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BUS 802

Economic Theory

Module 5

BUS 802 Economic Theory Module 5

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Module 5

Unit 1 Income, Employment and the Price Level

1.0 Introduction

You have been introduced to the basic principles of equilibrium level of income in units two, three, and four. We emphasised the role played by aggregate demand in income determination. The supply side of the process of income determination was largely ignored. In this unit, we attempt to emphasise aggregate supply, so that we can realistically include the behavioural variables for producers in the analysis of the model of income determination. As the supply side is made explicit, it will also be necessary for us to examine critically the relationship between output and employment. We will establish the link between output and employment. Since the link between output, price level, and employment are important, it would be too simplistic to constrain any one of the components of this network. The interrelationships between output, employment, and the price level appear so complex that no simple model can delineate all the intricacies. The models to be discussed in this unit are, therefore, meant to be suggestive rather than precise representation of reality. The models will be presented here for three basic reasons: first, the models will help to bring out the relations between output, employment, and the price level in a clear manner; second, the models will capture what many people have in mind as representing the interrelations involved; third, the models offer a transition to other works regarding employment and inflation.

2.0 Objectives

At the end of this unit, you should be able to:

- explain the supply curve of a firm
- explain the aggregate supply and aggregate demand analysis in various perspectives
- explain the relationship between aggregate demand and the level of employment
- describe the interdependence between aggregate supply and aggregate demand, and the determination of the price level.

3.0 Main Content

3.1 A Firm's Supply Curve

Theoretically, in the short run when a firm's productive capacity is held constant, its production function is given by:

$$Q = Q(L, K), \qquad (3.1)$$

Where Q is output level, L is labour input, and K represents capital stock.

Equation (3.1) informs you that in the short run, output depends on labour input, with capital and other things remaining the same; labour is the only variable input. It is also normal to assume that technology is constant in the short run and natural resources and raw materials are no problems for the firm. Under these conditions, output is assumed to vary directly with labour input. We also assume the existence of the law of diminishing returns, so that the way in which output varies with labour input can be specified. Note that the law of diminishing returns states that successive equal increments of a variable factor of production added to fixed factors do result in increasing output, but after some point the successive increases in output get smaller and smaller. Equation (3.1) can be sketched as in figure 3.1 below, assuming the law of diminishing returns.

Figure 3.1 (a) shows the total product (TP) curve for a given firm in the short run. It shows increasing returns in the early stages of production and then diminishing returns after point A. Observe that output increases are smaller after point A until output reaches a maximum at point C. Thereafter, increments of labour reduce total output as the curve bends the other way as shown. As illustrated in figure 3.1 (b), the average product of labour (APL) is at a maximum at point B and declines thereafter.

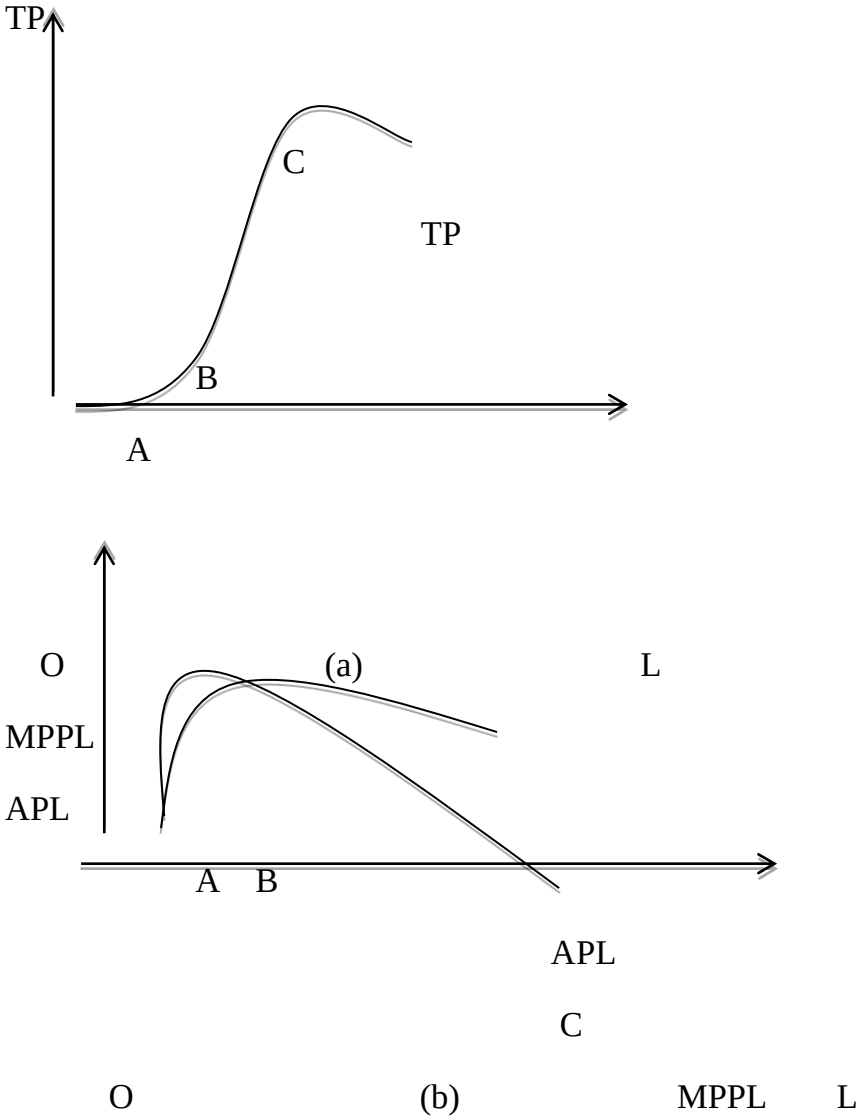


Figure 3.1: A Firm's Short-Run Production Function

Economic theory asserts that it is the marginal or extra unit of labour that is significant. The marginal physical product of labour (MPPL) is derived from the total product (TP) curve by calculating and plotting the slope at chosen points on the curve. The slope being represented by the derivation, dTPL/dL. The marginal product of labour increases up to point A in figure 3.1 (b), where diminishing returns set in, and thereafter declines to a value of zero, where the total product is at a maximum, and finally becomes negative after point C. The average product of labour (APL) is derived from the TP curve by constructing rays from the origin to points on the TP curve, dropping perpendiculars from these points, and measuring the value of the tangent formed thereby. When plotted, these values yield the APL curve in figure 3.1 ((b). You can see that the rational range of operation for the firm would be at output levels between B and C.

In the short run only labour input is permitted to vary, so that it is only the price of labour that is of concern to the firm. In the short run, other factors are assumed not to be affected by labour market operations. Since labour is the only variable input, wages become the only variable cost, and additions of labour to the production process are the only changes in variable costs.

If we assume that the firm sells its products in a perfectly competitive market, and that its objective is to maximise profits, the profit-maximising condition is given as:

Marginal Cost (MC) = Marginal Revenue (MR) = Price (P) = W/MPL, (3.2)

where W is the wage rate,

or

W = P.MPL (referred to as the marginal revenue product of labour) (3.3).

It can be shown that the shape of the marginal cost (MC) curve is the inverse of the shape of the MPL curve, since the price of labour (the wage rate, W) is constant. Figure 3.2 illustrates the shape of the marginal cost curve.

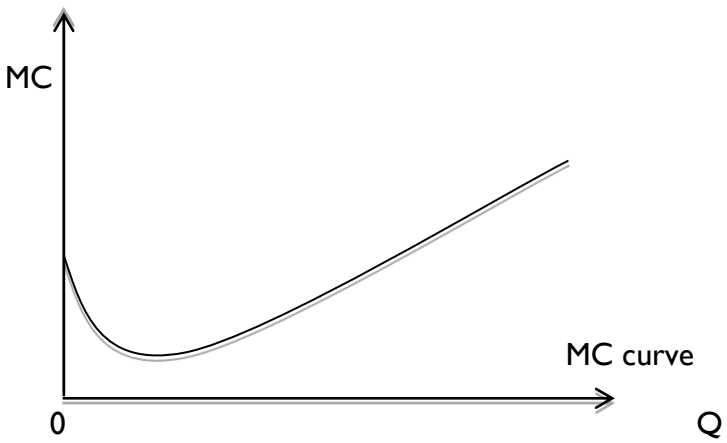


Figure 3.2: The Short-Run Marginal Cost Curve

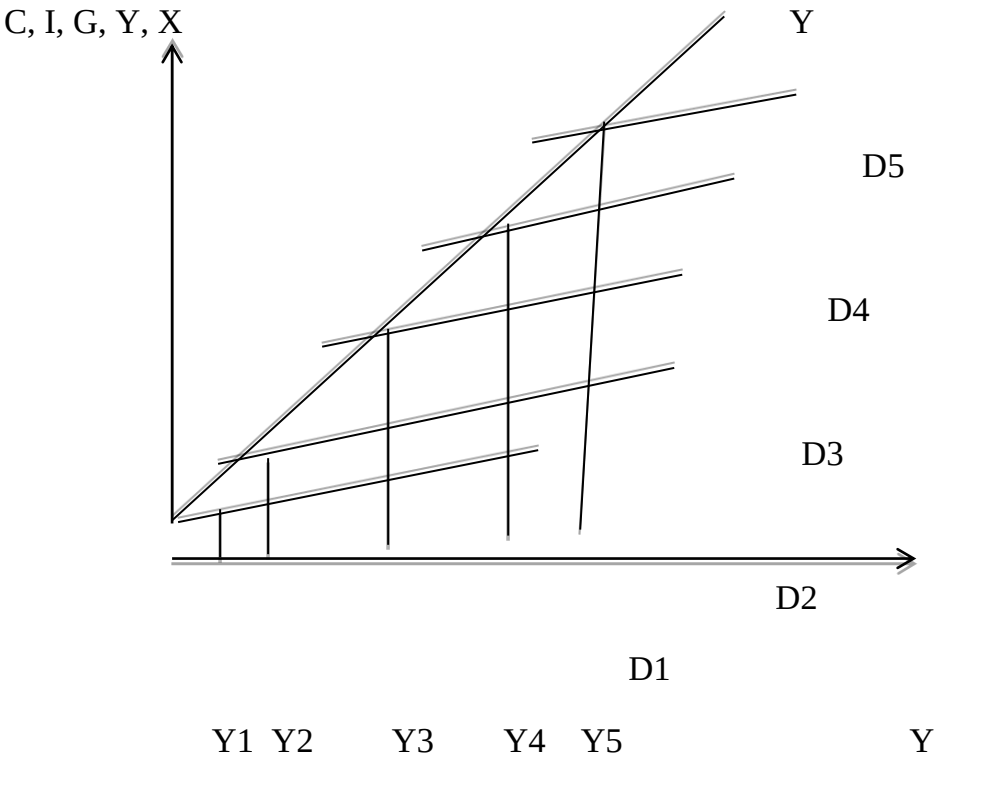
The law of diminishing returns is also evident in the shape of the MC curve, as costs fall in the early stages, reach some minimum, and then increase sharply. A firm faced with a rising MC curve and wishing to maximise profits must receive higher prices as output expands. It

is the willingness of firms to produce more output as price rises that transforms the MC curve into the firm's supply curve. The individual supply curves can be aggregated into the industry supply curve, and by extension into the aggregate supply curve for the economy as a whole. The aggregate supply is the horizontal sum of all firms and industry supplies.

3.2 Aggregate Supply and Aggregate Demand Analysis

In this section, we relate the Keynesian income determination model, employing the 45-degree line, the aggregate supply curve, as discussed in unit four to the aggregate demand. Figure 3.3 below explains the transition from the income determination model to the present model, where we explicitly include prices. In this figure, the graph of the income determination model is same as before in panel (a). Aggregate demand, D1, D2, D3, …, D5, intersect aggregate supply, the 45-degree line at different points, given rise to the levels of income Y1, Y2, Y3, …. Y5. We look at the price level as stable during the period under consideration and transform the analysis into monetary terms. Figure

3.3 (b) shows that, on the aggregate, the amount of goods and services supplied vary with the price level, since producers must be compensated for increasing costs brought about as a result of diminishing returns.



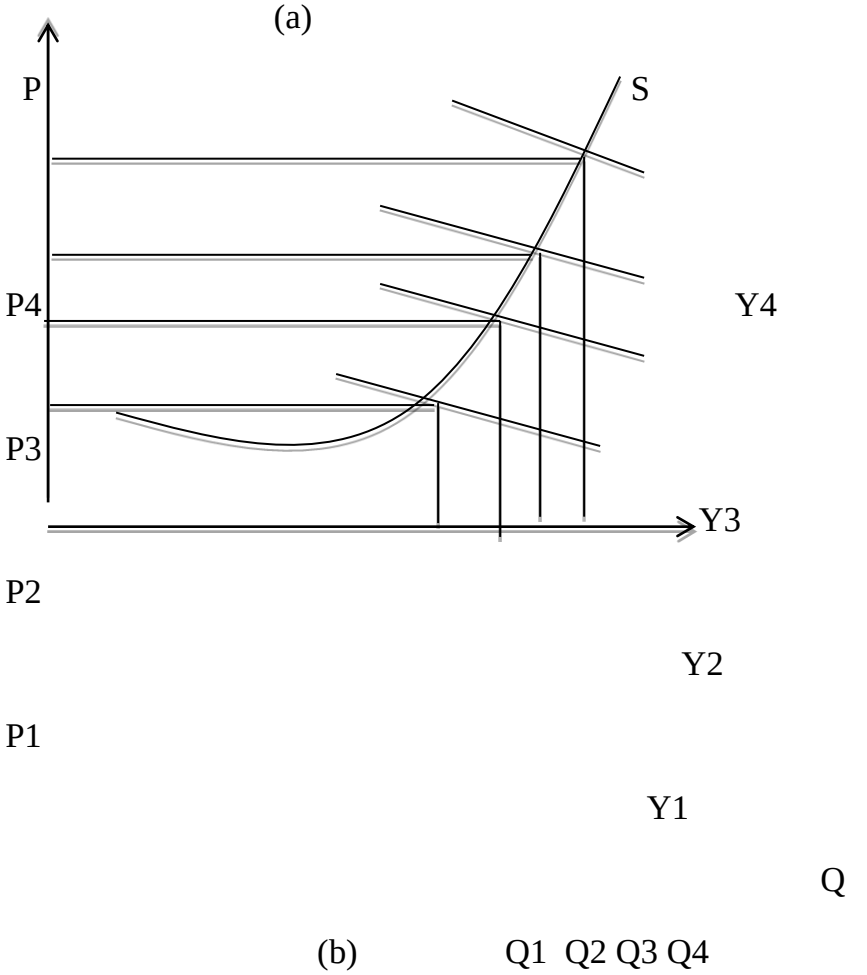


Figure 3.3: Aggregate Supply and Aggregate Demand Analysis

Consider the aggregate demand curves as represented by the letter Ys in figure 3.3 (b). The demand curves show the familiar relationship between output and price such that lower levels of output can be expected to command higher prices and vice versa. Corresponding to D1 is Y1; to D2 is Y2; and so on. The aggregate demand spending as shown by figure 3.3 (a) can be reinterpreted in figure 3.3 (b) to determine the output and price levels that are consistent with the level of spending. For example, for the demand level D1, there is a corresponding output level Q1 and price level of P1, and so on. It is assumed that along any demand curve, Y in figure 3.3 (b), total spending is constant so that $Y = PQ^*$ for any point on the curve. This also implies that the same total expenditure will be made for all productions regardless of the price level, the condition of unitary elasticity. This assumption however, undermines the introduction of the price level as a contributing variable in our present analysis. If the price level cannot affect the level of demand, then we gain nothing by changing from the 45-degree diagram in figure 3.3 (a). If the price and output level vary inversely in such a way that the total expenditure remains fixed, there is the presumption that the structure of demand remains unchanged and the price level changes do not disturb the expenditure on individual products, not only along any demand curve but also for shifts in the curves. This gives rise to aggregation problem making the simple model unable to handle the problems of relative prices as they affect substitutions or complements. This aggregation problem is always present and must be kept in mind.

3.3 Aggregate Supply, Aggregate Demand, and the Level of Employment

The relationship between the level of employment and the level of income can be explored by relaxing the assumption that the output demand curve is a rectangular hyperbola, one of unitary elasticity where total expenditure is constant along any one demand curve. Using an aggregate demand curve that is downward-sloping, the exploration can proceed. The modified aggregate demand and supply curves are shown in figure 3.4 (a) below. The output is measured on the horizontal axis and the price on the vertical axis. The intersection of the supply and demand schedules determines the output that will be sold and the price level, or the average price per unit of output. The economy's money income can be calculated as PQ and is equal to the area of the rectangle formed by dropping perpendiculars from the points of intersection of aggregate demand and aggregate supply. The employment side of economic activity is presented in figure 3.4 (b). The horizontal axis is the same as that of figure 3.4 (a), so that the relationship between output and employment can directly be seen. The supply of labour is represented by Ls and is assumed to be perfectly elastic, a horizontal line, meaning that the supply of labour offers no problem to the economy. All labour is assumed to be homogeneous and equally productive. These attributes of labour came from the assumption of a perfectly competitive labour market. Any labour of a given type or of equal productivity is also assumed to be available and willing to work.

The demand for labour is determined by its productivity, and the productivity of labour in the short run depends upon what is assumed about returns to scale; productivity varies with the level of output. The demand curve for labour is represented by Ld and shown in figure 3.4 (b). It follows the law of diminishing returns so that, in the beginning of the productive process, equal increments of labour yield equal increments of output (constant returns); eventually, equal increments of labour input result in smaller and smaller increments of output (the diminishing returns). Finally, at the level of output, Qf the full employment level of output, no further increments of output are possible.

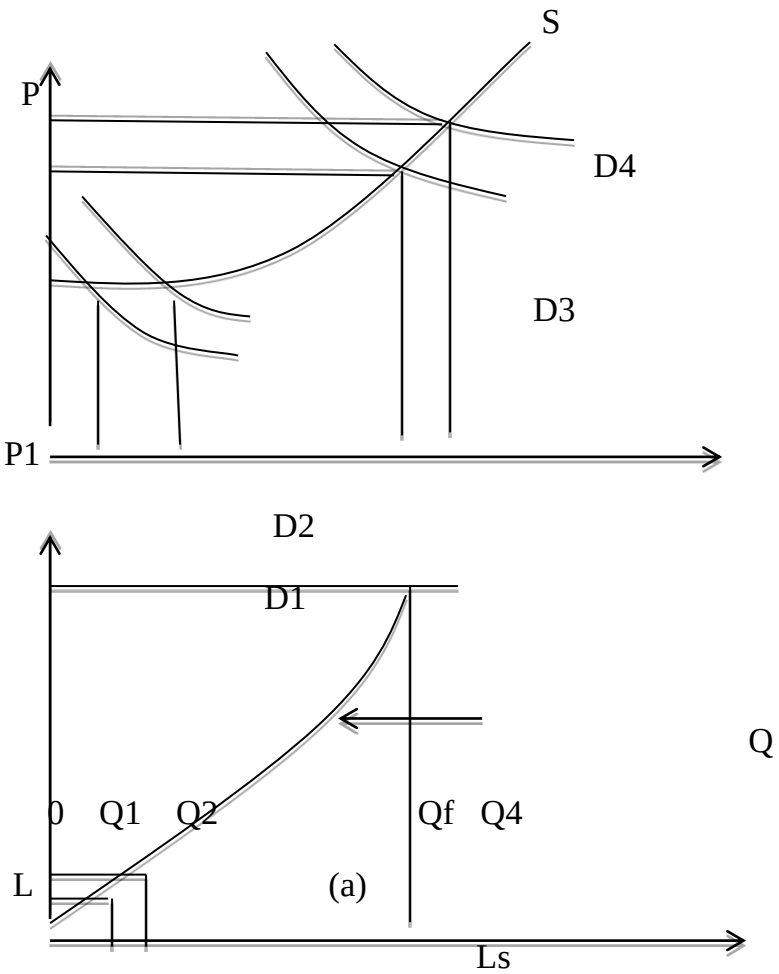


Figure 3.4: Aggr3egate Demand, Aggregate Supply, Output, and Employment

Connecting figures 3.4 (a) and 3.4 (b), you can begin to understand how income, employment, output, and the price level are related. In the early stages of the production process, returns to scale are assumed constant. This assumption can be seen from figure 3.4. As demand increases from D1 to D2 in the horizontal range of the aggregate supply curve, S, output increases from Q1 to Q2, but the price level remains constant at P1. The explanation for the constant price level can be observed in figure 3.4 (b). With constant returns to scale, the change in output from Q1 to Q2 requires the same change in labour input, L1 to L2. All labour input is assume equal in efficiency, and the productivity of labour remains constant in this range. Since labour is the only variable input in our analysis, the marginal cost of production, MC, also remains constant.

Self-Assessment Exercise

Discuss briefly the compositions of aggregate demand and aggregate supply.

4.0 Conclusion

Beginning with the simple theory of a firm, this unit has attempted to present the relations among output, employment, income and prices. One of the major things learned is that at full employment, prices are relatively stable and no further increments of output are possible. Employment is basically a function of the level of output and national income.

5.0 Summary

The unit uses a simple model of the theory of firm to establish discussions on aggregate supply. This model reveals the following:

First, it is the marginal unit of labour that is important. Secondly, the law of diminishing returns exists in any production process for which labour is the only variable input. Third, output depends on labour input in the short run. Fourth, the profit-maximising condition for a perfectly competitive firm requires that both marginal costs of production, marginal revenue product of labour and output prices must be equal.

The unit also informs us that the equilibrium level of national income occurs where aggregate demand equals aggregate supply. This is also the point for which full employment is attained. The production process is assumed to be efficient on attainment of full employment and the major determinant of employment is increments in output levels, assuming constant factor prices and stable output prices.

6.0 Self-Assessment Exercise

Discuss in detail, with appropriate graphical illustrations, how output, income and price levels can affect the level of employment in a given economy.

7.0 References/Further Reading

Campagna, A. S. (1974). *Macroeconomics Theory and Policy*. Boston: Hougthon Mifflin.

Begg, D. et al. (1981). *Macro-Economics*. (2nd ed.). United States: McGraw-Hill, Inc.

Unit 2 Inflation, Output and Unemployment

1.0 Introduction

This unit focuses on the behaviour of inflation, output, and unemployment. We will examine the rate of price changes as they relate to inflationary pressures. We attempt to develop a realistic framework for understanding the behaviour of the economy. Such basic macroeconomic questions as 'Why do inflation and unemployment often increase together?' will be analysed. This analysis is helpful in business decision making.

2.0 Objectives

At the end of this unit, you should be able to:

- explain inflation and unemployment
- define the long run relationship between money supply and inflation
- explain inflation and output in the short run
- explain the expectations-augmented Phillips curve
- explain the relationship between aggregate demand and expected inflation.

3.0 Main Content

3.1 The Long-Run Relationship between Money and the Rate of Inflation

If the rate of growth of money and output is constant, prices tend to rise at exactly the rate at which the nominal money stock is increasing. This statement can be summarised as follows:

$m = \Delta M/M$, where m refers to the rate of growth of money stock,

and $\prod = \Delta P/P$ = the rate of inflation.

A central statement in macroeconomics is shown in equation (1) below:

$$\prod = m \qquad (1)$$

Equation (1) implies that in the long run, or better still, on the average, there is a link between growth in money stock and inflationary pressures. Put differently, in a stationary economy, the rate of inflation equals the rate of growth of the nominal quantity of money.

To establish the long-run relationship between inflation and rate of growth of money supply, we refer to the equilibrium condition in the money market (derived from the LM curve):

$$M/P = L(i,Y) \qquad (2)$$

Where i = interest rate; and Y = equilibrium level of national income

Equation (2) can be transformed to become:

$M = PL(i,Y)$ (3)

While equation (2) states the money market equilibrium condition in terms of the real demand and supply of money, equation (3) state the condition in terms of the nominal demand and supply of money.

To maintain the long-run equality between the supply and demand for money, changes in the nominal money supply must be matched by corresponding changes in prices. For instance, if the stock of money increases by 5 percent per year, prices would have to be rising at the rate of 5 percent per year to maintain a constant real money supply, M/P, thus maintaining money market equilibrium. It again follows that, in the long run equilibrium, money and prices must grow at the same rate.

The economic argument that "inflation is always a monetary phenomenon" is simply an implication of monetary equilibrium. It follows that the real money supply that yields monetary equilibrium is equal to the real money demand. To maintain a constant real money supply, an increasing nominal money stock has to be matched by rising prices.

3.1.1 Output Growth and Long-Run Inflation

The relationship represented by equation (1) above needs to be adjusted to account for output growth. It is reasonable to note that growth in real income raises real money demand, rendering the assumption of constant demand for real balances inappropriate, especially when output is growing. With rising real demand for money, monetary equilibrium would require that the real money supply increases at that same rate. You will have to note that the growth rate in real money supply is the difference between the growth rate of the nominal money stock and the rate of inflation. For example, if the nominal money stock is increasing at 10 percent and the rate of inflation is six percent, the real money supply will be growing at four percent. In addition, if the money supply has to be growing at 2.1 percent to ensure monetary equilibrium, the rate of inflation should be 2.1 percent less than the rate of monetary growth. Symbolically, we have:

$\prod = m - 2.1$ percent. (4)

Equation (4) states that the rate of inflation equals to the growth rate of money *less* an adjustment arising from real growth in income.

In summary, the long-run relationship between inflation and monetary growth requires that:

- In the long run, inflation is a monetary phenomenon.
- The higher the growth rate of the nominal money supply, the higher the rate of inflation.
- The rate of inflation is lower, the higher the growth rate of real money demand. Alternatively, the lower the rate of inflation, the faster the rate of growth of output, and the more real money demand rises with increased real income or output.

- If a country wants to reduce its average inflation rate, it must attempt to reduce the average growth rate of the money supply.

3.2 Inflation and Output in the Short Run

It has been noted that the behaviours of price level and output are closely related in the short run. In this section, we look at the inclusion of expected inflation in our analysis of inflation. The expected rate of inflation affects both aggregate demand and aggregate supply. In terms of aggregate supply, nominal wages adjust not only to unemployment, but also to expected inflation. Nominal wages adjust to expected inflation because both firms and workers are concerned with the real wages. If prices are expected to increase at, say, 10 percent during the course of a labour contract, then nominal wages will tend to increase at a rate of 10 percent over the course of the contract. Wage rises are translated into price rises. And the inflation rate thus reflects expected inflation.

In terms of aggregate demand side, expectations of inflation are important because different interest rates are relevant for spending decisions and for portfolio choices, for equilibrium to occur in goods and money markets.

In the final analysis, the intersection between the aggregate demand and supply curves will determine the short run inflation rate and level of output. The movements of aggregate demand and aggregate supply curves over time tend to determine how the inflation rate and output adjust to changes in monetary and fiscal policy variables.

The aggregate demand and supply curves have been used to establish the following facts:

1. In the long run, increases in the rate of growth of money supply affect only the inflation rate, and not output.

2. The short-run equilibrium of the economy is determined by the current and last period's expected inflation rates.

3. The short-run response to an increase in the growth rate of money is typically a rise in both output and inflation. The response to an expansionary change in the fiscal policy variable is similar.

4. The behaviour of expectations is crucial to the dynamic adjustment of the economy to changes in monetary and fiscal policy.

3.3 The Expectations-Augmented Phillips Curve

In this section, we examine the relationship between inflation, aggregate supply, and inflationary expectations. Note that wage and price adjustment in response to the level of over-or underutilisation of labour and other economic resources would imply a positive relationship between inflation and gap in the gross national product (GNP). If output is above normal, wages and costs in general will be rising and firms will pass on such increasing costs into higher prices. Conversely, when output is below normal, declining costs would lead to falling prices. These arguments can be summarised by figure 3.3.1 below, discounting inflationary expectations.

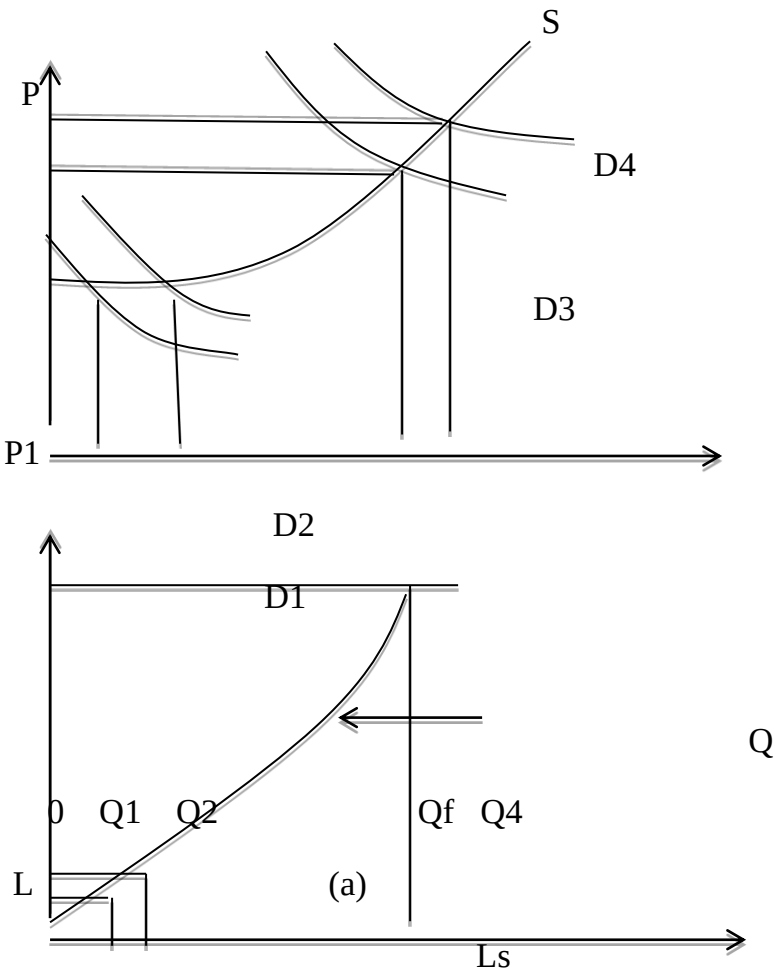


Figure 3.4: Aggr3egate Demand, Aggregate Supply, Output, and Employment

The line, AS_o, above shows the inflation rate associated with each level of output in the economy. At full employment output, Y_p, inflation rate is zero. With actual output above the full employment output, wages and prices are rising, or there is inflation. With actual output below the full employment output, there is deflation, or wages and prices are falling.

The extent to which gap in GNP affects inflation rate can be summarised using the slope of the aggregate supply schedule, AS_o. The steeper the aggregate supply schedule, the more adverse the inflation-output tradeoff; that is the more inflation we get from a given expansion in output and employment.

The role of inflationary expectations in influencing wage formation is central to an understanding of the inflation process. Because labour contracts fix nominal wages for a given period ahead, labour unions will be concerned about real wages over the period of the contract. A given money wage rate negotiated today will have less purchasing power some years from now if the inflation rate is 10 percent than if it is zero percent. When inflationary expectations are slow to adjust, monetary and fiscal policies will have serious effects on the level of output and relatively little effects on the inflation rate. There seems to be no generally accepted way of modeling inflationary expectations. Traditionally however, inflationary expectations have been regarded as some average of past inflation rates.

3.3.1 Inflationary Expectations and Aggregate Supply

Because both firms and workers are assumed to be concerned with real wages, nominal wages attempt to adjust for expected inflation, as well as in response to the state of the labour market. The resulting wage increases are then passed on into prices. In figure 3.3.2, we show the role of expectations in aggregate supply. According to the figure, an increase in the expected rate of inflation from, say, zero to 5 percent, will raise the aggregate supply schedule from AS_o to AS_1, so that at full employment we would observe a 5 percent rate of inflation. Conversely, a reduction in expected inflation below zero rate, an expected deflation, would shift the aggregate supply schedule downwards from ASo to AS2. This new schedule, AS2, reflects the expectation of prices falling at the rate of 2 percent. Higher rates of expected deflation will result in further downward shifts in the aggregate supply schedule.

Inflation depends on the state of the labour market, measured in this discussion by the GNP gap. Inflation also depends on inflationary expectations. Inflation is higher, the higher the actual output relative to potential output, and the higher the expected inflation.

Point B on figure 3.3.2 represents the existence of inflation and unemployment. This arises when the expectation of inflation causes wages and prices to rise, given that unemployment does not exert sufficient dampening pressure on wage settlements to restore full employment. This was the situation in the 1970s when persistent unemployment appeared together with inflation.

Self-Assessment Exercise

Discuss briefly the reason expected rate of inflation affects the position of aggregate supply schedule at any given point in time.

4.0 Conclusion

In this unit, you were exposed to the basic principles of, and relationships among inflation, output, and unemployment. You were also informed that the argument that inflation is a monetary phenomenon is simply an implication of monetary equilibrium, and to maintain a constant real money supply, an increasing nominal money stock must be matched with rising prices. We noted that the bahaviours of price level and output are closely related in the short run. In addition, the expected rate of inflation affects both aggregate demand and aggregate supply.

5.0 Summary

If the rate of growth of money and output is constant, prices tend to rise at exactly the rate at which the nominal money stock is increasing.

To establish the long-run relationship between inflation and rate of growth of money supply, we use the equilibrium condition in the money market (derived from the LM curve):

$$M/P = L(i,Y)$$

Where i = interest rate; and Y = equilibrium level of national income

Or, in real terms of the nominal demand and supply of money:

$$M = PL(i,Y).$$

Because inflation is always a monetary phenomenon, the real money supply that yields monetary equilibrium is equal to the real money demand. To maintain a constant real money supply, an increasing nominal money stock has to be matched by rising prices.

It follows that the long-run relationship between inflation and monetary growth requires that:

- In the long run, inflation is a monetary phenomenon.
- The higher the growth rate of the nominal money supply, the higher the rate of inflation.
- The rate of inflation is lower, the higher the growth rate of real money demand. Alternatively, the lower the rate of inflation, the faster the rate of growth of output, and the more real money demand rises with increased real income or output.
- If a country wants to reduce its average inflation rate, it must attempt to reduce the average growth rate of the money supply.

Wage and price adjustment in response to the level of over-or underutilisation of labour and other economic resources would imply a positive relationship between inflation and gap in the gross national product (GNP). If output is above normal, wages and costs in general will be rising and firms will pass on such increasing costs into higher prices. Conversely, when output is below normal, declining costs would lead to falling prices.

Finally, the role of inflationary expectations in influencing wage formation is central to an understanding of the inflation process. Because labour contracts fix nominal wages for a given period ahead, labour unions will be concerned about real wages over the period of the contract. A given money wage rate negotiated today will have less purchasing power some years from now if the inflation rate is 10 percent than if it is zero percent.

6.0 Self-Assessment Exercise

Using the aggregate supply and demand schedules (or curves), show how, in a steady state, the aggregate supply and demand functions would rise over time in such a way as to keep output constant.

7.0 References/Further Reading

Dornbusch, R. & Fischer, S. (1981). *Macro-Economics*. United States: McGraw-Hill, Inc.

Campagna, A. S. (1974). *Macroeconomics Theory and Policy*. Boston: Hougthon Mifflin.