

Inflation

8

Unit highlights:

- ⇒ Definition and types of inf
- ⇒ The consumer Price Index
- ⇒ GDP deflator
- ⇒ Inflation in classical mode
- ⇒ Demand pull inflation
- ⇒ Cost-Push inflation
- ⇒ Impact of inflation
- Phillips curve

Lesson-1: Definition, Measures and Types of Inflation

Lesson Objectives:

After reading this lesson you should understand and know the following:

- w Ambiguity surrounding the concept of inflation and a working definition of inflation.
- w Different measures of inflation
- w Rate of inflation and types of inflation.

What is inflation?

Inflation, in very simple terms, denotes a persistent rise in the general price level. There is ambiguity about the rate of price increase. Rate of price increase beyond a certain mark with or without objective basis may be considered appreciable (i.e. perceptible but not necessarily requiring adjustment by different agents or inflicting some adverse impact) or excessive (i.e. having the potential to inflict harmful effects). But there is no consensus about a specific percentage rate of price rise. After living many years with 8% - 16% annual inflation rate, 2% or 3% annual rise in general price level may not be considered inflationary by a society. The minimum rate of general price rise which qualifies to be accepted as inflation may itself rise over the years if the society continues to experience increasingly high rate of inflation as years pass by.

The next question is what should be the length of time span during which general price level is observed to rise persistently. If we agree about length of time span we may quite frequently have inflation in one period but deflation in another period. Besides, we may not have relevant macro-level data for smaller time periods like fortnights or weeks in most of the countries.

Controversy as to whether a state of rising prices be called inflation or not does not arise when we have double digit or higher annual rate of price increase sustained over a period of at least one year. Such states, most of the economists will agree, are inflationary states. Admitting some amount of ambiguity we define inflation as a persistent and appreciable rise in the general price level with the following clarifying note: (1) most of the prices must have sustained rise at least over a period of one year, and (2) general price level must rise at an annual rate of

Inflation may be defined as a persistent and appreciable rise of the general price level given that price level rises at an annual rate of 5% or more and most of the prices have sustained rise at least over a period of one

5% or more. There are still two other problems with this somewhat blunt definition of inflation: (a) it does not say what should be the measure of inflation. The Consumer Price Index, The Producer Price Index and The GDP Implicit Deflator all cover a wide variety of goods and services and hence, qualify as measures for inflation and (b) the above definition does not cover the so called suppressed or repressed inflation as they are notional and not observable. During war time markets may be substantially replaced by wage and price controls and rationing. Had the general price level not been controlled there could have been persistent and appreciable rise in the general price level . The existence of black market and rising prices in that market may bear testimony in support of that conjecture.

Measures of Inflation

Rate of inflation in year t may be worked out using the following expression: Rate of inflation in year t = (general price level in year t - general price level in year t-1) × 100. A price index is a measure of general price level and is a weighted average of the prices of a number of goods and services. The most important and frequently used price indexes are the consumer Price Index (CPI) the GDP Implicit Deflator and the Producer Price Index (PPI).

The Consumer Price Index (CPI)

It shows by what percentage cost of a standard bundle of consumer goods and services has risen in a particular time period (usually a year) relative to the cost of the same bundle in a predetermined time period called the base year. CPI can be found by using any of the following two expressions:

$$CPI = (\sum p_i^c q_i^b / \sum p_i^b q_i^b) \times 100 \dots\dots\dots (1)$$

In equation (1) p_i^c and p_i^b stand for prices for ith commodity in current year and base year respectively. q_i^b represents amount of ith commodity consumed in the base year. i ranges from 1 to n. Any of such numbers (i.e. 1, 2, 3 , n) represents a particular good or service. The other alternative expression is

$$CPI = \sum (p_i^c / p_i^b) \alpha_i \times 100 \dots\dots\dots (2)$$

where α_i = Proportion of total expenditure for n goods and services incurred in the base year, for the ith commodity or service.

In constructing CPI index each price (or price relative (p_i^c / p_i^b)) is multiplied by the corresponding fixed weight. CPIs can be found for different categories of consumers e.g. middle class urban families, industrial workers, small landowners and land-less peasants. Average retail prices are used in the construction of CPI.

The Producer Price Index

PPI is similar to CPI in construction. It however measures the prices of large number of goods (and not services) at the level of their first commercial transaction. This index is widely used by businesses. Prices are either wholesale prices or farmgate prices. Both CPI and PPI use fixed quantity weights for prices.

GDP Implicit Deflator

Unlike the CPI or the PPI, GDP Implicit Deflator uses variable weights for prices. This deflator is primarily used to get a measure of growth of real output over time. This covers final goods and services and considers all sectors of the economy. This deflator for a particular year is obtained by dividing the nominal GDP of that year by the real GDP of the same year. Hence is the use of the adjective, implicit. Real GDP of that year is obtained by multiplying the quantities of final goods and services produced in that year by the corresponding retail prices that prevailed in predetermined base year. Such products are then added up to obtain Real GDP (or GDP in base year prices).

We can use any of the above price indices to find rate of inflation in the following manner: Rate of inflation in year, $t = \{(Price\ Index\ in\ year\ t - Price\ Index\ in\ year\ t-1)/(Price\ Index\ in\ year\ t-1)\} \times 100\%$. All those indices do not consider the change of quality and introduction of new commodities. The first two indices are over estimates when people substitute relatively inexpensive goods and services for relatively expensive ones. Further more, problems arise when those indices differ widely among themselves and/ or move in opposite direction. For instance PPI may rise at an annual rate of only 3% while for CPI the rate is 8%. Such a situation probably suggest a poor or declining state of market integration. But when all the indices rise at high rates (say at double digit rate) the economy clearly suffers the brunt of inflation.

Rate of Inflation and Types of Inflation

On the basis of annual rate of increase sustained rises in prices are sometimes called creeping (less than 5%), walking inflation (5-10)%, trotting (two digit rates but less than 50%) and galloping or hyper inflation (more than 50% to 3 or 4 digit rates). The following three types of inflation are very often mentioned.

Moderate Inflation: This denotes single digit annual inflation rates. Prices rise predictably and people trust money. Long term contracts are kept in terms of money during moderate inflation.

Galloping Inflation: This type of inflation denotes two or three digit percentage annual rise of general price level. When such inflation occurs for a pretty long time most contracts are adjusted to price increases or accounts are kept in terms of a stable foreign currency. Preference for money holding greatly diminishes. Financial markets wither away as capital flows abroad. Even then economies experiencing galloping inflation are found to survive in many instances.

Hyper Inflation: Such inflation denote annual price rise at a rate of more than 1000%. Real demand for money falls drastically, relative prices become highly unstable causing serious distortion. A profound change in income distribution occurs and a moral and an economic disequilibrium take place.

Economies are reported to have survived or even prospered during a period of hyper inflation. An important distinction in effects in inflation occurs in an economy when it shifts from unanticipated inflation to anticipated inflation. If people had become accustomed to stable general price level or creeping inflation and then all on a sudden face double digit inflation, they cannot readily adjust their behaviour in the changed circumstances. Such an inflation is called **Unanticipated Inflation**. When general price rises and the rate at which it would rise are anticipated people can better adjust with the process to mitigate the adverse effects of inflation. Such an inflation is called **Anticipated Inflation**. Such a phenomenon is observed in societies where prices keep rising at more or less constant rate for a pretty long time even though growth rate of prices may be a double digit number.

Lesson-2: Analysis and Explanation of Inflation in Different Macro Model

Lesson Objectives:

After studying this lesson you should understand and know the following:

- w Classical model of inflation.
- w Explanation of Cost-push and Demand-pull inflation.
- w Difference between Cost-push and Demand-pull inflation.
- w What is validation of inflation?

Classical Model:**Treatment of Expectation**

Adjustment to rising prices depends on how expectations are formed by different agents of the economy. So far as labor market is concerned the employers (business firms) know for certain what money wages they would pay during a period. Furthermore, they are assumed to have more or less perfect knowledge of what would be the prices of the product since (i) they are the price setters in case of at least a few goods and services and (ii) they have better access to information regarding changes in exogenous variables and price determining process. Workers, on the other hand, know for certain what money wages they will be paid but they have to guess what would be the prices of the product they will purchase during the period as well as real wage. Labour supply would be a function of expected real wage.

Inflation in classical model is a purely a monetary phenomenon.

Nature of ACS and ADC and Impact of Change of Money Supply

In the classical model we have a vertical aggregate supply curve (ASC). In this model aggregate demand curve (ADC) shifts to the right whenever money supply increases. Increase in money supply, given constant income velocity of money, causes a right-ward shift of ADC as shown in figure 8.1. Vertical ASC in the classical model is the outcome of two assumptions:

1. Wages and prices are perfectly flexible; and
2. Price expectation, p_t^e of workers are positively related with actual price, p_t in the following manner $p_t^e = f(p_t)$ where $f' = 1$.

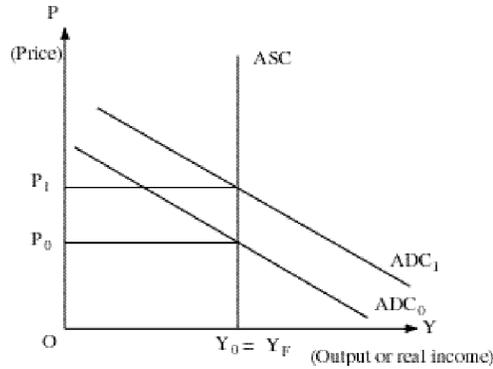


Fig 8.1: Equilibrium output or Income in classical model

The above expression implies that whenever actual price rises or fall, expected price will also change in the same direction and at the same rate. Starting with an equilibrium situation with actual price level, P_0 (actual price may or may not be equal to expected price p^e) and employment level, N_0 if actual price rises (or falls) by a certain percentage expected price will (or fall) by the same proportion too. At the new equilibrium point employment (and hence output) will remain the same but price will rise (fall). Hence we get a vertical ASC (see figure 8.2)

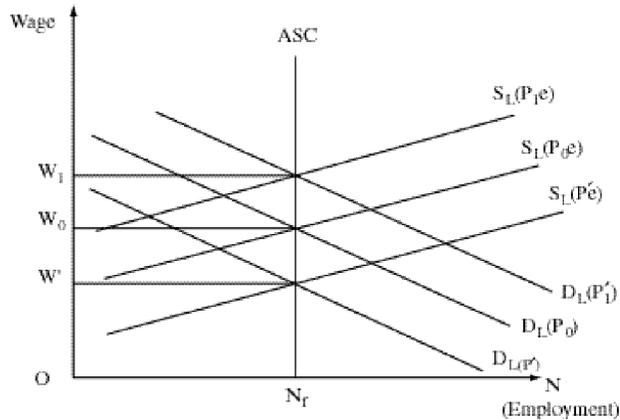


Figure 8.2: Aggregate supply curve in classical model

Inflation in classical model is a purely monetary phenomenon characterised by rise in prices only. Output and employment are determined solely by real forces in the classical model.

Types of Expectations

Apart from the naive expectation formation process incorporated in classical model there are two important mechanisms for formation of expectation. One mechanism is basically backward-looking and use error-correction method to

make **Adaptive Expectation**, the other is forward-looking and use the model and all the relevant information and is called rational expectation.

Adaptive Expectation

If one adopts adaptive expectation his or her prediction for the value of a variable (in this case price) in a period, t would depend upon actual value of the variable in period (t-1) and prediction error made in period (t-1) as shown by the following expression:

$${}_{t-1}P_t = P_{t-1} + \lambda ({}_{t-1}P_{t-1} - P_{t-1}) \dots \dots \dots (3)$$

where ${}_{t-1}P_t$ is (t-1) period's expected price for period t, P_{t-1} is actual price in period t-1, ${}_{t-2}P_{t-1}$ is (t-2) period's expected price for period (t-1), and λ is a constant whose value ranges from 0 to 1. If $\lambda = 0$, then expected price for period, t is equal to actual price in period, t-1. If $\lambda = 1$, ${}_{t-1}P_t = {}_{t-1}P_{t-1}$. In the former case the agent (here workers) ignore all the past erroneous predictions, while in the latter case his expectation does not change at all. If λ has positive value less than unity then ${}_{t-1}P_t$ would be a linear function of all past prices. Such prices will have progressively declining coefficients as we move further and further back in the past.

Adaptive expectation may imply positively sloped aggregate supply curves.

If λ is positive, the expected price will fall but remain greater than actual price when actual price keeps falling. The reverse happens (i.e. expected price continues to remain less than the actual price) when actual price keeps rising. The implication of this discrepancy in the labour market is that whenever prices

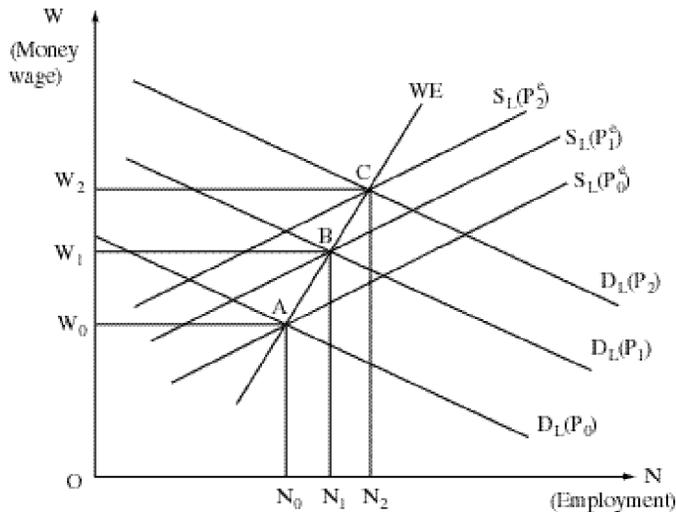


Figure 8.3: Relationship between Price, Wage and Employment (case of Adaptive Expectation)

rise by $x\%$ demand for labour curve would shift to the right by same percentage. Expected price will, however, either remain fixed or rise by a lower percentage so that supply of labour curve would either remain at the same position or shift to the left by a lower percentage than the demand for labour curve. (See figures 8.3) Joining the points of intersection between pair of demand and supply curve of labour in different situations we come up with a positive relationship between nominal wage and employment as price increases. But this positive relationship also implies positively sloped ASC. See figures 8.4 and 8.5.

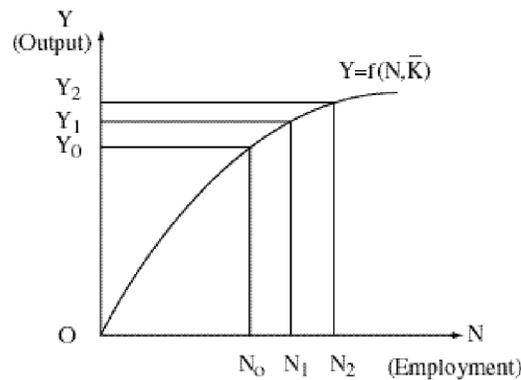


Figure 8.4: Production Function

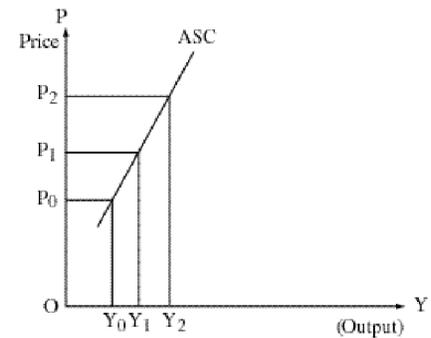


Figure 8.5: Aggregate Supply Curve (Adaptive Expectation Case)

Given a positively sloped ASC any rightward shift of ADC due to fiscal expansion (increase in government expenditure and reduction of tax rate, etc.) or monetary expansion (increase in money supply) would lead to an increase in both price and output level.

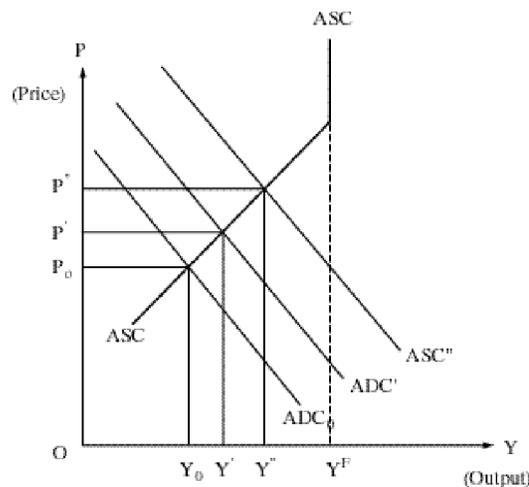


Figure 8.6: Impact of shift of Aggregate Demand Curve on Price and Output

If ADC keeps shifting rightward period after period we would have sustained increase in price and output. Once we reach full employment output level (i.e. vertical segment of ASC) further rightward shift of ADC will only lead to price rise. See figure 8.6.

Rational Expectation

Rational expectation is based on the model which shows how the economy works and knowledge of all other relevant information. It is assumed that the agents adopting Rational Expectation know the model - they know the outcome of the model at different periods as exogenous elements change over time. They know the functional forms of the equations constructing the model, the variables incorporated and their feasible values, parameter values and distributions of exogenous shock as well. Whenever some new information is obtained, it is incorporated in the model. Rational expectations are thus model-consistent. Rational expectation of price for period, t in the vintage period, (t-1), expressed as ${}_{t-1}P_t$ is an unbiased estimate of actual value, P_t . This result is expressed by the following expression:

$$P_t = {}_{t-1}P_t + \varepsilon_t \text{ with } {}_{t-1}\varepsilon_t = 0 \dots \dots \dots (4)$$

Equation 4 implies that there is no systematic difference between actual and expected price. ε_t is a random variable and its expected value is zero. On the average expected price would equal actual price. This means that rightward shift of D_L will be, on the average, accompanied by an equi-proportional leftward shift of S_L resulting a vertical ASC even in the short run. So continuous rightward shift of ADC will lead to a sustained rise of general price level only- output will not be affected.

Rational expectation implies vertical aggregate supply curve even in the short run.

Demand-Pull and Cost-Push Inflation

Inflation can be broadly categorized into Demand Pull Inflation and Cost-Push Inflation. Both types of inflation are characterized by excess demand.

Demand Pull Inflation

In AD-AS model a rightward shift of Aggregate Demand Curve (ADC) unaccompanied by any shift of Aggregate Supply Curve (ASC) will create excess demand and generate a tendency of price rise. Changes in the parameters of

Demand-Pull Inflation causes price rise and increase in output and employment.

exogenous elements associated with IS and LM curve underlying the ADC may cause such rightward shift of ADC. For instance any of the following—an increase in propensity to consume, a decline in tax rate, an increase in money supply, an increase in propensity to invest and an increase in government expenditure may increase the level of aggregate demand at each level of prices.

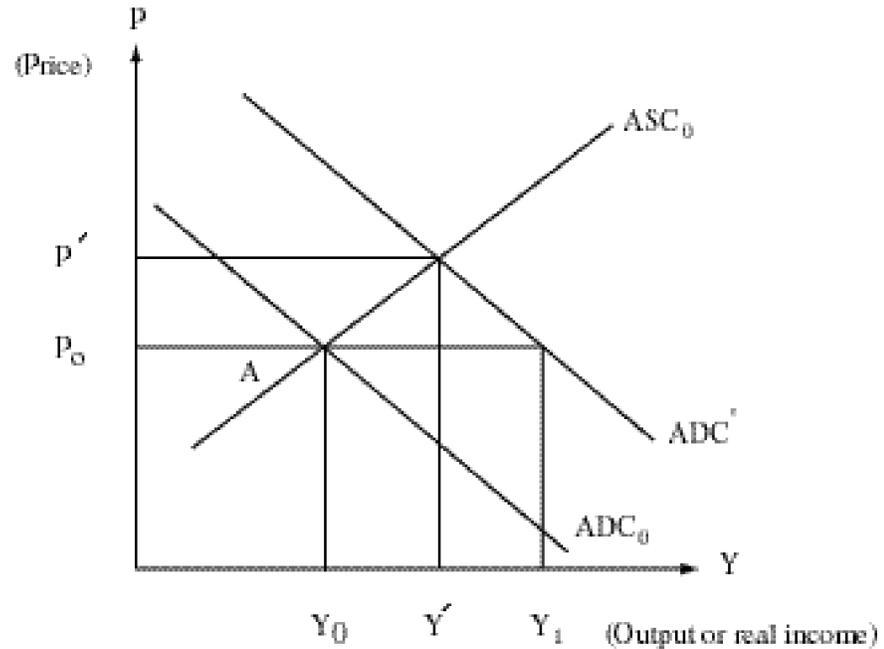


Figure 8.7: Demand-Pull Inflation

A shift of ADC to the right causes excess demand to the magnitude of Y_0Y_1 at old equilibrium price, P_0 . Note that ADC_0 and ASC_0 represent the initial aggregate demand and aggregate supply curve respectively. See figure 8.7

The excess demand raises the prices. This leads to a fall of quantity demanded and a rise of quantity supplied. The economy subsequently moves from the equilibrium point A to the new equilibrium point B.

Change in Product Market

As excess demand is created price level begins to move upward. If we assume that right ward shift of ADC was caused entirely by rightward shift of IS_0 (IS curve in figure 8.7, drawn corresponding to initial equilibrium price, P_0) to IS_1 .

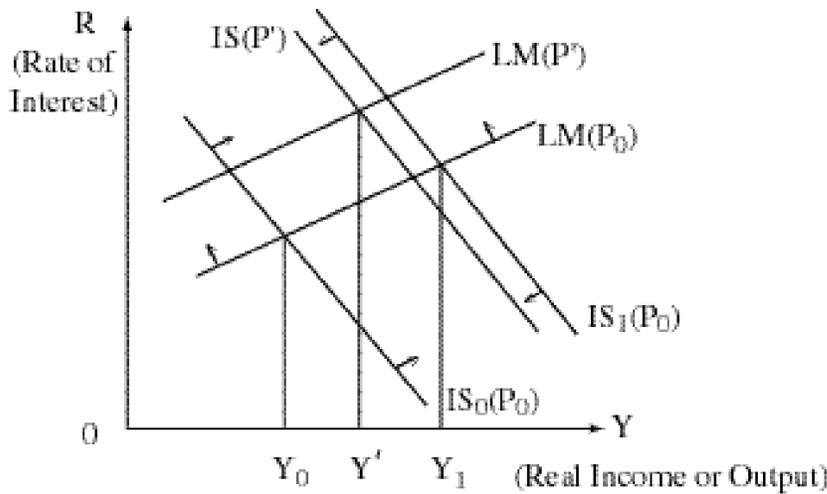


Figure 8.8: Demand-Pull Inflation and Adjustment in Product and money markets.

Such a price rise would not let the economy move to B with same level of price, P_0 but a higher level of income, Y_1 . As price rises both $IS_1(P_0)$ and $LM(P_0)$ would shift to the left since an increase in price causes real balance decline and reduce real net exports. See figure 8.8

Change in Labour Market

In the labour market price rise causes a rightward shift of demand for labour curve. Supply of labour curve shifts leftward due to change in expected price. If rate of change in actual price exceeds rate change in expected price both employment and output (we assume that technology and quality and efficiency of inputs remain unchanged) would rise. See figures 8.9a and 8.9b.

Cost-Push Inflation causes price rise and decline in output, but its impact on employment is ambiguous.

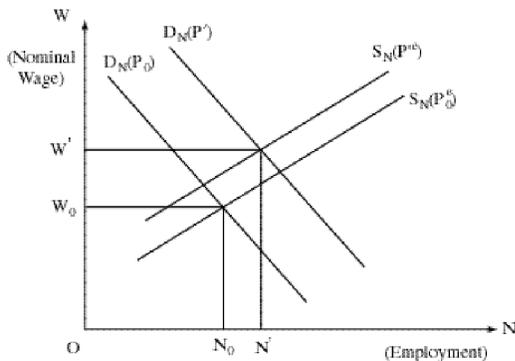


Figure 8.9a: Demand-Pull Inflation and Adjustment in labour market

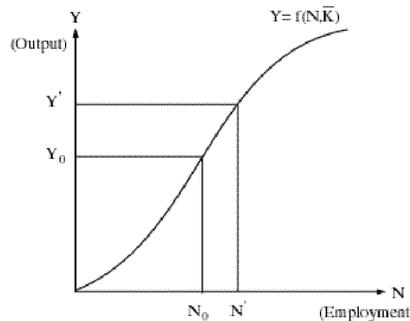


Figure 8.9b: Demand-Pull Inflation and Adjustment in Employment and output

Going back to figure 8.7 we find that as aggregate demand shifts to the right, the price rise causes aggregate demand to fall but aggregate supply to rise. Hence excess demand disappears and a new equilibrium with a higher price level, P' as well as a higher level of output, Y' is reached.

Cost Push Inflation

In contrast to Demand-Pull Inflation, Cost Push Inflation is caused by upward or leftward shift of ASC. Such upward shift may be the result of the following changes: (1) labours demand higher wage at the same price for each level of employment, (2) employers demand higher level of return for same level of employment, (3) cost of raw materials and energy goes up. Whatever may be the initial reason such leftward shift of ASC would cause price level to rise while output would decline. There is however an ambiguity as to the impact on employment. This impact depends upon the specific reason causing the leftward shift of ASC. See figure 8.10.

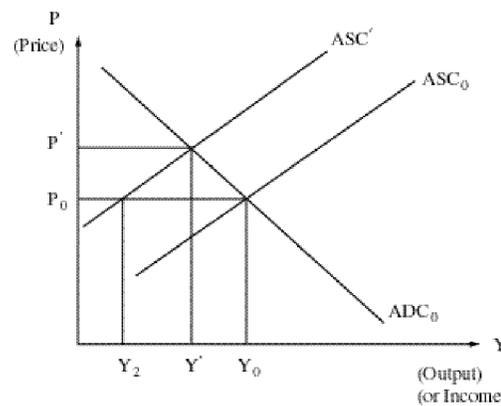


Figure 8.10: Cost-Push Inflation

The analysis that follows concentrates on Cost-Push Inflation caused by an upward or leftward shift of supply of labour curve.

An upward shift of labour supply curve may occur due to (1) increase of the expected prices level (2) increased preference for leisure (3) migration (4) restriction on entry of some segments of population into work force. We assume that labour supply curve has shifted due to increase of workers' preference for leisure. For same amount of work or employment they now demand higher nominal wage. As is obvious, at the initial equilibrium price (P_0) there will be excess demand of magnitude Y_0Y_2 . See figure 8.10. So price will rise.

Phillips Curve shows the relationship between rate of unemployment and rate of inflation. This curve holds out the prospect of trade-off between unemployment and inflation.

In the labour market due to increased preference for leisure and consequent leftward shift of labour supply curve, a new equilibrium could have been achieved with much lower level of employment and output, had the price level remained unchanged (see figures 8.11a and 8.11b). As price continues to rise labour demand curve shifts from $D_N(P_0)$ to $D_N(P_1)$ to $D_N(P_2)$ and supply of labour function is shifted further leftward from $S_N(P_0^e)$ to $S_N(P_1^e)$ to $S_N(P_2^e)$ Points A, B and C are pre-shift labour market equilibrium points while R, S and T are post-shift equilibrium points (see figure 8.11a).

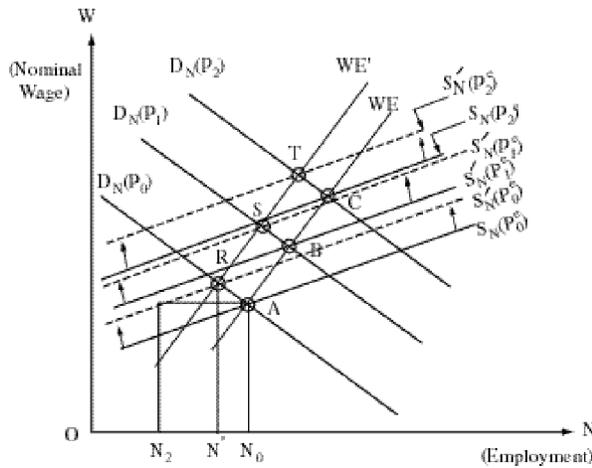


Figure 8.11a: Cost-Push Inflation and Adjustment in labour market

Note: that for leftward shift of labour supply curve, at each price level employment as well as output will be less than before.

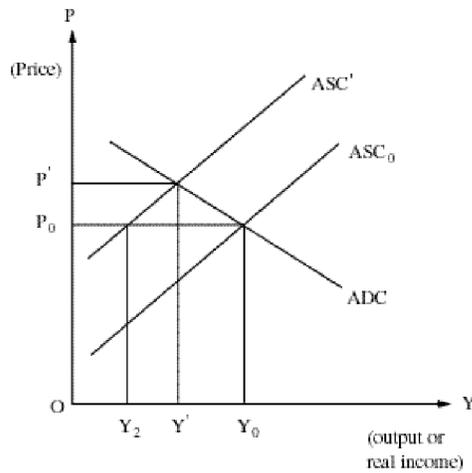


Figure 8.11b: Cost-Push Inflation and Adjustment in labour market and Production.

Note: ASC_0 corresponds to WE curve of figure 8.11a while ASC' corresponds to WE' curve of the same figure. Both WE and WE' show a positive relationship

between price and employment. This relationship may be used in conjunction with production function to derive aggregate supply curves.

In figure 8.11b ASC_0 and ASC_1 represent aggregate supply curve in the pre-shift and post-shift situation respectively. As price rises too the fall of output and employment would not be as much as under constant price at P_0 (see figure 8.11a and 8.10). At new equilibrium employment is ON' and output is OY' - they do not fall as much as (to N_2 and Y_2 respectively) in the absence of price rise.

On the demand side price rise leads to a leftward shift of both IS and LM curve implying fall of demand (see figure 8.12). As a consequence rate of interest goes up and income level falls.

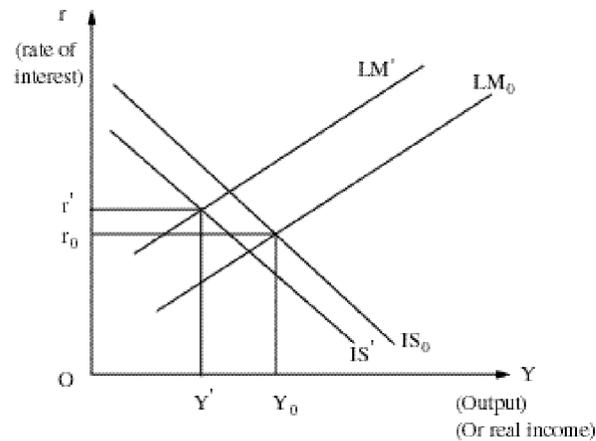


Figure 8.12: Cost-Push Inflation and Adjustment in Product and Money market

As ASC curve shifts left-ward excess demand is created. This excess demand raises the price level. As price rises supply is raised above OY_2 level and demand starts falling-price rise stops at OP where gap between ADC & ASC is closed.

Difference between Demand-Pull and Cost-Push Inflation

The basic difference between Demand Pull and Cost Push inflation is that in the former case both price and output rise and in the latter case price rises but output falls. When demand pull inflation occurs employment increases. The impact on employment is however uncertain in case of Cost Push inflation. If wage is raised by trade union pressure for instance, employment in industries covered by trade unions may fall but that in uncovered industries may rise. If inflation occurs due to increase in cost of inputs other than labour, decline in output may or may not be accompanied by fall in employment. In the second case employment may even rise.

This happens due to employers substitution of now costlier materials inputs or energy for relatively cheap labour.

In practice, it is however very difficult to separate Demand-Pull from Cost-Push inflation. In both the cases excess demand appears at the beginning. But prices and wages may rise in an unending sequence, rendering it difficult to know whether price increased first due to increase in aggregate demand or price increase followed wage increase caused by leftward shift of labour supply curve as well as aggregate supply curve.

It should be noted here that the above analysis does not, explain sustained price rise i.e. inflation, rather it explains why price should rise when aggregate demand curve shift to the right or aggregate supply curve shifts to the left and excess demand appears. The price increase induced by excess demand generates changes in labour market and product and money market such that supply of goods and services increases and demand for those fall to subsequently eliminate excess demand.

There may be sustained price rise in the following circumstances:

Suppose an economy is in equilibrium at a full employment level of output and the government is committed to maintain full employment. (Note that there is natural rate of unemployment to co-exist with theoretical full employment). Let there be cost-push inflation caused by leftward shift of ASC due to autonomous increase in wage-this will cause price rise and some unemployment too. Government may increase its expenditure to reduce unemployment. Price will further rise as labour supply function will again shift to the left to maintain real wage level. This process called **Wage- Price Spiral** repeats itself due to government's commitment to maintain full employment and workers endeavor to resist decline in real wage. As is obvious aggregate demand has to continue to expand to hold the unemployment rate to the level of the natural rate. In the economics literature this process is known as **Validation of Inflation**.

Lesson 3: Cost of and Curative Measures for Inflation

Lesson Objectives:

After completing this lesson you should know about

- w Cost of anticipated and unanticipated inflation
- w Impact of inflation on trade.
- w Phillips Curve
- w Different measures of cures for inflation

Cost of inflation in an economy depends on institutional structure of the economy and the extent to which inflation is anticipated. Important elements of the institutional structure are methods of taxation and nature of contractual arrangements. An economy is said to be indexed when certain aspects of taxation method and contractual agreement change in order to adapt to ongoing inflation. Below we consider the effects of fully anticipated inflation in a fully indexed economy.

Fully Anticipated Inflation

It should have the following characteristics:

1. Inflation is universally and accurately anticipated;
2. All savings are held in bonds, stocks, or savings accounts earning nominal interest rate;
3. An inflation of $x\%$ raises the market nominal interest rate for both saving and borrowing by exactly $x\%$ and there is no ceiling on nominal interest rate;
4. Wage and salary contracts as well as pensions are fully indexed;
5. Tax thresholds, tax brackets, fines and other payments fixed by law are also indexed;
6. Only real (not nominal) interest income is taxable, and only the real cost of borrowing is tax deductible;
7. Absolute prices of all goods and services as well as factors of production rise at the same rate due to inflation so that relative prices remain unaffected.

Cost of anticipated inflation in a fully indexed economy as mentioned above emerge mainly due to the practice of holding currency (notes and coins). The purchasing power of currency progressively declines as inflation continues. Since interest is not paid on currency holdings three effects called 'shoe leather cost', 'inflation tax' and "capital intensity effects" arise. Besides there are 'menu costs'

which arise due to rewriting payments contracts and changing price tags associated with indexation.

Shoe Leather Cost: When inflation is fully anticipated in an indexed economy nominal interest rate will rise at the same rate as price. People would then keep less real balance and some money will be transformed into interest earning assets. By doing so people would face inconvenience of illiquidity and they would go to financial institutions more frequently to obtain cash. The time and resource costs of the frequent trips to such institutions are termed as 'shoe leather cost' of inflation.

Inflation Tax: When inflation is fully anticipated real income remain unchanged but real value of cash balance declines while in case of zero rate of inflation the real value of income as well as real balance both remain unchanged. The decline of real balance has similar effect as imposition of a tax. What we lose in terms of our command over real resources is gain to the government. This is called inflation tax. We must compare the cost with the benefit of this inflation tax which depends on what government does with its additional command over real resources.

Capital Intensity Effect: Fall of real worth of cash balances during inflation encourages people to shift their money holding to assets with positive return - causing a substitution of physical capital for money. The increase in capital may raise output but it may lead subsequently to fall of total output due to diminishing marginal product of capital.

Other Costs and Impact of Inflation

Menu Costs of Inflation: When inflation is fully anticipated, the sellers are required to re-quote prices frequently. This involves a cost. The cost would be significant if there is high inflation rate.

Fiscal Drag or Bracket Drift: If the tax threshold and tax brackets are not indexed inflation may require some people who did not pay tax in earlier periods to pay income tax now although their real income has not changed. Tax rate would rise during inflation and real tax proceeds would also be higher. The rise in average tax burden implies that after tax real income declines.

Impact on Saving Decision: If nominal interest earnings are taxed, the saving decision is distorted. The decision to save depends on what would be the real after

tax rate. Taxation of nominal interest earning reduces the after tax real interest income.

Unanticipated Inflation

Impact on Investment on Houses

During unanticipated inflation people in order to acquire houses may borrow from financial institutions and keep the house under mortgage which is fixed in nominal terms. Capital value of the house increases but liability and its time frame of the borrower remains unchanged. This capital gain is at the expense of creditor, the building society. The savers having deposits with such societies would lose.

Impact on Consumption

It may be wise to buy a commodity now even through borrowing. The interest earned on saving may not be enough to purchase the commodity later. Unanticipated inflation hurts those who save for their retirement. They would be more adversely affected if prices of the commodities included in their bundle of consumption increase at higher rate. There will also be a shift from private to public sector as government turns out to be net debtor. Holders of bonds will also suffer.

Income redistribution effect

Wages generally lag behind prices. Wage earning of the workers who are not organized are likely to suffer most. Pension earners also suffer. During inflation income is usually shifted from wage to profit. Output increases along the shortrun aggregate supply curve in response to an expansionary policy as long as workers fail to anticipate inflation and as a consequence wage falls. But such fall cannot continue as infinitum. Government may interfere or resistance may grow among workers. If commodities cannot be exported as their price go up lack of adequate aggregate demand may put a brake on profit.

Impact on Trade

Inflation, whether anticipated or not, adversely affects balance of trade. If a certain country experiences inflation while its trading partners do not, then its export will decline while import would increase resulting a fall of employment.

This effect may be somewhat offset by a substantial depreciation of the domestic currency - but this may increase the domestic inflation rate.

Phillips Curve

Whatever may be the adverse impacts of inflation, high inflation rate are found to go hand- in- hand with high output and employment at least in the short run. Over the long run there seems to be no sustained relation between a country's inflation rate and its level or growth of output or employment.

The Phillips Curve better called Price Phillips Curve shows the trade-off between inflation rate and rate of unemployment. In the short run as the Phillips curve demonstrates an economy can achieve higher employment only if it accepts higher rate of inflation. The original Philips Curve introduced by A.W. Phillips depicts an inverse relationship between wage increase and unemployment. The phenomenon of original Phillips curve or Wage Phillips curve has the following theoretical basis. The rate of increase of wage rate, W^* is hypothesized to depend positively on the excess demand for labour as shown in the following expression:

Phillips Curve is vertical in the long run. It may be vertical even in the short run if labourers use rational expectation.

$$W^* = \left(\frac{dw}{w dt} \right) = f(N^d - N^s); f' > 0 \dots \dots \dots (1)$$

Where W^* = Rate of change of wage rate, N^d and N^s respectively represents demand for and supply of labour at the going wage rate, W , $(N^d - N^s)$ = excess demand for labour and t = time. Such excess demand would occur wherever we have a wage level below the equilibrium level. A particular money wage level may appear as an equilibrium money wage at a point of time. But if ADC shifts to the right then excess demand would appear at that wage level.

It should be noted here that we have a family of demand for labour curves-each curve showing the relationship between nominal wage and amount of labour demanded stands for a particular rate of inflation. Similarly we have a family of labour supply curves- each curve stands for a particular expected rate of inflation.

Expression (1) can be rewritten as

$$W^* = h(N^s - N^d) \dots \dots \dots (2)$$

where $h < 0$

$(N^s - N^d)$ represents excess supply of labour at a particular wage level. Equation (2) shows that W^* is inversely related with excess supply of labour. Unemployment rate, $u = U/L$ can be used as a proxy for excess supply of labour

(U = magnitude of unemployment and L = Labour force) so that we may write the following expression in place of (2)

$$W^* = g(u) \dots \dots \dots (3)$$

where $g' < 0$.

Note that u is negatively related with W^* . Family of Wage Phillips Curves may be represented by the following expression:

$$W = g(u) + P^e \dots \dots \dots (4)$$

where P^e stands for expected inflation rate

or $W^* = g(u, P^e) \dots \dots \dots (4a)$ (the more general form)

For each level of P^e there would be a Wage Phillips curve. As P^e rises, the Wage Phillips curve would shift up-ward implying that an increase in employment or reduction of unemployment by a certain percentage would require a higher wage rate increase. See figure 8.13.

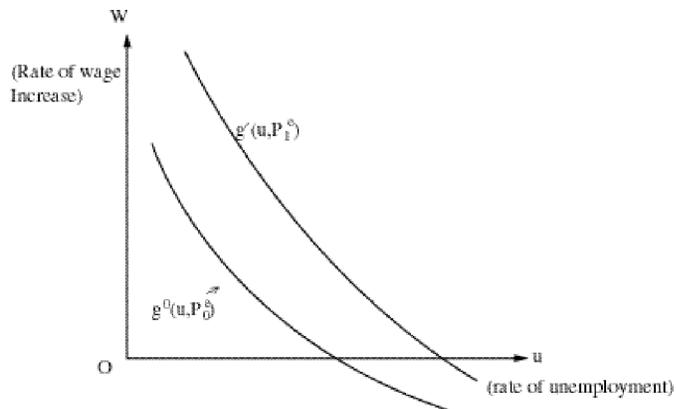


Figure 8.13: Wage Phillips Curve

In order to derive the Price Phillips Curve from (4) or (4a) we need to use the relation between W^* and P^* [rate of price increase, $(dp/dt)/P$] W^*

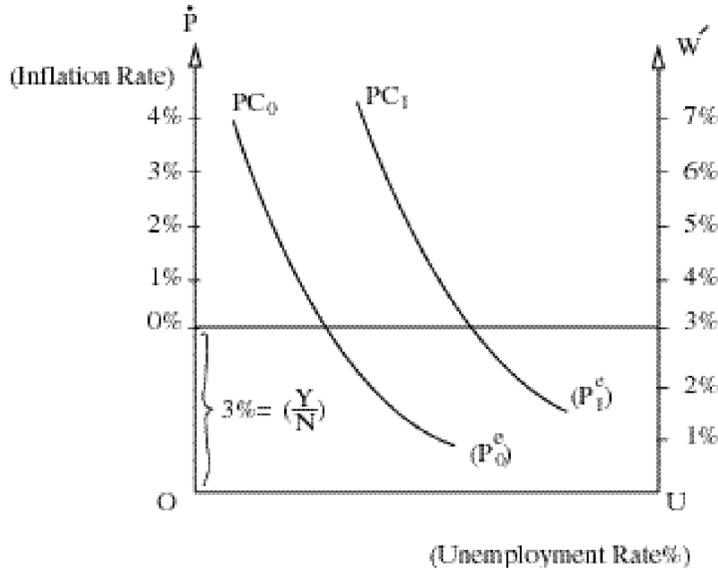


Figure 8.14: Wage and Price Phillips Curve

Note: The figure is drawn on the basis of assumption that labour productivity (Y/N) grows at a constant rate of 3%. PC_0 and PC_1 are price Phillips Curves when seen against left vertical axis (i.e. P -axis) and wage Phillips Curves when seen against right vertical axis (i.e. W -axis) PC_0 and PC_1 correspond respectively to expected price level, P_0^e and P_1^e . It should be noted that $P_1^e > P_0^e$

Let us assume that workers demand a constant share of income irrespective of the level of wage or price. Share of workers in total output, S_L can be shown by the following expression:

$$S_L = WN/PY \dots \dots \dots (5)$$

where W =money wage N =Level of employment, P =General Price level and Y =Level of real aggregate output.

$$\text{Now } S_L^* = (W/P)^* - (Y/N)^* = W^* - P^* - (Y/N)^* \dots \dots \dots (6)$$

Where $(Y/N)^*$ =growth of average labour productivity S_L^* , W^* and P^* represent growth rate of labours share, growth rate of money wage and growth rate of general price level respectively. When labour's share in aggregate real output remains constant S_L^* turns out to be zero. This means that

$$P^* = W^* - (Y/N)^* \dots \dots \dots (7)$$

Using equation (4) for W in (7), we drive

$$P^* = g(u) + P^e - (Y/N)^* + \varepsilon \dots \dots \dots (8)$$

Equation (8) represents family of Price Phillips curve (see figure 8.15). Such negatively sloped Price Phillips curves have important policy implication. If government takes expansionary policy it can reduce the level of unemployment but only at the cost of higher inflation rate.

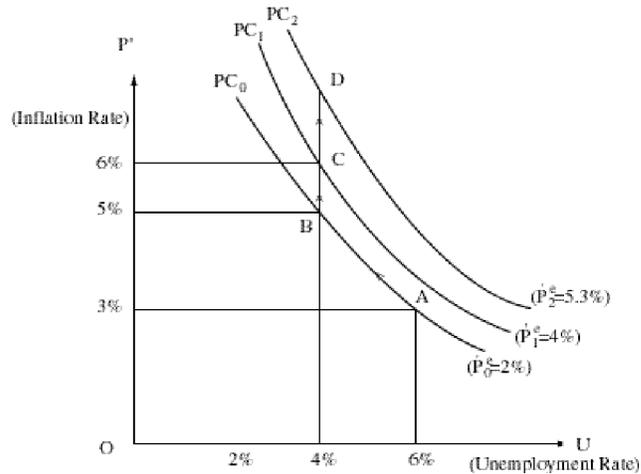


Figure 8.15: Trade-off between price stability and employment (Adaptive Expectation)

Suppose that the economy is initially at point A with 6% unemployment rate and 3% inflation rate (see figure 8.15). Government may move the economy from point A to point B through expansionary monetary or fiscal policy. At point B the economy has 4% unemployment rate but 5% rate of inflation. But the economy would not stay at point B for long. As actual inflation rate has gone up so would the expected inflation rate from P_0^e (say 2%) to P_1^e (say 4%). Government would have to resort to expansionary policy to reach C in order to maintain the rate of unemployment at 4%. This process would repeat itself so that government has to be prepared to accept accelerating inflation rate in order to maintain a lower rate of unemployment at u_1 . This trade off is rendered possible by the positively sloped supply of labour curve. Underlying such supply curve is the premise that expected inflation rate falls short of actual inflation rate. Under adaptive expectation scheme this outcome is possible as we have discussed earlier.

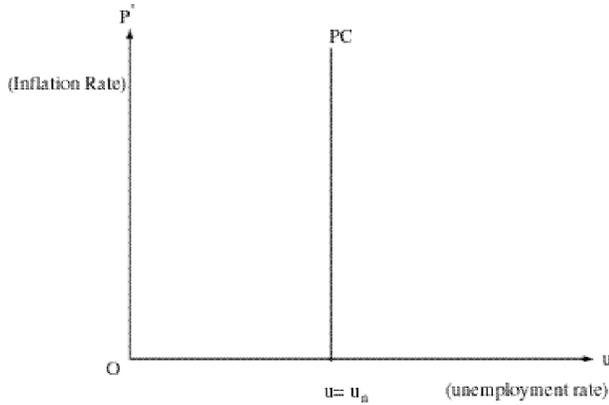


Figure 8.16: Vertical Phillips Curve (No Trade-off)

In any long run equilibrium with a constant rate of inflation, actual inflation rate would be equal to expected inflation rate. Writing $P^* = P^e$ in (8) we derive

$$g(u) - (Y/N)^* = 0 \dots \dots \dots (9)$$

For a given average labour productivity growth, $(Y/N)^*$, u would have fixed value called natural unemployment rate. Price Phillips Curve would be vertical at natural rate of unemployment (u_n). The implication of such a vertical Price Phillips Curve is that in the long run there is no trade-off between price stability and unemployment.

If workers use rational expectation rather than adaptive expectation then

$$P_t^* = {}_{t-1}P_t^* + \eta_t \dots \dots \dots (10)$$

where η_t is the random forecast error and ${}_{t-1}P_t^*$ is the unbiased estimate of P_t^*

Using (10) for ${}_{t-1}P_t^*$ (or P_t^e) in (8)

$$P_t = g(u) + P_t - \eta_t - (Y/N) + \varepsilon_t \dots \dots \dots (11)$$

(Note that we have used time subscribes in equation (8) for our convenience)

or
$$g(u) - (Y/N) + \varepsilon_t - \eta_t = 0 \dots \dots \dots (12)$$

The expected value of the unemployment rate when $\varepsilon_t = \eta_t = 0$ is, simply the natural rate of unemployment. Even in the short run with rational expectations, all but random inflation is anticipated, so all deviations from the natural rate of unemployment are random. The impact of systematic government expansionary policy on rate of inflation or deflation is anticipated, the workers would nullify the impact on employment by appropriately shifting the supply of labour curve upward to resist decline of real wage. Hence the government cannot move the

economy up along a downward sloped Phillips Curve. The effects of persistent shocks to private demand (consumption and investment) on real wage would also be anticipated. Such shocks may affect employment only when they first appear. In such a condition, there is no role for stabilization policy in the rational expectation case.

Anti-inflation Policy:

Recessionary Cure for Inflation

Inflation can be eliminated through deliberately creating recession.

Proponents of this cure base their prescription on Phillips Curve analysis. If the natural rate of unemployment prevails, the economy would experience a constant rate of inflation. Use of contractionary monetary and/or fiscal policy would cause fall of inflation rate but unemployment rate would go up causing output fall below potential output consistent with natural rate of unemployment. By how much unemployment rate would fall would depend on slope of Phillips Curve. If the Phillips Curve is relatively flat reduction of inflation rate by one percentage point will require bigger increase in unemployment rate than if the Phillips Curve is relatively steep. Thus there would be greater reduction in output as well as employment in case of a relatively flat Philip's Curve. The precise magnitude of the fall of output is shown by the Okun's Curve (introduced earlier in lesson 3 of chapter 7) which depicts a positive relationship between rate of inflation and output (see also Panel ii of figure 8.17 below).

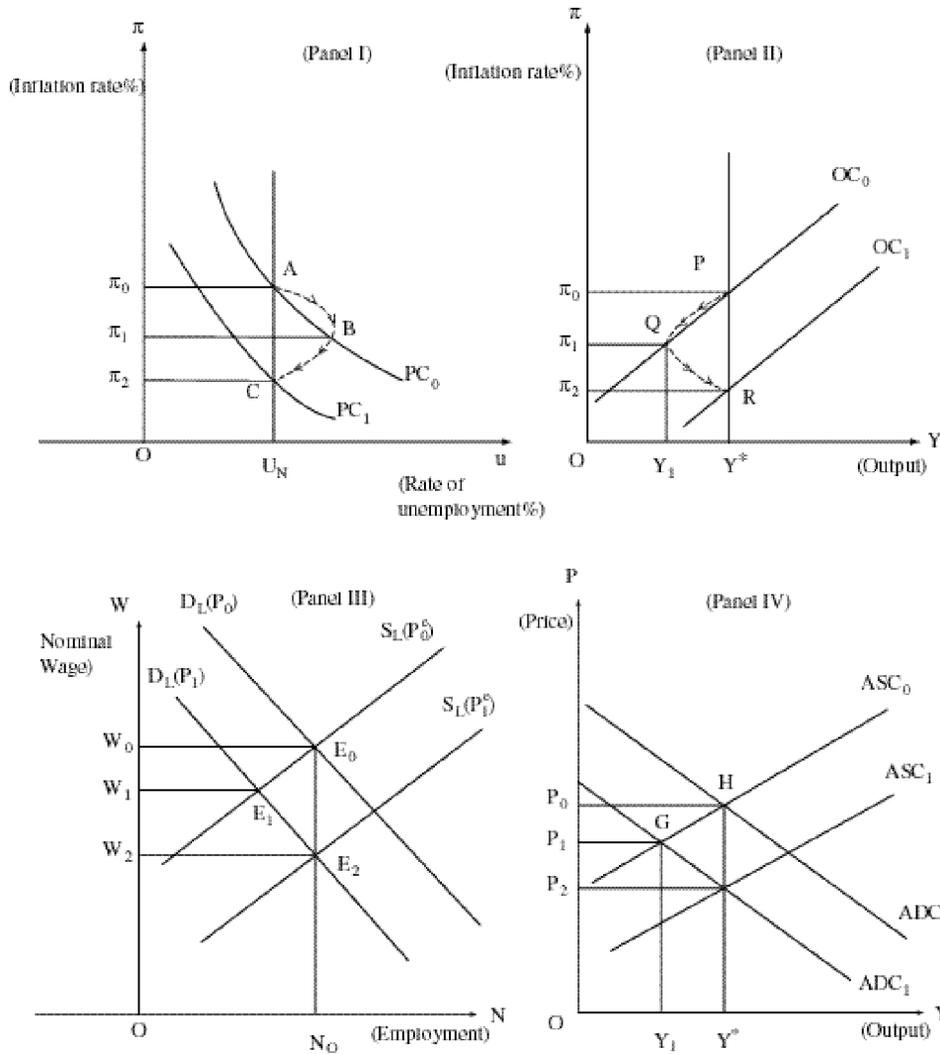


Figure 8.17: Recessionary Curve for Inflation

Note: PC_0 and PC_1 are Price Phillips Curves and OC_0 and OC_1 are Okun's Curves.

Recession starts when aggregate demand ADC_0 shifts leftward (as a consequence any of the following: tax rate may be increased, government expenditure may be lowered and money supply may be reduced) to ADC_1 (see panel iv of figure 8.17). Price falls initially from P_0 to P_1 . This results in a recession causing unemployment rate to exceed the natural rate of unemployment, U_N along Phillips Curve PC_0 [see panel i (for movement from A to B) of figure 8.17] and reach u_1 and output to fall from Y^* to Y_1 which is less than potential output Y^* [see panel ii (for movement from P to Q on Okun's Curve, OC_0) and panel iv (for movement from G to H, the point of intersection between ASC_0 and ADC_1) of figure 8.17]. In

the labour market nominal money wage rate falls to W_1 (see panel iii of figure 8.17) as there emerges excess supply of labour at the old equilibrium money wage, W_0 . Note that demand for labour curve shifts leftward from $D_L(P_0)$ to $D_L(P_1)$.

Inflation rate drops due to fall in money wage. But the fall in inflation rate causes labour supply curve to shift to the right until the real wage is restored. The fall in wage and prices would cause ASC_0 to shift to ASC_1 , Phillips Curve to the left from PC_0 to PC_1 and Oum'n's curve downward from OC_0 to OC_1 . Natural rate of unemployment would be restored along with potential output. The length of time the economy would take to move to natural rate of unemployment (or full employment) and potential output is not precisely known. The analyses indicate that it takes some long time for expectations to adjust and to make new contracts which are essential for the recovery.

The above view is considered to be too pessimistic to some economists who argue that credible and publicly announced policies adopting fixed monetary rules or targeting nominal GDP would lead to a repaid and inexpensive reduction in inflation. Such policies helped to control inflation in a few countries at a relatively low cost in terms of transitory loss of output and employment.

Price and Income Policy as a Cure for Inflation

This policy is based on consensus between the national government and labour unions of a country. A comprehensive accord between government and labour unions would cover, under such a scheme, a wide range of issues like wages and salaries occupational health and safety and matters pertaining to industrial relation. Workers give the undertaking that they would strive for the achievement of its wage objectives over time. The government commits to maintain after-tax real income through wage-tax deals and wage indexation. Government also ensures fall of cost of living index in response to fall in wage claims. Government introduces Medicare to maintain social wage.

This approach shifted the Phillips curve downward but made it flatter. Implementation of this policy becomes difficult if a section of workers believe that their jobs are indispensable and there is a shortage of supply of their type of workers. Rigidity of this system affect the relative variability of wages and prices. This may lead to resource misallocation.

Peace-time wage-price controls have been deployed in North European countries as well as the USA. They have been effective only in the former, though for a short period of time. Voluntary wage-price guidelines in those countries mentioned above showed some moderate success for a short period of time. They became ineffective and inequitable when expansionary fiscal and monetary policies were adopted. Many economists argued for deregulation of regulated industries, strengthening competition, banning all sorts of collusion to control prices and wages as such policies may increase the resistance to price and wage increases. On the other hand tax based income policies prescribe fiscal incentives for firms and industries whose wages and prices rise slowly and fiscal penalties for those whose wages and prices rise fast.

Reducing natural Rate of Unemployment

An altogether different approach would be to reduce natural rate of unemployment [also called non-accelerating inflation rate of unemployment (NAIRU)] itself instead of sacrificing some employment for a period of uncertain length for attaining price stability. The so called natural rate of unemployment is neither a natural or static concept nor it is necessarily socially desirable. It varies over time with demographic change, occupational composition of different sections of population, mobility of individuals, access to information and kinds of external shock. The natural unemployment rate is likely to be higher than optimum rate of unemployment.

Through improving the access to information and supply of information frictional and structural unemployment can be reduced. A close cooperation and liaison between skill training institutes, employers and job seekers would reduce unemployment rate. Government may overprotect the unemployed people from hardship of unemployment and reduce their effort level to look for appropriate job. This should be avoided.

In order to combat inflation it is necessary to have a consensus between different agents to maintain prices and incomes at certain levels without severely affecting the well-being of different section of population.

Concepts for Review

CPI	Anticipated Inflation
PII	Unanticipated Inflation
GDP Implicit Deflator	Shoe Leather Cost
Moderate Inflation	Inflation Tax
Galloping Inflation	Menu Costs of Inflation
Hyper Inflation	Capital Intensity Effect
Adaptive Expectation	Fiscal Drag
Rational expectation	Bracket Drift
Demand-Pul Inflation	Phillips Curve
Cost-Push Inflation	Trade-off between price
Validation of Inflation	Stability & unemployment
Wage-Price Spring	Recessionary Cure
	Price and Income Policy

Exercises

Give tick (✓) marks in the appropriate boxes to indicate whether the following statement are true or false. If a particular statement appears to be false write the correct statement.

- a. Inflation denotes appreciable and once-and-for-all increase in general price level.
True False
- b. Both CPI and GDP Implicit Deflator use variable weights for prices.
True False
- c. Economics cannot survive during a period of hyper inflation.
True False
- d. Excess demand occurs both during Cost-Push and Demand-Pull Inflation.
True False
- e. Employment necessarily declines during Cost-Push Inflation.
True False
- f. Adaptive expectation usually implies positively sloped aggregate supply curve.
True False
- g. Rational expectation produces vertical aggregate supply curve even in the short run.
True False
- h. Menu Costs appear both during inflation and deflation.
True False
- i. Sustained rise of general price level causes substitution of physical capital for money.
True False
- j. Inflation tax is a kind of tax imposed by the legislature at the beginning of a financial year.
True False
- k. Fiscal drag or Bracket Drift implies rise in income tax rate during inflation if tax-threshold income and tax brackets are not properly indexed.
True False
- l. Taxation of nominal interest earning keeps the after-tax real interest income unaffected during fully anticipated inflation.
True False
- m. Ration expectation rules out trade off between employment and price stability even in the short run.

- True False
- n. A rise in expected inflation causes a left ward shift of price Phillips curve.
True False
- o. Any attempt to reduce unemployment below natural rate of unemployment ultimately brings a right ward shift of price Phillips Curve.
True False
- p. In a free market natural rate of unemployment cannot be changed.
True False
- q. A consensus between government and labour unions is a prerequisite for using price and income policy in order to control inflation.
True False

2. Short Questions

- a. Why can we not explain the phenomenon of inflation in an ambiguous manner?
- b. How does inflation affect the desire to hold nominal balances?
- c. How do economies survive or even prosper during hype inflation?
- d. How is GDP implicit deflator used to measure rate of inflation?
- e. Present briefly the theoretical basis of Price Phillips Curve.
- f. Find the similarity and difference between cost-push and demand-pull inflation.
- g. What is meant by show leather cost?
- h. What do we mean by inflation tax? Who loses and who gain in this situation?
- i. How would you describe Price Phillips curve from Wage Phillips curve?
- j. How does recessionary curve for inflation work?
- k. Why is Price Phillips curve vertical in the long run?
- l. How can natural rate of unemployment be reduced?
- m. How can price and income policy be used to control inflation?
- n. Describe circumstances leading to Cost-Push inflation.
- o. What is the impact of inflation on savers, borrowers and lenders?
- p. How does Demand-Pull inflation occur?
- q. State the impact of inflation on investment.