Theory of Output and Employment

4

Unit highlights:

⇒ **The classical model with AD-AS frame work**

⇒ **The keynsion model**

⇒ **Aggregate demand and equilibrium**

Lesson-1: Output Determination in Classical and Keynesian Models: An Overview

Lesson Objects:

After studying this lesson, you will be able to

- see that aggregate demand- supply framework is capable of accommodating Classical and Keynesian ideas.
- understand why the classical economists agree that in equilibrium output is always at the full employment level.
- see how the Equation of Exchange can be transformed into a theory of demand in the classical model.
- understand why unemployment in the classical model is a temporary, disequilibrium phenomenon.
- appreciate the cure for unemployment proposed by the classical economists.
- understand why an unemployment equilibrium is a possibility in the Keynesian model, but not in the classical model.

Output Determination in Classical & Keynesian Models: An Overview

In Unit 3, we have discussed the behavioural foundations of consumption and investment. There we have tried to identify the factors which cause fluctuations in consumption and investment. Our interest in the causes of these fluctuations arises from the fact that consumption and investment spending are two key determinants of aggregate demand. But in the end, we are interested in fluctuations of national product, not in fluctuations in aggregate demand per se. Therefore, if the study of fluctuations in aggregate demand is to be of any importance, it must be because aggregate demand fluctuations have something do with changes in national product. Our purpose in this unit is to show that this, in fact, is the case. In particular, we shall focus our attention on the interactions between the level of aggregate demand and the level of national output. Before we embark on this issue which is basically Keynesian in spirit, we need to look at what Keynes' predecessors (the classical economists) had to say about output determination and its fluctuations. This will be our major preoccupation in this lesson.

Fluctuations in aggregate demand is related to those in national product.

As hinted earlier in Unit-1 the ideas held by the warring factions of macro economists, including those of the very recent ones, can neatly be captured in the general framework of aggregate demand and aggregate supply. The forces shaping

The AD-AS Framework is quite general.

aggregate demand and aggregate supply will, of course, vary among the schools of thought But these differences will be reflected in shapes and positions of aggregate demand and aggregate supply curves, the basic analytical apparatus remaining the same. In a latter unit (Unit-6), we shall have occasion to say more about the aggregate supply curve; the discussion here will, therefore, be relatively brief.

The Classical Model

The basic idea underlying the aggregate demand and aggregate supply framework is already familiar. Recall from Unit-1 that the aggregate output and the general price level are jointly determined at the intersection of aggregate demand (AD) and aggregate supply (AS) curves. According to classical economists, the AS curve is vertical at the level of output which the economy is capable of producing. That is, the level of output is independent of the price level. The aggregate demand, on the other hand, is an inverse function of the general price level (i.e. if one goes up, the other falls). Leaving aside geometry, let us ask: why is the aggregate supply curve vertical at the full employment level of output, or why is aggregate demand an inverse function of the price level.

According to the classical economists equilibrium output corresponds to the full employment level

Let us look at Fig. 4-1. According to the classical economist, the level of employment is determined in perfectly competitive labour markets by the interaction of demand for and the supply of labour, as shown in panel (a) of Fig-4-1. The demand for the labour (DN) falls with increasing real wage rates (W/P), while the supply of labour (SN) increase as the real wage rates goes up. In equilibrium (where DN=SN), the level of employment is No and the real wage rate is (W/P)*=Wo/Po. The equilibrium level of employment (No) corresponds to full employment of labour in the sense that at the prevailing real wage rate (W/P)* all those seeking work can get employed.

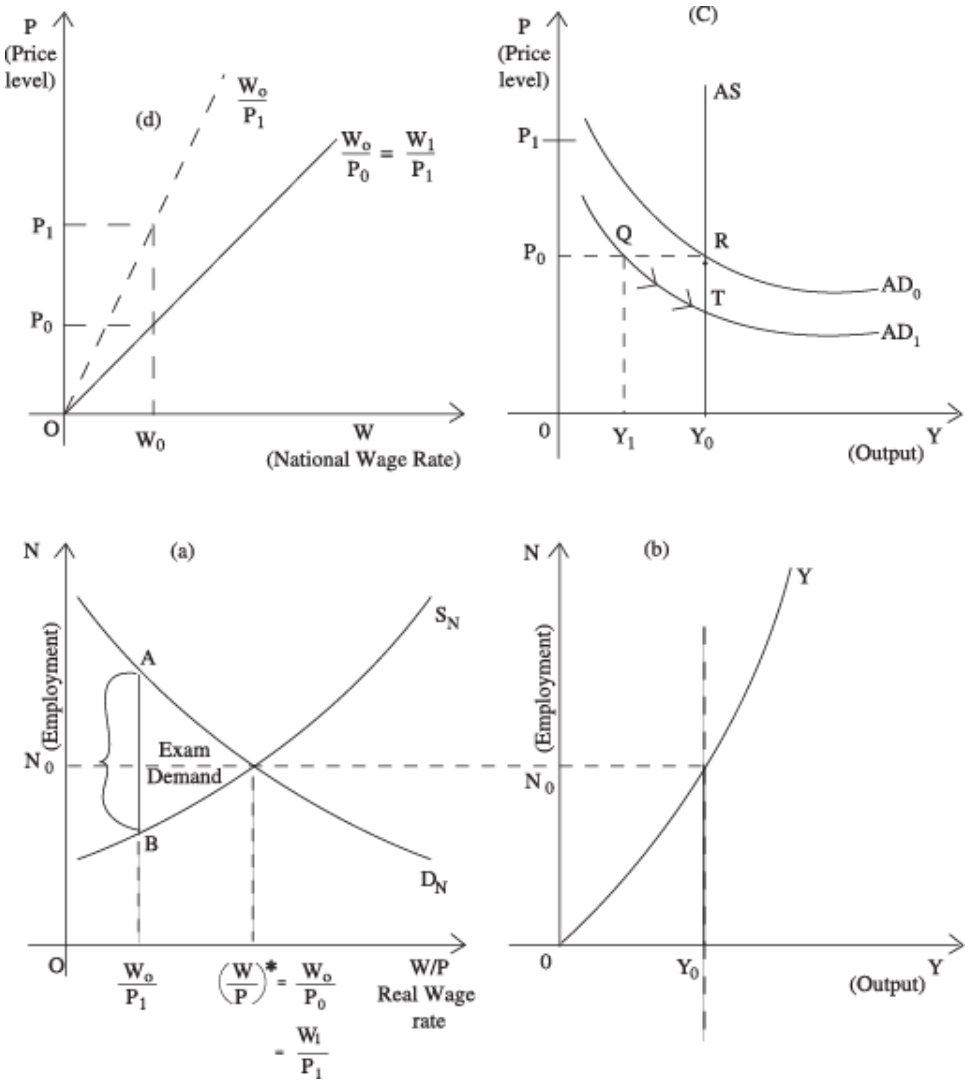

Fig 4-1: Output & price Determination in the Classical Model

In panel (b) is shown the aggregate production function relating employment (N) to output (Y). It is a positively sloped curve indicating larger output at higher employment levels, assuming other factors(such as the stock of capital and the state of technology) constant. From this curve, we find that the output at full employment (N_o) is Y_o. This is the full employment level of output. In panel (c), we have drawn the aggregate supply were (AS) as a vertical line at full employment output Y_o. Why?

Suppose that Y_o is sold at price, P_o (Price level determination will be explained soon). If P_o rises to (say) P_1, the existing real wage rate (corresponding to full employment level, N_o) $(W/P)^*$ will fall to (W_o/P), if the money wage were to remain unchanged. As a result, an excess demand for labour (=AB) will develop in the labour market [panel (a) of Fig 4-1]. The classical economists argue that since

Any disequilibrium in the labor is quickly remedied by movement in the wage rate

the labour market is competitive, the excess demand will push up the money wage rate. As this happens, the real wage rate will tend to rise, thus progressively reducing the excess demand in the labour market. The money wage rate will keep rising until the original real wage rate (W/P) * $=W_1/P_1$ which existed before the price rise is restored, and the labour market is back in equilibrium at full employment. This means that any increase in the price level will leave full employment output unaffected, if the adjustments indicated above take place fairly quickly. This is why the aggregate supply curve (AS) in panel (c) has been drawn as a vertical line at $Y=Y_o$ (full employment output).

The Equation of Exchange is an identity, which is true by definition.

Now let us turn to the question of how the original price level (P_o) was determined. According to the classical economists, total spending depends primarily on the quantity of money (M). In repeated transactions each unit of money can do the job of several units. For example, if a $10 bill changes hands 5 times in transactions, the total value of transactions made is $50(=5□10). The average number of times a unit of money changes hands (circulates) is called the velocity of circulation (V). Therefore, MV is the total value of transactions made by a given quantity of money (M). It is also claimed that the velocity is stable, at least in the short run. If P is the average price level, then it must be true by definition that

$$MV = PT \quad \ldots\ldots\ldots\ldots \quad (1)$$

which is known as the Equation of Exchange. This can be re-written as

$$P = \frac{MV}{T} \quad \ldots\ldots\ldots\ldots (1/)$$

Under the assumption that M is fixed and V is stable, the price level (P) and the real output (Y) will move in opposite directions. With help of these assumptions, the classical economists transform the Equation of Exchange (which is an identity) into a theory of demand, the so called **Quantity Theory**.

The Quantity Theory of Money serves as the aggregate demand function in the classical model

In equation ($1/$), we have the classical aggregate demand function (AD) for output (Y), as shown in panel (c) of Fig 4-1. We see that if the full employment output is Y_o and the aggregate demand curve is AD_o, the equilibrium price level must be P_o (as assumed before). At any price level lower than P_o, there will be an excess demand for output (and the price level will tend to rise). On the other hand, excess supply will develop at any price higher than P_o, tending to push down the price level. Notice that given the money supply (M) and the velocity of circulation (V), the price level has to be such that the full employment output Y_o is demanded by the purchasers at that price level.

We have explained how the price level and the level of output are determined in the classical model in the AD-AS framework. Though we have hinted how price-output fluctuations can arise, we have not explained them in any detail. To this explanation we now turn our attention. This is explanation we now turn our attention. It is clear from panel (c) of Fig. 4-1 that as long as there is no shift in the aggregate demand or aggregate supply curves, there will be no change in output, employment or the price level (Y_0, N_0, P_0). The aggregate supply is fixed in the short run for reasons already explained. The price level, however, can change at the unchanged full employment level of output. And obviously this can be due to disturbances arising from the demand side only.

The price level will change in response to demand, the aggregate remaining fixed.

The demand curve (AD_0) in panel (c) of Fig 4-1 is defined for a given money supply (M_0). If the money supply declines, for example, due to financial disturbances, the aggregate demand curve will shift downward to AD_1. As a result, an excess supply of goods (=QR) will develop at the initial price level, P_0. Assuming full price flexibility, classical economists suggest that the price level will fall by enough to clear the market again at the unchanged output level, Y_0. In other words, output may fall temporarily below the full employment level (Y_0) during the period of downward price adjustment. They also suggest that as long as prices and wages are flexible, full employment equilibrium, once disturbed, will be quickly restored. Why didn't this happen during the Great Depression of the 1930's? In terms of panel (c) of Fig. 4-1, the answer will be that the price level was sticky downwards, and so it took a long period for wage price adjustment to take effect. In other words, the Great Depression could be explained in terms of slow adjustment, but not lack of it.

In the classical model, unemployment is temporary, disequilibrium phenomenon.

From the classical analysis, the following cures of the depressed economy will emerge.

a) Encourage wages and prices to fall quickly so that a new equilibrium is reached promptly enough, though doing this may not be easy during a depression as a practical matter.

b) Increase the money supply by enough so that the full employment output can be absorbed at the original price level (P_0). In terms of Fig 4-1 [Panel (c)] this amounts to shifting AD_1, back to AD_0. This is a less painful policy compared to (a) above. But pursuing this policy was difficult too during the Depression years, because it came into conflict with the need for maintaining a fixed exchange under the international gold standard.

Tow curves of the depressed economy emerge from the classical model

In brief, the classical explanation of output determination is such that there can be no unemployment in equilibrium. When the classical economists speak of

unemployment, they emphasize that unemployment is a disequilibrium phenomenon. When the economy's full employment is disturbed by (say) a decrease in money supply, forces are set up (through wage price changes) to bring the economy back to full employment equilibrium. It is during the process of adjustment of equilibrium that the economy may experience temporary unemployment.

Keynes' Explanation of Unemployment

Unemployment equilibrium is possible, says keenness; it is not usually a temporary phenomenon.

J.M. Keynes disagreed with the classical notions about both aggregate supply and aggregate demand. He argued that, at least as a first approximation, the AS curve is like a reversed L as shown in Fig. 4-2. Suppose that the aggregate demand shifts from AD_0 to AD_1 so that at the existing price level (P_0) there is an execs supply of output (=AT). The classicists will argue that in such cases the price level will fall to P_1 to eliminate the excess supply. Keynes argues, however, that this will not normally happen, because of downward stickiness of prices. Therefore, unemployment will last longer than the classical economists anticipated. On the other hand, if AD goes up at the full employment level of output, only the price level will rise to eliminate the excess demand at the original price. Thus while the TR segment of the Keynesisan aggregate supply curve corresponds with the classical views, the AT segment (which represents unemployment equilibrium, because equilibrium at points like A are possible) does not.

According to Keynes, the Equation of Exchange,, should not be treated as a theory of aggregate demand.

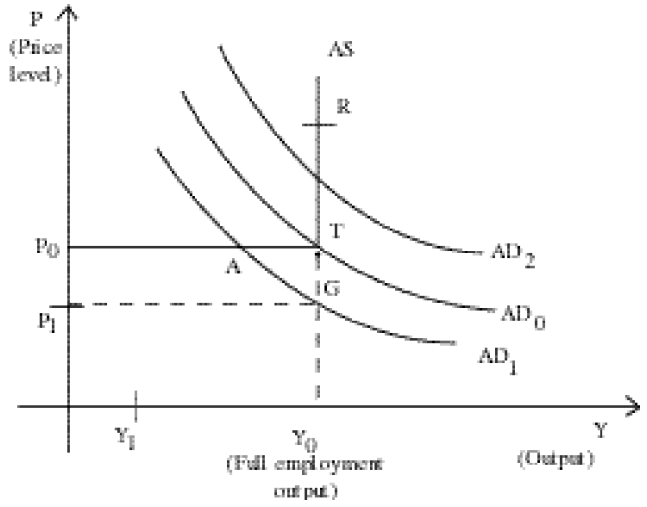

Figure 4-2: Keynesian aggregate supply curve

On the demand side, Keynes did not deny that the Equation of Exchange was valid, but he doubted that it could be regarded as a theory of aggregate demand, as did the classicists. He disagreed that the velocity of circulation (V) could be taken

as stable, especially during a depression. An increase in the quantity of money (M) may lead to a corresponding decrease in velocity (V), leaving the aggregate demand unaffected. According to Keynes, the most fruitful way to analyze aggregate demand is to look at its major components. In the following lessons of this unit, we turn our attention to this way of looking at aggregate demand in the context of output determination.

Review Questions

MCQ'S (Tick the correct answer)

1. Aggregate demand
   A. cannot influence national output
   B. can influence national output
   C. can be influenced by national output
   D. is such that both (B) & (C) apply

2. According to the classical economists equilibrium output
   A. corresponds to the full employment level
   B. is independent of the general price level
   C. is less than the full employment level
   D. is such that both (A) & (B) apply.

3. According to the classical model, if there is unemployment at any given real wage rate, then
   A. the real wages rate will rise
   B. the real wage rate will fall
   C. output will stay at the full employment level
   D. the real wage rate will not change.

4. The Equation of Exchange has been coverted into a theory of aggregate demand by classical economist by assuming that
   A. the money supply is constant
   B. the velocity of circulation of money is constant
   C. the money supply is constant and the velocity is stable
   D. aggregate demand is independent of supply

5. In the classical model cyclical unemployment
   A. is possible if the economy is out of equilibrium
   B. is possible when the economy is in equilibrium
   C. is a permanent feature
   D. cannot be cured by any kind of policy

6. According to Keynes, unemployment
   A. is not possible in equilibrium
   B. is possible in equilibrium
   C. is not related to aggregate demand
   D. is incurable

Short Questions :

1. Show that the classical and Keynesian ideas about price output determination can be analyzed within a basic AD-AS framework.
2. Following the classical economists explain why the equilibrium output will always be at the full employment level.
3. Under what assumptions did the classical economists transform the Equation of Exchange into a theory of aggregate demand? Explain.
4. "Unemployment in the classical model is a temporary, disequilibrium phenomenon. " Why?
5. What cures would you expect to emerge from the classical analysis of output determination?

   Explain how any disequilibrium in the labor market will be eliminated in the classical model.

Broad Questions

1. Briefly discuss the price and output determination in the classical model.
2. Does the Keynesian aggregate supply curve differ from that of the classical economists. In what respects? Relate the Keynesian aggregate supply curve to the possibility of unemployment equilibrium.

Answers (MCQ'S)

1. D 2. D 3. B 4. C 5. A 6. B

Lesson 2: Aggregate Demand & Equilibrium output

Lesson Objectives:

After studying this lesson, we will be able to

- see how aggregate demand affects and is affected by the level of output.
- understand what the equilibrium level of output means.
- appreciate why at the equilibrium level of output unplanned investment must be zero.
- see why the equilibrium level of output can be defined in several equivalent ways and how each can be applied for income determination.
- understand why the equilibrium level of output might change.

Aggregate Demand and Equilibrium Output

Aggregate demand affects, and is aggregated by, the level of output.

In Lesson 1 of this Unit, we supplied only the bare bones of the Classical and Keynesian models. We have seen that when the economy is operating below full employment, the Keynesian aggregate supply curve is paralled to the output axis, implying that when the economy suffers from massive unemployment, output can be expanded by stimulating aggregate demand without affecting the price level. In other words, in a depressed economy, the dominant influence on output is aggregate demand. In what follows, we try to explain how it is itself affected by the level of aggregate demand.

Aggregate demand is the total amount of goods demanded in the economy.

Whether or not an entirely flat aggregate supply curve is a true description of reality in a depressed economy, we begin by assuming that it is so, as a first step toward a fuller explanation of price and output determination. In this model of output determination, the driving force is aggregate demand, the price level being assumed constant throughout.

We further simplify matters by assuming that there is no government and no foreign trade. Then the aggregate demand (AD) for output produced must consist of expenditures for consumption (C) and for investment (I). In other words.

AD = C+I = Planned expenditures

This says that the aggregate demand is the total amount of goods demanded in the economy. We have seen before that consumption expenditures depend on the level of real disposable income, while investment depends on income and the rate of interest. For now, let us assume that both consumption and investment are

independent of income so that we can represent aggregate demand as a horizontal line AD in Fig. 4-3.

Equilibrium Level of Output

The equilibrium level of output is the level of output for which the amount produced equals the amount demanded. As you know, generally speaking, an equilibrium position is one in which no net force is operating to change that position. Therefore, equilibrium level of output too is such that no net force is acting to change it. But what is the force that is likely to change the level of output? In the present model, it is none other than the level of aggregate demand (AD).

In equilibrium output produced equals output demanded.

If the aggregate demand exceeds the level of output, then the firms responsible for the output will be forced to recognize that they had underestimated the aggregate demand. As a result, their inventories will decline. That is, there will be an unplanned inventory investment (negative) to the extent of (Y-AD). For instance, if Y=$2000 million while AD = $2,200 million, then unplanned investment of minus $200 million will take place (this simply means inventory decumulation). Taking note of the underestimation of demand, firms are likely to expand output. The opposite will happen when the actual output level exceeds aggregate demand, leading to unintended inventory accumulation. This will convince firms that they should cut down on production to correct for an over estimation of aggregate demand. Finally, when aggregate

If AD≠ Y, output will tend to move toward the equilibrium

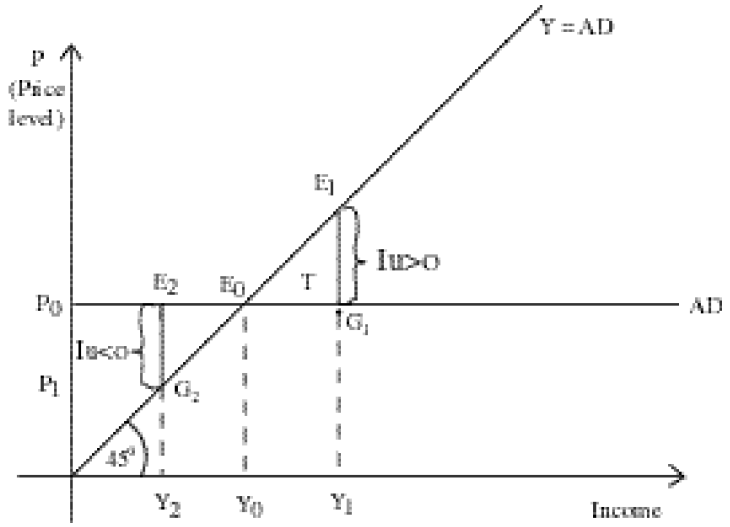

Fig 4-3 : Determination of Output With Constant Aggregate Demand

demand equals the output produced, there will be no unplanned inventory investment (positive or negative). This will convince the firms that they have accurately estimated aggregate demand and so they will not like to change the production level. Level of output is then in equilibrium.

Let us illustrate the idea of equilibrium output in terms of Fig. 4-3. The 45° line Y=AD helps us to read aggregate demand (AD) and compare it with the corresponding output level (Y). For example, suppose that we want to compare AD with output Y_1. Since $Y_1=E_1$ (by construction) and AD = G_1, we know immediately that actual output (Y_1) is greater than AD (E_1) and that the amount of execss (unsold) output is E_1G_1. This constitutes an unplanned (positive) investment (I_u) by firms. By similar reasoning, for output Y_2, aggregate demand exceeds output by E_2G_2, and this is unplanned (negative) inventory investment (inventory declines from the planned level). Only at output Y_0, we have AD=Y so that unplanned inventory investment is zero.

When the output is in equilibrium investment is zero.

We can now summarize how aggregate demand, output level and unintended investment are related. Recall in this connection that actual (realized) investment (I_a) is the (algebraic) sum of planned investment (I_p) and unplanned investment (I_u). That is $I_a = I_p+I_u$.

Equivalent ways of defining equilibrium output.

Then if

i) AD = Y, Then $I_a = I_p$, Since $I_u = 0$

ii) AD >Y, Then $I_a < I_p$, since $I_u < 0$

iii) AD < Y, then $I_a > I_p$, since $I_u > 0$

Using these relationships, we can define equilibrium output in three equivalent ways. Output is in equilibrium when

a) AD = Y; b) $I_a = I_p$; c) $I_u = 0$

We can confirm this from Fig. 4-3. The AD curve intersects the 45° line at E_0, indicating the equality of AD and output at this point. The corresponding output level (Y_0) is therefore, the equilibrium output by (a) above. And by virtue of output being equal to aggregate demand, we also know that at $Y = Y_o$, $I_a = I_p$ and $I_u = 0$. Let us emphasize that when $Y = Y_0$, the level of output is in equilibrium because there is no net force (excess demand or excess supply) causing output level to change.

Planned vs. Realized Values

At this point we must caution against one possible source of confusion. The expenditure method of GDP calculation gives us

It is important to distinguish between planned and realized magnitudes

$$Y \equiv GDP = C+I+G+NX$$

Under the assumptions made her (G=0, NX=0), this simplifies to

$$Y = GDP = C+I$$

However, we have stated a short while ago that

$$AD = C+I$$

Therefore, one may argue that

$$AD = Y$$

In other words, AD is equal to output at all levels of output and therefore all levels of output could be treated as equilibrium output. But this makes nonsense of what we have been saying so far, namely that there is only one level of output at which Y = AD.

What is important to remember here is that the figure Y ≡GDP≡C+I from National Accounts gives us a realized (what has already happened) magnitude, while the number AD=C+I represents a planned magnitude. To see what is involved assume that the value of GDP is $100 million which consists of $80 million of consumption and $20 million of investment spending. Assume also that planned investment was $15 million, so that unplanned investment (inventory accumulation) must have been $5 million. Therefore,

Y ≡GDP=Realised Consumption + Realized Investment

($100 million) ($80 million) ($20 million)

but

AD = Planned/Realized consumption + Planned investment

($95 million) ($80 million)+($15million)

It should now be clear that AD and Y would be equal only at the equilibrium level of Y (i.e. when planned and realized investment are equal).

Planned Expenditures (=AD)

Having made clear what equilibrium output (and income) means with help of the unrealistic assumption that consumption and investment spending are totally independent of income, we are now ready to take account of the fact that real consumption is an increasing function of real income. We can express such a consumption functions as

Aggregate demand in this simple economy is the sum of consumption and planned investment

$$c = c_0 + \hat{c}Y; \qquad C_0>0 : 0<\hat{c}<1 \ldots\ldots\ldots\ldots (1)$$

This has been shown as an upward sloping straight line (AB) in figure 4-4. The slope of this line $(\hat{c})$ reflects the marginal propensity to consume, while the intercept (OA) indicates autonomous consumption (C_0). Total consumption at any given real income (no distinction is needed between income and disposable income, because there are no personal income-taxes in the absence of a government) has two components: the autonomous consumption (C_0) which is independent of the level of income and the induced consumption ($\hat{c}$Y) which depends on income.

We shall simplify our discussion of output determination at this stage by assuming that investment is autonomous i.e independent of the level of income. Symbolically,

$I = I_0$

where I_o is a given positive number.

Aggregate Demand and Equilibrium Output

Given that $I = I_0$, the planned expenditure is

$AD = C+I$

or, $AD = C_0+\hat{c}Y+I_0$ ... . (2)

Since in equilibrium Y = AD, we have

$Y = C_0+\hat{c}Y+I_0$

or, $\bar{Y} = \frac{C_0 + I_0}{1 - \hat{c}}$

or, $\bar{Y} = \frac{1}{1 - \hat{c}} \bar{A}$ ... . (3)

Where $\hat{Y}$ = equilibrium level of income, and

$\bar{A}$ = total autonomous expenditure = I_0+C_0.

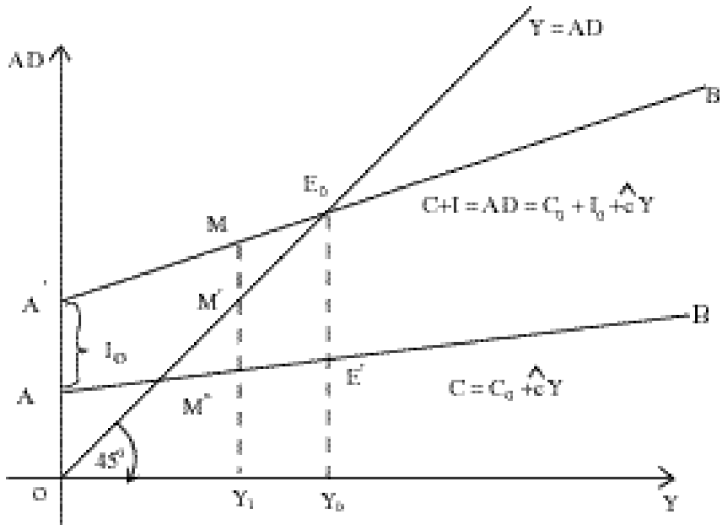

Fig 4-4: Determination of Equilibrium Income and Output

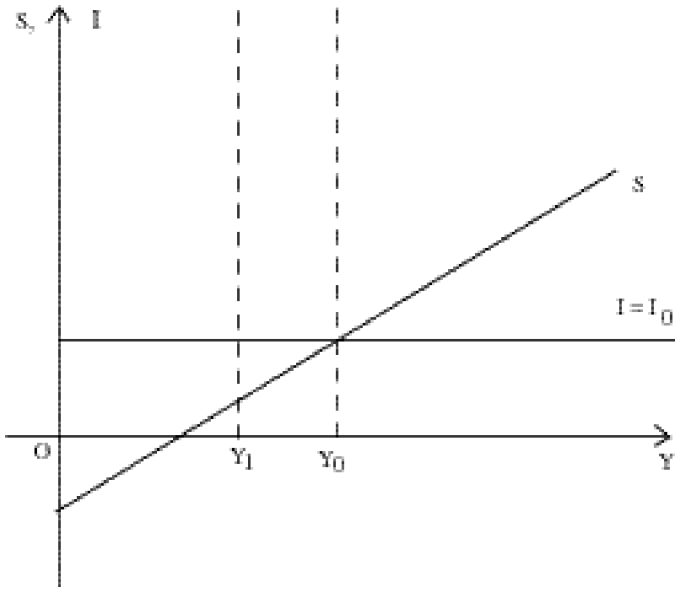

Fig 4-5 Determination of Equilibrium Income & Output: An Altentive Approach.

Eq (2) has been shown as line $A'B'$ in Fig 4-4. It has the same slope ($\hat{c}$) as the consumption function, AB. But its vertical intercept is larger by AA'($=I_0$). The vertical distance between the aggregate demand function A'B′ and the consumption function AB is obviously the autonomous investment ($=I_0$). Graphically, the equibrium of income is Y_0 which corresponds to the intersection of the 45^0 line (Y=AD) and the aggregate demand (=expenditure) line $A'B'$ (Fig 4.-4). As can be easily verified, for $Y>Y_0$ output exceeds aggregate demand (implying $I_u>o$) and so income will tend to fall. On the other hand, if Y is Less than Y_0, output will tend to rise because of excess demand ($I_u<0$). The level of equilibrium income depends on the intercept (C_0+I_0) of the aggregate demand

The level of equilibrium output depends on autonomous expenditures as well as on the marginal propensity to consume.

function, $A'B'$ as well as on its slop ($\hat{c}$). The higher the autonomous expenditure ($C_0+I_0=\overline{A}$) and the larger the marginal propensity to consume ($\hat{c}$), the higher will be the equilibrium level of income. This is readily seen by looking at equation (3). Finally, note that while output depends on aggregate demand, the latter also depends on output via the consumption function. In other words, aggregate demand and output are interdependent which can also be verified by looking at the circular flow diagram given before.

Equilibrium Income & Output (Savings-Investment Equality)

Equilibrium output can also be obtained as equality of planned investment and saving

Determination of output can also be illustrated in as equivalent way as the equality of planned investment and saving (I_u = 0). In an economy where there is no government and no foreign trade, the equilibrium has to be such that planned investment and saving are equal. Recall that the vertical distance between the consumption function (AB) and the aggregate demand function ($A'B'$) is autonomous planned investment (I_0). On the other hand, the vertical distance between the 45° line and the consumption function (AB) gives us the volume of saving, because by definition S≡Y-C.We already know that Y_0 is the equilibruim income, because at this level aggregate demand equals output produced. However, at Y_0 the volume of saving (E_0E') equals planned investment ($I_0=E_0E'$). It is easy to see that this equality hold only at Y_0. For example, consider the level of income Y_1 which is lower than Y_0. At this level of income planned investment ($=M'M''$) is greater than saving ($=M'M''$). We also know that at Y_1, AD>Y, so that income will tend to rise. In other words, if planned investment is greater than saving, income will tend to rise. By similar reasoning, we can convince ourselves that if planned investment falls short of savings (as at income level Y_2) income will tend to fall towards Y_0 where planned investment and saving are equal.

Graphically, the determination of equilibrium income has been illustrated in Fig 4-5. Here the investment function (I) is drawn parallel to income axis to reflect the fact that investment is independent of income. Saving, on the other hand, rises with income, because. S ≡Y-C and C rises with income. Note that a part of the saving function (S) lies below the income axis (i.e. S<0) for reasons explained earlier (see Fig 3-2 of lesson 1, Unit 3). The saving function (S) intersects the planned investment curve (I) at Y = Y_0 (Fig 4-5). Thus Y_0 is the equilibrium level of income. For Y>Y_0, S>I, while for Y <Y_0, S<I, and hence in either case income is not in equilibrium.

We can also show algebraically that income is in equilibrium when planned investment (I_0) equals saving (S). We know that in equilibrium

$$Y = AD$$

Subtracting consumption from both sides,

$$Y - C = AD - C$$

or $$S = I_0 \text{ ... . (4)}$$

If we write $C = C_0 + \hat{c}\, Y$ then

$$S = Y - C_0 - \hat{c}\, Y$$

But in equilibrium, $S = I_0$ Therefore,

$$Y - C_0 - \hat{c}\, Y = I_0$$

or $$Y_0 = \frac{1}{1-\hat{c}}\,\bar{A} \text{ ... . (5)}$$

where $\bar{A} = I_0 + C_0$ = Autonomous expenditure (demand). Comparing (5) with (3), we see that both are the same, as we should expect.

Reviews Questions

MCQ'S (Tick the correct answer)

1. Equilibrium output in a two-sector model is such that at this level
   A. Planned investment is greater than planned saving
   B. Planned investment is smaller than planned saving
   C. Planned and realised investment are unequal
   D. Planned saving equals planned investment

2. When planned saving is smaller than planned investment
   A. Output should increase
   B. Output should fall
   C. Output should not change
   D. Rate of interest will rise

3. When planned consumption is C = 40+0.9Y and planned investment is 100, the equilibrium level of income is
   A. 140
   B. 1500
   C. 1400
   D. 1200

4. When planned expenditure is equal to the level of income, unplanned investment (I_u) is
   A. Positive
   B. Negative
   C. Zero
   D. None of the above.

5. If planned aggregate demand is <u>not</u> equal to the level of output, the latter is expected to move
   A. away from the equilibrium output
   B. toward the equilibrium output
   C. away from equilibrium interest rate
   D. towards aggregate saving.

6. If realized investment is higher than planned investment, we know that unplanned investment (I_u) is
   A. Zero
   B. Positive
   C. Negative
   D. None of the above.

Short Questions

1. Define the equilibrium level of income in three equivalent ways.
2. What will happen to the level of income when

   a) Planned saving is greater than planned investment

   b) planned spending is greater than output.
3. Explain why it is important to distinguish between planned and realized investment in the discussion of determination of equilibrium output.
4. Explain why the equilibrium level of output will change if a) autonomous expenditures change, b) the marginal propensity to consume changes.

Broad Question

1. Diagrammatically explain the determination of equilibrium output in a simple two-sector economy.

   Algebraically derive an expression for the equilibrium level of income. Using these, show that the equilibrium income will rise if there is any increase in autonomous expenditures.

Answer (MCQ'S)

1. D 2. A 3. C 4. C 5. B 6. B

Lesson 3: Change in Planned Investment and Equilibrium Income: The Multiplier Analysis

Lesson Objectives:

After studying this lesson, we will be able to

- see why the equilibrium income level will change, if there is any change in planned investment
- understand why income will change by a multiple of the change in investment.
- identity the factors which determine the size of the multiplier.

Changes in Planned Investment and Equilibrium Income: The Multiplier Analysis

Equilibrium level of income will change when planned investment changes.

Lesson 2 of this Unit was devoted to providing an explanation of output determination in a simple economy consisting of two sectors-the households and the firms. This Lesson is an attempt at explaining what causes the equilibrium level of income and output to change. As can be easily imagined, any change in equilibrium income must be due to shifts in the aggregate demand function, (C+I) [Line $A'B'$ in Fig 4-4 of lesson 2]. Recall that the total expenditure function (in this two-sector model) is the vertical sum of the consumption function and the investment function. Therefore, it can bounce up and down because of shifts in the consumption function or in the investment function. The latter is usually less stable than the consumption function. It is thus expected that upward or downward shift in the expenditure (aggregate demand) function will be more owing to shifts in investment than in consumption function. In any case, in this lesson we concentrate on shifts in planned investment function in order to study their impacts on the level of equilibrium income.

The Investment Multiplier

Let us suppose that the initial level of investment in the economy is I_0, so that the expenditure schedule, given the consumption function, is AD in Fig 4-6. Now if firms decide to permanently increase investment spending to I_1, the total expenditure curve shifts to AD_1. Note that AD and AD_1 must be parallel to each

other, the vertical distance between the two being equal to ΔI ($= I_1 - I_0$). As a result of the shift in expenditure function, the equilibrium level of income has

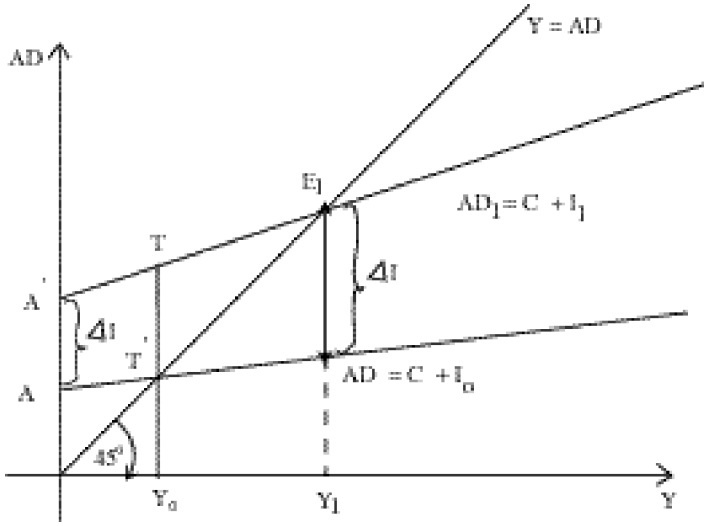

Fig 4-6 : Illustration of the Multiplier

been shown to rise from Y_0 to Y_1. We can easily explain why this should be the case. From Fig 4-6, we see that at the original equilibrium level of income (Y_0), there is now an excess demand for goods measured by TT'. For reasons mentioned before, firms will respond to this excess demand by increasing output. As this happens, the gap between aggregate demand and output is gradually narrowed. The reason is that a part of each addition to income is saved in view of our assumption that the marginal propensity to consume is less than unity. When the increase in income(ΔY) is such that additional saving (ΔS) from this additional income becomes equal to the increase in investment (ΔI), aggregate demand equals output (AD=Y). Therefore, any further growth in income ceases. In terms of Fig 4-6 this happens when the level of income reaches Y_1.

The interesting question now is; how does ΔY compare with ΔI? Apparently the two should be equal, because if investment rises by ΔI, aggregate demand (and therefor income) should also rise by the same amount. But this would have been true, only if the marginal propensity to consume were zero. Since we have assumed (quite realistically) that the marginal propensity to consume is a positive fraction (as reflected in the slope of the AD curves), income will, in fact, rise by a multiple of ΔI. This multiple is known as the multiplier. In this case it may be called investment multiplier, because the cause of increase in income is change in investment. Multiplier may be defined as the ratio of the change in equilibrium

Change in equilibrium income will be a multiple of the change in planned investment. This multiple is called the multiplier.

income to change in spending (here investment) which caused income to change. In the from of a formula, it can be written as

$$\text{Multiplier } (\alpha) = \frac{\text{Change in Y}}{\text{Change in I}} = \frac{\Delta Y}{\Delta I}$$

In other words, the multiplier is the amount by which equilibrium output changes when autonomous aggregate demand increases by one unit. For example, if ΔI= \$1 and $\alpha = 5$, then ΔY =\$5.

The larger the marginal propensity to consume the larger is the multiplier.

Notice that for any given increase in investment, the magnitude of change in Y (ΔY) depends on the marginal propensity to consume ($\hat{C}$). You can experiment with AD curves of varying steepness and convince yourself that (ΔY) will be larger [for any given increase in investment (ΔI)] the larger the marginal propensity to consume ($\hat{C}$). In short, the higher the marginal propensity to consume, the larger the multiplier and vice versa (we shall soon explain why this must be so). We can easily verify this by simple mathematical manipulation. In the previous lesson we derived the following expression for the equilibrium level of income:

$$Y = \frac{\bar{A}}{1 - \hat{c}}$$

where = $\bar{A}$ = I_0+C_0 = autonomous expenditure, and $\hat{c}$ = marginal propensity to consume. From this we can write

$$\Delta Y = \frac{1}{1 - \hat{c}} \Delta \bar{A}$$

$$\text{or, } \Delta Y = \frac{1}{1 - \hat{c}} \Delta I \qquad (\because \Delta C_o = 0)$$

$$\text{or, } \frac{\Delta Y}{\Delta I} = \frac{1}{1 - \hat{c}}$$

$$\text{or, Multiplier } (\alpha) = \frac{1}{\text{1- Marginal propensity to consume}} \quad \text{... .... (1)}$$

From (1) we can clearly see that the value of the multiplier varies directly with the marginal propensity to consume ($\hat{c}$). For instance, if $\hat{c}$ = o.8, $\alpha = 5$, while if $\hat{c}$ = o.9, $\alpha = 10$,

How the Multiplier Works

We can easily understand the mechanism through which the multiplier works with the help of a numerical example. Suppose that firms decide to spend an additional $ 100,000 on investment. To be more concrete, let us assume that this amount has been spent on buying building materials. This means that $ 100,000 are received by construction workers and construction companies in the from of wages and profits. Their income rises by $100,000. They will then spend a fraction of this income, the exact amount depending on their marginal propensity to consume. If it is 0.8, then additional consumption out of the additional income of $ 100,000 will be $80,000 (=$100,000×0.8)

The multiplier effect is the result of induced income and consumption changes at various rounds.

As a result, the aggregate demand (and hence income) will rise by $80,000. Those who receive $80,000 as additional income will again spend (assuming the same marginal propensity to consume) $64,000(=$80,000×0.8). This in turn raises aggregate demand and income by $64,000 of which $51,200 (=$64,000×0.8) will be spent in the next round of consumption. As a result, income will again rise by $51,200. How long will this continue? Note that at each round a part of the additional income is saved. Gradually, the cumulative total of saving will approach the original increase in investment ($100,000), and in the limit will equal this amount. At that point income will have risen sufficiently to generate a total saving of $100,000, and income expansion will stop. For this to happen, income must have risen by $500,000 (=$100,000×5). We can easily verify this. We Know that ΔY should be such that $\Delta S = \Delta I$. But

$\Delta S = \Delta Y (1-\hat{c}) = \$500,000 \times 0.2$

$= \$100,000 = \Delta I$

Algebraic Derivation of the Multiplier

The dynamics of the multiplier numerically illustrated above can be seen more succinctly with the help of simple algebra. This requires some knowledge of how to sum an infinite geometric progression such as

The multiplier derived algebraically

$$1+r+r^2+r^3+ \dots \dots \dots \dots \dots \dots (1)$$

where r is a fraction known as common ratio, Let S stand for the sum of this series. Then

$$S =1+r+r^2+r^3+ \dots \dots \dots \dots \dots \dots (2)$$

Multiplying both sides by r, we have

$$rS = r+r^2+r^3+ \dots \dots \dots \dots \dots \dots \quad (3)$$

Subtracting (3) from (2), we get

$$S-rS = 1$$

$$\therefore S = \frac{1}{1-r} \quad \dots \dots \dots \dots \dots \dots \quad (4)$$

We can now use this result (4) for deriving a formula for the multiplier algebraically. From the discussion above, it should be clear that an additional investment of ΔI will lead to the following increases in consumption and income at various rounds.

Round	Change in Y(ΔY)
1st	ΔI
2nd	$\hat{c}\,\Delta I$
3rd	$\hat{c}^2\Delta I$
4rth	$\hat{c}^3\Delta I$

Therefore, the total increase in income caused by ΔI is

$$\Delta Y = \Delta I\,(1+\hat{c}+\hat{c}^2+ \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots)$$

And using formula (4), we have

$$\Delta Y = \frac{1}{1-\hat{c}} \,.\, \Delta I$$

$$\text{or,} \qquad \frac{\Delta Y}{\Delta I} = \frac{1}{1-\hat{c}} \quad \dots \dots \dots \dots \dots \dots \dots \dots \quad (5)$$

which, not surprisingly, is the same as the multiplier obtained in (1).

Review Questions

MCQ'S (Tick the correct answer)

1. When planned investment goes up, the equilibrium level of income (assuming that the marginal propensity to consume is a positive fraction) will go up
   A. by less than the increase in investment
   B. by more than the increase in investment
   C. by as much as the increase in investment
   D. by half as much as the increase in investment.

2. The vertical distance between the aggregate demand function (where planned investment is autonomous) and the consumption is given by
   A. autonomous consumption
   B. autonomous investment
   C. induced consumption
   D. None of the above.

3. If the marginal propensity to consume is 0.8 and planned investment goes up by $200, income will
   A. rise by $1200
   B. fall by $1000
   C. rise by $1000
   D. remain unchanged.

4. The value of the multiplier is 1 when the marginal propensity to consume is
   A. equal to 1
   B. equal to 0
   C. less than 1
   D. none of the above

Short Questions

1. Briefly explain why you would expect equilibrium income to rise following an increase in planned investment.
2. Assume that consumption is an increasing function of income, while planned investment is independent of income. Would you say that the marginal

propensity to consume and the marginal propensity to spend must be equal? Why?

3. "If there is an increase in planned investment, the increase in income has to be such that the saving generated by increased income is equal to the increase in investment." Do you agree? Give reasons for your answer.

Broad Questions

1. Graphically explain how an increase in planned investment will affect the equilibrium level of income, assuming that the marginal propensity to consume is a positive fraction.

   Explain with help of a numerical example the mechanism through which an initial increase in investment will have a multiplier effect on income.

Answers (MCQ'S)

1. B 2. B 3. C 4. B