By assuming that prices are fixed and that the economy has spare resources, Keynesian models suggest that boosting aggregate demand will always lead to higher output. But prices are not fixed for ever. Inflation is one of the key macroeconomic issues. And, with only finite resources, the economy cannot expand output indefinitely. By introducing aggregate supply, or firms' willingness and ability to produce, we now show how demand and supply together determine both the price level and the level of output.

We shall see that printing money, or steadily increasing the money supply, must eventually create inflation since output and employment cannot expand for ever. Similarly, fiscal expansion must eventually increase prices and interest rates rather than continue to increase output. To introduce these ideas we move from the Keynesian extreme, in which wages and prices are fixed, to the opposite extreme, in which wages and prices are fully flexible.

The *classical model* of macroeconomics analyses the economy when wages and prices are fully flexible.

In the classical model we shall show that the economy is *always* at its full-employment output. Monetary and fiscal policy then affects prices but not the aggregate level of output and employment.

In the very short run, before prices and wages have time to adjust fully to the pressures of demand and supply, the Keynesian model remains relevant. In the long run, after all prices and wages have adjusted, the classical model is relevant. The key issue in the modern macroeconomic debate is how quickly prices and wages *actually* adjust in the real world. Taken by themselves, neither the Keynesian nor the classical model is a complete description of how the economy works.

In seeking to understand macroeconomics, the challenge is to master the analysis of how the economy makes the transition from the Keynesian short run to the classical long run. Many of the policy issues most keenly debated today turn on differing assessments of how quickly the economy makes the transition. Hence in the second part of the chapter we examine in detail the process through which the economy responds to shocks to aggregate demand or aggregate supply.[1]

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[1] In this chapter, for simplicity we assume that the long-run equilibrium or full-employment position is constant over time. We discuss how the economy gradually works its way back to its long-run equilibrium. In practice, of course, the world does not stand still and the full-employment equilibrium is itself changing slowly over time. The economy is gradually adjusting back towards a moving target. Changes in long-run equilibrium are discussed more fully in Chapters 26 and 2

25

Aggregate Supply, the Price Level, and the Speed of Adjustment

Figure 25-1 outlines the analysis of the chapter. We study the interaction of three markets: the markets for goods, money, and labour. This sounds more complicated than it is. The analysis breaks down into two parts. Aggregate demand depends on the interaction of the markets for goods and money. That is the part we have already learned. The new element is the introduction of aggregate supply, which involves the interaction of the markets for goods and labour.
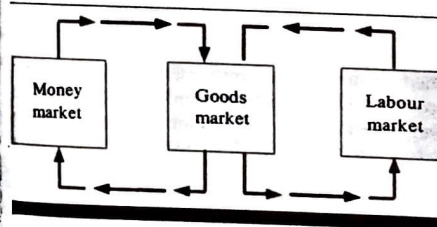
25-1 THE PRICE LEVEL AND AGGREGATE DEMAND

In this section we show that the real money supply is the key variable linking the aggregate demand for goods and the price level.

The *price level* is the average price of all the goods produced in the economy.

The real money supply is defined as the nominal money supply divided by the price level. It shows the quantity of goods that a given quantity of nominal money will purchase. When the price level is fixed, the real money supply increases (decreases) only if the nominal money supply increases (decreases). But when the price level can change, the real money supply will rise (fall) if the price level falls (rises) while the nominal money supply remains unchanged.

FIGURE 25-1 THE MARKETS FOR MONEY, GOODS, AND LABOUR. A complete macroeconomic model determines output and employment, interest rates, wages, and prices by analysing links between the markets for money, goods, and labour. Goods and labour markets are linked both by output and employment and by wages and prices. Goods and money markets are linked by prices and interest rates.
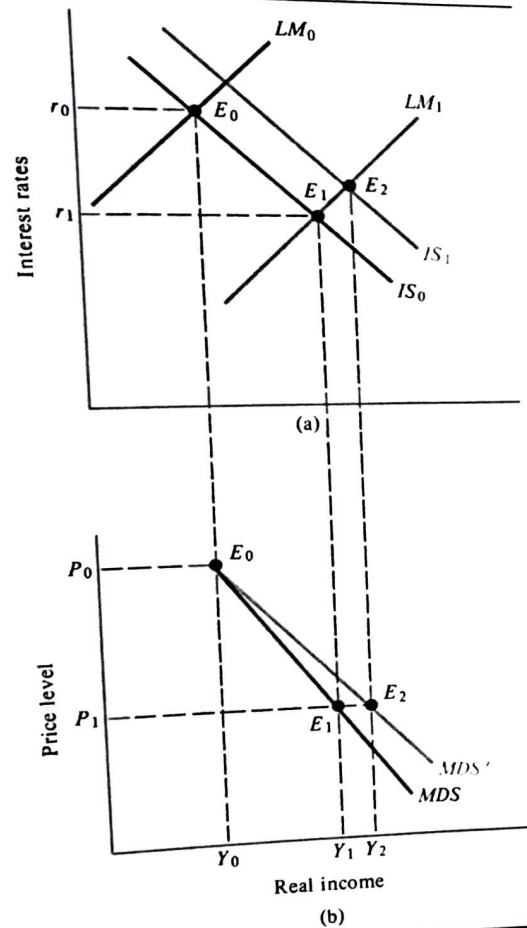

In Figure 25-2(a) we plot real income against interest rates, and in Figure 25-2(b) we plot the price level against real income. Since we wish to isolate the effect of prices alone on aggregate demand, we hold constant all other determinants of aggregate demand such as the nominal money supply, the level of government spending and tax rates, and private sector expectations of future profits and future incomes.

Suppose the economy begins with a price level P_0. Given the fixed nominal money supply, P_0 determines the real money supply and hence the position of the LM schedule, say LM_0. Given the level of government spending and all other variables relevant to aggregate demand, we can draw the IS schedule, say IS_0, showing the different combinations of interest rates and income at which planned spending on goods equals actual output of goods. Notice crucially that for the moment we continue to assume that output is demand-determined and that firms will happily produce whatever output is demanded. Exploring whether this is true is precisely where we are going to use the aggregate supply schedule later in the chapter.

As we saw in the previous chapter, planned spending on goods equals actual output of goods at all points on the IS schedule. And the money market is in equilibrium at all points on the LM schedule. Hence only at the intersection of the IS schedule (assumed for the moment to be IS_0) and the LM schedule (assumed for the moment to be LM_0) is the money market in equilibrium and the planned spending on goods equal to the actual output of goods. In Figure 25-2(a) this point is shown as the point E_0. Hence in Figure 25-2(b) we draw the point E_0 showing that the money market clears and that planned and actual output are equal when the price level is P_0 and the level of aggregate demand is Y_0.

Now consider a lower price level P_1. Given the fixed nominal money supply, the lower price level means a higher real money supply and shifts the LM schedule to the right from LM_0 to LM_1. At each interest rate it takes a higher income level to induce people to hold the larger real money stock.

FIGURE 25-2   THE MACROECONOMIC DEMAND SCHEDULE. For a given nominal money supply, a lower price level increases the real money supply, shifts the LM schedule to the right, and increases equilibrium income. Given the IS schedule IS_0, a fall from P_0 to P_1 induces the shift from LM_0 to LM_1, and an increase from Y_0 to Y_1. The macroeconomic demand schedule MDS shows the different combinations of prices and income at which the money market is in equilibrium and actual output satisfies the aggregate demand for goods. The relevance of IS_1 and MDS' is discussed in the text.

Since the IS schedule remains IS_0, the point E_1 in Figure 25-2(a) now shows the combination of interest rates and income at which the money market is in equilibrium, and planned spending equals actual income *and* output. In Figure 25-2(b) we draw point E_1 showing that, when the price level is P_1, the level of income at which planned spending and actual spending are equal is Y_1. This point already recognizes the adjustment in interest rates that will be required to maintain equilibrium in the money market at this income level.

By considering each possible price level in turn, and hence the corresponding real money supply and position of the LM schedule, we can trace out a whole set of points such as E_0 and E_1 in Figure 25-2(b). Joining up these points, we obtain the macroeconomic demand schedule MDS.

The *macroeconomic demand schedule* MDS shows the different combinations of the price level and real income at which planned spending equals actual output once interest rates are set at the level required to keep the money market in equilibrium.

The macroeconomic demand schedule slopes downwards because a lower price level increases the real money supply, reduces equilibrium interest rates, and increases aggregate demand. It is drawn for a given level of the nominal money supply, government spending, and all other variables relevant to the level of aggregate demand. Real changes, such as an increase in government spending, which would shift the IS schedule upwards also shift upwards the MDS. At each price level – and hence each level of the real money supply and position of the LM schedule – a higher level of government spending will increase aggregate demand and increase income in the short run. Hence the macroeconomic demand schedule must shift upwards, showing a higher income at each price level. Similarly, for each price level, a higher nominal money supply will imply an LM schedule lying further to the right and a higher level of aggregate demand and actual income. Again, the macroeconomic demand schedule will shift upwards.

The purpose of the macroeconomic demand schedule is to show how lower prices increase aggregate demand by increasing the real money supply and reducing the equilibrium interest rate. Because it is so important, we restate why we can think of it as a *demand* schedule. The schedule simultaneously incorporates two conditions. The first is that planned spending equals actual output, and the second is that interest rates have adjusted to keep the money market in equilibrium at this level of income and output. But we have not yet asked whether firms, whose aim is to choose the output level that maximizes their profits, *wish* to supply this output. For the moment we have simply assumed that firms will supply whatever output is demanded. The macroeconomic demand schedule assumes that there is no internal inconsistency on the demand side. Planned spending on goods equals actual output of goods, and demanders of goods are getting the quantities they desire. But we have still to investigate whether firms are happy to produce this output. Thus we can think of the macroeconomic demand schedule as the actual output that would satisfy aggregate demand for goods even when we take account of the induced changes in interest rates necessary to keep the money market in equilibrium at the same time.

In Figure 25-2 the macroeconomic demand schedule MDS slopes down because a lower price level shifts the LM schedule as a higher real money supply reduces interest rates. This moves us down a given IS schedule. Although this mechanism is sufficient to allow the construction of a downward-sloping macroeconomic demand schedule, we briefly examine a second mechanism which also has this effect.

The Real Balance Effect

In the last chapter we constructed the IS schedule to isolate the effect of interest rates on aggregate demand. Lower interest rates increase aggregate demand both by increasing investment demand and by shifting the consumption function upwards, through increasing the value of household wealth and also by making consumer borrowing cheaper. Here we note that consumer wealth may

increase for a reason not directly connected with the fall in interest rates, and that in consequence the consumption function *and* the IS schedule will shift upwards.

The source of this additional wealth effect is the real value of that part of household wealth held in money. A lower price level increases the value of households' real money balances, adding directly to their wealth. To distinguish this wealth effect from the wealth effect operating through the effect of interest rates on the value of bonds and company shares, we call it the real balance effect.

The *real balance effect* is the increase in autonomous consumption demand when the value of consumers' real money balances increases.

Because the IS schedule isolates the increase in aggregate demand that is due to interest rates *alone*, we must show the real balance effect as an upward shift in the IS schedule. At each interest rate, aggregate demand and output increase when real balances are higher. Figure 25-2 shows the consequence of extending our analysis to include the real balance effect. Suppose we begin as before, with the price level P_0 and the schedules LM_0 and IS_0. E_0 remains the point of equilibrium in the goods and money markets. However, at the lower price level P_1, not only does the real money supply increase and the LM schedule shift from LM_0 to LM_1, but the real balance effect shifts the IS schedule from IS_0 to IS_1. Hence the new equilibrium point is E_2, which we also plot in Figure 25-2(b).

Repeating the analysis for all price levels, we now get the macroeconomic demand schedule MDS'. It is flatter than MDS because a fall in prices increases aggregate demand not only through lower interest rates, but also through the real balance effect. Even so, the main conclusion of this section is unaffected. The macroeconomic demand schedule – the set of points at which the money market clears *and* planned spending on goods equals actual income and output – is a downward-sloping schedule relating the price level and the level of real income.

To determine which of these combinations of prices and real income will be relevant, we must now turn to the linkage between the goods and labour market which is summarized in the aggregate supply schedule.

25-2 THE LABOUR MARKET AND AGGREGATE SUPPLY

The *aggregate supply schedule* shows the quantity of output that firms wish to supply at each price level.

Since the quantity of output will depend on the quantities of inputs employed, we begin our analysis of aggregate supply by examining the labour market.

Labour Demand

Firms have a given amount of machines, buildings, and land – we shall call these resources capital – which can be combined with labour to produce output for sale in the goods market. Figure 25-3 plots the labour demand schedule *LD* showing how much labour firms demand at each real wage.
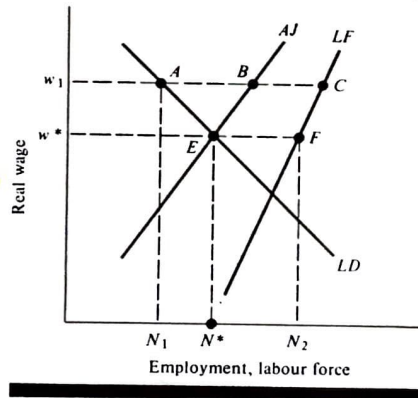
The *real wage* is the nominal or money wage divided by the price level. It shows the quantity of goods that the nominal wage will buy.

We briefly review the analysis of Chapter 10 explaining why a fall in the real wage increases the quantity of labour demanded.

The *marginal product of labour* is the increase in output produced from a given capital stock when an additional worker is employed.

If the marginal product of labour exceeds the real wage, firms will increase profits by expanding employment, since the marginal benefit of another worker (the extra output) exceeds the marginal cost (the real wage). If the marginal product of labour is less than the real wage, firms will reduce employment, thereby avoiding the losses made by hiring the last worker whose marginal cost exceeded the marginal benefit. Hence firms maximize profits by increasing employment up to

FIGURE 25-3 THE LABOUR MARKET. The labour demand schedule *LD* shows that firms will offer more jobs the lower is the real wage. The schedule *LF* shows that more people wish to be in the labour force the higher is the real wage. The schedule *AJ* shows how many workers have actually chosen to accept a job at each real wage. At any wage, some workers are in the labour force but have not accepted a job, either because they are holding out for a better offer or because they are temporarily between jobs. Labour market equilibrium occurs at *E*, where the quantity of employment demanded by firms equals the number of jobs that people wish to accept. The horizontal distance between the *AJ* and *LF* schedules shows the level of voluntary unemployment at each wage rate. At the equilibrium wage rate the level of voluntary unemployment *EF* as a percentage of the labour force N_2 is called the natural rate of unemployment. When the real wage exceeds w^*, some people are involuntarily unemployed. They would like to take a job but can't find one. At the real wage w_1, involuntary unemployment is *AB* and voluntary unemployment is *BC*.

the point at which the marginal product of labour just equals the real wage.

With a fixed capital stock, the marginal product of labour falls as extra workers are hired. More and more workers have to share the same capital, and an extra worker can add less and less to total output. Hence firms will demand a higher quantity of labour only if the real wage falls to compensate for the reduction in the marginal product of the last worker when more workers were employed. Thus Figure 25-3 shows a down-sloping *LD*

schedule for a given capital stock. An increase in the capital stock would shift the *LD* schedule upwards. At any real wage, firms could take on more workers until marginal product of labour was reduced to equal that real wage. Hence firms would demand more labour at each real wage.

Labour Supply

We must distinguish between the people wishing to register as being in the labour force and the people who actually have accepted a job.

The *registered labour force* is the number of people registered as wishing to work. It is the number of people in employment *plus* the *registered unemployed*, those without a job who are registered as seeking a job.

In Figure 25-3 the upward-sloping schedule *LF* shows that more people join the labour force as the real wage increases. Being in the labour force has certain costs. People have to commute to work or spend time job hunting. Either way, they must give up leisure, and possibly hire babysitters or buy special clothing. As the real wage rises, more people will find it worthwhile to enter the labour force in search of a job. We discussed the decision to join the labour force in detail in Chapter 10.

The schedule *AJ* shows that as the real wage rises more people will accept jobs. In part this is because there are more people in the labour force looking for jobs, but we show the *AJ* schedule getting closer to the *LF* schedule as the real wage increases. For a given level of unemployment benefit, a higher percentage of the labour force are likely to accept jobs the higher is the real wage relative to the level of unemployment benefit.

The horizontal distance between the job acceptances schedule *AJ* and the labour force schedule *LF* shows how many people are unemployed because they are refusing to accept jobs at that real wage even though they are in the labour force and registered as seeking employment. Some people will inevitably be in between jobs. They will be temporarily unemployed in a world where the pattern of employment is continually changing. Others may have been tempted into the labour

force at a particular wage rate in the hope of finding an unusually good employment offer which pays more than the average wage. They are still searching for better offers.

Other things equal, we expect an increase in the population of working age to shift both the *LF* and the *AJ* schedules to the right. At any real wage, more people will enter the labour force and more will accept jobs. An increase in the real level of unemployment benefit will shift the *AJ* schedule to the left since people in the labour force can now be more choosy about which job offer to accept. In the UK, people whose income from whatever source falls below a national minimum are entitled to draw supplementary benefit to restore their income to this minimum level. An increase in supplementary benefit will shift the *LF* and *AJ* schedules to the left. Working is now less attractive relative to not working and fewer people will join the labour force or accept job offers.

Labour Market Equilibrium

In Figure 25-3 labour market equilibrium occurs at the real wage w^*. The quantity of employment N^* that firms demand equals the number of people wishing to take jobs at the real wage w^*. Everyone who wants a job at this real wage has found a job. Although we call this position the *full-employment equilibrium*, registered unemployment is not zero. Figure 25-3 shows that *EF* people are registered as unemployed. They want to be in the labour force but do not want a job at this real wage.

The *natural rate of unemployment* is the percentage of the labour force that is unemployed when the labour market is in equilibrium. They are *voluntarily unemployed* because they choose not to work at that wage rate.

At any real wage above w^* some people are *involuntarily unemployed*.

People are *involuntarily unemployed* when they would like to work at the going real wage but cannot find a job.

At the real wage w_1 there are thus two kinds of unemployment. A number of workers *AB* are

involuntarily unemployed. They would like to accept jobs but firms are only offering N_1 jobs at this real wage. In addition a number of workers BC are voluntarily unemployed. The real wage w_1 has tempted them into the labour force, perhaps in the hope of securing an unusually good offer in excess of w_1, but they are not actually prepared to take a job at the wage rate w_1.

When the labour market clears at the real wage w^*, employment can be increased only if firms are prepared to take on more workers at each wage rate (a rightward shift in the labour demand schedule) or if workers are prepared to work for lower wages (a rightward shift in the job acceptance schedule). Moreover, since the AJ schedule is probably quite steep in practice, the main consequence of a rightward shift in labour demand will probably be to bid up the equilibrium real wage rather than to increase equilibrium employment by very much. In contrast, when the real wage exceeds w^* and there are involuntarily unemployed workers, an increase in labour demand will lead to an increase in employment without increasing the real wage. In Figure 25-3 would be happy to the number of workers AB would be happy to work at the real wage w_1 if only firms were offering more jobs.

Money Wages, Prices, and Real Wages Figure 25-3 says that it is *real* and not *money* wages that matter in the labour market. Real wages tell firms the cost of a worker relative to the extra output that he or she can produce, and real wages tell households how many goods they can buy if they supply their labour. If all prices and all money wages double, nothing real changes. Workers can still buy as many goods with their wage income and firms' money wage costs have risen exactly in line with their output prices. Firms and workers who recognize that it is real wages that matter are said not to suffer from money illusion.

Money illusion exists when people confuse nominal and real variables.

Suppose all wages and prices double. If firms reduce employment because *money wages* have risen, they are suffering from money illusion. In

fact, real wages are no higher than before. Any time people respond to changes in nominal values rather than real values there is money illusion.

If prices and money wages are fully flexible, real wages are also fully flexible. In the classical model this means that the labour market is *always* in equilibrium. Any excess supply of labour or demand for labour will (instantaneously) bid real wages back to their equilibrium level. Combining the assumption of full flexibility with the assumption of an absence of money illusion has two strong implications. First, only real changes (a higher capital stock, higher population, etc.) shift labour demand and supply schedules and alter the equilibrium real wage. Hence any price increase must *not* caused by a shift in these schedules must be matched by an equivalent change in money wages to leave real wages at their unchanged equilibrium level. Second, because real wages are unchanged, equilibrium employment must also be unchanged. We now develop these two points which are central to the classical model of output determination.

Suppose that output prices double but neither the labour supply nor labour demand schedules shift. At the original money wages the real wage has now been halved. Hence there is excess demand for labour which bids up the money wage as firms compete for scarce workers. Only when the money wage doubles will real wages be restored to the equilibrium level and excess labour demand be eliminated. But at that point, employment also will have returned to its equilibrium level. Thus, if neither the labour supply nor the labour demand schedules shift, and if wages are instantly and fully flexible, a change in prices will be instantly matched by a change in money wages precisely because both firms and workers care about real wages rather than money wages. And prices will have no effect on either the real wage or the level of employment. This is the strong result obtained in the classical model.

Employment, Output, and Prices

The last step on the supply side is to link employment, output, and prices. In the classical

model, where both prices and money wages are flexible, real wages adjust to keep the labour market in equilibrium continuously. Employment is always at its full-employment level, where nobody is involuntarily unemployed. And this employment level is unaffected by changes in prices in the absence of any real shocks to the labour market.
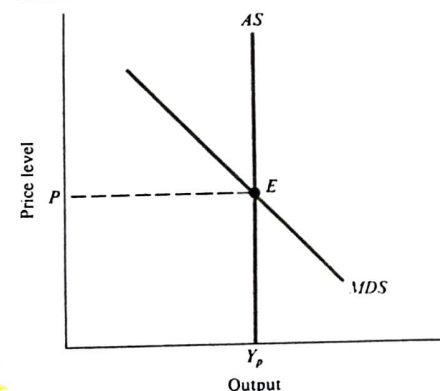
Together with the existing capital stock, this full-employment level determines the quantity of output firms are willing and able to produce. *Potential output* is the output produced when labour is fully employed. Since the level of full employment is unaffected by changes in prices alone, we conclude that the level of output supplied by firms must also be independent of prices alone. Firms always supply full employment output or potential output in the classical model. In Figure 25-4 we show this result as a vertical aggregate supply schedule at the level of potential output Y_P.

The *aggregate supply schedule AS* shows the quantity of output firms wish to supply at each price. In the *classical model* there is no money illusion and money wages are flexible. The quantity of output supplied is then independent of prices, and the aggregate supply schedule is vertical at the level of potential output.

Before reading the next sentence, explain to yourself why in the classical model a fall in prices does *not* result in a reduction in the output that firms wish to supply. The answer? Beginning from labour market equilibrium, a fall in prices with a given money wage would increase the real wage, causing excess labour supply. Flexible money wages are immediately bid down until the real wage is restored to its equilibrium level and the excess supply is eliminated. Thus employment remains at its full-employment level and output at the potential output level.

Full wage flexibility is the critical assumption. Later in the chapter we examine how realistic an assumption it is.

FIGURE 25-4 FULL EQUILIBRIUM IN THE CLASSICAL MODEL. With flexible wages and prices, the real wage always adjusts to maintain full employment in the labour market. Given this labour input, firms produce potential output Y_P. The classical aggregate supply schedule AS is vertical at Y_P. Any change in prices is immediately reflected in a change in wages to maintain equilibrium real wages, full employment, and potential output. The macroeconomic demand schedule MDS shows points at which money demand equals money supply and planned spending on goods equals actual output. Hence, at E the markets for labour, goods, and money are all in equilibrium. The equilibrium price level is P, determined jointly by aggregate supply and macroeconomic demand.

25-3 THE EQUILIBRIUM PRICE LEVEL

We have developed the macroeconomic demand schedule MDS and, for the classical model, the vertical aggregate supply schedule AS. Figure 25-4 shows that these two schedules intersect at E: output is at its potential level and the equilibrium price level is P.

The *equilibrium price level P* does a lot of work. It clears the markets for goods, labour, and money. The labour market is in equilibrium anywhere on the classical aggregate supply schedule. But at E we are also on the macroeconomic demand schedule along which the money market clears

and aggregate demand for goods equals the actual output of goods.

Suppose prices were higher than P. The real money stock would be lower and interest rates higher. Hence aggregate demand would be lower. At any price above P, firms could not sell the output Y_p they wish to produce. In the classical model, firms immediately cut prices to eliminate excess demand. In so doing, they increase the real money supply, lower interest rates, and boost aggregate demand until they get back to equilibrium at E again. Conversely, if prices were below P, real money supply would be higher, interest rates lower, and aggregate demand would exceed potential output. Excess demand would bid up prices and return the economy to equilibrium at the point E, at the equilibrium price level P. Given this price level, we can calculate the money wage level that secures the real wage required for equilibrium in the labour market.

What Determines Prices?

The equilibrium price level P depends on a number of factors reflected in the positions of the macroeconomic demand schedule and the aggregate supply schedule. On the supply side, the level of potential output Y_p depends chiefly on the labour supply and demand schedules that determine the equilibrium level of employment. If more workers want to work at each real wage, the labour supply schedule shifts to the right and the equilibrium level of full employment and potential output increases. Similarly, if firms have a larger capital stock, the marginal product of labour will rise at each level of employment, shifting the labour demand schedule to the right and increasing the level of equilibrium employment and potential output. Thus an increase in the willingness to work, or an increase in the stock of capital available, will increase potential output, shift the aggregate supply schedule to the right in Figure 25-4, and reduce the equilibrium price level. Lower prices boost aggregate demand in line with the increase in the potential output that firms wish to supply.

Although we have seen that many factors can affect the macroeconomic demand schedule, we concentrate on those directly under government control. Other changes may be analysed in a similar manner. Under Keynesian assumptions, with prices given and output determined *only* by demand, we showed in the previous chapter that an increase in the nominal money supply, or in the level of government spending, boosts aggregate demand and increases output. We now show that the situation is very different under the assumptions of the classical model.
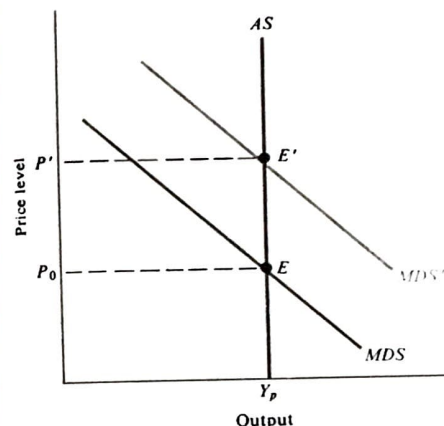
25-4 MONETARY AND FISCAL POLICY

Movements along the macroeconomics demand schedule show how changes in prices alter the real money supply, thus changing aggregate demand both by altering the interest rate and through the real balance effect on consumption demand. But changes in the nominal money supply, or in fiscal policy, *shift* the macroeconomic demand schedule by altering the level of aggregate demand at each price level.

Monetary Policy

Suppose the economy begins in equilibrium at point E in Figure 25-5 and that the nominal money supply is now doubled because the central bank purchases government securities through an open-market operation. At each price level, the real money stock is now higher than before and the macroeconomic demand schedule shifts upwards from MDS to MDS'. At each price level, interest rates are lower and there is also a real balance effect on consumption.

The new equilibrium point is E'. When all wages and prices have adjusted, the only effect of an increase in the nominal money supply is to increase the price level. There is no effect on output, which remains Y_p since the classical aggregate supply schedule is vertical. We can be even more specific. When the nominal money supply doubles, the macroeconomic demand schedule in Figure 25-5 must shift up from MDS

FIGURE 25-5 MONETARY AND FISCAL EXPANSION. The macroeconomic demand schedule is drawn for a given nominal money supply and a given fiscal policy. A doubling of the nominal money supply increases aggregate demand at each price level, shifting the macroeconomic demand schedule from MDS to MDS'. Since the equilibrium point moves from E to E', in the classical model an increase in the money supply leads to higher prices but not higher output, which remains Y_p. In fact, if nominal money doubles, equilibrium prices must also double. Only then is the real money supply unaltered. Since interest rates are unaltered, aggregate demand will remain exactly Y_p as required. Fiscal expansion also shifts the macroeconomic demand schedule upwards. Since output supply remains Y_p, in the classical model prices must rise just enough to reduce the real money supply and increase interest rates enough to completely crowd out private expenditure, leaving aggregate demand unaltered at Y_p.

to a position MDS' such that the equilibrium price level exactly doubles in moving from P_0 to P'. Why?

With a vertical supply schedule, real aggregate demand must remain unchanged at Y_p in the new equilibrium. This can happen only if the *real* money supply also remains unchanged. Otherwise interest rates would change, thus affecting aggregate demand. There would also be a real balance effect on consumption if the real money balances of households changed.

In the classical model, a change in the nominal money supply leads to an equivalent percentage change in nominal wages and the price level. The real money supply, interest rates, output, employment, and real wages are unaffected.

This proposition, that changes in the nominal money supply lead to changes in prices and wages, rather than to changes in output and employment, is one of the central tenets of the group of economists called *monetarists*. Figure 25-5 shows that the proposition is correct in the classical model in which there is full wage and price flexibility and an absence of money illusion.

It is helpful to spell out the process through which the economy adjusts (instantaneously in the classical model) from point E to point E' when the nominal money supply is increased. Beginning from E, where the price level is P_0, an increase in the nominal money supply increases the real money supply, lowers interest rates, and increases aggregate demand. Aggregate demand exceeds potential output but firms wish to supply Y_p whatever the price level. Excess demand for goods instantaneously bids up the price level until equilibrium is restored. Higher prices have offset the initial increase in the nominal money supply. The real money supply and interest rates have returned to their original level. And in the labour market, higher money wages have matched the increase in the price level, maintaining real wages at their original level. The economy has returned to full employment and potential output. In the classical model all these adjustments happen instantaneously.

Fiscal Policy

Figure 25-5 may also be used to examine the effect of a fiscal expansion. At each price level, and the corresponding value of the real money supply, an increase in government spending (or a cut in taxes) will increase aggregate demand, shifting the macroeconomic demand schedule from MDS to MDS'. Again, since the classical aggregate supply schedule is vertical, the consequence of fiscal expansion must be a rise in prices from P_0 to P'.

but not an increase in output, which remains at its full-employment level Y_p.

The impact of the fiscal expansion is to increase aggregate demand if prices remain unchanged. But since firms wish to supply potential output, there is excess demand. Prices are bid up (instantaneously) until excess demand for goods is eliminated. Since firms wish to supply Y_p whatever the price level, higher prices must eliminate excess demand entirely by reducing the demand for goods. With a given nominal money supply, higher prices reduce the real money supply, drive up interest rates, and reduce private expenditure on consumption and investment. When aggregate demand has fallen to its full-employment level again, full equilibrium is restored. The economy has higher prices and nominal wages, a lower real money stock, and higher interest rates. Government spending is higher but private consumption and investment are sufficiently lower that aggregate demand remains at its full-employment level. The increase in government spending is exactly offset by a reduction in private expenditure on consumption and investment.

> An increase in government spending *crowds out* an equal amount of private expenditure in the classical model, leaving aggregate demand unaltered at the level of potential output.

There is a subtle difference between partial crowding out in the Keynesian model and this complete crowding out in the classical model. In the Keynesian model discussed in the previous chapter, prices and wages were fixed and output was demand-determined in the short run. Although the nominal and real money supplies were both fixed, an increase in government expenditure bid up the equilibrium level of interest rates through its effect on aggregate demand and actual output. Higher output increased the demand for money and required a higher interest rate to maintain money market equilibrium. In turn, the higher interest rate reduced consumption and investment demand and partly offset the expansionary effect of higher government spending on aggregate demand and output.

In the classical model the mechanism is quite different. Now it is full employment aggregate supply that is the binding constraint. Whenever aggregate demand does not equal the potential output that firms wish to produce, excess supply or demand for goods will alter the price level and the real money supply until aggregate demand is restored to its full-employment level. Hence an increase in government expenditure (in real terms) must reduce consumption and investment together by exactly the same amount (in real terms). That is the implication of saying that aggregate demand $C + I + G$ remains equal to the constant level of aggregate supply Y_p.
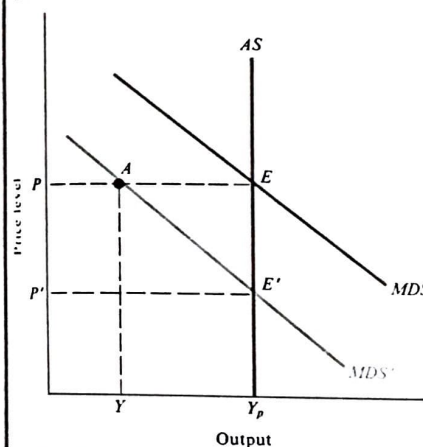
A Moment for Perspective

Before proceeding, it is worth stopping for a moment to take stock. Figure 25-6 is useful. Suppose the economy begins with the macroeconomic demand schedule MDS and is in full equilibrium at the point E. There is now a downward shock to aggregate demand, say because firms get pessimistic about future profits and reduce investment demand, or because consumers get pessimistic about future incomes and reduce consumption demand. Hence the macroeconomic demand schedule shifts down from MDS to MDS'.

In the classical model, prices fall from P to P'. There is a corresponding fall in money wages to maintain real wages at the full-employment level. Lower prices increase the real money supply. The real balance effect on consumption, together with the lower interest rates required to induce people to hold the larger real money supply, increase aggregate demand again. They completely offset the initial downward shock to aggregate demand, restoring it to Y_p. The new equilibrium is at E'.

In contrast, the Keynesian model assumes that wages and prices are fixed. Beginning from equilibrium at E, the downward shift in the macroeconomic demand schedule leads to a new equilibrium at A, with the price level still at P. This is an equilibrium in the sense that the money market clears and that planned spending on goods equals actual output of goods. But it is not a *full*

FIGURE 25-6 KEYNESIAN AND CLASSICAL MODELS COMPARED. The economy begins in equilibrium at E. Given a downward shock, the macroeconomic demand schedule shifts from MDS to MDS'. In the classical model prices fall from P to P' to keep aggregate demand equal to potential output. Money wages fall to maintain equilibrium real wages in the labour market. In the Keynesian model, the failure of prices and wages to adjust leads to equilibrium at A. The money market clears and planned spending on goods equals actual output. But this is less than the output that firms wish to supply. And with lower output and employment, but unchanged real wages, there is involuntary unemployment. Output and employment are demand-determined. Fiscal and monetary policy can shift the demand schedule upwards from MDS' to MDS. In the classical model this leads only to higher prices and higher money wages, a move from E' to E. In the Keynesian model it leads to an expansion of output and employment, a move from A to E.

equilibrium. Suppliers would really like to be producing Y_p but are only producing Y. Output is demand-determined.

What happens next in this story? One of two things. First, a Keynesian government may adopt an expansionary fiscal or monetary policy to shift the macroeconomic demand schedule up from MDS' to MDS, in which case suppliers will happily produce the extra output, taking them back on to

their desired supply curve. Income will increase from Y to Y_p. Fiscal or monetary policy will be capable of increasing output precisely because the economy had spare resources at point A. Suppliers were producing less than they wished. In consequence, they were demanding less labour than households wished to supply. At point A there was involuntary unemployment in the labour market, since the quantity of employment had been reduced but the real wage had remained unchanged.

Alternatively, in the absence of a government boost to aggregate demand, it is possible that firms will begin to cut prices to try to raise output towards the level they would like to produce, and that workers will accept nominal wage cuts as involuntary unemployment puts downward pressure on wage rates. Thus it is possible that the economy will gradually drag its way down the schedule MDS' from point A to point E', where full employment and equilibrium in all markets are restored.

Thus, on the one hand the classical model asserts that these price and wage adjustments happen immediately, or at least sufficiently quickly that, for the purpose of practical analysis, we can ignore the short time interval during which this adjustment occurs. On the other hand, the extreme Keynesian model assumes that, in spite of the fact that at point A firms are not selling as much output as they wish and workers are not finding as many jobs as they wish, there is nevertheless no downward movement of prices and wages.

Viewed in this way, we can regard the Keynesian story as describing the behaviour of the economy in the short run, before prices and wages have time fully to adjust, and the classical story as describing the behaviour in the long run, after all wages and prices have had time to adjust. The crucial issue is how quickly this adjustment takes place in practice. The analysis of this issue is the focus of the rest of the chapter. How quickly does the classical long run become relevant?

Before leaving Figure 25-6 we should note two final points. First, there is no disagreement between the Keynesian model and the classica

model about the fact that monetary and fiscal policy can shift the macroeconomic demand schedule. Expansionary policies shift the schedule upwards. In the Keynesian model the economy has spare resources which the expansion can mop up; below full employment, output is demand-determined. In contrast, in the classical model we are always at full employment; the aggregate supply schedule is vertical at this output, and the only consequence of expansionary policy is to bid up prices to knock out the effect of the expansion on aggregate demand and maintain demand at the level of potential output Y_p.

Finally, in the classical model in which output is always Y_p, the way for the government to increase output and employment is not to adopt demand management policies to boost demand, but to adopt supply-side policies to boost full employment output.

Supply-side economics is the pursuit of policies aimed not at increasing aggregate demand but at increasing aggregate supply.

Supply-side policies include measures such as cutting the rate of income tax (designed to increase households' willingness to work), increasing the level of equilibrium employment in the labour market, and shifting the aggregate supply curve for goods to the right. We discuss such policies in detail in the next chapter, when we examine employment and unemployment in greater detail.

For the remainder of this chapter we focus on the adjustment process by which the economy responds to an initial shock. how does the economy make the transition from the Keynesian short run, before prices and wages have time to adjust, to the classical long run, in which all prices and wages have fully adjusted and full equilibrium in all markets has been restored?

25-5 THE LABOUR MARKET AND WAGE BEHAVIOUR

In modern industrial economies such as those of the UK, Western Europe, and the United States, downward shocks to aggregate demand are followed by periods of unemployment that can be severe and persistent. Recessions are usually measured in years rather than weeks or months. Although the classical model is a useful guide to the long-run equilibrium to which the economy is adjusting, that adjustment can be slow and painful.

Adjustment is not immediate because prices and wages do not leap immediately to their new long-run equilibrium positions as the extreme classical model suggests. But why don't they? We must now come to grips with how wages and prices are actually set in the short run. Since firms must cover their costs of production, and since wages are usually the most important component in these costs, it is sluggish wage adjustment that is the most likely cause of a slow adjustment of prices to changes in aggregate demand. Thus we begin by examining how wages are actually set in the labour market.

To examine wage-setting behaviour we must think about the general relationship between firms and their workforces.

Long-term Job Commitments

From the viewpoint of both firms and workers, a job is typically a long-term commitment. For the firm, it is expensive to hire and fire workers. Firing an existing worker usually means a severance or redundancy payment. It also means the loss to the firm of whatever special expertise the worker has built up on the job. Hiring a worker means advertising, interviewing, and training the new worker in the special features of work within that firm. Thus, firms are reluctant to hire and fire workers merely because of short-term fluctuations in demand and output.

From the worker's viewpoint, looking for new jobs is costly in time and effort. It can also mean beginning from scratch, throwing away experience, seniority, and perhaps the high wages that go with the high productivity that comes from having mastered a particular job in a particular firm. Like firms, workers are concerned with long-term arrangements. Since both firms and workers view job arrangements as long term, both want to reach some explicit or implicit understanding about the terms of work. This includes agreement about wages and how to handle fluctuations in the output produced by the firm.

Adjustments in Labour Input

A firm and its workers have *explicit* or *implicit labour contracts* specifying working conditions. These include normal hours, overtime requirements, regular wages, and pay schedules for overtime work. It is then up to the firm to set the number of hours, within the limits of these conditions, depending on how much output it wishes to produce in that week.

The firm's *labour input* is the total number of labour hours it employs in a given period. Labour input may be changed by changing the number of hours worked by a given number of people, by changing the number of workers employed to work a given number of hours, or by some combination of the two. When the firm wishes to change its output, and hence its labour input, how does it choose whether to change the hours worked or the number of workers it employs?

Suppose the demand for a firm's output falls. Given the costs of hiring and firing labour, in the short run the firm's first reaction will be to abolish overtime and try to get by with the same labour force but a shorter working week. Factories may even close before the end of a normal working day. If demand does not recover, or declines still more, firms may then lay off some of their workers.

A *lay-off* is a temporary separation of workers from the firm.

Workers are made unemployed but they are not fired. Given their skills specialized to that firm, there is a mutual understanding that the workers will be rehired when demand improves. The layoff makes sense for the firm, which does not lose its skilled workers for ever, and makes sense for the workers, who need not look for jobs in which they will have to start learning skills from scratch. But when the firm finally concludes that demand prospects are poor, it may make workers redundant, or fire them permanently.

Conversely, during a boom a firm's first reaction will be to get its existing workforce to work overtime. Then it may seek temporary workers to supplement the existing labour force. Only when the firm is confident that higher sales can be sustained is it likely to embark on a major recruiting programme. We now discuss the implications of this pattern of hours and employment adjustment for wage settlements.

Wage Adjustment

In modern industrial economies, wages are not set in a daily auction in which the equilibrium wage clears the market for labour. We have explained that firms and workers both stand to gain by reaching long-term understandings. To some extent this mutual commitment insulates a firm and its workforce from conditions in the labour market as a whole.

Nor can a firm and its workforce spend every day haggling about terms and conditions of employment. Bargaining is a costly process, using up valuable time which workers and managers could have been using to produce and sell output. Although there may be regular meetings to deal with minor grievances, in practice the costs of bargaining about the firm's general wage structure mean that such negotiations can be undertaken only infrequently. In the UK this usually means once a year. In the United States many bargains are for a three-year period.

The existence of bargaining costs (which may include the use of strikes initiated by the workforce or lock-outs initiated by the managers) provides a microeconomic rationale for wage changes only at discrete intervals. The macroeconomic consequence is that immediate wage adjustment to demand shocks is ruled out. At best, many firms will have to wait until the next scheduled date for a revision in the wage structure. In practice, complete wage adjustment is unlikely to take place even then. We now examine some of the reasons why adjustment is even more sluggish.

Suppose there is a fall in aggregate demand and some firms have made workers unemployed.

Other firms may still be doing all right. Merely because there is a pool of involuntarily unemployed workers prepared to work at, or perhaps even below, the going wage it does not mean that all firms will use this excuse to reduce wages. First, a new worker is a poor substitute for an existing worker familiar with the job and the firm. Second, and of greater importance, long-term co-operation between a firm and its workforce is more important than short-term gains from forcing wages down a little. The reputation of a firm as an employer is an important determinant of the firm's ability to attract and retain its skilled workers in the long run.

If its existing labour force dislikes fluctuations in the wage rate, the firm will have an incentive to smooth out wages in the long run to keep its labour force happy. The firm will lose out in the times when it would like to be cutting wages, but it will correspondingly gain in the times when demand is high and labour market pressures are tending to raise wages. Thus, firms and workers may reach an implicit understanding that wages will neither be drastically cut during slumps nor drastically raised during booms.

In Section 10-7 we discussed other reasons why involuntary unemployment might not be immediately eliminated by instantaneous wage adjustment. We grouped these arguments under the headings of trade union effects, the effect of scale economies, insider–outsider effects, and arguments based on efficiency wages when information on worker quality and effort is expensive for the firm to collect. If you do not recall these arguments in detail, we strongly suggest that you

go back to Section 10-7 before continuing with this chapter.

Recap

Table 25-1 summarizes our discussion and provides a road map for the rest of the chapter. The table lays out the labour market adjustment in the short run, the medium run, and the long run. Based on our own reading of the empirical evidence, we also give our view about how long each of these 'runs' might be. We suggest three months for the short run, one year for the medium run, and four to six years for the long run. We should emphasize that it is precisely on this assessment that many macroeconomists disagree. Many modern monetarists think that adjustment will be faster than we have suggested and some modern Keynesians think it will be considerably slower than we have suggested. But the assessment of Table 25-1 corresponds to the view of a large number of mainstream economists.

The table shows, in the short run, variations in labour input largely take the form of changes in the work week, perhaps supplemented by layoffs or recalls from lay-offs. In the medium run, as changes in labour demand persist, the firm begins to alter its permanent workforce. The alternative, continuing to run a factory with large overtime or short-time working, is simply too expensive. And in the long run, adjustment becomes complete. By then, firms have fully adjusted to the new long-run equilibrium and the classical model becomes relevant.

In the short run the wage structure within a firm is largely given. The firm has a bit of flexibility

TABLE 25-1
ADJUSTMENT IN THE LABOUR MARKET

	SHORT-RUN (3 months)	MEDIUM-RUN (1 year)	LONG-RUN (4–6 years)
Wages	Largely given	Beginning to adjust	Clearing the labour market
Hours	Demand-determined	Hours/employment mix adjusting	Normal work week
Employment	Largely given		Full employment

over earnings as distinct from negotiated wage rates, because fluctuations in overtime and short time affect average hourly earnings. But this flexibility is limited. In the medium run the firm begins the process of adjusting the wage structure, and in the long run this process has been completed and the economy as a whole is back on the vertical classical aggregate supply schedule at full employment output.

Although the table suggests that firms will be slow to fire workers, the fact that firms make long-run decisions means that they will also be slow to take on new workers when demand picks up or wages are reduced. While this means that involuntary or Keynesian unemployment may be slow to build up, it also means that it is not quickly eliminated once it has built up.
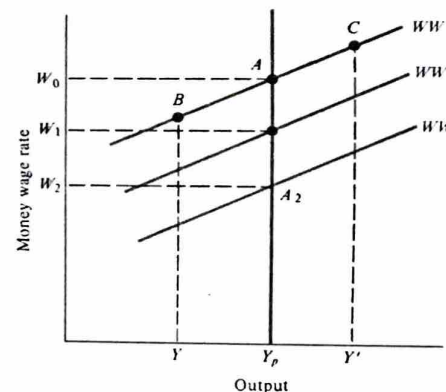
Having examined behaviour in the labour market, we turn now to the link between the labour market and the goods market.

25-6 WAGES, PRICES, AND AGGREGATE SUPPLY

Figure 25-7 shows the implications of our discussion of short-term wage adjustment. Suppose the economy begins in full employment at the point A. In the short run there is a very flat wage schedule WW. If firms wish to produce more output, their first reaction will be to use overtime payments to get more labour input out of their existing labour force, producing at a point such as C. Conversely, if demand for their output falls, firms will initially meet this reduction in demand and output by reducing the working week, ending overtime, and slightly reducing hourly earnings in consequence. Faced with this reduction in demand, the short-term response will be to produce at a point such as B.

If demand does not pick up, in the medium run firms will begin making workers unemployed and cutting wages. However, wage rates are unlikely to be reduced all the way to W_2, the level we assume would restore full employment in the classical long run. Rather, in the medium run there will be partial adjustment, say to the wage schedule

FIGURE 25-7 WAGE ADJUSTMENT. Beginning at the full employment point A, there is a short-run money wage schedule WW along which output changes are met primarily by changing hours of work and overtime bonuses. A permanent fall in aggregate demand initially will be met by a move from A to B. Output is cut and short-time working introduced. As time elapses, workers are fired and wage adjustment begins. The new wage schedule is WW_1. Since wages have not fallen enough to restore full employment, the economy is at a point on WW_1 to the left of Y_p. Only in the long run do money wages and prices fall enough to restore aggregate demand and attain full employment and potential output, at the point A_2. Temporary fluctuations in demand around full employment will then be met by movements along WW_2 and will be reflected chiefly in temporary fluctuations in hours worked.

WW_1. As we shall shortly explain, lower wages will allow lower prices, and this will partly restore the level of aggregate demand by increasing the real money supply and reducing interest rates. But sluggish wage adjustment implies that this adjustment will not be accomplished fully in the medium run. Hence firms will still be producing an output below potential output Y_p.

Only in the long run is the wage schedule finally reduced to WW_2. Now, wages and prices have fallen sufficiently to increase the real money supply and lower interest rates to the extent

demand lies below the level of potential output. In the short run, firms are on their short-run supply schedules producing as much as they wish, *given the inherited level of money wage bargains.*

Which market is not clearing in the short run? The labour market. Sluggish wage adjustment is preventing immediate adjustment back to full-employment equilibrium. As we shall see, when aggregate demand for goods is reduced, firms cut back on the output they wish to produce and the jobs they wish to offer. Since wages do not fall immediately, there is involuntary unemployment. Until wages fall in the long run to restore full employment, there will be more people wishing to take a job than there are jobs on offer. Some people will want to take a job at the going wage but be unable to find a job. Since there is excess supply of labour at the wage rate ruling in the short run, *employment* is demand-determined in the short run. Only when wages have eventually fallen to eliminate involuntary unemployment will full employment be restored.

We can use Figure 25-9 to analyse the effect of a downward shift in the macroeconomic demand schedule. To be specific, suppose there is a once-and-for-all reduction in the nominal money supply. Initially the economy is at point E in full equilibrium, producing potential output Y_p at an equilibrium price level P. Money wages W are at the level that clears the labour market at the equilibrium real wage $w = W/P$. The point E lies on the macroeconomic demand schedule MDS along which the money market clears and actual output equals planned spending. It also lies on the long-run aggregate supply schedule which is vertical at potential output Y_p.

When the nominal money supply is reduced, there is a lower level of aggregate demand at each price level. The macroeconomic demand schedule shifts down from MDS to MDS'. In the classical model there is immediate price and wage adjustment to maintain the economy at full employment and potential output. The equilibrium price level falls immediately to P_3 and the level of money wages falls to W_3 such that the real wage W_3/P_3 remains at its unchanged full-employment level. The new equilibrium point is E_3.

The reduction in the price level from P to P_3 has just matched the reduction in the nominal money supply. The real money supply is unaltered. Interest rates are unaltered. Aggregate demand remains at its full-employment level. No real variables have changed. That is why the economy is able to remain at its full-employment position.

Now we recognize that the classical results will be valid only in the long run. Eventually the economy will move from E to E_3 in Figure 25-9, but we wish to study the adjustment process while wages, and hence prices, are slow to adjust. When the money supply is first reduced, the economy faces the short-run aggregate supply schedule SAS, reflecting the money wage settlements already in force.

In the short run, the downward shift in the macroeconomic demand schedule is met by a move from E to E'. Since firms have few opportunities for reducing costs per unit output, they will want to cut back output a lot. At E' the goods market is clearing. We are on both the demand schedule MDS' and the short-run supply schedule SAS but prices have not fallen much. Output has fallen a lot. Since money wages have not yet adjusted, *real* wages have actually risen. The money wage is unaltered and the price level is lower. Once firms start adjusting employment, they will be offering fewer jobs but more workers will want to take a job. That is why there will be involuntary unemployment.

In the medium run this starts to put downward pressure on money wages. With a lower wage settlement, firms move on to a lower short-run aggregate supply schedule, say SAS'. The goods market now clears at the point E". Lower goods prices mean that the original money wage cut turns out not to have reduced real wages so much. Some involuntary unemployment persists. But since prices are lower at E" than E', aggregate demand for goods has increased. The real money supply has begun to increase, interest rates have fallen, and the economy has moved down the demand schedule MDS', showing that output has begun to move back towards its full-employment level.

Only in the long run is full adjustment completed. Money wages have fallen in proportion the original reduction in the nominal money supply. And so have prices. The short-run aggregate supply schedule has shifted down to SAS_3 Figure 25-9 and the economy is in full equilibrium at the point E_3, lying both on the short-run and the long-run aggregate supply schedules. Prices have fallen sufficiently to restore the real money supply to its original level. Interest rates and aggregate demand have been restored to the original full-employment position. And in the labour market, the real wage has returned to its full-employment level. Involuntary unemployment has been eliminated.

Figure 25-10 shows how the decrease in the nominal money supply has affected output and prices. The economy began in full employment at E. At time t_0 there was a once-and-for-all reduction in the nominal money supply. Initially output fell sharply to Y' but then it began to move back towards its full-employment level as wage and price reductions increased the real money supply, reduced interest rates and boosted aggregate demand. Once wages and prices had fallen in proportion to the original fall in the nominal money supply, all real variables were back to their original position and full equilibrium had been restored.

Figure 25-10 provides a good way of seeing how the real world lies between the extreme simplifications adopted by the simple Keynesian model and the simple classical model. In practice, prices and wages are neither fully flexible nor fully fixed. A monetary contraction has real effects in the short run since output and employment are reduced. But after wages and prices have fully adjusted, the only consequence of a monetary contraction is a reduction in nominal wages and prices. No real variables have changed, and the economy has returned to full employment and potential output.

Similar conclusions apply in other contexts. We strongly suggest that you use a figure like Figure 25-9 to analyse for yourself the short-run and long-run effects of a once-and-for-all increase in

FIGURE 25-9 A REDUCTION IN THE NOMINAL MONEY SUPPLY. Beginning from long-run equilibrium at E, a reduction in the nominal money supply shifts the macroeconomic demand schedule from MDS to MDS'. Given the inherited money wage level, and the short-run supply schedule SAS, the goods market clears at E'. There is a large output fall, from Y_p to Y'. Since prices have fallen from P to P' but money wages are unaltered, real wages have risen. There is involuntary unemployment in the labour market. Gradually this leads to reductions in money wages. Hence the short-run supply schedule for goods shifts from SAS to SAS' and the goods market now clears at P". As money wages keep falling, the short-run aggregate supply schedule shifts down until it reaches SAS_3. Money wages have now fallen in the same proportion as the original reduction of the nominal money supply. Prices have also fallen by this proportion. Full equilibrium is re-established at E_3.
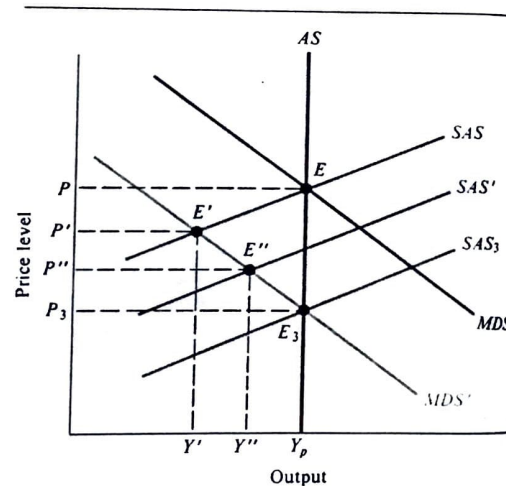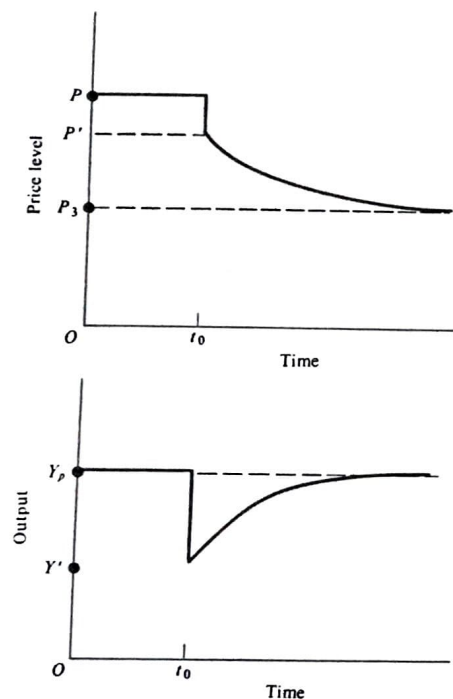
FIGURE 25-10 ADJUSTMENT PATHS FOR PRICES AND OUTPUT. The economy begins at potential output Y_p with an equilibrium price level P. At time t_0 there is a once-and-for-all reduction in the nominal money supply. In Figure 25-9 the economy moves from E to E'. Here this is shown as a fall in the price level to P' and a fall in output to Y'. Thereafter, as wages slowly fall, the price level gradually falls to its new long-run equilibrium level P_3. As the real money supply gradually increases again, output rises slowly back to its full-employment level Y_p. Employment follows a path similar to that shown for output.

the nominal money supply. Similarly, in problem 7 at the end of this chapter we ask you to analyse the effect of a change in fiscal policy.

This analysis also demonstrates the possibility of a *business cycle*. An initial expansion (a boom)

or an initial contraction (a slump) will set in motion forces that gradually reverse the initial movement and bring the economy back to full employment and potential output. But it takes time. We examine business cycles in detail in Chapter 29.
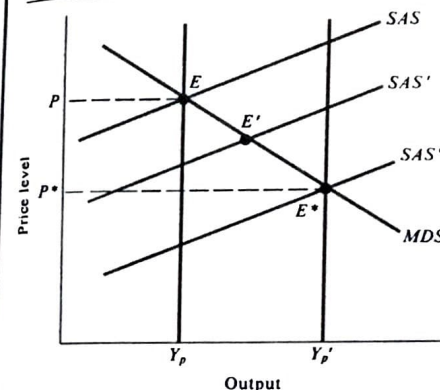
25-8 A SHIFT IN AGGREGATE SUPPLY

When aggregate demand increases and the MDS schedule shifts upwards, output and employment temporarily increase until a temporary period of inflation has reduced the real money supply sufficiently to restore aggregate demand to the level of potential output. The effect of a shift in aggregate supply is very different. Suppose a change in social attitudes towards women working leads to more people wishing to work at each real wage rate. The labour supply schedule shifts to the right, increasing the level of equilibrium employment in the long run. Figure 25-11 shows this as an increase in potential output from Y_p to Y'_p.

Until this pool of extra labour starts to reduce wage settlements, there will be no effect on the short-run aggregate supply schedule. Beginning from the point E, the schedule remains SAS in the short run. Prices, output, and employment are unaffected. Since more people wish to work, recorded unemployment will rise.

Over time, this will put downward pressure on wages, and the short-run aggregate supply schedule will shift from SAS to SAS'. With lower wages and prices, the real money supply and aggregate demand will increase and the new equilibrium point will be E'. Unemployment has been reduced but not eliminated. Only in the long run do wages and prices fall sufficiently to establish equilibrium at point E^*. At this point, output and employment are permanently higher, and prices are permanently lower than at the original equilibrium point E.

Table 25-2 summarizes the important differences in the way the economy reacts to a supply shift and a demand shift.

FIGURE 25-11 AN INCREASE IN POTENTIAL OUTPUT. An increase in the willingness to work increases the level of full employment and increases potential output from Y_p to Y'_p. Beginning from E, initially there is no effect on output or prices, so unemployment increases. Gradually this leads to lower wages. The short-run aggregate supply schedule shifts from SAS to SAS' and the new equilibrium is at E'. Eventually wages fall sufficiently to shift SAS' to SAS", and full employment is attained at E^*. Prices are permanently lower and output permanently higher in the long run.

An Adverse Supply Shock

So far, wages have been the only determinant of costs, prices, and the aggregate supply schedule. We now recognize other cost items. Suppose the price of oil increases as it did in 1973 and 1979. In Figure 25-12 we begin from long-run equilibrium at E. Even with given wage rates, the schedule SAS

no longer allows firms to cover costs when oil prices increase. At any output level firms have to charge a higher price, thus passing on the increase in the price of oil inputs.

We show this as an upward shift in the short-run supply schedule, from SAS to SAS'. The new short-run equilibrium is at E'. Prices rise but output and employment fall. Higher prices reduce the real money supply and aggregate demand.

An *adverse supply shock* increases prices and reduces output in the short run.

In the long run, one of two things may happen. Figure 25-12 illustrates the case in which unemployment gradually bids down wages, the short-run supply schedule gradually shifts downwards, and the economy gradually moves down the MDS schedule back to the original equilibrium at E.
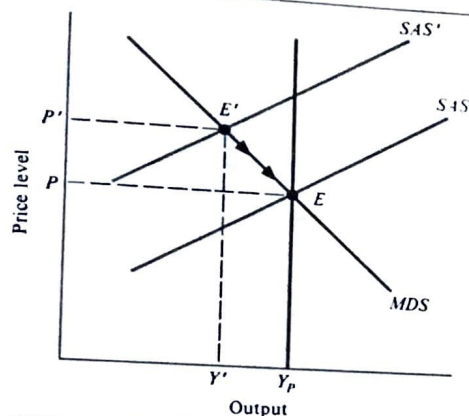
Although oil prices are permanently higher, wages and other prices have fallen sufficiently that the aggregate price level has returned to P, thus restoring aggregate demand to the level of potential output Y_p.

In practice, a second outcome is more probable. Since the price of oil has risen relative to other commodities, firms will try to get by with less oil. Since oil is one of the inputs with which labour works to produce output, labour will now have fewer materials with which to work in producing output. Thus, at each employment level the marginal product of labour is likely to be reduced. The labour demand schedule will shift downwards. Because it will now cross the labour supply schedule at a lower level of employment, full employment and potential output will be reduced. Hence a more complete analysis of an oil shock would have to take account not merely of the

TABLE 25-2

REACTIONS OF THE ECONOMY TO SHIFTS IN DEMAND AND SUPPLY

RIGHTWARD SHIFT OF:	EFFECT ON OUTPUT		EFFECT ON PRICE LEVEL	
	SHORT RUN	LONG RUN	SHORT RUN	LONG RUN
Aggregate demand	Rise	Zero	Rise	Higher
Aggregate supply	Zero	Higher	Zero	Lower

FIGURE 25-12 AN ADVERSE SUPPLY SHOCK. Higher oil prices force firms to charge more for their output. In the short run, the supply schedule shifts from SAS to SAS' and equilibrium from E to E'. Higher prices reduce aggregate demand and output falls to Y'. Unemployment gradually reduces wages and allows SAS' to shift down gradually towards SAS again.

short-term effect of higher prices in reducing aggregate demand, as shown in Figure 25-12, but also of the possibility that the level of potential output Y_p may be permanently reduced. If so, the new long-run equilibrium will occur at a point higher up the MDS schedule than point E in figure 25-11. Output will be lower and the price level higher in the long run.

A Wage Increase   Figure 25-12 can also be used to show the effect of an increase in trade union power or militancy. Beginning from E, an 'unjustified' wage increase will force firms to raise prices and will move the supply schedule from SAS to SAS'. Output will fall and unemployment increase. Gradually, this is likely to put downward pressure on wages and to allow the supply schedule to shift back to SAS again. Workers who keep their jobs during the transitional period will temporarily have higher real wages, but other workers will be temporarily priced out of a job while aggregate

demand is reduced by higher prices and a lower real money supply. Nevertheless, those who expect (correctly or mistakenly) to keep their jobs during the transitional period may succeed in outvoting the other workers and forcing the union to press for the wage increase.

25-9   THE BUSINESS CYCLE

Shifts in aggregate supply and demand generate changes in the level of output and prices and affect the inflation rate during transitional periods of adjustment. Shifts in aggregate supply and demand are thus the underlying source of the business cycle.
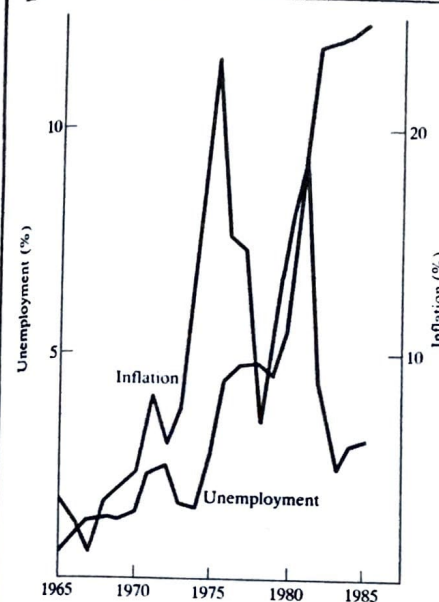
> The *business cycle* is the tendency for output and employment to fluctuate around their long-term trends.

Although the economy is continuously buffeted by small shocks, major shocks are infrequent. The UK got through the 1960s without a major supply-side shock, but in both 1973 and 1979 there were major supply-side shocks in the form of the oil price increases. In the UK the latter was exacerbated by an increase in VAT from 8 to 15 per cent, which also dramatically increased the prices that suppliers had to charge their customers.

Figure 25-13 shows that these two supply-side shocks, displayed as temporary increases in the annual inflation rate, were quickly followed by sharp rises in the unemployment rate, as Figure 25-12 predicts. But we can also identify periods in which demand-side shocks were occurring. In previous chapters we have discussed the Heath government's 'dash for growth', when monetary and fiscal expansions were undertaken during 1971–73. Figure 25-13 shows that unemployment was falling immediately prior to the first oil price shock but that prices had already started to rise quite sharply, as Table 25-2 predicts. Similarly, during 1980–82, tight fiscal and monetary policy succeeded in reducing the inflation rate slowly, but in the short run they also contributed to rising unemployment.

Thus recent economic history illustrates the

FIGURE 25-13 INFLATION AND UNEMPLOYMENT IN THE UK. (*Source: CSO, Economic Trends.*)

usefulness of the supply and demand apparatus we have developed in this chapter to analyse short-run adjustment. Of course, we could have made the theory more sophisticated, allowing for example a better understanding of the exact timing of the adjustment responses. But the big picture comes through clearly. The rates of inflation and output levels are being moved around by shifts in

aggregate supply and aggregate demand to whic the economy responds only sluggishly.

Persistent Inflation   A close look at Figure 25-1 leaves us with one remaining puzzle. Althoug swings in unemployment reflect shifts in aggregat supply or demand, there is *always* inflation Inflation slows down when unemployment is hig but prices never actually fall. Since prices ris essentially because wages rise, this means tha money wages are rising even when unemploymen is 10 per cent of the labour force. Why aren' workers taking wage cuts?

The answer in part is that they are. It is rea wages that firms and workers care about. Suppos inflation is 10 per cent. Workers need a 10 pe. cent rise in money wages just to maintain rea living standards. If workers in fact settle for 7 pe: cent wage increases when prices are rising at 1C per cent, they are taking a 3 per cent cut in thei: real wages. But to expect workers actually to cut *money* wages by, say, 5 per cent when prices are rising at 10 per cent would be to suppose that workers would accept a 15 per cent reduction in real wages in the course of a single year. In practice, the labour market rarely adjusts this quickly.

Hence, money wages continue to increase, even during a slump, because prices have been rising and are expected to continue to rise. And in seeking money wage increases that, at least in part, allow them to protect their living standards, workers reach deals with firms that ensure that wage costs will keep rising and that prices will have to be raised again. We examine the interaction of rising wages and rising prices at length in Chapter 27, where we deal explicitly with the question of inflation.

SUMMARY

1 The classical model of macroeconomics assumes full flexibility of wages and prices, and the absence of money illusion.

2 The macroeconomic demand schedule shows at each price level the level of income at which planned spending on goods equals actual output when the money market is also in equilibrium. The schedule slopes downward. Lower prices increase the real money supply, thus increasing aggregate demand both through lower interest rates and through the real balance effect on consumption.

3 An increase in the real wage increases the quantity of labour supplied but reduces the quantity of labour demanded. Since the marginal product of labour declines as employment increases, firms need a lower real wage to match the declining marginal product of labour when more workers are employed.

4 In the classical model, there is always full employment and the aggregate supply schedule is vertical at the corresponding level of potential output. The equilibrium price level is determined by the intersection of the aggregate supply schedule and the macroeconomic demand schedule. The markets for goods, money, and labour are all in equilibrium.

5 In this model, fiscal or monetary expansion cannot increase output. Rather, they increase prices until the real money supply has fallen sufficiently to restore aggregate demand to the level of potential output that firms wish to supply.

6 Supply-side economics considers how potential output can be increased by providing incentives to increase the supplies of factor inputs.

7 In practice, wages change only slowly in response to shocks since job arrangements are long term. Firms incur costs in hiring and firing, and workers lose seniority when they switch jobs and have to learn particular skills afresh. Firms and workers reach implicit understandings about terms and conditions of work.

8 In the short run, variations in labour input are met chiefly by changing hours. Only in the longer run is the quantity of workers adjusted.

9 Wage adjustment is sluggish not merely because wage bargaining is infrequent, but because workers prefer their long-term employers to smooth wages. Trade unions, scale economies, insider–outsider distinctions, and efficiency wages may all act to reduce short-run wage flexibility.

10 Prices are based chiefly on labour costs. The short-run aggregate supply schedule shows how much firms wish to produce given the wage settlement in force. Output is responsive to small price changes since small variations in overtime and other bonuses allow firms to produce the extra output at only slightly different labour costs. As wage adjustment takes place, the short-run supply schedule shifts and prices change much more.

11 Thus, in the short run prices and wages are capable only of small changes. In the long run, a period of several years, they are fully flexible. Hence the Keynesian model is a good guide to short-term behaviour but the classical model describes behaviour in the long run.

12 A shift in the macroeconomic demand schedule, whether caused by changes in private expenditure or by changes in fiscal and monetary policy, will thus affect output more than prices in the short run. But in the long run the economy returns to potential output as induced price changes alter the real money supply and the level of aggregate demand.

13 A shift to the right in the aggregate supply schedule may have little short-run effect, but in the long run output is permanently higher at the new level of potential output and prices are permanently lower, thus ensuring a corresponding increase in aggregate demand.

14 Sluggish adjustment implies that shocks to aggregate demand or aggregate supply set off a business cycle. Because shocks are irregular, the business cycle is also irregular.

KEY TERMS

Classical model	Job acceptance schedule
Wage and price flexibility	Supply-side economics
Macroeconomic demand schedule	Aggregate supply schedule
Money illusion	Lay-offs
Crowding out	Overtime and short time
Real balance effect	Short-run aggregate supply schedule
Voluntary and involuntary unemployment	Adverse supply shock
Labour force schedule	Business cycle

PROBLEMS

1 (a) Define the macroeconomic demand schedule. (b) What happens to the schedule if (i) consumers' propensity to save increases? (ii) prices fall? (iii) investment demand increases?

2 Explain how and whether an increase in the money supply affects prices and output in the classical model.