# A REVIEW OF THEORIES ON INFLATION AND AN EMPIRICAL ANALYSIS OF INFLATION IN INDIA

By

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# C O N T E N T S

# A C K N O W L E D G E M E N T

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# I. INTRODUCTION

The economy can be envisaged as a net work of interrelationships. All research in economics can be said to be the search for inter-relationships. Economic theory also can be thought of as a system of inter-relationships according to Kurien (1972). The logical core of the theory cannot easily be detached from the empirical part of the theory. If economic theory has been so systematised and unified it becomes a close ally in the search for the structure of inter-relationships in the economy. For building up the economy, economic research must become a hand made of economic policy. It must become problem and policy-oriented according to Ahuja (1972). In the development process of an economy there is reason to believe that policy-makers in the field of economics have brought about considerable difference to the developmental experience of different countries. The economic revolutions that are credited to Ludwig Erhard in Germany and Keynes in the post depression era do suggest what a powerful tool economic policy can be in developmental process. The basic taks of economic research in a developing economy is to assist in economic policy and decision-making which is made possible through the policy implication of economic theories.

It is a characteristic of the development of economic theory that it has not followed a well designed pattern. Economic theory is more than two hundred years old now, if we trace it to the appearance of Adam Smith's Wealth of Nations. It has travelled far, but it has not travelled along the same direction. It is of the nature of economic science that it deal with events and phenomena which not only change complexion overtime but do not also occur at all places. Questions that emerge as crucial at one time may turn out to be totally irrelevant at another time in the same economy, and those that are relevant in the context of one economy may well be irrelevant else-where. An economic theory has to be judged not in absolute terms, but in relation to the peculiar setting to which it belongs and to the purpose which it is expected to serve (Das Gupta, 1981). The evolution of monetary theory is one conspicuous example of how changing institutions have their impact upon the structure of the theory. Yet even here the old theory may still hold its own as an independent theory, valid enough in relation to the condition into which it had once been projected.

According to Brahmananda (1977) Indian economy is the hot-house of numerous economic theories and because of the relative openness of the economy and the autonomy of the statistical processes, it is possible to confrontt various theories with evidence.

Price levels and their movements, affect the well-being of the majority of the population both directly and indirectly. The first problem that the Indian economy faces is inflation. Inflation menaced the Indian economy to a greater extent and it continues to be on the increase. The economy witnessed during the 1970's tremendous inflationary pressure. The price rise was of the order of 24.0 per cent in 1972-73, 27.9 per cent in 1973-74, 25.2 per cent in 1974-75, -1.1 per cent in 1975-76, 5.3 percent in 1976-77, -1.2 per cent in 1977-78 and 9.5 per cent in 1978-79. Between Feb. 1979 and March 1980 the prices registered a 20 per cent increase. The tempo of economic development was greatly upset by the alarming price rise. Hence inflation remain high in the policy makers' agenda and theories bearing on inflation assume relevance for their policy implication.

Inflation is a dynamic disequilibrium process (Ranganadhachari, 1980). For a long time it was considered as a post full employment phenomenon and as euphoric state of the economy. Today it is accompanied by stagnation or recession. The co-existence of inflation with recession has brought with it new names for the process like "Stagflation", "slumplation" and most recently "unemplation". New terms have also been coined to describe the rate of price increase. An annual increase in price level just over 3 per cent is now accepted as

"equilibrium rate" of inflation in the western countries. If the rise in the price level exceeds 20 per cent and touches 30 per cent per annum as in some Latin American countries it is called "Strato-inflation".

Defintions on inflation:

For Ricardo, inflation always meant excess issue of currency, not raising prices.

Henry Thornton, a distinguished contemporary of Ricardo and a fore runner of Wicksell as well as Keynes and Robertson, also held inflation as an excess issue of currency. But he recognised the importance of inflation of money in the process of capital formation, and thus distinuished himselffrom other classical economists.

Keynes identified inflation as a state of excess demand in commodity market. Bent Hansen, defined it as a state of affairs where actual production and sales were less than planned production and expected sales. For Ralph Turvey it is a process resulting from "competition as attempting to maintain total real income, total real expenditure or total output at a level which has become physically impossible or attempting to increase any of them to a level which as physically impossible".

Laidler and Parkin in their survey article define inflation as a process of continuously rising prices or equivalently of a continuously falling value of money.

According to Brahmananda (1977) inflation is essentially due to an imbalance or disproportion between the rate of growth of stock of commodities essential for production and the rate of growth in money supply.

Process of Inflation:

The classical economists analysed the causes for inflation from a purely monetary point of view. According to them supply of money was the only cause of inflation Irving Fisher in his quantity theory of money arrived at the conclusion that if the quantity of money is doubled, the prices will also double. Though later economists modified this theory to a certain extent they maintained the basic idea intact. The change brought in by them was that the relation bwetween the quantity of money and prices is not so exact. Fisher is calculating the supply of money included besides the quantity of money issued by the Government, its velocity too. The supply of money is equal to the quantity of currency in circulation multiplied by its velocity.

An increase in the supply of money leads to inflations, but it is not the only factor. As a result of price rise,

cost of production of various goods rises. Workers demand a higher wage as they find the maintenance of their usual standard of living difficult due to a rise in the prices of consumer goods. So also the prices of raw materials go up. When thus, the cost of production goes upto maintain their usual margins of profits, the entreprenuers are forced to raise the prices of their products. In fact, the enterprenuers would not now be satisfied with the usual margin of profit. A price rise hits them also and to maintain their standard of living they need higher money profits. Hence, the price rise is more than in proportion to the increase in the cost of production. This means that there is a fresh price rise which leads to a fresh demand for a rise in the wages. This vicious circle moves all over again. Thus a price rise in one sector affects the prices in other sectors which react again on the former and lead to a further price rise there. The process become cumulative. This cumulative nature is the important characteristic feature of inflation.

Thus when the supply of money increases it raises the total effective demand in the economy and hence the price level. This is known as the demandpull inflation in the economic jargon. When the cost of productions rises it leads to a rise in the price level. This is called the cost-push inflation.

Charles Schultz has formulated another theory of inflation. He argues that the prices and wages are flexible only upwards. In those sectors where the demand increases the prices increase. But the prices do not fall in those sectors where the demand falls, for the prices are not flexible down-wards, according to his assumption thus a fall in demand leads to a fall in production and employment and not in prices. This means that the price level always tends to rise.

These are monetary explanations of inflation. Hayek, pointed out that inflation is a symptom of disequilibrium in the economy. Thus is due to the non-realisation of the expectations. It results in real changes in the production and consumption which are not anticipated and hence not intended by the people who undergo them. Thus workers are attracted by the higher money wages and they, therefore, prefer to work harder to enjoying their extra time as leisure, in the hope of raising their standard of living. If they would have been fully aware of the failing purchasing power of their money wages they would not have probably behaved like this. Thus to quote. Lerner people are induced to do things other than what they really intend. These real changes constitute inflation, according to Prof. Hayek. In conclusion, there is no single factor creating inflation. All the

factors, the excess supply of money the rising velocity of money an increase in the cost of production, administered prices the rigid price structure in the economy acting together lead to the inflationary conditions.

Causes for Inflationary Situation in India:

The causes accounting for inflation in India are three dimensional. First, there is the complex factor of demand management. The demand for goods and services in the form of money supplies out run the availability of goods and services. In the years 1977-78, 1978-79 and 1979-80, money supplied was increased each year by 15-18 per cent while the economy grew only by 7.4 per cent in 1977-78 by 3.5 per cent in 1978-79 and decelerated by 3.5 per cent in 1979-80. Hence there was high liquidity in the economy over the last three years with prices being stable in the first two of the three years. The result has been price explosion last year and this year which is the familiar phenomena of too much money chasing too few goods.

Another aspect of this demand management cause for inflation is the availability and the proper distribution of goods and services. All important industrial inputs- iron and steel, cement, coal, fertilizer, non-ferrous

metals, railway transport are in short supply and so their price gets pushed up especially in the black market.

A second major cause for inflation is from cost-push factors. This was applicable to crude oil and petroleum products which has pushed up industrial and agricultural costs by 3 to 4 per cent. The rise in railway freight rates has also pushed up costs. Incidentally the analysis of costs of 450 comapnies by the R.B.I. (1979-80) shows that raw materials and machinery costs have over the seventies increased by 4-5 per cent, while the share of wages has declined.

A third cause for inflation, is the parallel economy, sector consisting of black money. This parallel economy of Rs. 25,000 to 30,000 crores is one of the major causes for pushing up all prices of capital as well as consumer goods. The general price level(s) in the Indian economy is determined by the following factors according to the memorandum submitted by the Economists to the Prime Minister (Commerce Pamphlets, 1974):

1) The behaviour of the price level(s) in the economy is governed largely by non-monetary factors like (a) supply of output (b) public distribution system's coverage and efficiency (c) distributional factors (d) structural parameter like the relative pressures of different

interest groups (e) the growth of population and so on.

2) The behaviour of the price level is governed largely by monetary factors.

3) The behaviour of the price level(s) is governed largely by monetary and supply factors.

4) The behaviour of the price level(s) is governed largely by government expenditure investment expenditures etc.

5) The behaviour of the price level(s) is governed largely by trends in money wages in cooperation with productivity trends.

For the purpose of the study the third view point is considered.

The behaviour of the price level(s) is governed largely by monetary and supply factors.

The objectives of the study are:

1. to review and theories on inflation in the Indian situation; and

2. to study the interrelationship between price level, money supply and net domestic production.

The empirical part of the study has as its data base the information on national accounts and price level published by the official sources like the central statistical organisation, the Reserve Bank of India Reports on currency and finance. Using multiple regression analysis the interrelationships have been tested and derived. It is hoped that the review of the theories on inflation in the Indian context would reveal their explanatory powers as well as identify the gaps that may exist in them. The evidence examined in this study would be another contribution towards examining the hypothesis that inflation remains by and large a monetary phenomenon in the Indian context.

The current study is organised in two parts. Part I surveys the theories and some selected studies on inflation, while Part II describes the methodology adopted for the emprical analysis of the data relatively to the Indian set up and discusses its results.

# PART - I

# THEORIES AND STUDIES ON INFLATION

PART - I

## II. REVIEW OF THEORIES AND SELECT STUDIES ON INFLATION

The survey on the theories of inflation is attempted under the following heads:

1. Excess demand theories
2. Cost push theories
3. Philips curve
4. Structural or social theories.

This is followed by a review of the selected empirical studies on inflation.

The theories of inflation can be broadly divided into four types, observes Ranganadachary (1980).

1. Monetary/expenditure theories which lay stress on excess demand (2) cost-push theories (3) the Phillips curve and (4) the structural or social theories. The theories on inflation were propounded on the basis of a particular cause from out of conditions existing at the time of its formulation.

### 1. Excess Demand Theories:

Irving Fisher (1911) argued that an increase in the amount of gold and silver in a country would lead to expansion of economic activity and eventually to rise in prices as it raises the price of labour.

Friedman (1956) restated the theory in terms of velocity of circulation or as an equilibrium ratio between the money stock and the flow of output. According to him while the individual can adjust his cash balances to any desired level the community as a whole cannot adjust and equilibrium in a situation of full employment must be achieved by price changes.

While analysing the causes of the present inflation, the Reserve Bank of India (1979) points out that continued growth of money supply and bank credit, together with strong expectation of price increases tend to strengthen the inflationary tendencies as borne out by the experience of India. An analysys of the money supply reveals that growth in $M_3$ ($M_1$ plus time deposits) was 21.2 per cent during 1978-79 as compared to 19.7 per cent in 1977-78. Among the positive impulses behind the money supply increase, bank credit to the commercial sector was the most prominent with a growth of Rs. 4,326 crores. A noteworthy feature was that the proportion of the Reserve Bank's Credit in the total incremental credit to the Government went up sharply from 20.5 per cent in 1977-78 to 51.7 per cent in 1978-79. As a result of the sizeable expansion of the Reserve Bank credit to the government, the growth rate in reserve money that is high powered money has been 21.2per cent. The high powered money provides a base for further

expansion in money supply. The effect would have been more severe but for a decline in the money multiplier ratio from 1.59 per cent in 1977-78 to 1.58 per cent in 1978-79 which shows that the price problem is due to lack of proper management of the economy. The R.B.I. has rightly cautioned that "situation contains potential for a resurgence of inflation and hence require immediate and careful handling.

According to the monetarists there occurs stable relationship between the stock of money and national income given a stable demand function for money. The income Y, is always identical to MV. M is the stock of money and 'V' is the velocity defined as the ratio of the flow of income to the stock of money that is V = Y/M. From this equation it is clear that a stable V will always being about a stable income stream. Their basic contention is that the demand for money is unresponsive to the changes in interest rates. The increase in expenditure merely causes a rise in interest rates without augmenting income and employment. Under such conditions, the monetary measures alone can achieve full employment maintains Mosood Hasan. Keynes analysis seeks to discover how the changes in the quantity of money affect prices via the influence of the changes in the rate of interest stated in a broader way the effect could conveniently be derived from the equality

preference schedule, the investment demand schedule and the propensity to consume schedule. Taking into account all these functions and the influences exerted upon them by a variety of shifting circumstances there will indeed be a determinate increase in effective demand corresponding to and in equilibrium with, a given increase in the quantity of money (Hansen, 1953).

Keynes argument for the revival of the economy from its low level unemployment equilibrium emanate from his assumptions about workers attitude not to accept lower money wage rate and the liquidity preference function. The demand for money is affected by the changes in the rate of interest. The keynesians gained importance when monetary measures could not help the revival of economies during depression inspite of the reduction in wage rate and price level. There was a peculiar type of phenomenon 'liquidity trap' when the demand for holding money in the form of cash become insatiable. The L M curve in the I s - LM model becomes almost horizontal. In this situation, everybody expects a fall in the price of bonds and all the increases in the money supply are held. Interest rate does not fall because people do not purchase bonds.

Keynes places greater emphasis on the liquidity preference as the real cause of stagnation in developing economies. Keynes observes that "at all times India has

provided an example of a country impoverished by a preference for liquidity amounting to so strong a passion that given an enormous and chronic influx of the precious metals has been insufficient to bring down the rate of interest to a level which was compatible with the growth of real wealth". The reduction in interest rate does not help the increase in production except raising the prices and entangling the operation of multiplier by the wage increases. The problem in Indian economy had been the lack of productive investment enabling simultaneous development of multiple sectors so that supply in one sector created demand for goods in another. Hasan (1980) believes that deficiency in the stock of capital goods and disguised unemployment in agriculture are the limiting factors in our economy rather than money supply. The low amount of real capital goods implies that in such an economy, even if we reach a position of full employment in the Keynesian sense there would still exist a large volume of unemployed resources in the physical sense. In Indian economy, there has neither been a situation of excess capacity nor the lack of effective demand. There is inadequate capital equipment which are not enough to fully employ the available supply of labour force.

Hasan (1980) states that in developing economics, both the Monetarist and Keynesian models are to be employed in a coordinated manner and with certain modifications in order to make them relevant to their different social and economic environment.

## 2. Cost Push Theories:

Cost-Push theories were evolved in the late 1950's, when the economists took into account the supply side of the cause of inflation. The price rise was attributed to the behaviour of trade unions, monopolists, profiteers, hoarders etc. by these economists. The cost push theory explains how these factors can control the supplies of commodities or influence the cost of production of the commodities. Trade unions, big business corporations were identified to be responsible for 'wage-push' and 'profit-push' leading to inflation. Such actions cannot be dealt with by any monetary or fiscal policies.

Taking the case of India, cost push factors have their influence on price rise. The escalation of price due to cost push factors can be regulated by increasing the production of the goods in question, so that the increased cost can be spread over a large number of units and reduce the unit cost. To increase the production, there must be increase in demand, through pumping in the purchasing power of the individuals through a vast programme of public works and other employment oriented programmes (Kurien, 1981).

## 3. The Phillips Curve:

The Phillips curve which cut a cross the two groups

of theories demand pull and the cost-push is an analysis following Phillips emperical discovery (1958) of a long run relationship between changes in wage rates and unemployment. Those phillips wage change-unemployment relationship was transformed into a rate of price change when ever wages rose more rapidly than labour productivity. Phillips curve shows that inflation and unemployment can co-exist. To the extert to which stable relation exists between the two, a permanent decrease in unemployment can be purchased by a permanent increase in the rate of inflation. A distinction is drawn between anticipated and unanticipated inflation. Stable equilibrium exists when actual inflation is fully anticipated. unemployment which prevails then is defined as natural unemployment rate. If the Government uses monetary fiscal programme to close the gap between actual output and its full employment potential an unanticipated inflation will take place and the unemployment rate falls temporarily. After a process in which expectations adjust, the expected rate of inflation rises, so that unemployment rate hypothesis contends that for each expected rate of inflation there exists a unique phillips curve. The Steady-state situation corresponds to different fully anticipated inflation rates such that the long-run phillips curve would be a vertical line passing through the horizontal axis at the natural rate of unemployment. (Ranganadachary,1980)

This analysis has certain conclusion. The Government may often be the cause of inflation when it tries to cure unemployment by reducing its rate below the natural rate. It implies that an incomes policy is not only useless, but easily evaded. Lastly, it implies that any attempt to hold unemployment below its natural rate will result in an ever-accelerating rate of inflation.

(2.4) The structural theories

Research needs to be directed toward analyzing in depth the causal machanism of driving force in the inflationary process. Such an analysis of an inflationary movement must come to concern itself much more with the institutional factors, observes (Myrdal-1974)

According to the structural theories on inflation, inflation is a natural and inevitable a accompaniment of every major development effort. Henri Aujac (1974) make a significant observation that 'Stocks and flows neither exist nor move by themselves emphasising that the economy could not be seen as a set of economic flows manipulated by the pressure of different social groups. Structuralists attribute the price rise to the structural bottle necks and basic rigidities in the economy'.

The conventional approaches of quantity theory of money and the Keynesian concept of inflationary gap are not adequate to explain the behaviour of inflation in the developing economy. In such an economy there are structural and institutional factors acting over and above the monetary and real factors states Neog (1974).

In the Indian economy since the proportion of agricultural output in the National Product is large, the behaviour of agricultural prices determine very largely the behaviour of the general price level observes (Ranganadachary, 1980). In a situation asin the present Indian case, even when there is excess capacity in the Industrial sector, the mere increase in the prices of food grains and prices of raw materials is sufficient to exert an upward pressure on industrial prices. The price rise has resulted from excees demand arising from increased investment and consequent money income generated. The existence of excess demand manifested itself not only with reference to wage goods like food grains, edible oils, common varieties of cloth etc. but also with reference to investment goods and raw material inputs. These are the basic factors for inflationary price rise. International factors like oil crisis and fluctuating exchange rates complicate the process. Social and political institution, vested interests etc. also

contribute to inflation according toRanganadachary. Hence he observes that in studying inflationary price trends, in economics like India, analysts should not stop with explaining price behaviour in terms of money supply and excess demand, effort should be made to study institutional and structural factors to tackle the problem of inflation in the long run perspective.

A new theory on inflation formulated by Brahmananda (1977) attributes it to the existence of stock less money. "Stockless Money" according to Brahmananda was that money supply which has come into existence without relationship whatsoever with real capital stock and/or its growth, adjusted for output productivity of capital. It is this stockless money which causes inflationary price rise. In other words "Inflation is essentially due to an imbalance or disporportion between the rate of growth of stock of commodities essential for production and the rate of growth in money supply". The point focussed by Brahmananda was that in a real liquidity conscious economy like India hoarding and dishoarding played a vital role in the variations of income and prices in the short-run. Brahmananda develops his monetarist inventorist approach, keeping the hoarding of stocks as the central point. He explains that only a part of the changes in the price level could be deemed to be accounted for by monetary

factors and other part is to be accounted for the implications resulting from hoarding and dishoarding. However, it was not clear how the stock of real capital can explain the behaviour of out put and prices in the short run (Krishnamurthy).

In reviewing the theories it is evident they fail to present a complete remedy or policy implication to curtail inflation. Each theory emphasises on any one or the other of the factors that contribute to inflation. In that sense they are incomplete and their relevance to the Indian situation is limited. Many economists have surveyed the theories on inflation from time to time Jhonson (1970) in his survey on the theories of inflation explains the difficulty in defining inflation as a sustained rise in prices which is a common meaning for inflation. According to him defining inflation in terms of the policies held to be responsible for it causes serious error. He then proceeds to give a brief historical sketch of inflation problem and theories and analyses the process of inflation which took place in world war I and continued after the war, and German hyper inflation in the early 1920s in the context of developing economies.

Bronfenbrenner and Holzman in their study have concentrated on analysing the developments in both

monetary and expenditure theories and the relationship between inflation onthe one hand and on the other economic quantities such as the level of employment rate of economic growth and the functional distributionof income.

## 5. Select Studies on Inflation:

In this section two select empirical studies on inflation in India are reviewed for their objectives, models and results.

### Trivedi's Study on Inflationary expectation and demand for money in India:

Trivedi (1980) had studied the issue of inflationary expectations and demand for money in India. His study is based upon annual data, convening the period between 1951-52 to 1974-75. He investigates the role of inflationary expectations in the money demand relation. Some standard models of demand for money in which anticipated rate of inflation is specified as the opportunity cost variable are tested and their empirical performance evaluated. The results suggest that a model of demand for money which specifies it is as a function of permanent income and anticipated rate of inflation fits the data remarkably well. In particular, the results strongly indicate that although the Indian economy has not experienced as high rates of

inflation as some Latin American countries have, the anticipated rate of inflation comes out as unambiguously significant.

The approach underlying the present study considers the expected rate of finflation as the measure of opportunity cost of holding money. Due to the unavailability of relevant data the inflation rate variable alone is used as a measure of the opportunity cost variable. The procedure rests on the assumption that the real rate of interest remains constant or on a weaker assumption that variations in the nominal interest rates are dominated by the variations in rate of inflation. The assumption is supported by the empirical results of the investigation.

The basic model of demand for money postulated by Trivedi is the equation

$$mt = \beta_o + \beta_1 y^2 + \beta_2 p^e \quad (1)$$

This equation states that demand for real balances m, is a linear function of expected or permanent level of income $y^e$ and expected rate of inflation $p^e$. B1 and $\beta_2$ are the respective slope coefficients of m with respect to $y^e$ and $p^e$. It is expected that $\beta_1 > 0$, $\beta_2 < 0$. The $U^t$ is the disturbance term assumed to be serially uncorrelated with zero mean and constant variance.

His estimated regression equation is as follows.

$m_1 = 27.0 + 0.752\ Y$
(14.56)

$R^2 = 0.903$

$R^2 = 0.890$

D.W. = 1.2

(Durbin - Watson Static Tool)

$m_1 = -10.78 + 1.14\ Y$
(16.67)

$R^2 = 0.926$

$R^2 = 0.923$

D.W. = 1.1

The finding points out the desirability of augmenting the orthodox specification of demand for money by introducing some version of the cost variable as an additional explanatory variable in the money relation.

Brahmananda's study on price level determination in the Indian economy:

The study by Brahmananda tests the hypotheses pertaining to price level behaviour from the view point of Ancient Quantity Theory of Money. The study uses the data on national income and the wholesale prices and a series of whole sale prices of wage goods and of basic

goods. On the basis of these variables the national income deflator is derived. These composites are matched with the corresponding supply category in respect of goods. The national income deflator is matched with the series is real national income. The index numbers of whole sale prices are matched with the value-added in the goods sector and the index number of basic-goods with the supply index of basic goods.

The behaviour of price level is theoritcally specified in various ways.

P W G = f (WG, M, V, TWG), where V refers to the velocity of money and TWG to the average turn round of wage goods during the year.

P B G = = f (BG, M, V, TBG), where TBG refers to the average turn-round of basic goods.

P Y D = f (YD, M, V, T)

P Y G = f (YD, M, V, Tg) where Tg refers to the average turn-round of goods.

$$PWG = f\left\{(M/KD),\ (WG/K)\ V,\ Twg\right\}$$

where

P = index number in regard to price level

KD = stock of real capital

M = Stock of nominal money

WG = Supply measure of wage-goods

BG = Measure of supply of basic goods.

YD = real net domestic product

YDG = Net domestic product in the goods sector

PWG = Price index of wage-goods

PBG = Price index of basic goods

PYD = National income deflator

PYG = Index of the price level of the value - added in the goods sector

Assuming that $V_s$ and $T_s$ are constant, these two items are dropped from each of these equations and the following functional forms are adopted for the regressions.

(16) $PWG = AWG^{\beta_1} M^{\beta_2} U$

(2b) $PBG = ABG^{\beta_1} M^{\beta_2} U$

(3b) $PYD = AYD^{\beta_1} M^{\beta_2} U$

(4b) $PYG = AYG^{\beta_1} M^{\beta_2} U$

(5b) $PWG = A(M/KD)^{\beta_1} (WG^{\beta_2}/K) U$

Transforming into logarithms these become:

(1e) $I_n PWG = \alpha + B_1 I_n WG + B_2 I_n M + I_n U$

(2e) $I_n PBG = \alpha + B_1 I_n BG + B_1 I_n M + I_n U$

(3e) $I_n PYD = \alpha + B_1 I_n YD + B_1 I_n M + I_n U$

(4e) $I_n PYG = \alpha + B_1 I_n YG + B_2 I_n M + I_n U$

(5e) $I_n PWG = \alpha + B_1 I_n WG + B_2 I_n M + I_n U$

where $\alpha$ = log A

The hypothesis regarding the quantity theory of money is tested by fitting the data to the above equations.

If the quantity theory has to be valid, $\beta_1$ must be statistically equal to minus unity and $\beta_2$ to plus unity. If $\beta_1$ is equal to minus unity and $\beta_2$ is not equal to plus unity, the monetary side of the quantity theory has not been validated and the supply side is $\beta_2$ is equal to unity but $\beta_1$ is not equal to minus unity, the supply side of the quantity theory would not have been indicated and the monetary side alone would have been. If $\beta_1$ is not equal to minus unityand $\beta_2$ is not equal to plus unity the Quantity Theory of Money as a whole would not have been validated.

The empirical results of his study done are as follows:

1. For all the four sets of price levels, the supply coefficients for double log fittings or original values range from -0.62 to -0.8$\frac{1}{2}$, all values statistically not different from minus unity. The 't' values are all highly significant.

2. The money coefficients range around 0.97, numerically close to unity and of course, statistically not different from unity. The 't' values are all highly significant.

3. In the logarithmic first difference results, for all the sets of price levels, the money coefficients range around 0.71 statistically not different from unity. The 't' values are all highly significant.

4. In logarithmic first differences, for all sets of price levels, the supply coefficients are statistically insignificant.

The behaviour of all the four sets of price(levels) appears to bear out the impact of the ancient quantity theory of money. Statistically, the coefficients on the money-side are not different from plus unity and those on the physical supply side not different from minus unity.

Taking into account the logarithmic first differences, the money side is fully vindicated whereas the physical supply side is not. Treating first difference results as referring to the short period and the original values results as referring to the long period, only the money-side is vindicated, in both the periods, the supply-side being vindicated only in the long period. The ancient proposition is wholly valid in the long period according to the study, and only partially true in the short period.

# PART - II

# INFLATION IN INDIA AN EMPIRICAL ANALYSIS

## III. METHODOLOGY

The current and the subsequent chapters deal with the analysis of inflation in India with a view to testing the hypothesis evolving from the quantity theory approach to inflation. This hypothesis pertaining to the behaviour of price level has been summed up by Brahmananda. According to him, if we assume that there is no excess capacity to produce in the economy, then price level can be considered as function of money supply and supply of goods and services in the economy.

In the present study, the investigator has tested this hypothesis by taking into consideration the following variables, namely wholesale prices, money supply ($M_1$) and NDP at current prices. The narrow definition of money $M_1$ that includes the currency with the public, demand deposits and other deposits with RBI had been adopted in this study. According to Trivedi (1980) this definition corresponds better to the Quantity Theory Specification than $M_2$ the broader definition of money. The investigator has concentrated on the above variables since they tend to have more influence on the price level in the economy than others.

Data base of the Study:

For the analysis a period covering between 1970-78 was taken for study. The entire data relating to wholesale

prices money supply $M_1$ and net domestic production is taken from the Reserve Bank Publications like R.B.I. Bulletin and Report on currency and finance (Vide Appendix I). Thus the entire data is secondary in nature.

Method of data:

Since the investigator was interested in studying the interrelationship among the three given variables namely the whole sale price, money supply and net domestic productions, a multi-regression model was fitted to the above data (vide Appendix II). The above model was based on the assumption that there exists no excess capacity in the economy. The basic model postulated in this study can be stated in the form of the equation.

$$P = \hat{b}o + \hat{b}_1 M_s + \hat{b}_2 - Y - (1)$$

where P stands for wholesale prices, $M_s$ for money supply, Y for net domestic production, $\hat{b}_1$ is the net regression coefficient relating money supply to wholesale prices taking net domestic product into account, $\hat{b}_2$ is the net regression coefficient relating net domestic production to wholesale prices taking money supply into account and $\hat{b}_o$ is a constant.

The equation states that price level is a linear function of money supply and net domestic production.

For the hypothesis to be valid, $\hat{b}_1$ should be positive and $\hat{b}_2$ should be negative.

Based on the above equation the investigator estimated $\hat{b}_o$, $\hat{b}_1$ and $\hat{b}_2$ by means of the following method:

$$\hat{b}_o = \bar{P} - b_1 \bar{M}_s - b_2 \bar{Y} \quad - \quad (1\ a)$$

$$\hat{b}_1 = \frac{(\Sigma Pms)\ Y^2 - (\Sigma PY)(\Sigma Msy)}{(\Sigma M_s^2)\ (\Sigma y)^2 - (\Sigma Msy)^2} \quad - \quad (1b)$$

$$\hat{b}_2 = \frac{(\Sigma py)\ (\Sigma Ms^2) - (\Sigma Pms)\ (\Sigma M_s y)}{(\Sigma M^2_s)\ (\Sigma Y^2) - (\Sigma M_s Y)^2}$$

where $\bar{P} = \Sigma P/N$

$\bar{M}_s = \Sigma M_s/N$

$\bar{Y} = \Sigma Y/N$

$\Sigma PM_s = \Sigma \left| (P - \bar{P})\ (M_s - \bar{M}_s) \right|$

$\Sigma Y^2 = \Sigma (Y - \bar{Y})^2$

$\Sigma PY = \Sigma \left| (P-\bar{P})\ (Y - \bar{Y}) \right|$

$\Sigma M_s Y = \Sigma \left| (M_s-\bar{M}_s)\ (Y - \bar{Y}) \right|$

$\Sigma M_s^2 = \Sigma (M_s - \bar{M}_s)^2$

$(\Sigma M_s Y)^2 = \left| \Sigma \left| (M_s - \bar{M}s)\ (Y - \bar{Y}) \right| \right|^2$

After estimating the parameter $b_o$, $b_1$ and $b_2$ the investigator estimated the correlation coefficient $R^2$ by using the following formula

$$R^2 = \frac{\hat{b}_1 \sum PM_s + \hat{b}_2 \sum PY}{\sum p^2}$$

$R^2$ = measures the proportion of variance in P that is explained by $M_s$ and Y.

If the value of $R^2$ is above 0.5, it implies that nearly 50 per cent of variation in the income can be explained by the variables $M_s$ and Y.

The maximum value of $R^2$ is unit which implies that it is possible to explain all the variation in Y but not more than all of it.

To test the statistical significance of the given parameters the 'Z' test was applied

$$Z^*_{b_1} = \frac{\hat{b}_1}{\text{standard error of } b_1}$$

and $$Z^*_{b_2} = \frac{\hat{b}_2}{\text{Standard error of } b_2}$$

If the calculated Z* is greater than 2, it means the variable is statistically significant. If it is less then 2 it means that the variable is not statistically significant.

The actual computations are shown in Appendix II.

Limitations of the Model

1. The model has a serious limitation that it does not take into account the presence of certain dummy variables, multicollinerity, time lag and other non-linearities which often occur in multiple regression equation.

2. Since the entire calculation is based on secondary data, the predictive power of our results will depend on how precise and accurate the secondary data is.

The findings of the study are discussed in the following chapter.

## IV. RESULTS AND DISCUSSION

In India, price level has been always increasing at a faster rate and since 1970's it has shown a tremendous increase. This price rise can be attributed in part to non-monetary factor such as supply of output, public distribution system's coverage and efficiency, distributional factors, structural parameters like the relative pressures of different interest groups, growth of population and other factors like government expenditure, investment expenditures, behaviour of the price level due to trends in money wages in cooperation with productivity trends etc. However, the present study confines itself to money supply and NDP and how the variation in these variables affect the price level in the economy.

The exact interrelationship among these variables was examined by fitting a multiple regression equation. The regression results are shown below:

$$P_1 = 13.8 - 4.6\ M_s + 3.16\ Y$$

$$R^2 = 0.97;\ Z^*_{b_1} = 2.16,\ Z^*_{b_2} = 2.11$$

*Stands for significance at 5 per cent level

The fit is excellent since the coefficient for determination is high (0.98), Z* ratio for both variable $M_s$ and Y is significant at 5 per cent level. The regression estimates however are not in the expected directions. The assumption underlying the model was that estimate of $\hat{b}_1$ will be positive and the estimate of $\hat{b}_2$ will be negative. If there were any direct relationship between changes in money supply and changes in price level we would expect the coefficient of money supply to take a positive sign. Here the regression coefficient of money supply, contrary to this belief has taken a negative sign and the estimate of the coefficient of $\hat{b}_1$ is significant at 5 per cent level making it clear that the influence of money supply on price level has not been statistically vindicated.

This idea is also supported in Black's dynamic model of quantity theory (1974). According to this model, in the long run variations in the quantity of money predominently affects the inflation rate but in the short run there is no particular reason to expect any close correlation between inflation rate and the rate of monetary expansion.

Production is believed to have a mellowing effect on prices. Increases in production through raising supplies bring down the price rather than raise them, the

other things remaining the same. We would expect the production coefficient to take a negative sign. However, in the regression equation derived this coefficient takes a positive sign indicating that price level in India during the period 1970-78 has been influenced by far stronger factors than the level of production. The impact of changes in production on price level has been counteracted by the influence of other factors causing inflation during the said period.

In the Indian set-up money supply has not been the source of inflation, neither has inflation been tamed by rise in production. The quantity theory relationship among these variables has not been substantiated by her experience. The irrelevance of quantity theory explanation to the behaviour of price level in the short run in India has been demonstrated by this equation. This is in line with Brahmananda's finding that the proposition of the ancient quantity theory is only partially true in the short period though it may be wholly valid in the long period.

In conclusion, the price rise in the Indian economy may be attributed to the following factors - low ~~cost~~ level of economic activity less than full employment and high marginal prosperity to consume in the economies because of low levels of income — all of which exercise an upward

pressure on effective demand and therefore on prices, relagating the ~~monetary and supply demand and~~ monetary and supply factors to the background in the short run. It is open to the future researchers to test the hypothesis that in India inflation is far from being a monetary phenomenon, subdued by improvements in production. The institutional and non-monetary factors that intensify inflation in the Indian context deserve to be studied as emplanatory variables in any study on inflation. As Ranganadachary (1980) observes "In studying inflationary price trends in economies in India, analysts should not stop with explaining price behaviour in terms of money supply and excess demand, efforts should be made to study institutional and structural factors to tackle the problem of inflation in the long run perspective".

# V. SUMMARY AND CONCLUSION

The economic science is characterised by events and phenomena which not only change complexion over time but do not also occur at all places. However, there exists one major exception to this, that is the phenomenon of inflation. This has been the central issue of monetary theory and the structure of the theory itself has changed considerably over a period of time, influenced by the changing institutions. In India inflation has proceeded at rates much higher than those anticipated in the programmes of economic development. The tempo of economic development consequently had been upset by cost escalations and distributive injustice. Inflation thus remains thigh as the problem number one in the policy makers agenda and theories bearing on inflation assume relevance for their policy implication. Brahmananda (1977), observes with the availability of statistical processes Indian evidence has been used indiscriminately to substantiate numerous economic theories.

This study was undertaken with the objectives of

1. Reviewing the theories on inflation in the Indian context and
2. Studying the interrelationship between price level, money supply and net domestic production.

The present study was organised in two parts - where Part I is a review of theories and select studies on inflation and Part II presents an empirical analysis of inflation in India.

The entire study was based on secondary data which was collected from official publications like RBI's Report on Currency and Finance and RBI Bulletin. The interrelationship between these variables were analysed by using a multi-regression analysis. The main contribution of this study is towards examining the hypothesis that in the Indian context inflation is predominantly a monetary phenomena.

No single theory taken by itself fully applies to Indian situation nor can it be used to explain the factors causing inflation in India. A review of the excess demand theories on inflation in the light of Indian experience shows that her main problem had been the lack of productive investment which was a handicap to raising supplies and production simultaneously in all sectors. Mean (1980) had identified deficiency in the stock of capital goods and disguissed unemployment as the two limiting factors causing inflation in Indian economy rather than money supply.

The cost push factor do influence the rate of price rise in India and Kurien suggest that the pressure on prices exerted by cost push factors can be regulated only by fuller utilisation of existing capacity and thereby increasing the production of goods in question, only then the increased cost can be spread over a large number of units and the unit cost of production can be reduced. This increase in production could not take place unless the purchasing power of the individuals improve through employment oriented programmes. A study of price change unemployment relationship indicated by the Phillips Curve implied that any attempt to hold unemployment below its natural rate may result in an accelerated rate of inflation and that income policy may be totally useless in tackling the problem of inflation.

An examination of structural theories of inflation with reference to India under scored the need for explaining price behaviour in terms of institutional and structural factors. The analysis pointed out that those should be used as explanatory variables in any behavioural model that seeks to explain inflation apart from money supply and excess demand.

The regression equation applied to the data on

money supply, net domestic product, and price level in India during the period 1970-78, yielded following estimates.

$$P = 13.8 - 4.6 M_s + 3.16 Y$$

$$R^2 = 0.97; \; Z^* b_1 = 2.16, \; Z^* b_2 = 2.11$$

*stands for significance at 5 per cent level

The equation gave the best fit to the data of the coefficient of determination was very high (98) and both the regression estimates were statistically significant at 5 per cent level. The regression estimates however were not in assumed direction. The estimate of $\hat{b}_1$ that is the coefficient of money supply was negative indicating that the influence of money supply on price level was not statistically vindicated during the short period of 1970-78 in India. The positive production coefficient again showed that far stronger factors influencedthe rate of price rise in India over-shadowing the influence of supply factors on prices. In sum the empirical analysis pointed out that money supply was not a source of inflation in India nor was that inflation tamed by rise inproduction.

The conclusion was in agreement with Brahmananda's finding that the influence of money supply and supply factors were only partially true in the short-period as

explanatory variables of inflation. The current study thus recognises the need for introducing the institutional and non-monetary factors characterising the Indian economy as explanatory variables in inflation studies, so as to high light the nature and causes of the problem in full and to derive the associated policy implications.

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# APPENDIX

APPENDIX I

STATISTICAL DATA ON WHOLESALE PRICE LEVEL, MONEY SUPPLY AND NDP AT FACTOR COST

| Year | At current Prices **NDP (Rs. Crores) | *Money supply ($M_1$) (Rs Crores) | Wholesale Price index 1970-71 = 100 (All Commodities) |
|---|---|---|---|
| 1970 -71 | 34696 | 7321 | 100 |
| 1971 - 72 | 36623 | 8320 | 105.6 |
| 1972 - 73 | 40693 | 9684 | 116.2 |
| 1973 - 74 | 50990 | 11172 | 139.7 |
| 1974 - 75 | 59606 | 11907 | 174.9 |
| 1975 - 76 | 61864 | 13144 | 173.0 |
| 1976 - 77 | 66793 | 15609 | 176.6 |
| 1977 - 78 | 73389 | 18383 | 185.8 |

Source: Report on currency and Finance Vol II. Satistical statement RBI, BOMBAY

Foot notes;

* Money Supply include

(a) Currency with the Public and

(b) Deposit money of the Public

** NDP includes Production figures of Primary, Secondary, transport, communication and trade, finance, real estate, community and Personal Services.

$$Z^{*}_{b_1} = \frac{\hat{b}_1}{\text{S.E of } \hat{b}_1}$$

$$S(\hat{b}_1) = \sqrt{\text{Var. } \hat{b}_1}$$

$$\text{Var. } \hat{b}_1 = \hat{\sigma_u}^2 \frac{\Sigma y^2}{\Sigma m_s^2 \Sigma y^2 - (\Sigma m_s y)^2}$$

$$\hat{\sigma_u}^2 = \frac{\Sigma e_i^2}{n-k} = \frac{\Sigma e_i^2}{n-3}$$

$$\Sigma e_i^2 = \Sigma p^2 - \hat{b}_1 \Sigma p m_s - \hat{b}_2 \Sigma p y$$

$$= 8781 - (-4.8)\ (848) - (3.6)\ (3518)$$

$$= 8781 + 4070.4 - 12664.8$$

$$= 12851 - 12664.8 = \frac{186.6}{n-3} = \frac{186.2}{5} = 37.3$$

$$\text{Var. } \hat{b}_1 = \frac{37.24 \times 1454}{10.721} = 5.05$$

$$\text{S.E } \hat{b} = 5.05 = 2.24$$

$$Z^{*}_{b_1} = \frac{4.8}{2.24} = 2.16$$ 2 (Statistically significant at 5% level)

$$Z^{*}_{b_2} = \frac{\hat{b}_2}{\text{S.E of } \hat{b}_2}$$

$$\text{S.E } \hat{b}_2 = \sqrt{\text{Ver } \hat{b}_2}$$

$$\text{Var } \hat{b}_2 = \hat{\sigma_u}^2 \times \frac{\Sigma m_s^2}{\Sigma m_s^2 \Sigma y^2 - (\Sigma m_s y)^2}$$

$$= \frac{37.24 \times 848}{10721} = 2.94$$

$$\text{S.E of } \hat{b}_2 = \sqrt{\frac{2.94}{3.6}} = 1.714$$

$$Z^{*}_{b_2} = \frac{3.6}{1.7146} = 2.11$$

(Statistically significant at 5% level)

$$\hat{b}_1 = \frac{(\Sigma Pms)\,\Sigma y^2 - (\Sigma Py)(\Sigma msy)}{\Sigma ms^2\,\Sigma y^2 - (\Sigma msy)^2}$$

$$= \frac{(848)\ (1454) - (3518)\ (365)}{(1454)\ (99) - (365)^2}$$

$$= \frac{1232992 - 1284070}{143946 - 133225} \qquad = \frac{-51078}{10721}$$

$$= \frac{-4.8}{}$$

$$\hat{b}_2 = \frac{(\Sigma Py)(\Sigma ms^2) - (\Sigma Pms)(\Sigma msy)}{(\Sigma ms^2)(\Sigma y^2) - (\Sigma msy^2)}$$

$$= \frac{(3518)\ (99) - (848)\ (365)}{10721} = 3.6$$

$$\hat{b}_o = \bar{P} - \hat{b}_1 \bar{ms} - \hat{b}_2 \bar{y}$$

$$\hat{b}_o = 147 + (4.8)\ (12) - 3.6\ (53)$$

$$= 147 + 57.6 - 190.8 \qquad = 13.8$$

$$R_2^2 = \frac{\hat{b}_1 \Sigma Pms + \hat{b}_2 \Sigma Py}{\Sigma p^2}$$

$$= \frac{(-4.8)\ (848) + (3.6)\ (3518)}{8781}$$

$$= \frac{-4070.4 + 12664.8}{8781}$$

$$= .98$$

## APPENDIX II

### METHOD OF ANALYSIS

| P | $P-\bar{P}$ | $(P-\bar{P})^2$ | Y | $Y-\bar{Y}$ | $(Y-\bar{Y})^2$ | $(Y-\bar{Y})$ | $(P-\bar{P})$ | Ms | $(M-\bar{M})$ | $(M-\bar{M})^2$ | $(M-\bar{M})$ | $(P-\bar{P})$ | $(Y-\bar{Y})$ | $(M-\bar{M})$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | -47 | 2209 | 35 | -18 | 324 | 846 | | 7 | -5 | 25 | | 235 | | 90 |
| 106 | -41 | 1681 | 37 | -16 | 256 | 656 | | 8 | -4 | 16 | | 164 | | 64 |
| 116 | -31 | 961 | 41 | -12 | 144 | 372 | | 10 | -2 | 4 | | 62 | | 24 |
| 140 | -7 | 49 | 51 | -2 | 4 | 14 | | 11 | -1 | 1 | | 7 | | 2 |
| 175 | 28 | 784 | 60 | 7 | 49 | 196 | | 12 | 0 | 0 | | 0 | | 0 |
| 173 | 26 | 676 | 62 | 9 | 81 | 234 | | 13 | 1 | 1 | | 26 | | 9 |
| 177 | 30 | 900 | 67 | 14 | 196 | 420 | | 16 | 4 | 16 | | 120 | | 56 |
| 186 | 39 | 1521 | 73 | 20 | 400 | 780 | | 18 | 6 | 36 | | 234 | | 120 |
| | | 8781 | | | 1454 | 3516 | | 95 | | 99 | | 848 | | 365 |

$$\bar{P} = \frac{\Sigma P}{N} = 146.625 = 147$$

$\bar{Y} = 53$ $\bar{M} = 11.875 = 12$