



[Academic Script]

Phillips Curve

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Lecture No. & Title:	Lecture – 2 Phillips Curve

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1. Introduction

The Phillips curve is the curve that shows the empirically fitted relationship between the rate of change of price level (Inflation) and the rate of unemployment. It expresses an inverse relationship between the rate of unemployment and the rate of increase in price level (Inflation). British Economist, Phillips derived the empirical relationship that when unemployment is high, the rate of increase in price level is low. This is because "workers are reluctant to offer their services at less than the prevailing rates when the demand for labour is low and unemployment is high so that price level fall very slowly."

Inflation is a highly controversial term which is also a major concern for a growing economy like India. Inflation is a galloping rise in prices as a result of the excessive increase in the quantity of money. But Keynes in his General Theory denied this phenomenon. Instead he argued that there was always full employment in the economy which resulted in hyper-inflation with increases in the quantity of money. According to him, there being underemployment in the economy, an increase in the money supply leads to increase in aggregate demand, output and employment and hence rise in general level of prices. But his this theory failed to explain the poor condition of world economy during world-war II, and there is when neo-classical economists defined inflation as "Inflation is always and everywhere a monetary phenomenon".

Labour is yet another driving force in every economy – wages paid for labour, and the output of labour is essential for companies. Likewise, unemployed workers represent unused

resources within an economy. Hence, unemployment is a major and significant concern within various world economies. Every economy, keeps close watch on the rate of unemployment prevailing the country. This rate of unemployment gives the ratio of non-employed work force among the employable work force. Hence, it gives a big picture to the policy makers on how many jobs to be created in order to bring unemployment ratio down. However, lack of effective aggregate demand of labour is one of the principal reasons for unemployment. Especially, in the less developed economies a substantial portion of the total workforce works as surplus labour. This problem is very prevalent in the agricultural sector.

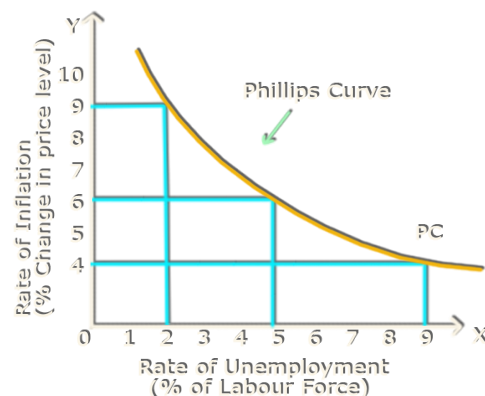
2. Inflation-Unemployment Trade off – Phillips Curve

A.W. Phillips had worked historical data of U.K. and had arrived at the conclusion that there existed an inverse relationship between rate of unemployment and rate of inflation. This inverse relation infers the trade-off that is a low level of unemployment can be achieved, with increase in the general level of price or in the form of a higher rate of inflation. And in order to reduce the rate of inflation, one need to pay prices in terms of a higher rate of unemployment. On graphically fitting a curve to the historical data, Phillips obtained a downward sloping curve exhibiting the inverse relation between rate of inflation and rate of unemployment and this curve is now named after his name as Phillips Curve.

The below figure, shows Phillips curve where along the horizontal axis the rate of unemployment and along the vertical axis the rate of inflation is measured. It can be observed that

when rate of inflation is 9%, the unemployment rate is 2%, and when rate of inflation is reduced to 4% p.a say by pursuing contractionary fiscal policy and thereby reducing aggregate demand, rate of unemployment increases to 9% of labour force. This is how Phillips curve was derived.

FIGURE



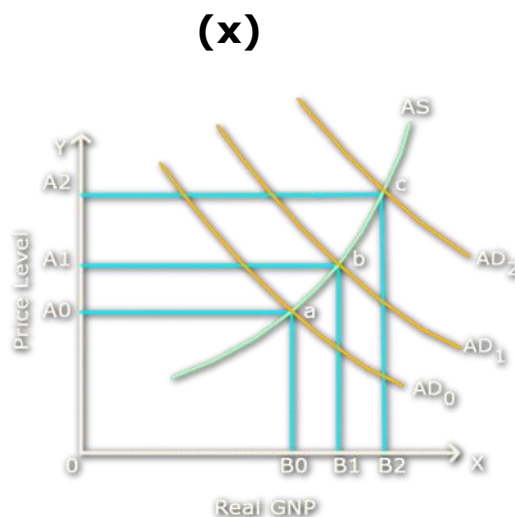
This empirical data proves that there existed a stable Phillips curve which depicted a predictable inverse relation between inflation and unemployment. Thus on the basis of a stable Phillips curve for a country, the trade-off between inflation and unemployment was emphasised which confronted the economic policy makers. However the trade-off puts the policy makers in a more awkward situation where they need to choose either of two one, a higher rate of inflation with lower unemployment or two, a higher rate of unemployment with a low inflation rate.

EXPLANATION OF PHILLIPS CURVE

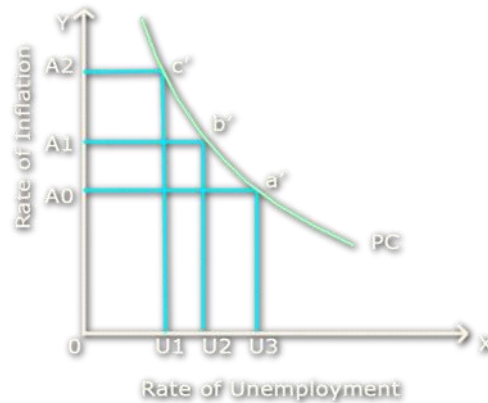
Let us now learn the explanation of Phillips Curve by the Keynesian economists. As Keynesian economists have assumed that there is an upward sloping aggregate supply curve. i.e. as the economy approaches near full employment level the AS curve slopes upward. There are two major reasons of AS curve to slope upward -

- Firstly, because of law of diminishing returns to variables. As labour force increases, the marginal physical product of labour (MPP_L) falls due to diminishing marginal utility. Since the wage rate (w) is constant and given, fall in MPP_L will lead to increase in Marginal cost of the production i.e. $\{MC = (w/MPP_L)\}$.
- Secondly, the rise in marginal cost is also due to increase in wage rate as a result of increase in employment and output. Thus the rise in wage rate and fall in MPP_L together tends to rise the MC of production. Thus, MC of the firms increases as more labour is employed due to diminishing MPP of labour and also because wage rate rises.

Figure



(Y)



In X of figure, that with the initial AD curve, AD_0 and the given AS curve AS, the price level A_0 and output level B_0 . Now suppose the AD curve increases from AD_0 to AD_1 , it will be seen that price level rises to A_1 and aggregate national output increases from B_0 to B_1 . The rise in the price level A_0 to A_1 results in reduction of unemployment rate and hence proving an inverse relation between the two. Further, if AD increases to AD_2 , the price level further rises to A_2 and national output increases to B_2 which will further lower the rate of unemployment. Thus, a higher rate of increase in AD and consequently higher rate of rise in price level is associated with the lower rate of unemployment and vice – versa. This is what is represented by the Phillips curve.

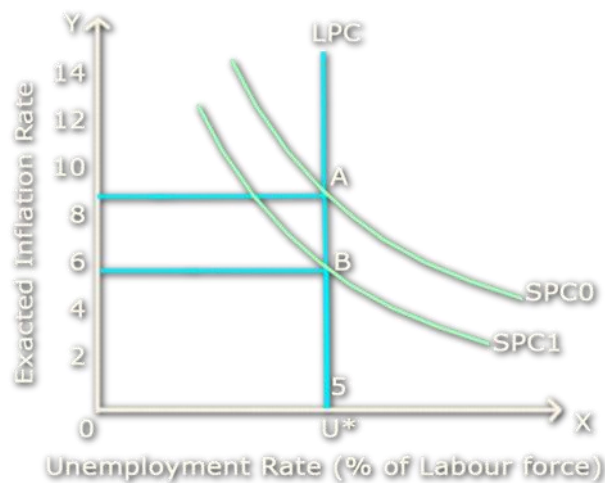
In figure Y, where point **a'** on downward sloping PC corresponds to point 'a' of figure X. In figure Y it is observed that the rate of unemployment is equal to U_3 corresponding to price level A_0 of X. When AD shifts to AD_1 , a certain rate of inflation is observed and price level rises to A_1 followed by expansion in aggregate output to B_1 . As it can be observed that this increase in aggregate output boosts the employment in the economy and

hence leads to decline in unemployment rate. Now, when the rate of price level increases from A_0 to A_1 in figure X following the increase in AD greater than the rate of rise in the price level of the previous period, a lower rate of unemployment U_2 is obtained higher than that corresponding to the previous period. With still a higher rate of inflation say A_2 , when price level rises from A_1 to A_2 in figure X following the increase in AD to AD_2 we have a further lower rate of unemployment equal to U_1 in figure Y corresponding to c' on the Phillips Curve PC. This gives us a downward sloping.

3. Short Run and Long Run Phillips Curve

It is important to know the relationship between short run Phillips curve and long run Phillips curve. The position of the short run Phillips curve (SPC) which passes through a point on the long run Phillips curve (LPC) depends on the anticipated inflation rate. Short run Phillips curve is like the short run AS curve (SAS) which is drawn with given expected price level. In long run the Phillips Curve is a vertical line at nominal unemployment rate which is considered as natural by the policy makers in this case we have assumed it to be 5%. Whereas in short run Phillips curve an anticipated inflation rate change is shown in the fig.

Figure:



If the expected inflation rate is 9% a yr. Then as will be seen from the fig. the SPC_0 passes through the corresponding point A on the LPC with natural unemployment rate of 5%. The movement along a short run Phillips curve occurs as a result of changes in AD. When there is unanticipated increase in AD, inflation rate rises more than the expected rate & GNP increases causing a fall in unemployment rate, we move upward to the left from pt. A on the short run Phillips curve SPC_0 . On the other hand when there is unanticipated decrease in AD, inflation rate falls & unemployment rate increases above the natural rate and as a result we move downward to the right from pt. A along the short run Phillips curve SPC_0 .

However when the expected inflation rate changes the SPC shifts. As shown in the fig. if the expected inflation rate falls to 6% a year, the SPC shifts below SPC_1 . The new SPC passes through LPC at the new expected inflation rate of 6%. The distance by which the short run Phillips curve shifts to a lower position is equal to the change in the expected rate of inflation.

4. Shift in the Phillips Curve

To check this inflation rate the central bank of a country will take steps to lower the growth in money supply. As a result, actual inflation rate falls to 6% p.a. However at first the fall in actual inflation rate is unanticipated & therefore the wages & other input prices continues to rise at their original rate consistent with 9% expected inflation rate & there is rightward movement along the SPC. SPC_0 resulting in fall in GNP & increase in unemployment rate. However when the inflation rate remains steady at 6% p.a. This rate eventually comes to be anticipated. As this happens increase in wage rate and other input prices slows down & with the expected increase in AD, GNP increases & unemployment rate falls to the natural level. As a result, the SPC shifts downward to the new position SPC_1 that corresponds to the new lower expected inflation rate of 6% p.a. as already noticed in the above diagram.

SHORT RUN

The consequent increase in AD will cause the rate of inflation to rise say to 7%. Suppose that the level of wage rate is fixed at 5% rate of inflation. It is expected that this rate of inflation is going to continue to occur higher price level, since the actual rate of inflation has exceeded the expected rate of inflation, expansion in the profits of the firms is observed. Hence in the anticipation of the profits earned at the higher price level, businesses will hire more labour to fulfil the increase in AD. Thus, the economy will move to pt. A_1 on the curve SPC_1 in the fig. below where unemployment has decreased to 3.5% while inflation rate has risen to 7%. It may be noted from the fig. that

in moving from A_0 to A_1 on SPC_1 the economy accepts a higher rate of inflation as the cost of achieving a lower rate of unemployment. Thus this is in conformity with the concept of Phillip curve. However the advocates of natural unemployment rate theory interprets it in a slightly different way. They think that lower rate of unemployment achieved is only a temporary phenomenon. They think when the actual rate of inflation exceeds the one that is expected unemployment rate will fall below the natural rate only in the short run. In the long run, the natural rate of unemployment will be restored.

5. Natural Unemployment Rate Hypothesis and Adaptive Expectations

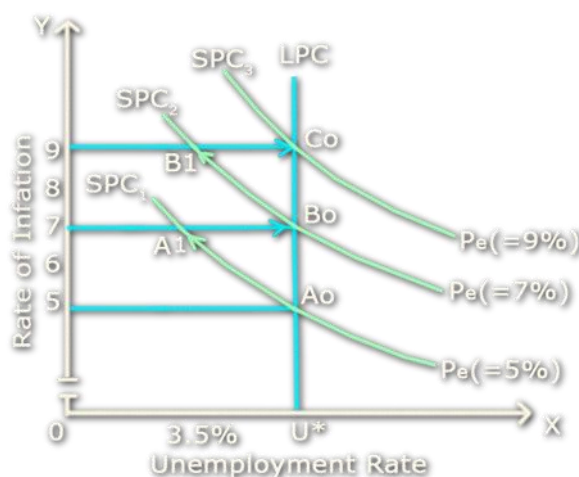
Friedman challenged the concept of a stable downward sloping Phillips curve. He argued that there is no long run stable trade-off between rate of inflation & unemployment. According to Friedman's natural rate hypothesis though there is trade-off between inflation and unemployment in the short-run the economy is stable in the long run at the natural rate of unemployment. It is necessary to explain the concept of natural rate of unemployment on which the concept of LPC is based. The natural rate of unemployment is the rate at which in the labour market the current no. of unemployed is equal to the no. of jobs available. These unemployed workers are not employed for the frictional and structural reasons, though the equivalent no. of jobs are available for them.

PHILLIPS CURVE AND ADAPTIVE EXPECTATIONS

Friedman put forward a theory of adaptive expectations according to which people form their expectations on the basis

of previous period rate of inflation & change or adapt their expectations only when the actual inflation turns out to be different from their expected rate. According to this theory, there may be a trade-off between rates of inflation & unemployment in the short run, but there is no such trade-off in the long run.

The view of Friedman & his follower monetarist illustrated the Phillips curve as SPC_1 and the economy is at point A_0 , on it corresponding to the natural rate of unemployment equal to 5% of the labour force in the fig. below. The location of this point A_0 on the short run Phillips curve depends on the level of AD. Further we assume that the economy has been experiencing a rate of inflation equal to 5%. The other assumption we make is that nominal wages have been set on the expectations that 5% rate of inflation will continue in the future.



6. Long Run Phillips Curve

Now suppose in the Long run for some reasons, the government adopts expansionary fiscal and monetary policies to raise AD.

This brings us to the concept of LPC which have been put forward by the economists. According to them, the economy will not remain in a stable equilibrium position at A_1 . This is because the workers will realise that due to the higher rate of inflation than the expected one, their real wages and incomes have fallen. The workers will therefore demand higher nominal wages to restore their real income. But as nominal wages rise to compensate for the higher rate of inflation than expected, profits of business firms will fall to their earlier levels. This reduction in their profits implies that the original motivation that promoted them to expand output and increase employment resulting in lower unemployment rate will no longer be there. Consequently they will reduce employment till the unemployment rate rises to the natural level of 5%, i.e. with the increase in nominal wages in figure the economy will move from A_1 to B_0 at a higher inflation rate of 7%. It may be noted that the higher level of AD which generated inflation rate of 7% and caused the economy to shift from A_0 to A_1 still persists.

Further at B_0 & with the actual rate of inflation equal to 7%, the workers will now expect this 7% inflation rate to continue in future. As result, the SPC shifts upward from SPC_1 to SPC_2 . According to Friedman and other natural rate theorists the movement along a Phillips curve SPC is only temporary. In the long run when nominal wages are fully adjusted to the changes in the inflation rate & consequently unemployment rate comes back to its natural level, a new SPC is formed at the higher expected rate of inflation.

However the above process of reduction in unemployment rate & then its returning to the natural level may continue further. With the new increase in AD, the price level will rise further with nominal wages lagging behind in the short run. As a result profits of business firms will increase and they will expand output & employment causing the reduction in the rate of unemployment & rise in the inflation rate. With this the economy will move from B_0 to B_1 along the SPC_2 . After sometime, the workers will recognize the fall in their real wages and press for higher nominal wages to compensate for the higher rate of inflation than expected. When this higher nominal wages are granted, the business profits decline which will cause the level of employment to fall & unemployment rate of return to the natural rate of 5%, i.e. the economy moves from B_1 to C_0 . The new SPC will now shift to SPC_3 passing through C_0 . The process may be repeated again with the result that while in the short run, the unemployment rate falls below the natural rate & in the long run it returns to its natural rate. But throughout this process the inflation rate continuously goes on rising. On joining points such as A_0 , B_0 , C_0 corresponding to the given natural rate unemployment we get a vertical LPC.

Thus in the adaptive expectations theory of natural rate hypothesis, while the SPC is downward sloping indicating that trade-off between inflation and unemployment rate in the short run, the LPC is a vertical straight line showing that no trade-off exists between inflation & unemployment in the long run.

7. Summary

In this lesson we learnt about Inflation and unemployment prevailing in the developing countries. The dilemma faced by policy makers in controlling rate of inflation & rate of unemployment. We understood, how this dilemma has been answered by A.W. Phillip by inflation & Unemployment trade of Phillip Curve. We also made efforts to understand the shifts in Phillip curve & difference in short run & long run Phillip curve.