AGGREGATE DEMAND
AND THE CLASSICAL THEORY
OF THE PRICE LEVEL

INTRODUCTION

The classical theory of the price level is sometimes called the quantity theory of money or the classical theory of aggregate demand. It was developed in the latter part of the nineteenth century and the early part of the twentieth century, although early versions of the theory can be found in the work of David Hume, an eighteenth-century Scottish economist.

Why be interested in a theory that is now almost 200 years old? First of all, there are some questions to which the classical theory still provides very good answers. The most important of these is the classical explanation for the cause of inflation, particularly where the rate of inflation is, or has been very high, such as in Brazil, Bolivia, Argentina, or Israel. Classical theory works well in high-inflation countries for the same reason that Newton's theory of gravity works well at velocities that are well below the velocity of light. Both theories are wrong in some dimensions, but sometimes those dimensions are not important.

The second important reason for studying the classical theory is that it can help you understand how modern intertemporal equilibrium theories work. These theories build on the classical theory by being explicit about the factors that lead households and firms to vary their demands and supplies for labor through time. The classical theory makes some

unrealistic simplifications, but it is a good idea to start with simple concepts and learn about the complicated ones later.

Last but not least, learning the classical theory of aggregate demand and supply is worthwhile because the classical theory has been incorporated into the **neoclassical synthesis**, the theory used by almost all economic journalists and policymakers to understand today's economy. The neoclassical synthesis developed as economists tried to merge two alternative lines of research. One line was initiated by John Maynard Keynes, who proposed an alternative to the classical theory to explain how output and employment fluctuate during booms and recessions. A second line of analysis, called neoclassical growth theory, developed the classical theory of aggregate demand and supply, and it was used to determine the economy's long-run trend level of output. According to the neoclassical synthesis, Keynesian economics should be used to describe year-to-year fluctuations in employment, output, and inflation, but neoclassical growth theory applies in the long run.

THE THEORY OF THE DEMAND FOR MONEY

The **classical theory of the price level**, or **classical theory of aggregate demand**, is a hybrid that adds a theory of money to the classical theory of aggregate supply, which we studied in Chapter 4. To integrate money into this theory, we begin with the budget constraint of a family in a static, one-period economy, and we show how this constraint is altered when a family engages in repeated trade through time, using money as a medium of exchange.

THE HISTORICAL DEVELOPMENT OF THE THEORY

The classical theory of aggregate demand is a modern name for the **quantity theory of money**. The quantity theory of money was an attempt to explain how the general level of prices is determined. It has a long history, dating back at least as far as David Hume (1711–1776), whose delightful essay, *Of Money,* is still relevant to modern economics. Later economists who worked on the quantity theory include the American Irving Fisher (1867–1947) and the English economist Alfred Marshall (1842–1924). The approach taken in this chapter is based on Marshall's work because it was Marshall who first argued for an explicit treatment of money using the framework of demand and supply.

THE THEORY OF THE DEMAND FOR MONEY

To understand why people use money, the classical theorists extended their static theory of the demand and supply of commodities by constructing a **theory of the demand for money**. Just as a household demands goods up to the point where the marginal benefit of an additional purchase of a commodity equals its marginal cost, so the classical theory of the demand for money argues; people 'demand money' up to the point where its marginal benefit equals its marginal cost. Money is a durable good that is not consumed the way butter or cheese is consumed. Money is more like a television set or a refrigerator; it yields a flow of services over time. A television set yields a flow of entertainment services, and

money yields a flow of **exchange services** that increase the convenience of buying and selling goods. The cost of holding money is the opportunity cost of forgoing consumption of some other commodity; the marginal benefit is the additional usefulness gained by having cash on hand to facilitate the process of exchange.

Let us examine both the costs and benefits of holding money, beginning with the costs. Our first task is to show how holding money can reduce the household's ability to buy other commodities; we will examine the household's budget constraint in a monetary economy. If households continue to use money when holding money is costly, they must be gaining some benefit. The classical theorists assumed this benefit to be proportional to the volume of trade.

BUDGET CONSTRAINTS AND OPPORTUNITY COST

Money imposes an **opportunity cost** because the decision to use money reduces the resources available for other goods. In Chapter 9, we discuss the opportunities for borrowing and lending, and modify our analysis of the opportunity cost of holding money. But for the moment, we assume that money is the only asset available to households as a store of wealth. In our simple model, the opportunity cost of holding money arises from the fact that if the household chooses not to hold money, it will be able to purchase additional commodities. We will illustrate this idea by contrasting the budget constraint in a static model (in which all exchange takes place at a single point in time) with the budget constraint in a dynamic model (in which exchanges take place at different points in time). The purpose of this examination is to show how the use of money imposes a cost on consumers by reducing the resources available for purchasing other commodities.

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Budget Constraints in a Static Barter Economy

The type of economy we studied in Chapter 4 is called a **static barter economy**. The word "barter" means that commodities are directly exchanged for one another without the use of money. The word "static" means that the economy lasts for only one period of time: agents exchange labor for commodities they produce and consume, then the world ends.

We can rewrite the budget constraint faced by families in the static barter economy by measuring everything in terms of dollars instead of real commodities. Recall that P refers to the money price of commodities, and the symbol w is the money wage.

5.1
$$PY^D \quad = \quad P\pi \quad + \quad wL^S$$

| Demand for commodities | Profit | Labor income |

Equation 5.1 represents the household budget constraint in a static barter economy. In this economy, no money changes hands and no family uses money for trade, but money can be used as an accounting unit. To illustrate how this accounting device works, suppose that you offered your labor services to a farmer who owns an orchard. The farmer offers to pay you $5.00 per hour, and he sells his apples for $0.20 each. Rather than accept $5 an hour, you could well agree to accept 25 apples per hour. The real wage (w/P) in this economy is 25 apples per hour; the money wage (w) is $5.00 per hour; and the price of commodities (P) is $0.20 per apple. The budget constraint in the barter economy, given in Equation 5.1, expresses relative prices by quoting labor and commodities in terms of money, even though money is never used in exchange.

Budget Constraints in a Dynamic Monetary Economy

How would this budget constraint be altered in a world in which money *must* be used in exchange? The classical theorists argued that since the typical household does not buy commodities at the same time that it sells its labor, during an average week the household has a reserve of cash on hand to facilitate the uneven timing of purchases and sales.

Consider a household that starts the week with some cash on hand. We call this the household's supply of money. The household earns income each week and makes routine purchases, such as groceries, movie tickets, or restaurant meals. Perhaps the household is also saving a little money each week to pay for a vacation in July. Because of the coming vacation, the household ends the week holding more cash than it began with. We call the cash held at the end of the week the household's "demand for money." If we measured the cash held by this particular household, we would see that it increases steadily from August through June as the household saves for its vacation and then decreases again in July as the household spends its savings.

The economy as a whole consists of many households just like the one we described. Some of these households accumulate cash to buy cars, some pay for Christmas gifts, and others finance weddings. Because these households all plan to spend their accumulated

cash at different points in time, on average we see that the cash held across the whole economy at the end of the week is equal to the cash held at the beginning.

By separating purchases and sales at points in time, the classical theory explicitly models production and exchange as an ongoing dynamic process rather than as static episodes. To formally model this idea, we need to make a change to the household's budget constraint.

5.2
$$M^D \quad + \quad PY^D \quad = \quad P\pi \quad + \quad wL^S \quad + \quad M^S$$

| Demand for money | Demand for commodities | Profit | Labor income | Supply of money |

Equation 5.2 adds two additional terms to the budget constraint of a barter economy. M^S represents the money that the household owns at the beginning of the week; we call this the household's *supply of money* because it will be supplied by the household during the week to other households in the economy in exchange for commodities. M^D is the money that the household owns at the end of the week. We call this the household's *demand for money* because it represents cash that the household chooses to keep on hand at the end of the week—money that will be used to buy and sell commodities in the future. The supply of money owned by the household at the beginning of the week is like additional income that is available to be spent on commodities. The demand for money at the end of the week is like a demand for any other commodity because the decision to keep cash on hand from one week to the next reduces the funds that the household has available to spend on produced goods. Because the household's supply of money could be used to purchase additional commodities, the decision to hold money imposes an opportunity cost on the household. The lost opportunity that arises from holding money is the additional utility that could have been gained by purchasing additional commodities.

THE BENEFIT OF HOLDING MONEY

If households continue to hold money, and if that money imposes a cost, then money must also yield a benefit. To classical theorists, this benefit was the advantage that comes from being more easily able to exchange commodities with other households in the economy; in other words, money is a generally acceptable medium of exchange.

Consider the process of exchange in a barter economy. Suppose that an individual is a seller of good X and a buyer of good Y; we will call him Mr. Jones. For example, good X might be an economics lecture and good Y might be a haircut. In the barter economy, Mr. Jones must find a second individual, Mr. Smith, who wants both to sell good Y and to buy good X. This problem is called the **double coincidence of wants**; it implies that in a barter economy, it would be necessary for Mr. Jones, if he wants a haircut, to find a barber who wants to hear an economics lecture. Exchange is greatly simplified if everyone agrees on a commodity that they will accept in exchange, not for its own sake, but because by convention others will also accept this commodity. This is the purpose of money.

Classical theorists argued that the stock of money that the average household needs at any point in time is proportional to the dollar value of its demand for commodities. Households that purchase a higher value of commodities each week will on average need to keep more cash on hand. The constant of proportionality between the average stock of cash held by the household during the week and the value of its flow demand for commodities is called the **propensity to hold money**, and it is represented in the demand for money equation by the symbol k.

$$5.3 \qquad M^D \qquad = \qquad k \qquad \times \qquad PY^D$$

| **Demand for money** | **Propensity to hold money** | **Nominal value of commodities demanded** |

Notice that the demand for money in the classical theory is the relationship between a stock (money on hand) and a flow (weekly purchases of commodities). The theory predicts that a person who earns $200 per week will on average carry half as much cash and keep half the checking account balances as a person who earns $400 dollars per week. Because the theory describes the relationship between a stock and a flow, the constant k has units of time: the number of weeks of income that the average family carries in the form of money. Using a measure of money called $M1$ (mainly cash and checking accounts), the propensity to hold money in the postwar United States has been equal to 10 weeks (of income) on average, although k has been falling since the end of World War II.

AGGREGATE DEMAND AND THE DEMAND AND SUPPLY OF MONEY

The classical theorists used the classical theory of the demand for money to explain more than the use of cash in exchange. By putting a theory of the demand for money together with the assumption that the quantity of money demanded is equal to the quantity of money supplied, they explained the quantity of commodities demanded by households at a given price level. This relationship between the aggregate demand for commodities and the price level is called the "classical theory of aggregate demand."

FROM MONEY DEMAND TO A THEORY OF THE PRICE LEVEL

A critical step in the development of the classical theory of aggregate demand is the assumption that the quantity of money demanded is always equal to the quantity of money supplied. To understand the logic behind this assumption, suppose instead that, on average, households hold more cash each week than they need to buy and sell commodities. When a household finds that it has more money on hand than it needs, it can plan to buy more commodities than it would purchase during a normal week. But although a single household can reduce its money holdings by planning to buy more commodities, the community as a whole *cannot* reduce its money holdings in this way. Every attempt to buy a commodity by one household must necessarily lead to an accumulation in the cash held

FIGURE 5.1

The Classical Aggregate Demand Curve

The classical aggregate demand curve is a relationship between the average price of commodities and the quantity of commodities demanded.

At every point on the aggregate demand curve, the quantity of money demanded is equal to the quantity of money supplied.

$$P = \frac{M^S}{kY^D}$$

P (Price of commodities)

P^1

P^2

Y^D_1 Y^D_2

Y^D (Quantity of commodities demanded)
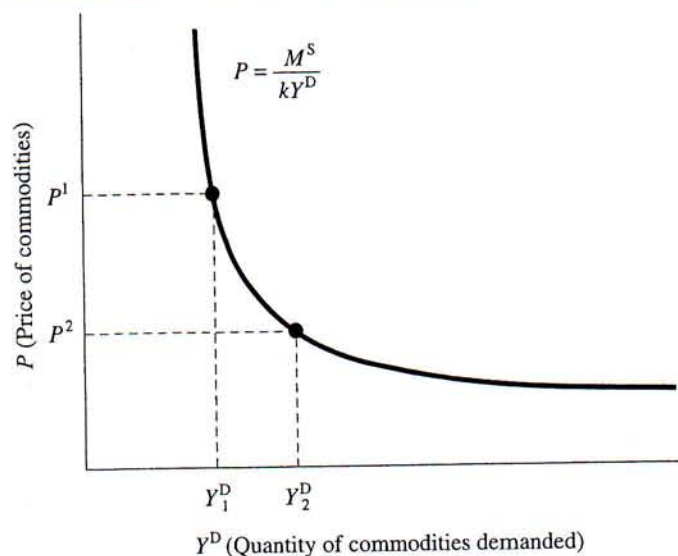
by another. For the community as a whole, the demand for money must always be equal to its supply. The fact that the demand for money must equal its supply can be used to develop a theory of how the aggregate demand for commodities varies with the nominal price. This relationship between price and the flow of GDP demanded is called the **classical aggregate demand curve.**

5.4 P $=$ $\dfrac{M^S}{kY^D}$

Price level $=$ $\dfrac{\text{Supply of money}}{\text{Propensity to} \times \text{Aggregate demand}}$
                                $\quad\;\text{hold money}\quad\;\text{for commodities}$

Equation 5.4 illustrates the classical aggregate demand curve. It is derived from Equation 5.3 by making the assumption that the demand for money is equal to the supply of money and rearranging terms to write the price level on one side of the equation. Figure 5.1 graphs this equation, plotting the price of commodities on the vertical axis and the quantity of commodities demanded on the horizontal axis. Although the graph in Figure 5.1 is called an aggregate demand curve, it is not a demand curve in the sense the term is used in microeconomic theory. It is an equation that shows how the price level would have to be related to the level of GDP if the quantity of money demanded and the quantity of money supplied were equal. As we move along the aggregate demand curve from left to right, the nominal value of GDP is constant. Since the quantity of money demanded is pro-

portional to nominal GDP, each point along the aggregate demand curve is associated with the same demand for money. The position of the curve is determined by the quantity of money demanded at each point on the curve being exactly equal to the nominal money supply. At every point on the classical aggregate demand curve, the quantity of money demanded and the quantity of money supplied are equal.

To understand why the aggregate demand curve slopes downward, suppose that the price is at P_1 and the quantity of commodities demanded is at Y_1^D. If the price were to fall to P_2, the average family in the economy would have more cash on hand than it needed to buy commodities during the week because excess dollars would now be able to finance a greater flow of transactions. Each family would try to eliminate its excess cash by planning to purchase additional commodities. Thus, the economy experiences an increase in the aggregate quantity of commodities demanded, and the aggregate demand curve slopes downward.

IRVING FISHER AND THE VELOCITY OF CIRCULATION

The theory of aggregate demand, as we have described it so far, was developed in Cambridge, England, by Alfred Marshall. At about the same time, Irving Fisher of Yale University worked on a parallel development that led to similar conclusions. A key component of Fisher's version is a concept called the **velocity of circulation**. This measures the average number of times that the stock of money circulates in the economy, and it is defined as the ratio of the average value of transactions per unit of time to the nominal stock of money. In the following formula, V is the velocity of circulation, P is the price level, T is the number of transactions per unit of time, and M^S is the stock of money.

5.5
$$V = \frac{PT}{M^S}$$

$$\text{Velocity of circulation} = \frac{\text{Average value of transactions}}{\text{Nominal money supply}}$$

As it stands, Equation 5.5 is a definition of V. To make this into an operational theory, quantity theorists make two extra assumptions. The first is that T, the average number of transactions per unit of time, can be approximated by real aggregate demand for goods and services, Y^D. The second is that V is a constant. Using these additional assumptions, we can write Fisher's version of the quantity theory as follows:

5.6
$$P = \frac{VM^S}{Y^D}$$

$$\text{Price level} = \frac{\text{Velocity of circulation} \times \text{Supply of money}}{\text{Aggregate demand for commodities}}$$

If you compare Equation 5.6, which comes from Fisher's version of the quantity theory, with the Cambridge version of the theory from Equation 5.4, you will see that if we let $V = 1/k$, the two theories lead to the same equation for aggregate demand. We will now explore this equation and see how it can be used to explain the classical theory of the price level.