + \Sigma bi\, Y_{t-i} + u_t$$
$$Y_t = \Sigma ci\, Y_{t-i} + \Sigma di\, X_{t-i} + v_t$$

where u and v are uncorrelated white-noise series. In this specification although i can take a value of infinity, in practice it is assumed finite and shorter than the given time series. The definition of causality implies that Y is causing X provided Σbi is not statistically zero. Similarly, X is causing Y if Σdi is not statistically zero. If both these events occur, there is said to be a feedback relationship[14].

In implementing the bi-variate causality test between money supply growth (μ) and inflation (π), the lag length was sequentially set at 1,2,3, ...,10 months. This was done because causal inference is sensitive to the choice of lag length. Given the sample size the maximum lag length of 10 month for the test was reasonably long. It did allow a reasonable amount of time for money supply growth to exert its impact on inflation.

In order to remove deterministic trend and seasonalities, each of inflation and money supply growth was first regressed on constant, time trend, and monthly seasonal dummies. The residuals for inflation (πr) and money supply growth (μr) were then used for the conduct of the Granger test.
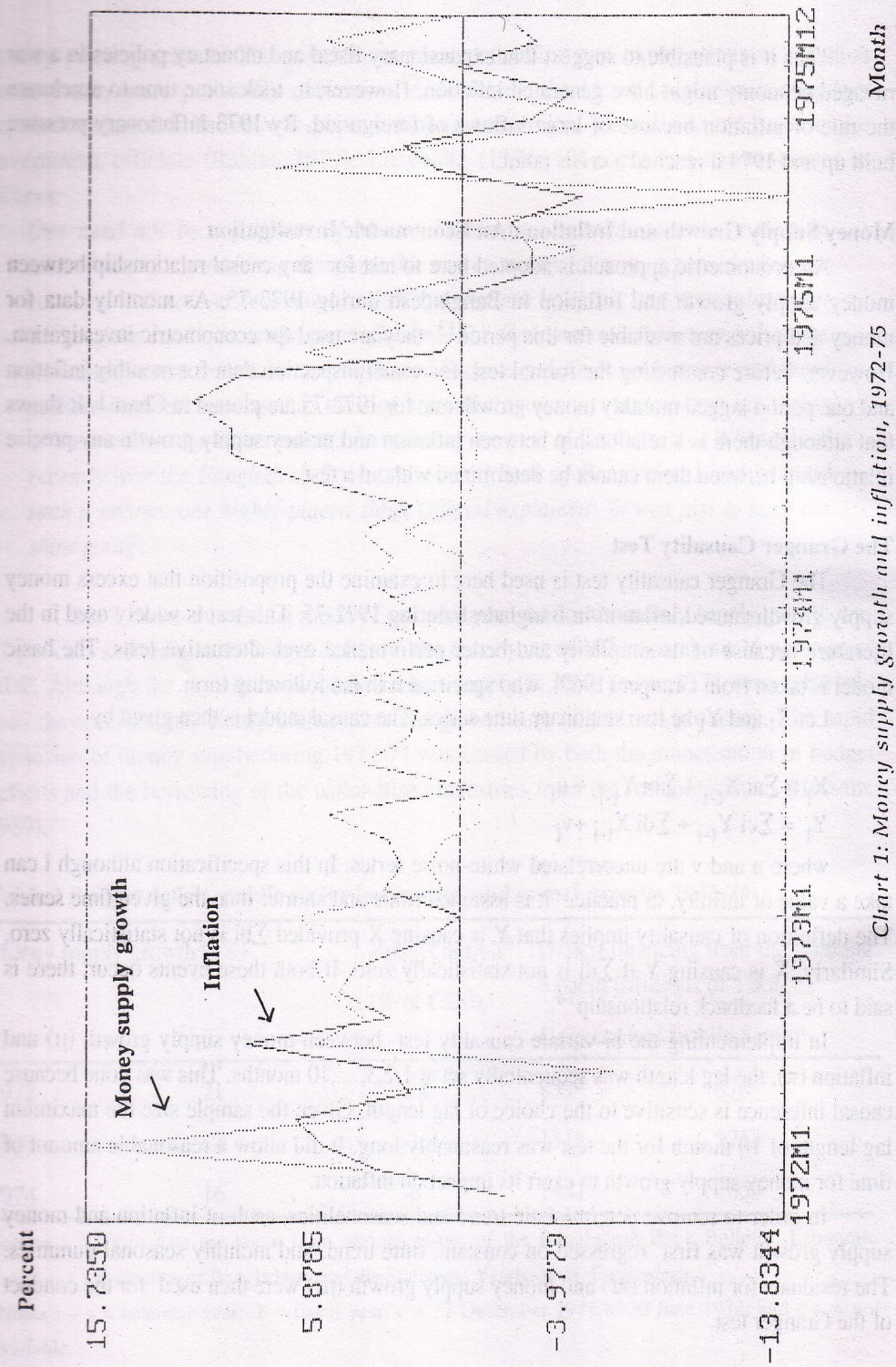
Chart 1: Money supply growth and inflation, 1972-75

Table 3 reports the test results for two definitions of money: narrow (M1) and broad (M2)

Table 3 The Granger Causality test results

Lag length	F-Statistic (degrees of freedom)	
	Narrow Money	Broad Money
1	7.5^a (1,44)	4.3^b (1,44)
2	5.2^a (2,41)	2.5^c (2,41)
3	3.1^b (3,38)	1.0 (3.38)
4	2.7^b (4,35)	0.7 (4,35)
5	1.4 (5,32)	0.9 (5,32)
6	1.1 (6,29)	1.0 (6,29)
7	0.9 (7,26)	0.9 (7,26)
8	0.7 (8,23)	0.9 (8,23)
9	0.6 (9,20)	1.6 (9,20)
10	0.7 (10,17)	1.7 (10,17)

Notes : * $\pi = 100$ (In CPI - In (CPI (-1)); and $\mu = 100$ (In M - In M(-1), where CPI is the consumer price index for the middle class government employees in Dhaka city, and M is the Stock of money supply.
+ Regression model: $\pi r_t = \sum a_i \pi r_{t-i} + \sum b_i \mu r_{t-i}$ (i = 1,2, ...10)
! a, b and c denote significance at the 1, 5, and 10 per cents level.

The Granger causality test results are found sensitive to the choice of lag length. The null hypothesis that the growth rate of the narrow money supply did not cause inflation in Bangladesh during 1972-75 is rejected at the 5 per cent level until the lag length is extended beyond four months, while the null hypothesis that the growth rate of the broad money supply did not cause inflation during the above period is rejected at the 10 per cent level until the lag length is extended beyond two months.

An implication of the above results is that money supply growth did have a **short run effect** on inflation, but its long run effect was insignificant[15]. Apparently this finding is inconsistent with the Monetarist proposition that money supply growth does have a pronounced effect on inflation in the long run, but not in the short run. However, such a conclusion should not be drawn because of the small number of observations and because by long run Monetarists sometimes consider a period of five or even ten years.

The overall results suggest that money supply growth did have an immediate effect on inflation. It usually happens in a hyperinflationary situation when money is treated like **a hot**

potato. Indeed, during a hyperinflation inflationary expectations (formed on basis of inflation) may become dominant and create a self-sustaining inflationary process (Cagan, 1956). Bangladesh of course did not experience hyper inflation, but there was a period in 1974 when inflation was about to explode. It appears that inflationary expectations played a major role in the inflationary process in Bangladesh during 1972-75. As most economic agents in Bangladesh during 1972-75 were directly or indirectly aware of expansionary macroeconomic policies of the government, the money supply growth might have captured the inflationary expectations as assumed under rational expectations model of inflation (Sargent, 1986). The contemporaneous causal relationship between money supply growth and inflation thus may reflect the economic behavior under an explosive inflationary situation.

The monetary dynamics of hyperinflation is linked with a specialsed form of the money demand function developed by Cagan (1956) in which real money balances depend on expected inflation. Such a relationship is examined below for Bangladesh.

Money Demand and Expected Inflation

Cagan (1956:91) remarked that 'hyperinflation can be explained almost entirely in terms of the demand for money'. He found that real money demand sharply declined during all seven hyperinflations he investigated in his study. He suggested that the decline in money demand was not because of any change in individuals' preference for real money balances but was in response to expected inflation. In a simplified form the Cagan money demand function can be specified as:

$$\ln m_t = m\,(\pi^e) \tag{2.1}$$

where m is the holding of real money balances and π^e is expected inflation which is a proxy for the opportunity cost of holding money. As in a highly inflationary economy, expected inflation roughly approximates actual inflation, real money balances may be expressed as a function of actual inflation (π)

$$\ln m_t = m\,(\pi) \tag{2.2}$$

Dynamic Specification of Money Demand

For estimation purposes a general dynamic specification of the following form is used

$$Y_t = \alpha_1 z_t + a_2 z_{t-1} + \alpha_3 Y_{t-1} \tag{2.3}$$

Hendry, Pagan and Sargan (1984) suggest that the model of the above form is general in that it encompasses at least nine types of dynamic specification. They also mention that any dynamic model whatever theoretical reason may lie behind its specific form must be tested against the general unrestricted dynamic form to protect it from unwarranted mis-specification. In particular, they suggest that invalid exclusion of z_{t-1} can have important

repercussions since the shape of the distributed lag relationship derived form a simple partial adjustment model

$$Y_t = \alpha_1 Z_t + \alpha_3 Y_{t-1} \qquad (2.4)$$

may be skewed with a large mean lag when a_3 is large though that from model (2.3) need not be for the same numerical value of α_3.

Regression Result

Initially the following money demand model was used for estimation

$$\ln m_t = \alpha_0 + \alpha_1 \ln IP_t + \alpha_2 \ln IP(-1) + a_3 \pi_t + a_4 \pi_{t-1}$$
$$+ \alpha_5 \ln m_{t-1} + \text{Seasonals} + \zeta_t \qquad (2.5)$$

Where IP is industrial output and ζ_t is a random error term. Although during hyperinflation real output may be assumed constant, this has not been the case for Bangladesh. Therefore, an index of industrial output was used in the money demand model to avoid mis-specification error. (Monthly data for aggregate output are not available.)

Preliminary regression results showed that the industrial output index was insignificant and that the coefficient on lagged dependent variable exceeded one. The latter result might have been due to exclusion of any relevant variable in the estimating equation. Therefore, in order to minimise any mis-specification error a time trend (T) was used in the estimating equation. From such an expanded model, the following equation was found to fit the data best. In the regression results the figures in parentheses below the coefficients are absolute t-ratios, Adj. R^2 is the adjusted coefficient of determination, Dh is the Durbin h-statistic and LM is Lagrange Multiplier statistic (F-version) for twelve order serial correlation.

Equation of Real Narrow Money Balances : m (M1/CPI)

$$\ln m_t = 0.45 \quad -0.70\pi_t \quad -0.39\pi_{t-1} \quad -0.04 \ln T$$
$$(120) \quad (2.97) \quad (1.77) \quad (2.47)$$
$$+ 0.97 \ln m_{t-1} \quad + \text{seasonals}$$
$$(23.02)$$

Sample : 1972 M3-75M12 Estimator: OLS Adj. R^2 = 0.98 Dh = undefined LM:(12,18) = 1.19

As expected, the coefficient on current inflation bears a negative sign and is significant. The coefficient on one period lagged inflation also bears a negative sign and is significant (albeit, at the 10 per cent level). The results suggest that economic agents reduced their holding of real money balances in response to inflation and perhaps increased their demand for real goods, particularly food grains in the absence of alternative financial assets.

The explanatory power of the equation is high. Detailed diagnostic test statistics (not all reported here) do not suggest any major statistical problem. Chart 2 plots the actual and fitted values of real money balances. It shows that the fitted values closely track the actual values over the sample period.
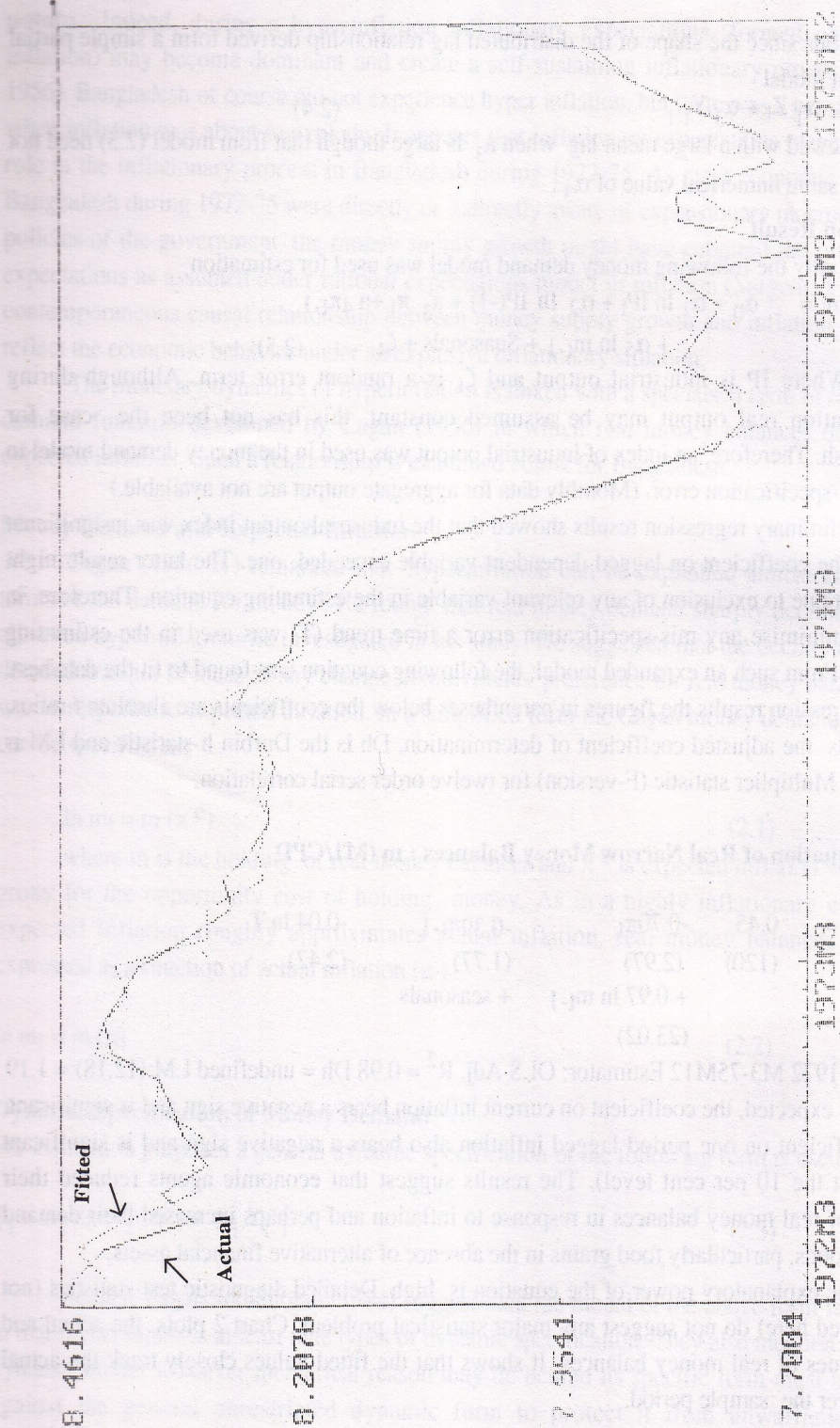
Chart 2: Actual and fitted values of (log) of real narrow money balances

III. THE RELATIVE PRICE OF FOOD AND THE FAMINE

One feature of the 1974 Bangladesh famine was that it was accompanied by a sharp increase in the relative price of food. Chart 3 plots the relative price of food for 1973-75.

It shows that the relative price of food began to increase from the mid-1973 and that it reached the peak level during the mid-1974. An unresolved issue is why did the relative price of food sharply increase in 1974 despite a relatively high level of food availability (Table 4)

Table 4   Index of food availability (or rice output), 1970-75

Year	Index of per-capita food availability		Index of per-capita rice output	
	A	B	A	B
1970	115	113	115	111
1971	100	100	100	100
1972	103	96	90	89
1973	103	103	95	89
1974	**107**	**104**	**105**	**101**
1975	100	98	99	93

Sources : A = Alamgir (1980); and B = Author's estimate from food statistics of Islam (1978).

Did Floods and Smugglers and Hoarders Cause the Food Shortage?

Table 4 reveals that the level of food availability (or rice output) in 1974 was higher than that in 1973 and in 1975 . Therefore, the level of food availability (or rice output) cannot explain the sharp increase in the relative price of food and later famine.

The 1974 floods remain one popular explanation of the rise in food price. Sen (1981) however discounts their impact on food price rise. He writes:

> ..the rise in rice price could not, however, have been the result of the flood only. Indeed, in the early months of 1974, long before the floods, rice prices were rising sharply- almost as fast as they did during the flood and immediately after... Thus the explanation of the rise in rice price must be sought partly in influences that have nothing to do with the floods. And this is where a macroeconomic study dealing with such factors as effective demand, money supply, etc., could contribute substantially (Sen, 1981:150-51).

Another plausible explanation of the increase in the relative price of food has been the smuggling and hoarding of food grains (Ahmad, 1983; Alamgir, 1980). It was apparently so. However, there was no economic explanation of hoarding[16] and smuggling of food grains. When a number of influential ruling party members were found linked with hoarding and

Chart 3: Index of relative price of food, 1973-75
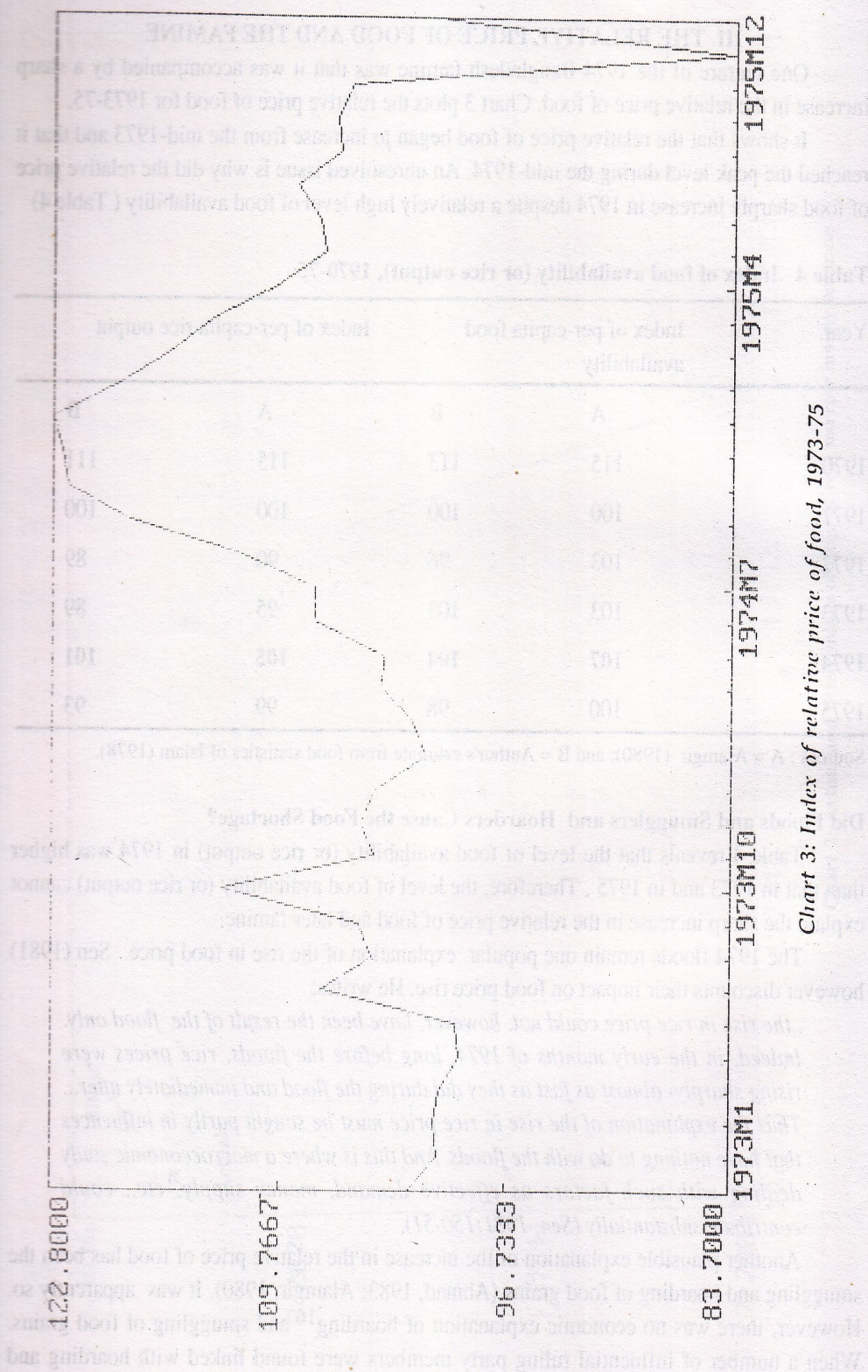
smuggling of food grains (Maniruzzaman, 1975), the political opposition and media became interested in blaming the government for not taking any decisive action against anti-state elements instead of looking for the root causes of hoarding and smuggling. Thus an impression was created that food shortage was essentially a law and order, rather than a macroeconomic problem. Far from the truth, the main causes of hoarding and smuggling of food grains can be found in the domain of economics.

Detailed information on the volume of hoarding and smuggling of food grains is not available. There is also no consensus on the idea that there was excess smuggling of food grains in 1974[17]. However, there is a broad consensus that the panic buying of food grains by Millions of consumers in a hyperinflationary situation (and the delay in marketing food grains by surplus farmers) might have created food shortage in the market. Therefore, despite the view that the deteriorating law and order situation might have worsen the food crisis, it was unlikely that any punitive action by the government against smugglers and hoarders would have made much difference in the way that food prices were increasing unless such an action could have brought confidence back to the people in the government's ability to control inflation. But in reality the government lost both its credibility and the trust of the people, which led most people to reach a conclusion that the government would not be able to stabilise the economy.

Therefore, it becomes obvious that the sharp increase in the relative price of food needs to be explained within a macroeconomic perspective. Keeping this in mind, a food price determination model is developd below which explains the increase in the relative price of food in an inflationary situation.

A MODEL OF THE RELATIVE PRICE OF FOOD

The Model

The demand for food

The amount of food demanded (Fd) can be expressed as a function of per-capita real income (y), the relative price of food (pf) and expected price level (p^e)

$$Fd = Fd (y, pf, p^e) \hspace{3cm} (3.1)$$

The partial derivatives of Fd with respect to y and p^e are positive and the partial derivative of Fd with respect to pf is negative.

The supply of food

The amount of food available in the market for sale can be expressed as a function of the relative price of food and expected price level. Assume that the government imports food grains and distributes them through the rationing system. For simplicity the level of food imports (Fm) is assumed exogenously determined[18]. The aggregate food supply function can then be written as

$$Fs = Fs (pf, p^e) + Fm \hspace{3cm} (3.3)$$

The partial derivative of Fs with respect to pf is positive and the partial derivative of Fs with respect to p^e is negative.

The equilibrium price of food

Assume that food price is determined by market forces and that the government influences the price of food by changing the level of food supply through the distribution of imported food grains. The equilibrium price of food can then be obtained by setting: Fd = Fs. By imposing this condition the equilibrium price of food can be expressed as a function of per-capita real income, expected price, and food imports.

$$pf = pf (y, p^e, Fm) \hspace{4cm} (3.3)$$

The partial derivative of pf with respect to each of y and p^e is positive and the partial derivative of pf with respect to Fm is negative. In this specification the crucial variable is the level of expected price, which is assumed to be determined outside the food market by macroeconomic policies. Expected price level affects both the supply of and demand for food. If there is an increase in the level of expected price, the suppliers of food will supply less in the market and the demanders of food will increase their demand for food. As had happened in Bangladesh during the 1974 famine, surplus farmers sold less food in the market (Alamgir, 1980) because of their expectation of higher food prices. By contrast, expecting higher price level, the demanders of food (consumers and hoarders) increased their demand for food[19].

Figure 1 explains the rapid increase in the relative price of food during an inflationary situation. Assume that the food market is in equilibrium at point **A** with **price pfo** and output **qo.** Let there be an exogenous agricultural supply shock (e.g., floods or droughts) that damages the food crops. Such a shock will shift the supply curve of food to **Fso*** (given that expected price level remains p^{eo}). As a result there will be increase in food price from **pfo** to **pfo***, which will lower the level of food transaction form **qo** to **qo*** (position B). Such an increase in food price is temporary in the sense that a normal food production in the next period will lower the food price to its original level. However, it may not be so in an inflationary situation.

Assume that the expansionary monetary and fiscal policies have created an inflationary situation. Any supply shock in such a situation will induce the suppliers of and demanders for food to except a higher level of price (p^{e*}). When it is assumed that the suppliers of food have an information advantage, they would upwardly adjust their price expectations while the demanders for food may maintain their original price expectations (p^{eo}). Such a situation is represented by position **C**. However, in a highly inflationary situation it is reasonable to expect that both the suppliers of and demanders for food would acquire relevant information from various sources and change their price expectations so that one group may not have any inormation advantage over the other . Under such a situation the supply curve of food will shift to **Fs**** and the demand curve of food will shift to **Fd*.** Figure 1 shows that relative price of food under a higher level of expected price (position D) is much higher that the relative price of food after a supply shock, but without any change in expected price (position **B**). Note that economic agents during high inflation do not need any supply shock

to revise their price expectations. Continuation of expansionary macroeconomic policies in an inflationary situation may also induce economic agents to upwardly revise their price expectations.
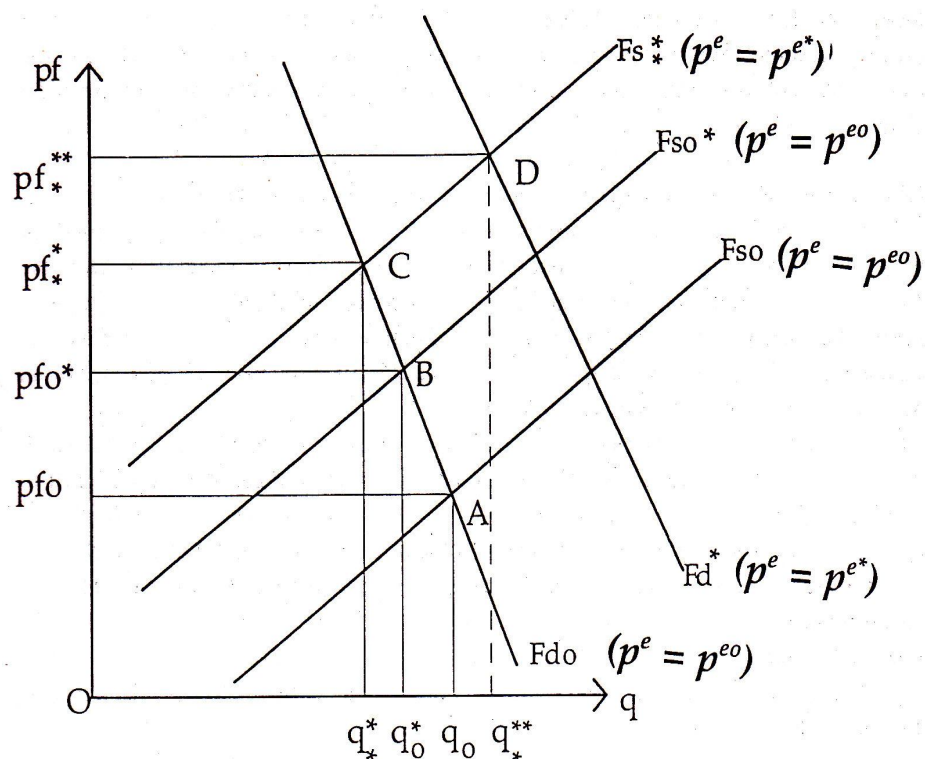

FIGURE 1. RELATIVE PRICE OF FOOD

NOTES TO FIGURE:

pf	=	relative price of food
q	=	food output
p^e	=	expected price ($p^{e*} > p^{eo}$)
A	=	original food market equilibrium position (Fso = Fdo)
B	=	Position after the agricultural supply shock, but no change in expected inflation
C	=	position after the agricultural supply shock and with higher expected inflation by the suppliers of food only
D	=	position after the agricultural supply shock and with a higher expected inflation by the suppliers of and demanders for food

As indicated above, the then government adopted expansionary monetary and fiscal policies from the beginning of 1972. They might have created inflation and higher price expectations. When inflation was already high and accelerating, any food crop damaged by floods might have induced the suppliers of and demanders for food to upwardly adjust their price expectations. This might have shifted the supply curve of food to the left and the demand curve of food to the right, both of which could have caused the sharp increase in the relative price of food[20].

Relative Price of Food and Expected Price Level : Did They Move Together?

One empirical test for the above model of food price during high inflation is a test for the relationship between the relative price of food and expected price level. Note that in the classical view, the relative price of any good is independent of the level of absolute price because the relative price of any good is determined in the real sector by the interaction of the demand for and supply of good in question, while the level of absolute price determined by an exogenously determined stock of money supply.

For simplicity, assume that any change in real income during high inflation is small relative to the change in the price level. A simple statistical test can then be designed to examine the relationship between the relative price of food and expected price level. The presence of any statistical relationship between them would then suggest that the classical view of no relationship between the relative price of food and the level of expected (or actual) price is broken.

A Testable Model

Let the relationship between the relative price of food and expected price level be expressed in log-linear form:

$$\ln pf_t = \beta \ln p^e_{t+1} + \zeta_t \qquad (3.4)$$

where ζ is a random error term which is assumed stationary. To assume away any mis-specification error, the error term may be considered as capturing the effect of real variables, such as real income and food imports.

Although there is a debate on the question of how price expectations are formed, it can be assumed that any forecasting error of (log of) expected price level ($\varepsilon_{t+1} = \ln p_{t+1} - \ln p^e_{t+1}$) is stationary. Equation (3.4) can then be written as

$$\ln p_{t+1} = \beta^{-1} \ln pf_t + \omega_{t+1} \qquad (3.5)$$

where $\omega_{t+1} = (\varepsilon_{t+1} - \beta^{-1} \xi_t)$

Subtraction of $\ln p_t$ from both sides of (3.5) will yield

$$\ln p_{t+1} - \ln p_t = \beta^{-1} \ln pf_t - \ln p_t + \omega_{t+1} \qquad (3.6)$$

By assumption, $\ln p_{t+1} \ln p_t$ and ω_{t+1} can be considered as stationary. This suggests that the liner combination $[\beta^{-1} \ln pf_t - \ln p_t]$ is also stationary despite the possibility that $\ln pf_t$ and $\ln p_t$ are individually non-stationary. In the terminology of cointegration approach to time

series modeling, this would mean that the relative price of food and the price level would move together in statistical sense and be cointegrated (Engle and Granger, 1991).

Evidence from Bangladeshi Data

Chart 4 plots the (log) of relative price of food and the price level in Bangladesh for 1973-75. It shows that there was a close relationship between the relative price of food and the price level since the late-1973. However, a relationship between the two time series does not suggest any causal relationship between them unless it statistically established. To achieve such an objective it is desirable to investigate the time series properties of the relative price of food and the price level to determine the presence of cointegral relationship between them. However, because of the small sample size the cointegration approach may not be appropriate for the present case. Instead, as monetary expansion might have increased the price level and caused high price expectations, a direct test for the relationship between money supply growth and the relative price of may food be conducted.

Empirical Results

The following regression model was to examine the effect of money supply growth on the proportional change in the relative price of food

$$\Delta \ln (FP/CPI)_t = \alpha + \sum \beta_i \ln (M1_{t-i}/M1_{t-i-1}) + \sum \eta_i \ln FO_{t-i} + \sum \lambda_i \ln CD_{t-i}$$
$$+ \sum \psi_i \ln FM_{t-i} + \upsilon_t \quad (i = 0, 1, 2, ..)$$

Where FP is the index of food price, CPI is the consumer price index, M1 is the stock of narrow money supply, FO is the offtake of food grains from government stocks through the rationing system, FM are the imports of food grains, CD is a measure of crop damage by floods and other natural causes, and υ is the random error term which is considered as capturing the effects of random factors, including real economic growth. The expected signs of the parameters are: $\beta_i > 0, \eta_i < 0, \eta_i < 0$ and $\psi_i < 0$.

Given the availability of data[21], the above equation was estimated for 1973 M1-75M8. After experimenting with the general form of the equation, the following equation was found to fit the data best.

$$\Delta \ln (FP/CPI)_t = \quad 0.05 \qquad +0.20 \, \Delta \ln\left(M1_t / M1_{t-1}\right) + \quad 0.24 \, \Delta \ln (M1_{t-1}/M1_{t-2}$$
$$\qquad\qquad (0.58) \qquad (2.20) \qquad\qquad\qquad\qquad (2.65)$$
$$\qquad\qquad -0.01 \ln FM_t \qquad\qquad\qquad\qquad\qquad +0.02 \ln CD_t$$
$$\qquad\qquad (2.84) \qquad\qquad\qquad\qquad\qquad\qquad (1.22)$$
$$\qquad\qquad\qquad + \text{seasonal dummies}$$

Estimator : OLS Adj.R^2 = 0.49 Durbin-Watson statistic = 2.03

In the estimated equation the coefficients of current and one period lagged money supply growth variables bear a positive sign and are significant. It indicates that money supply growth contributed to the rapid increase in the relative price of food. Endnote 9 reports a plausible channel through which money supply growth may increase the relative price of food. The result obtained here is however different from Ravallion's (1987) finding that money growth did not have an effect on food price. He of course used rice price, rather than
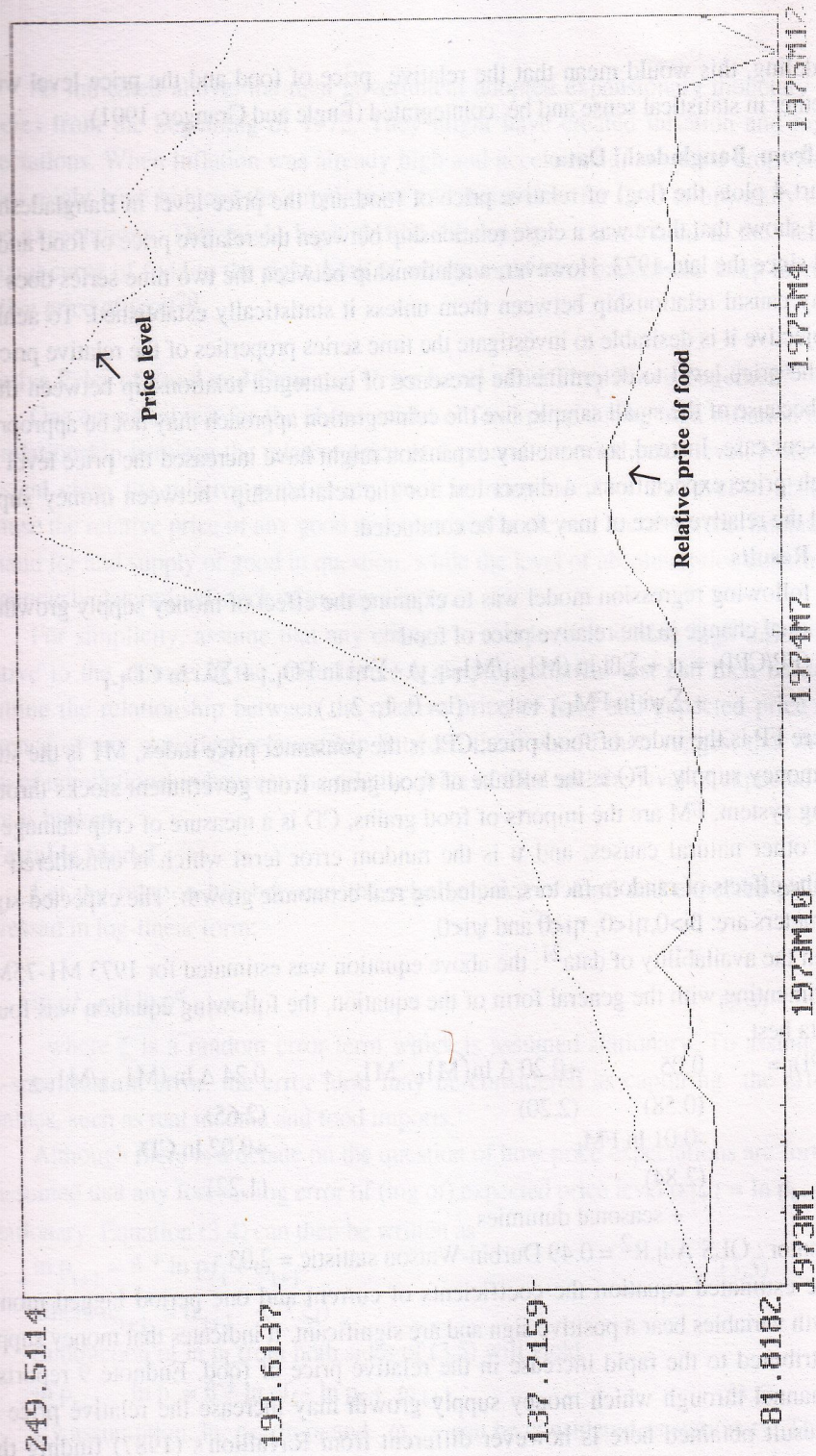
Price level

Relative price of food

Chart 4: Index of each of relative price of food and the price level

1973M1   1973M10   1974M7   1975M4   1973M12

249.5114   193.6137   137.7159   81.8182

the relative price of food. The coefficients of crop damage and food imports bear their expected signs, and the coefficient of food imports is significant.

IV. AGRICULTURAL WAGES AND EMPLOYMENT

As the 1943 Bengal famine, the 1974 Bangladesh famine was essentially a rural phenomenon. Following the definition of Alamgir (1980), it was a class famine. The assetless rural poor (e.g., wage labourers, transport workers, village craftsmen and petty traders) were the victims of the famine (Alamgir, 1980; Sen, 1981). The wage labourers being largely dependent on wage income became the victims of the famine when their real wage income fell following the decline in both the real wage rate and employment. The sharp increase in the relative price of food indeed lowered the food purchasing power of their wage income.

The simultaneous decline in the real wage rate and employment apparently suggests that the labour market did not function in the neoclassical fashion, in the sense that any decline in the real wage rate did not increase the demand for labour and hence employment. This was however not the case. The apparent labour market failure originated from the fact that the traditional neoclassical wage model is not adequate in explaining the working of the labour market under economic distress. However, a marginally modified model of agricultural wage determination can explain the simultaneous decline in the real wage rate and employment under economic stress.

Decline in Employment in 1974

Based on the Bangladesh Institute of Development Studies Famine Survey, Alamgir (1980) estimated the decline in rural employment between July-October 1973 and July October 1974.

Table 5   Percentage decline in employment of hired labourers between July-October 1973 and July - October 1974

Area	Landowner	Landless Labourers	All Villagers
All area	5.0	**18.7**	4.6
Famine area	33.9	**34.5**	24.5
Nonfamine area	-7.7	**6.4**	-2.4

Source : Alamgir (1980:346)

Table 5 reveals that the employment of landless labourers in both the famine and non-famine areas sharply declined in July-October 1974 compared with that in July-October 1973. This decline in employment for wage labourers was a sign of low demand for wage labour.

Cause of Decline in Labour Demand

Chadha and Teja (1989) argue that involuntary unemployment during the 1974 Bangladesh Famine was not caused by unwillingness of workers to accept lower real wages but rather by unwillingness of employers to hire them at lower wages because lower real wages mean the possibility of undernourishment and hence of low **work effort** of workers. This does not appear to be a satisfactory explanation of the decline in labour demand because the efficiency wage theory has been found inconsistent with empirical evidence for Bangladesh and India (Ahmed,1981; Bardhan, 1984; Binswanger and Rosenzweig, 1984). Ravallion (1987:116) finds that the efficiency wage theory is also inconsistent with empirical evidence for Bangladesh during the famine. He writes:

> A strong implication of this [the efficiency wagey theory is that the food wage rate should be invariant to the price of food. This property is shared by the well-known models of Lewis (1954) and Fei and Ranis (1964) in which the real wage is fixed at a predetermined 'subsistence' level. Such theories appear to be at odds with Bangladesh's experience of considerable real wage flexibility during the 1974 famine.

Chart 5 shows that, contrary to the implication of the efficiency wage theory that there is a set floor to wages, the real wage rate in Bangladesh fluctuated sharply during 1972-75.

Supply Shocks and Labour Demand

It is plausible to assume that the rise in rural involuntary unemployment during the famine was the consequence of a series of supply shocks of different magnitude beginning from 1971 upto 1974 as they had a cumulative negative effect on both farm and non-farm activities. The immediate shock was the country-wide devastating flood in 1974 which damaged the major crops and lowered the employment opportunities of wage labourers. As most non-farm activities in the rural areas are directly and indirectly linked with farm activities, the decline in farm activities had a flow on effect on non-farm activities and that lowered the employment opportunities of village craftsmen, petty traders, transport workers, and the producers of various other services[22]. When the economic condition began to deteriorate the rich and medium farmers also experienced the pressure of (actual or perceived) economic stress. Facing economic distress, they reacted in two ways. First, as a cost cutting measure, they used family labour more intensively for farm activities which would otherwise had been done by wage labourers. Such a substitution of family labour for wage labour lowered the demand for wage labour. Second, most non-essential farm and non-farm activities were deferred until the economic condition was improved. On the supply side, the sharp increase in the relative price of food increased the supply of wage labour for two main reasons. First, as the food wage rate declined, the reservation wage rate of wage labourers fell and for survival, they offered more labour for sale. Second, new workers (including children, destitute women and the old) entered the labour market under the pressure of economic distress.
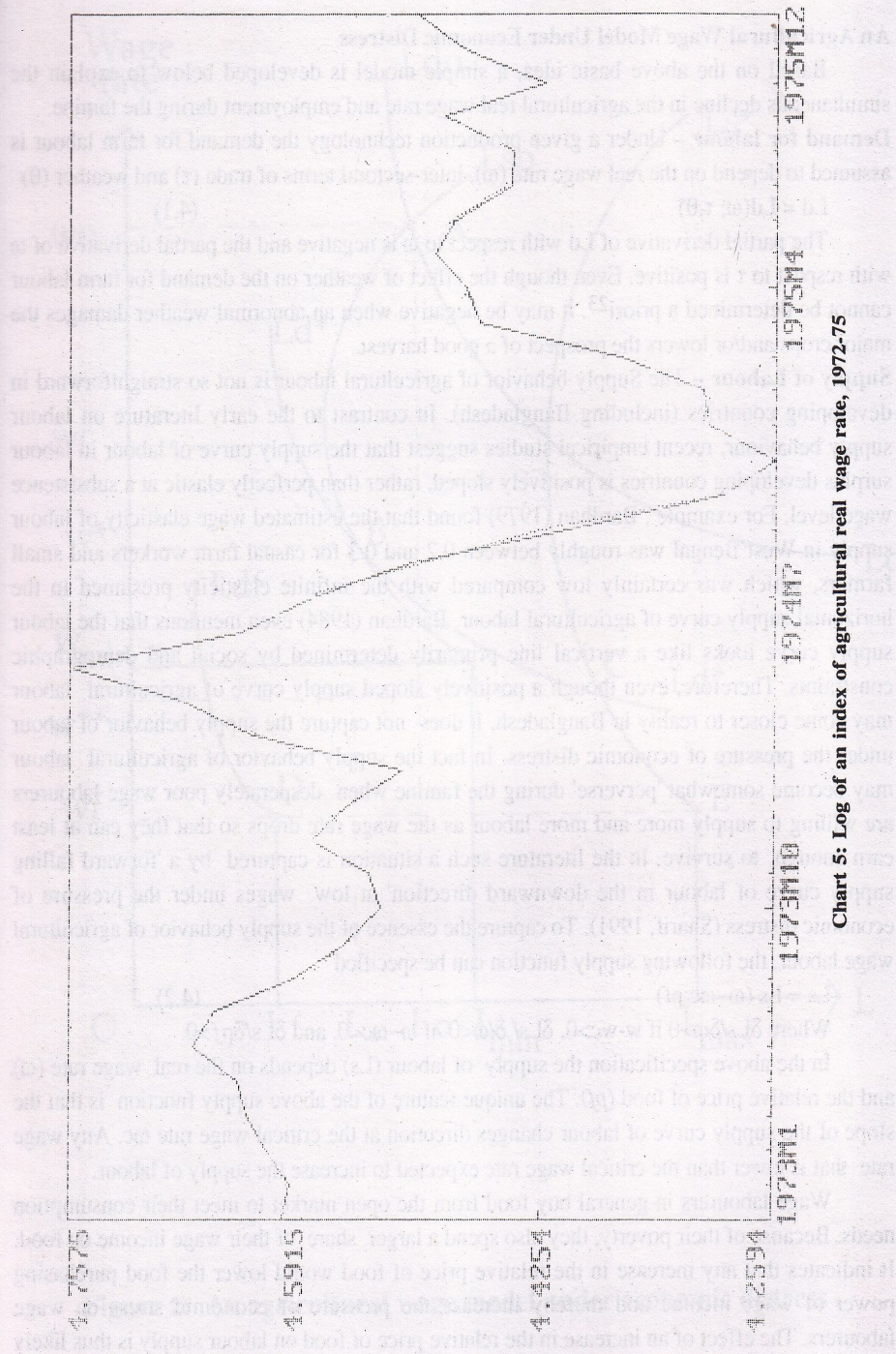
An Agricultural Wage Model Under Economic Distress

Based on the above basic idea, a simple model is developed below to explain the simultaneous decline in the agricultural real wage rate and employment during the famine.

Demand for labour – Under a given production technology the demand for farm labour is assumed to depend on the real wage rate (ω), inter-sectoral terms of trade (τ) and weather (θ)

$$Ld = Ld(\omega; \tau, \theta) \qquad (4.1)$$

The partial derivative of Ld with respect to ω is negative and the partial derivative of ω with respect to τ is positive. Even though the effect of weather on the demand for farm labour cannot be determined a priori[23], it may be negative when an abnormal weather damages the major crops and/or lowers the prospect of a good harvest.

Supply of Labour – The Supply behavior of agricultural labour is not so straightforward in developing countries (including Bangladesh). In contrast to the early literature on labour supply behaviour, recent empirical studies suggest that the supply curve of labour in labour surplus developing countries is positively sloped, rather than perfectly elastic at a subsistence wage level. For example , Bardhan (1979) found that the estimated wage elasticity of labour supply in West Bengal was roughly between 0.2 and 0.3 for casual farm workers and small farmers, which was certainly low compared with the infinite elasticity presumed in the horizontal supply curve of agricultural labour. Bardhan (1984) even mentions that the labour supply curve looks like a vertical line primarily determined by social and demographic constraints. Therefore, even though a positively sloped supply curve of agricultural labour may come closer to reality in Bangladesh, it does not capture the supply behavior of labour under the pressure of economic distress. In fact the supply behavior of agricultural labour may become somewhat 'perverse' during the famine when desperately poor wage labourers are willing to supply more and more labour as the wage rate drops so that they can at least earn enough to survive. In the literature such a situation is captured by a 'forward falling supply curve of labour in the downward direction' at low wages under the pressure of economic distress (Sharif, 1991). To capture the essence of the supply behavior of agricultural wage labour, the following supply function can be specified

$$Ls = Ls \,(\omega - \omega c; pf) \qquad (4.2)$$

Where $\delta Ls/\delta\omega > 0$ if w-wc>0, $\delta Ls/\delta\omega < 0$ if $\omega - \omega c < 0$, and $\delta Ls/\delta pf > 0$.

In the above specification the supply of labour (Ls) depends on the real wage rate (ω) and the relative price of food *(pf)*. The unique feature of the above supply function is that the slope of the supply curve of labour changes direction at the critical wage rate ωc. Any wage rate that is lower than the critical wage rate expected to increase the supply of labour.

Wage labourers in general buy food from the open market to meet their consumption needs. Because of their poverty, they also spend a larger share of their wage income on food. It indicates that any increase in the relative price of food would lower the food purchasing power of wage income and thereby increase the pressure of economic stress on wage labourers. The effect of an increase in the relative price of food on labour supply is thus likely
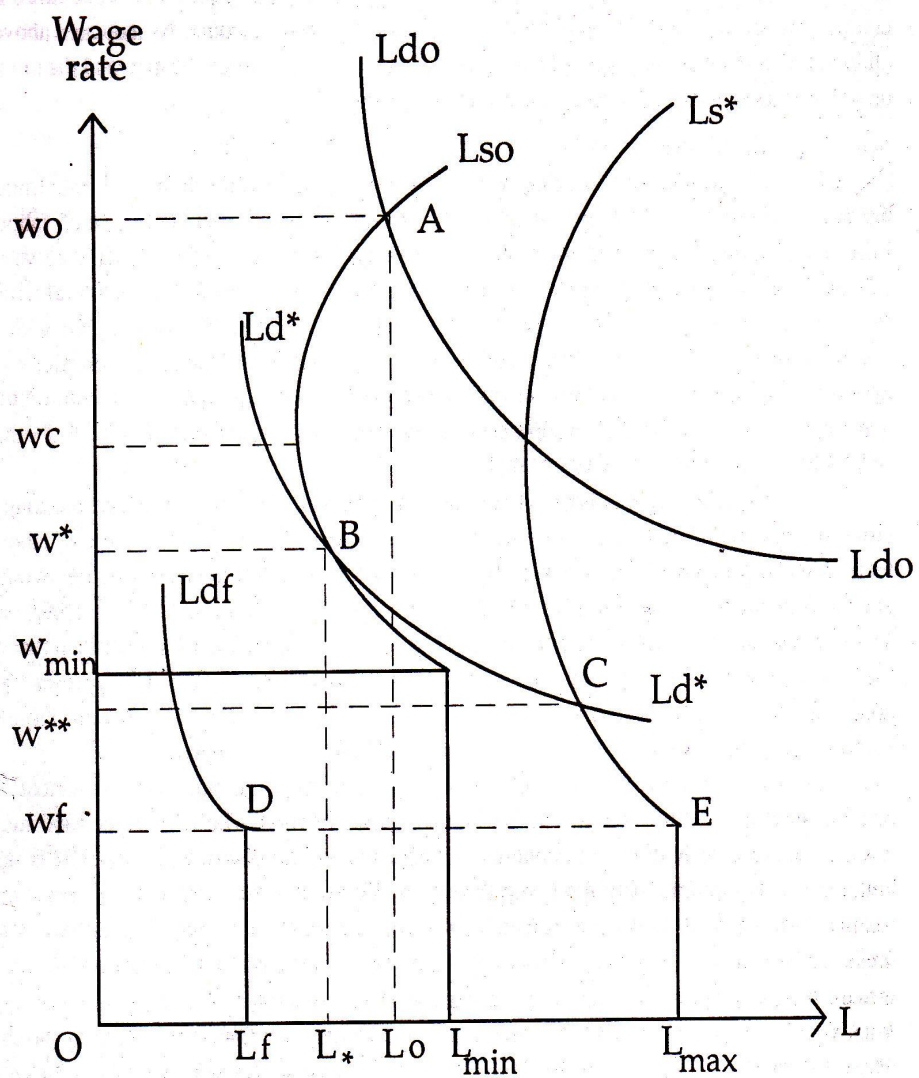
Figure 2: An agricultural wage model under economic distress

to be positive because for survival the wage labourers may be required to work more to compensate for any loss of food purchasing power of their wage income. As indicated above, an increase in the relative price of food is also likely to induce children, women and the old to enter the market under the pressure of economic stress.

Working of the Model

Figure 2 explains the working of the model. ωo is the equilibrium wage rate under normal agricultural condition. It is determined at the level where the demand curve of labour Ldo cuts the upward sloping segment of the labour supply curve (Lso). The demand curve of labour (Ldo) is normal shaped and is drawn at the given levels of weather, agricultural terms of trade, and production technology. The supply curve of labour (Lso) is drawn with a relatively steep slope because of the general empirical finding that the supply elasticity of agricultural labour is relatively low in developing countries. W_{min} represents the minimum wage rate which is acceptable to farm workers under normal agriculture condition. At this wage rate L_{min} is the level of labour supply.

Assume that there has been an agricultural supply shock which damaged the major crops and lowered the prospect of a good harvest. This will shift the demand curve of labour leftwards to a position Ld^*. Given the supply curve of labour (Lso), the real wage rate would decline from wo to w^* and the level of employment would decline from Lo to L^*. However, as the wage rate w^* is below the critical rat ωc, the level of employment is higher than that at the critical wage rate. The wage rate w^* and the level of employment L^* represent an abnormal labour market condition, but not famine situation. Farm workers remain largely employed and they earn their living by working more hours at a low wage rate.

The worst situation may arise if the decline in both the wage rate and employment is accompanied by a sharp increase in the relative price of food. The relative of food may increase because of both macro economic policies and natural disasters, although it is not automatic. For example, any food crop damage by floods may not necessarily increase the relative price of food. If the government can import the required amount of food grains to meet the demand and the stockholders trust in the ability of the government to stabilise food prices, there may not be any significant increase in the relative price of food. By contrast, the relative price of food is likely to increase if there is already an inflationary situation and the stockholders do not have trust in the ability of the government to stabilise food prices. In such a situation, there may be excess hoarding and panic buying[24]. This was exactly what had happened in Bangladesh in 1974.

To represent such a situation, assume that there has been an increase in the relative price of food from pfo to pf^*. This will shift the supply curve of labour from Lso to Ls^*. Given the demand curve of labour Ld^*, such a shift of the supply curve of labour will lower the wage rate to the level w^{**}. Although the wage rate w^{**} is lower than W_{min}' it may now be acceptable to wage labourers because the intensity of economic distress is such that they would 'self-exploit' themselves for survival. However, if the increase in the relative price of

food is such that it creates a famine situation, the demand curve of labour is unlikely to remain at the level Ld^*. It will shift to the left at a position Ldf because employers may become pessimistic and then overreact, in the sense that in order to ensure that they do not themselves become the victims of the famine, they simply stop hiring workers except for any urgent farm and non-farm work. In this situation the level of employment would be demand determined at the famine wage rate (wf), defined as the food wage rate that may satisfy 'basic survival requirements' (Alamgir, 1980:51). At this wage rate the demand curve becomes vertical. Employers would then be able to hire workers from a large pool of unemployed hungry workers. It is also likely that the employees would select only the 'skilled workers', leaving less-skilled, women and the old unemployed. In the figure DE represents the level of involuntary unemployment, which includes regular wage labourers, children, women and the old.

A Monthly Econometric Agricultural Wage Model, 1973-75
The Wage Model

A general form of the wage model can be specified as follows.

Labour demand function: $Ld = g(\omega, tr, c, f)$ (4.3)

where w is the real wage rate, t is the agricultural terms of trade, r is rainfall (a measure of weather), c is crop damage (a proxy for floods and droughts) and f is fertilizer (a proxy for the production technology). The parameters of this function are expected to have the signs : $\delta Ld/\delta w<0$, $\delta Ld/\delta \tau>0$, $\delta Ld/\delta c<0$ and $\delta Ld/\delta f>0$. The expected net effect of rainfall on the demand for labor is indeterminate.

Labour supply function: $Ls = h(\omega, pf)$ (4.4)

The parameters of the labour supply function are expected to have the signs: $\delta Ls/\delta \omega>0$, and $\delta w/\delta pf>0$.

Equilibrium condition: $Ld = Ls$ (4.5)

By imposing the equilibrium condition, a reduced form wage equation can be derived as follows:

$$W = j(\tau, r, c, f, pf)$$ (4.6)

The reduced form parameters of the wage equation are expected to have the signs: $\delta w/\delta \tau>0$, $\delta w/\delta f>0$, $\delta w/\delta c<0$ and $\delta w/\delta pf<0$. The expected net effect of rainfall on the real wage rate is indeterminate.

Dynamic Specification

For reasons discussed in Section 2, a general dynamic specification of the following form was used for estimation purposes

$$y_t = \alpha_1 z_t + \alpha_2 z_{t-1} \ \alpha_3 y_{1-1}$$ (4.7)

Estimation and Analysis of Regression Results

Monthly data for all the required variables, except for the agriculture terms of trade, a crop damage proxy and the relative price of food, are available for 1972M1-75M12. Data for

the agricultural terms of trade and the relative price of food available for 1973M1-75M12, while the data for a crop damage proxy is available for 1972M7-75M8. (For detailed data sources, see Data Appendix.) given the availability of data the regression equation was initially estimated for 1973M1-75M8. When it was found that the crop damage dummy was not significant, the sample period of estimation was extended up to 1975M12. After experimenting with rainfall and the relative price of food, it was found that these two variables were not significant. When these variables were dropped, the following equation was found to fit the data best

$$\ln w_t = 1.79 \quad -0.15 \ln \tau_t \quad +0.10 \ln f_{t-1}$$
$$\quad (1.76) \quad (2.06) \quad (2.71)$$
$$\quad +0.53 \ln w_{t-1} + \text{seasonal dummies}$$
$$\quad (4.01)$$

Sample : 1973M1-1975M12 Estimator : OLS Adj.R^2 = 0.92 Durbin h=0.46

It was unexpected that rainfall, crop damage dummy, and the relative price of food (both current and lag terms) did not have any significant effect on the real wage rate. It was discussed in footnote 16 that the net effect of weather on labour demand is indeterminate. The insignificant coefficient on rainfall suggests that on the average, weather did not have any effect on the real wage rate. It was the same for both the relative price of food and crop damage. As the relative price of food and the agricultural terms of trade are correlated, the equation was estimated without the terms of trade variable. Even in such a restricted equation the coefficient on the relative price of food was not significant. It appears that although the supply shock variables might have some effect on the wage rate at the time of their occurrences, on the average they did not have any significant effect on the real wage rate over the sample period of estimation .

In the estimated equation, one period lagged fertilizer is significant. Fertilizer is an input which captures the introduction of the seed-fertilizer-irrigation technology in an otherwise traditional agriculture. The seed-fertilizer-irrigation technology has been found to increase the demand for labour by increasing land productivity (Hossain, 1989). The positive coefficient of fertilizer is thus consistent with a prior expectations.

A somewhat unexpected result is the negative coefficient of the agricultural terms of trade. In fact there is a debate on the impact of the agricultural terms of trade on the wage rate. For example, in an earlier study over a long sample period, Khan (1984) found that an improvement in the agricultural terms of trade result in higher real wages in Bangladesh. By contrast, Boyce and Ravallion (1987) found that an increase in the price of rice relative to the price of manufactured goods had an adverse effect on the agricultural real wage rate.

One plausible explanation of the adverse effect of the terms of trade on the wage rate is that the improvement in the agricultural terms of trade in Bangladesh during 1972-75 was essentially because of the increase in the relative price of rice. The increase in the relative price of food might have induced farmers to allocate more acreage to rice production at the expense of acreage for jute cultivation, the latter is a more labour intensive export crop
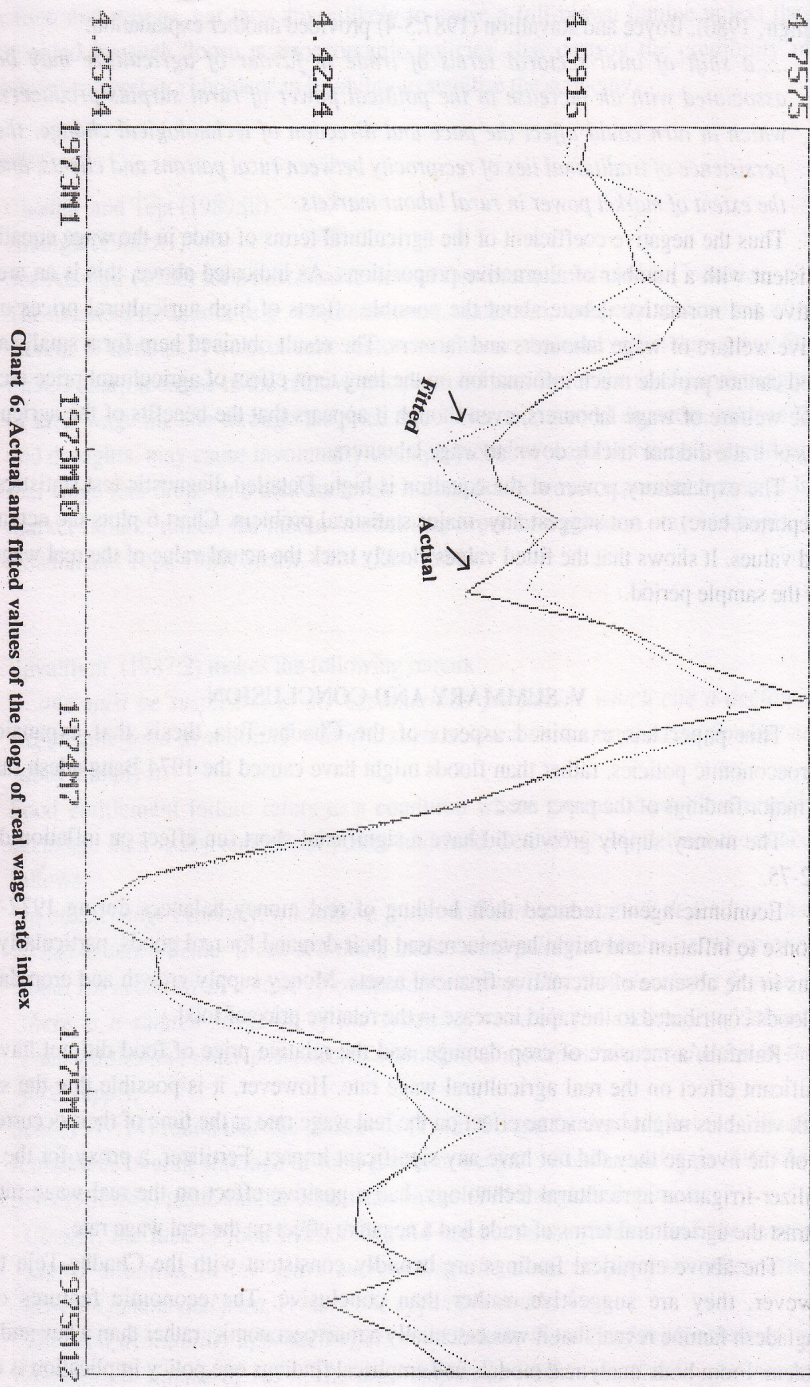
4.7575

4.5915

4.4254

4.2594

1973M1　1973M10　1974M7　1975M4　1975M12

Fitted

Actual

Chart 6: Actual and fitted values of the (log) of real wage rate index

(Alamgir, 1980). Boyce and Ravallion (1987:3-4) provided another explanation:

> *.....a shift of inter-sectoral terms of trade in favour of agriculture may be associated with an increase in the political power of rural surplus producers, which in turn could affect the pace and direction of technological change, the persistence of traditional ties of reciprocity between rural patrons and clients, and the extent of market power in rural labour markets.*

Thus the negative coefficient of the agricultural terms of trade in the wage equation is consistent with a number of alternative propositions. As indicated above, this is an area of positive and normative debate about the possible effects of high agricultural prices on the relative welfare of wage labourers and farmers. The result obtained here for a small sample period cannot provide much information on the long term effect of agricultural price increase on the welfare of wage labourers, even though it appears that the benefits of the agricultural terms of trade did not 'trickle down' to wage labourers.

The explanatory power of the equation is high. Detailed diagnostic test statistics (not all reported here) do not suggest any major statistical problem. Chart 6 plots the actual and fitted values. It shows that the fitted values closely track the actual value of the real wage rate over the sample period.

V. SUMMARY AND CONCLUSION

This paper has examined aspects of the Chadha-Teja thesis that expansionary macroeconomic policies, rather than floods might have caused the 1974 Bangladesh famine. The major findings of the paper are :

The money supply growth did have a significant short run effect on inflation during 1972-75.

Economic agents reduced their holding of real money balances during 1972-75 in response to inflation and might have increased their demand for real goods, particularly food grains in the absence of alternative financial assets. Money supply growth and crop damage by floods contributed to the rapid increase in the relative price of food.

Rainfall, a measure of crop damage, and the relative price of food did not have any significant effect on the real agricultural wage rate. However, it is possible that the supply shock variables might have some effect on the real wage rate at the time of their occurrences, but on the average they did not have any significant impact. Fertilizer, a proxy for the seed-fertilizer-irrigation agricultural technology, had a positive effect on the real wage rate. By contrast the agricultural terms of trade had a negative effect on the real wage rate.

The above empirical findings are **broadly** consistent with the Chadha-Teja thesis. However, they are suggestive, rather than conclusive. The economic features of the Bangladesh famine reveal that it was essentially a macroeconomic, rather than a law and order problem. From both analytical models and empirical findings one policy implication is drawn that random natural disasters, such as floods and droughts, may cause sectoral economic

dislocation and misery, but they are unlikely to cause a full-blown famine unless they are accompanied by such 'loose macroeconomic policies' that destroy the credibility of the government to 'food stockholders' in its ability to stabilise the economy.

Endnotes

1. Chadha and Teja (1989:iii)
2. Alamgir (1980:81)
3. See Alamgir (1980) for a historical review of famines in South Asian Countries.
4. The assetless rural poor (e.g., wage labourers, craftsmen, and petty traders) are often the victims of famines. Two economic factors may cause their starvation during any famine. First, a sharp increase in the relative price of food may lower the food purchasing power of their wage income through the price effect. Second, natural disasters, such as floods and droughts, may cause involuntary unemployment of wage labourers even though the real wage rate drops to a distress lavel. It does not however represent a case of labour market failure; rather, the labour market may work in a perverse way (Alamgir, 1980; Chadha and Teja, 1989; Sharif, 1991; Sen, 1981).

5. Ravalllion (1987:2) makes the following remark:
   ...one must be suspicious of all 'explanations' for famine which cite a decline in aggregate food availability. Plainly, such an event is not implied by famine, nor does it imply it.
6. Food entitlement failure refers to a condition where groups of people are unable to exchange their assets and labour power into food. Sen (1977:34) defines the concept as follows:
   In an exchange economy, wheather a family will starve or not will depend on what it has to sell, whether it can sell them, and at what prices, and also on the price of food. An economy in a state of comparative tranquillity may develop a famine if there is a sudden shake-up of the system of rewards for exchange of labour, commodities and other possessions, even without a sudden, sharp reduction in the food supply.
7. Sen (1977:14) found that 'the disastrous [1943] Bengal famine was not the reflection of remarkable overall shortage of food grains in bengal' . Chadha and Teja (1989:14) and Sen (1981:141) made similar comments on the 1974 Bangladesh famine:
   Clearly, the lack of food availability did not cause the famine, and the overall supply situation in the years surrounding the disaster, far from alternating between famine and feast, is more one of famine amidst feast.
   The food availability approach offers very little in the way of explanation of the Bangladesh famine of 1974. The total output, as well as availability figures for

Bangladesh as a whole, point precisely in the opposite direction, as do the inter-district figures of production as well as availability.

8. Their basic idea is similar to the concept of 'macroeconomic populism', which has been popularsed by Rudiger Dornbusch and Sebastian Edwards in the context of Latin America. They argue that... 'populist policies do ultimately fail; and when they fail it is always at a frightening cost to the very groups who were supposed to be favored' (Dornbusch and Edwards, 1990:247). See Hossain (1994) for a critical examination of macroeconomic policies in Mujib's Bangladesh within the framework of macroeconomic populism.

9. The idea that expansionay macroeconomic policies might have cased inflation and later famine in Bangladesh can be found in Ahmad (1983) and Lifschultz (1974a, 1974b). However, Chadha and Teja (1989) have provided an explicit transmission mechanism, which can be schematically shown as follows:

$$\mu{\uparrow} \rightarrow \pi{\uparrow} \rightarrow \pi^e{\uparrow} \rightarrow m{\downarrow} \rightarrow pf{\uparrow} \quad \begin{matrix} \nearrow w{\downarrow}\searrow \\ \\ \uparrow \searrow un{\uparrow}\nearrow \end{matrix} \quad \rightarrow \text{food entitlement failure.}$$

where μ is the growth rate of the money supply (policy determined), μ is actual inflation, π^e is expected inflation, m is the level of real money balances, pf is the relative price of food, and un is the rate of involuntary unempolyment in the non-food sector.

10. In his study of the 1974 Bangladesh famine, Ravallion (1987:72) discounts the effect of money supply growth on the price of rice and hence famine. He writes:

    Excessive money supply growth has been discussed elsewhere as a possible explanation of the famine... However, the present investigations have not been supportive. Current and lagged values for the log difference of M1 and M2 stocks were tested as additional variables in the [rice] price model, but were insignificant, A number of ad hoc specifiations were also tested with the change in log price regressed against a distributed lag of current and past money supply changes. These models performed poorly. While a reasonable case might be made for the belief that high rates of money supply growth in the first year after Independence did have an inflationary effect, this does not appear to have been a reason for the high rice prices in late 1974.

11. See Hossain (1989) for detailed theoretical and econometric analysis on the relationship between crop failure and inflation in Bangladesh.

12. Lifschultz (1974a:50) makes the following remark:

    ..montary policy is the one clear and unchallenged example of where the State is in full control of what happens. Should monetary expansion be viewed as a reason of equal or greater cause for spiralling prices, then, logically not only would

> *smugglers and hoarders be lined up before the firing squad, but so would*
> *Government officials [or politicians?] responsible for monetary policy.*

13. Monthly data for money and prices are taken from various issues of the Bangladesh Bank Bulletin and the Economic Indicators of Bangladesh and from IMF, IFS Supplement on Prices 1986.

14. A feedback causal relationship running from inflation to money supply growth may arise because inflation can increase the size of budget deficit. Although such a feedback causal relationship is not investigated here, it has been examined by the author elsewhere (Hossain, 1987).

15. When the velocity of money (V) is constant in the equation of exchange (MV = Py), the growth rate of money supply (μ) equals the sum of the growth rate of the real economy (g_y) and the rate of inflation (π). The general monetarist argument is that in the short run an increase in the growth rate of the money supply will increase the growth rate of the economy, but in the long run, real output will be independent of money supply growth. The results obtained here suggest that the increase in the money supply growth did increase inflation almost instantaneously, but when a period of about 6 months was passed the narrow money growth did not have any significant effect on inflation possibly because it might have increased real output and thereby neutralised the inflationary effect.

16. Ravallion (1987) is an important exception. He has examined the price expectations behaviour of rice merchants and found that their rice price expectations were overly optimistic. Such a biased price expectations might have caused excess hoarding. He did not however examine the price expectations might have caused excess hoarding. He did not however examine the price expectations behaviour of consumers and the effect of consumer's panic buying on food price.

17. Sen (1981) points out that the smuggling of rice out of Bangladesh might not have been high in the famine year because the relative price of rice in Bangladesh vis-a-vis in India rose sharply. Reddaway and Rahman (1975) indeed found that the level of smuggling was not excessive. Alamgir (1980) however criticised their finding and argued the level of smuggling was indeed excessive.

18. See Hossain (1989) for a specification of the food import demand function for Bangladesh.

19. Note that in a financially repressed poor economy, food is an attractive and effective inflation hedge. In a famine situation, food is a guarantor of survival. Therefore, when consumers expect that the price level will increase, they increase their demand for food and/or substitute food for real money balances in an uncertain situation. Ravallion (1987:61) correctly points out that "Although there does not appear to be any comparable evidence for rice storage in Bangladesh, there must be a reasonable presumption that stockholders (farmers, millers, and merchants) were not solely motivated by expected profits during the period. Stockholders are also likely to have

viewed their stocks as a desirable precaution in a period of very considerable social instability."

20. The sharp decline in the relative price of food after the military coup on 15 August 1975 might have been the consequence of a shift of the supply curve of food to the right and a shift of the demand curve of food to the left because of a downward adjustment of price expectations. As Hartman and Boyce (1983) argue, one plausible interpretation of the falling prices in August 1975 is that the Mujib government fostered confidence on the part on stockholders that future prices would be high and that they were safe from governmental harassment (Ravallion, 1987). Osmani (1986) mentions that a greater public confidence in the government's ability to stabilise food consumption helped to avoid further famines in 1979 and 1984.

21. Basic data are taken from various issues of Bangladesh Bank bulletin and the Economic Indicators of Bangladesh and from Ravallion (1987).

22. Note that although the services of artisans are in demand during normal economic condition, during famine the demand for rural services sharply decline because the demanders of such services can live without them until the situation becomes normal. When most people in the rural areas think about their own survival during the famine, the first thing that potential user of a non-essential service does is to stop its use altogether and it does not matter whether the artisan or worker in question is well-fed or not. The question of work effort comes only if an employer decides to employ someone in the first place. Sen(1981:150) correctly points out that the lack of employment opportunities were the reason for the decline in wages. He writes:

> It is quite remarkable that, not merely did the money wage fail to stay in line with rice price; it actually fell in absolute terms in these [famine] districts. The weakening of the market strength of labour that this reflects may be partly traceable to the decline in employment opportunities as a result of the flood and related contraction of rural economic activities.

23. In Bangladesh agriculture, weather plays a crucial role and most agricultural activities are more or less conditioned by weather related factors. For example, timely and optimal rainfall increases the effective supply of land and is the prerequisite for a good harvest. A good harvest prospect generates additional demand for labour because each agricultural operation is performed properly and intensely. By contrast, production uncertainty arising from droughts, excessive rainfall, floods and cyclones can both increase and decrease the demand for laborur for a number of reasons. During an abnormal weather the demand for labour may decrease because the rich farmers in such a situation may keep a part of their relatively less productive land as fallow or may lease it out to sharecroppers, and they may use less intensive cultivation practices in order to minimise the costs of production. The demand for labour may increase for several reasons: excessive rainfall promotes weed growth, which requires more labour for weed control: ploughing, weeding and harvesting during abnormal weather are more labour

consuming and can be performed properly by skilled and experienced labourers, who usually claim higher wages; the span of each agricultural operation is considerably shortened during abnormal weather, and everybody tries to complete the job as quickly as possible, because the costs of delay can be enormous; and the prospect of a bad harvest worries farmers and may induce them to use more labour to complete each agricultural operation properly and intensively, so that at least a subsistence level of output can be achieved.

24. It may be relevant to note that even in Japan during march 1994 there was hoarding and panic buying of rice when the country experienced rice shortage and was forced to import food from abroad (Australian Financial Review, 18 March, 1994).

Appendix : Definitions of Variables and Data Source

M1 = Narrow money, which equals currency plus demand deposits (excluding inter-bank items). Millions of Taka at current prices. Sources: Various issues of both the Economic Indicators of Bangladesh and Bangladesh Bank Bulletin.

M2 = Broad money, which equals M1 plus time deposits. Millions of Taka at current prices. Sources: Various issues of both the Economic Indicators of Bangladesh and Bangladesh Bank Bulletin.

CPI = Consumer price index for the middle class government employees in Dhaka city. Sources : Various issues of both Economic Trends and Bangladesh Bank Bulletin.

FP = Food price index for the middle class government employees in Dhaka city. Sources : Various issues of both Economic Trends and Bangladesh Bank Bulletin.

IP = Index of industrial output. Source : Various issues of the Economic Indicators of Bangladesh.

τ = The ratio of agricultural wholesale price index to the industrial wholesale price index. Source: Various issues of the Economic Indicators of Bangladesh.

FM = Imports of food grains (Tons). Source: Alamgir (1980).

FO = Offtake of food grains. Source : Various issues of the Economic indicators of Bangladesh.

CD = Crop damage by floods. Source : Ravallion (1987).

ϖ = Data for the agricultural nominal wage rate in Taka were taken from various issues of the Agricultural Statistical Yearbook of Bangladesh. An index of the agricultural wage rate was deflated by the consumer price index to obtain the agricultural real wage rate.

f = Fertilizer (Tons). Source : Various Issues of Monthly Statistical Bulletin of Bangladesh.

r = Rainfall (Inches). Source : Monthly rainfall data for 24 stations were provided by the Bangladesh Meteorological Department. These statistics were used by the author to compute the average rainfall in an index form.

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