THE CLASSICAL THEORY OF THE PRICE LEVEL

THE ROLE OF THE PRICE LEVEL IN THE THEORY OF AGGREGATE SUPPLY

The classical theory of aggregate demand and supply is a complete explanation of the factors that determine the level of employment, the level of GDP, the relative price of labor and commodities (the real wage), and the prices of labor and commodities in terms of money (the nominal wage, w, and the price level, P). In this section, we fill in the remaining part by explaining how the classical theory of aggregate supply can be amended to accommodate the fact that trades take place using money as a medium of exchange. We explain the role of the price level in the theory of aggregate supply using three diagrams: the labor demand and supply diagram, the production function diagram, and the aggregate supply diagram.

THE PRICE LEVEL AND THE LABOR DEMAND AND SUPPLY DIAGRAM

Assume that the labor demand and supply decisions of households in a dynamic monetary economy are the same as the decisions that would be made in a static barter economy. This assumption, used by classical economists to simplify the theory of aggregate supply, is valid if the way that people make choices is greatly simplified. These simplifications are modified in the modern theory of dynamic equilibrium, which is discussed in Chapter 17.

In Figure 5.2, the labor demand and supply curves plot the choices of the household and the firm. In the classical model, the labor market is assumed to be in equilibrium. The real wage and the level of employment are determined by the intersection point of the labor demand and supply curves, denoted by $(w/P)^E$ and L^E , where E stands for equilibrium. The important feature of the classical analysis is that households and firms care only about the real wage because the ratio of w to P indicates how many commodities the household will receive for a given labor effort. The equilibrium values of L^E and $(w/P)^E$ depend in practice on the nature of the technology and the preferences of the households, since these features of the economy determine the positions and the slopes of the labor demand and supply curves.

THE PRODUCTION FUNCTION DIAGRAM

The second step in the classical theory of aggregate supply is to determine the supply of output. For a given level of employment, the supply of output is determined by the production function. The higher the level of employment, the greater the supply of output. Figure 5.3 reproduces the production function. The equilibrium supply of output, Y^{E} , is the amount of output that would be produced when the demand is equal to the supply of labor; that is, when the labor input is equal to L^{E} . The characteristics of the production function and the preferences of the households determine this particular output value.

Chapter 5 Aggregate Demand and the Classical Theory of the Price Level

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Part B The Classical Approach to Aggregate Demand and Supply



THE AGGREGATE SUPPLY DIAGRAM

The final step is to determine how the supply of output is related to the money price of commodities. Since the quantities of labor demanded and supplied are both determined by the real wage, there is no relationship between the price of commodities and the supply of output. In other words, a classical economy will supply exactly Y^{E} units of commodities per week, regardless of the dollar price of commodities. When the price increases the nominal wage increases proportionately, leaving the real wage, the quantity of employment, and the supply of commodities unchanged.

The diagram in Figure 5.4 illustrates the classical theory of aggregate supply by plotting the price of commodities on the vertical axis and the aggregate supply of commodities on the horizontal axis. Because there is no relationship between the price of output and the aggregate supply of commodities, this graph is a vertical line at the level of output Y^{E} . At every point on this vertical line, the quantity of labor demanded is equal to the quantity of labor supplied.

THE COMPLETE CLASSICAL THEORY OF AGGREGATE DEMAND AND SUPPLY

We have used three diagrams to show how the classical theory of aggregate supply determines the real wage, the level of employment, and the aggregate supply of output. Figure 5.5 puts these three diagrams together to illustrate how the price level, output, and



Part B The Classical Approach to Aggregate Demand and Supply

employment are determined in the complete classical system. Panel A plots the aggregate demand and supply curves on a single diagram; panel D is the labor demand and supply diagram; panel C is the production function; and panel B has a line at 45° to the axis that is used to take vertical distances from panel C and plot them as horizontal distances on panel A. We use this panel to translate the supply of output, determined by panels C and D, to the aggregate demand and supply diagram in panel A.

The following analysis explains why the aggregate supply curve is a vertical line. Beginning with panel A, pick an arbitrary value for the price of commodities. Call this arbitrary value P_1 . To find a point on the aggregate supply curve, we must find the quantity of output produced when the price level equals P_1 . We turn to panel D, the labor demand and supply diagram, to establish a value for the quantity of output supplied.

From panel D we find that at any commodity price, the equality of the quantity of labor demanded with the quantity of labor supplied will result in L^{E} hours of labor being traded at a real wage of $(w/P)^{E}$. To find the equilibrium supply of output, we may read off the quantity of GDP produced when L^{E} hours of labor are employed from the production function on panel C. The final step is to use the 45° line in panel B to translate the distance Y^{E} from the vertical axis of panel C to the horizontal axis of panel A. This step establishes that the point $\{P_{1}, Y^{E}\}$ is on the aggregate supply curve.

To find a second point on the aggregate supply curve, we could begin with a price value that is either lower or higher than P_1 . Once again, we find that the equality of the quantity of labor demanded with the quantity of labor supplied will require the household to supply exactly L^E hours of labor. The crucial point in this argument is the fact that the quantities of labor demanded and supplied depend on the real wage and not on the nominal wage or the price level. If the price level doubles, a labor market equilibrium will exist in which the nominal wage is twice as high. This equilibrium will have the same employment level and the same quantity of output supplied as the labor market equilibrium at the price level P_1 . Because the equilibrium quantity of employment depends only on the real wage and not on the price level, the assumption of labor market equilibrium generates the same supply of output for every possible value of the price level.

CLASSICAL THEORY AND THE DISTINCTION BETWEEN REAL AND NOMINAL VARIABLES

It is possible to classify all economic variables as either **real variables** or **nominal variables**. A real variable is measured in units of commodities. A nominal variable is measured in monetary units (like U.S. dollars). Table 5.1 presents an example of how to classify some of the variables we have seen so far.

An important proposition logically follows from the classical assumption that all markets are in equilibrium. In the classical model, the aggregate supply curve is vertical. A vertical aggregate supply curve implies that a fall in aggregate demand will cause a fall in the price level and leave all real variables unaffected. Since the demand for money is proportional to the demand for commodities, a 10% fall in the supply of money is predicted to lead to a 10% fall in all nominal variables, including the price level and the nominal wage. The proposition that nominal variables will move in proportion to changes in the quantity of money and that real variables will be invariant to these changes is referred to as the **neutrality of money**.

Chapter 5 Aggregate Demand and the Classical Theory of the Price Level

THE SUPER			
	Variable	Туре	Units
М	The nominal money supply	Nominal	Dollars
Р	The price level	Nominal	Dollars per commodity
w	The wage	Nominal	Dollars per hour
(w/P)	The real wage	Real	Commodities per hour
Y	Real GDP	Real	Commodities per year
PY	Nominal GDP	Nominal	Dollars per year
5	Employment	Real	Hours per year
M/P)	Real money balances	Real	Commodities

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THE NEUTRALITY OF MONEY

Figure 5.6 illustrates the response of output, employment, the real wage, and the price level to a reduction in the quantity of money, as predicted by the classical model. Suppose that the average household begins each week with \$500 cash. During the week it receives labor income and profits, and it purchases commodities from other households equal to the value of its income. In a typical week, the stock of cash held at the beginning of the week will equal the stock of cash on hand at the end of the week. Consider how this economy would respond to an exogenous event that reduced the stock of cash in circulation. In practice, there are several ways this might happen. Suppose that the government removes \$100 from the average household.¹ The week the money supply contracts, the outlays of the household will be higher than usual because it must both finance its purchases and pay \$100 to the government. If it were to maintain its normal spending pattern, the household would end the week holding only \$400 in cash. This would not be consistent with the equality of the demand and supply of money because the household requires \$500 in cash at the end of the week to meet its future need for money as a medium of exchange. In the classical economy, the household tries to return its cash holdings to normal by spending less on goods and services, but although a single household can choose to hold \$500 in cash, the economy as a whole cannot.

^{1.} In practice, most changes in the stock of money are accomplished by actions of the central bank, called *open market operations*. An open market operation involves the sale of interest-bearing bonds to the public. In return for bonds, the public surrenders some of its money to the central bank. The public ends up holding more bonds and less money.

