Chapter 4 Consumption, Saving, and Investment

Introduction

Chapter 3 considered the supply side of the economy, focusing on constraints that resource availability and technology imposed on economic possibilities.

This chapter considers the demand for goods and services in the economy.

Ultimately, we will develop an equilibrium condition for the goods market.

Components of Aggregate Demand (Spending)

Consumption

Investment

Government Purchases (taken as given in this chapter)

Net Exports (Assumed to equal zero in this chapter)

Spending and Saving

The focus on this chapter is spending, but we simultaneously are studying the determinants of saving.

> When individuals receive income, they normally spend some of it and save the rest. Thus, if we can explain spending, we must also be explaining saving.

Spending is important because it tells us about the current demand for output; saving is important because it provides a channel for accumulating capital that will increase production in the future.

Spending and Saving Identities

For the case of a closed economy (isolated from other countries) we define national saving as:

$$S = Y - C - G$$

where S saving, Y is output (analogous to GDP) or equivalently income, C is consumption, and G is government purchases of goods. These are all measured in real terms.

Private and Government Saving

National saving is the sum of private saving and government saving:

$$S = Y - C - G$$

$$S = Y - C - T + T - G$$

$$S = (Y - C - T) + (T - G)$$

$$S = S_{pvt} + S_{govt}$$

These results were presented in Chapter 2, but were complicated there because they were presented in an open-economy context.

Desired Spending

It turns out that in this chapter it is important to distinguish "desired" or "planned" spending from actual spending.

So, desired consumption spending is:

$$C^d$$

and desired national saving is:

$$S^d = Y - C^d - G$$

(We assume that the government always spends exactly what it plans).

A Look Ahead: Goods Market Equilibrium

Where is this chapter going?

Our equilibrium condition for the goods market will be that desired spending should be equal to output:

$$Y = C^d + I^d + G$$

or, subtracting C^d and G from each side:

$$S^d = I^d$$

So in order to proceed, we need to specify what determines desired consumption (or desired saving) and desired investment.

Consumption and Saving

If I receive income today, I could consume it all today, or I could save a portion of it.

By saving today, I will be able to spend more in the future.

So a consumer's choice about saving is really a choice of consuming today versus consuming in the future.

The real rate of interest turns out to be a key variable influencing the choice to consume today versus tomorrow (as subsequent sections show).

Consumption Today and Consumption Tomorrow

Let r be the real interest rate, say 0.03, i.e., 3%.

This means that if I save a $1 today, then in one year I can use the saving plus interest to consume $1.03 worth of goods next period.

Essentially, I can trade $1 worth of goods today for $1.03 (which is equal to $1+r$), worth of goods tomorrow.

Saying the same thing once again in a different way, I could say the price of consuming a unit of output today is $(1+r)$ units of output tomorrow.

As the price of consuming today changes, so will an individual's planned consumption.

The Effects of the Real Interest Rate on Consumption

A change in the real rate of interest has both substitution and income (wealth) effects.

When r rises, current desired consumption becomes relatively more expensive, encouraging less current consumption and more saving. This is the substitution effect.

When r rises, this tends to increase the income of lenders, but decrease the income of borrowers. Higher income normally would lead to both more consumption and more saving. So lenders would want to consume more today, and borrowers would want to consume less.

Aggregate Impact of a Change in the Real Interest Rate

Combining income and substitution effects across a large number of individuals, we are left with an ambiguous conclusion.

The substitution effect implies that a higher interest rate decreases current consumption, but the income effect is ambiguous, as is the total impact.

Empirical evidence suggests that an increase in the real rate of interest probably has a negative impact on desired consumption, but the effect is small.

A Complication: After-Tax Real Rate of Interest

We have argued that the real rate of interest affects consumption and saving, but in the real world there is a further complication.

When one earns interest, one must normally pay taxes on the interest. Complicating matters further, the taxes are normally levied on normally on nominal interest earnings rather than real interest earnings.

 The appropriate interest rate to consider is the expected real after-tax rate of interest.

$$r_{a-t} = (1-t)i - p^e$$

Other Determinants of Desired Current Consumption

Changes in current income

Changes in expected future income

Changes in wealth (e.g., the stock market)

Government spending (more on this coming up!) and taxes

Government Purchases and Private Consumption I

Suppose that government spending increases by $10 million this period (but this is a one-year spending spree). Further, suppose that the government increases taxes by $10 million also.

Since taxes go up, individuals have less income to spend, and consumption will fall.

However, consumption is not likely to fall by the full amount, individuals like to smooth consumption over time. Instead, individuals may save less, or even borrow.

Government Purchases and Private Consumption II

Suppose again that government spending increases by $10 million this period, but this time taxes are not raised. Instead, the government runs a deficit.

When the government borrows, it is committed to repay (with interest). So citizens may see no tax burden today, but they should probably anticipate the need for higher taxes tomorrow, at least as long as other government spending plans remain unchanged.

But if consumers expect higher future taxes (lower future disposable incomes) they will cut consumption today. Under some circumstances, the reduction in consumption could be the same as when taxes were increased.

Tax Cuts

Suppose the government has been running a balanced budget, but this year taxes are cut. No spending plans are changed.

With lower taxes, consumers' disposable incomes rise, so we might expect desired consumption to increase.

However, consumers should also anticipate higher future taxes. Indeed, in "present-value" terms, the future required payments to bondholders are equivalent to the current value of the tax reductions. If people think ahead sufficiently, a tax cut may leave desired consumption unchanged.

This result, that a current year tax cut may have no impact on current consumption, is called the Ricardian equivalence proposition.

Desired Investment

We have now concluding our discussion of desired consumption and saving, so now we turn to a discussion of desired investment.

Recall we will eventually impose this equilibrium condition:

$$Y = C^d + I^d + G$$

Investment is of independent concern because:

it fluctuates sharply with the business cycle;

it results in accumulation of capital, increasing productive capacity for the long run.

A Firm's Desired Capital Stock

Firms use capital (e.g., machines) much as they use labor. Both capital and labor are inputs used to produce output, and firms will presumably choose how much to employ based on a profit maximization calculation.

Sometimes a firm can rent machines. In this case the price for the use of capital services for a period is easily observed.

Typically, however, firms buy machines and use them for an extended period of time, making a calculation of the user cost of capital services more difficult.

The User Cost of Capital I

What is the expected real cost of using a unit of capital for a period?

> Profit-maximization will require that marginal costs and benefits be equated when the optimal amount of capital is used, so we must consider this cost.

The User Cost of Capital I

Suppose I purchase a machine. As I use the machine, it depreciates, and this is a cost. Further, buy owning a machine, I forgo the opportunity to earn interest on the funds tied up in it—this is also a cost. The one-period user cost of capital sold at real price p_K is:
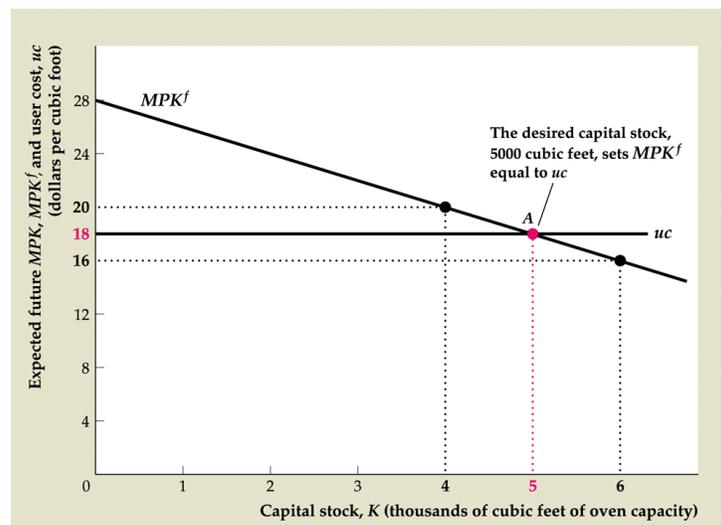
$$uc = (r + d)p_K$$

where r is the real expected rate of interest and d is the rate of depreciation.

> Consider the example of a new automobile (to be used as a rental car).

The Desired Capital Stock

A firm's desired capital stock will be the stock at which the expected marginal product of capital equals the user cost of capital.

$$MPK^f = uc$$

Changes in the Desired Capital Stock

Changes that affect the marginal product of capital (e.g., technology) or the user cost of capital (e.g., the expected real rate of interest) will change the desired capital stock.

An increase in the expected marginal product of capital will increase the desired capital stock.

An increase in the expected real rate of interest will increase the user cost of capital, and decrease the desired capital stock.

Taxes and the Desired Capital Stock

If a firm's revenues are taxed, then a portion of the marginal product of capital must go to the government. For simplicity, assume that corporate taxes can be treated as taxes on firm revenue.

Then the firm's profit maximization condition (for the desired capital stock) becomes:

$$(1-t)MPK^f = uc$$

where t is the effective tax.

Investment

Investment is spending on newly produced capital goods. Investment is a flow that adds to the capital stock.

What determines investment?

The difference between today's capital stock and the amount desired for next period.

The amount that today's capital stock will depreciate this period.

If next period's capital stock is higher than today's, we must replace capital that deteriorates today and then add even more to get to the new preferred level.

Investment (Equation)

If investment spending aims at reach the desired capital stock one-period in the future, investment spending will be:

$$I_t = K_{t+1} - K_t + dK_t$$

Note that investment has two parts, the increase in the desired capital stock, $K_{t+1} - K_t$, and the replacement of capital that wears out, dK_t.

Note that spending on capital in this period is assumed to result in a higher capital stock in the next period. Also deviations between actual and desired capital stocks may take long than a period (a year) to make up.

Housing and Inventory

The preceding discussion was couched in terms of investment in factory and equipment—business fixed investment.

Residential investment and inventory investment are influenced by similar factors.

> The logic to invest in apartments is essentially the same as for machines. Investors compare future rents (related to the output of housing services) to the costs of depreciation and forgone interest.

> Firms hold inventories to increase sales, but also face costs of depreciation and interest (since resources tied up in inventory might otherwise have earned interest).

Goods Market Equilibrium

Recall from an earlier slide that our equilibrium condition for the goods market will be that desired spending should be equal to output:

$$Y = C^d + I^d + G$$

or, subtracting C^d and G from each side:

$$S^d = I^d$$

Equilibrium Condition versus Identity

Note that the equilibrium condition is different from the national income accounting identity:

$$Y = C + I + G$$

The condition above must always hold true—it is true by definition.
However, desired spending equals output only when the economy is in equilibrium.

Suppose an economy produces 100 pineapples. Consumers only plan to purchase 95. The 5 unsold cars become unplanned inventory investment—this makes actual spending equal output. But *planned* spending did not equal output.

The Sense of the Equilibrium Condition

Suppose that desired spending is less than output.

> Inventories would accumulate. Facing accumulating inventories, producers would either wish to cut production or change prices. Either way, economic pressures for change are present, so this is not an equilibrium.

Suppose that desired spending is greater than output.

> Inventories will decline. But firms will either wish to increase output to replenish inventories or they will wish to increase prices—again pressures for change would arise.

Equilibrium: A Diagram

Consider the equilibrium condition in the form:

$$S^d = I^d$$

Both desired saving and desired investment depend on the expected real rate of interest.

> We argued that consumption today is probably inversely related to the real interest rate. Less consumption implies more saving (other things held equal), so desired saving is positively related to the interest rate.

> Desired investment is inversely related to the interest rate.
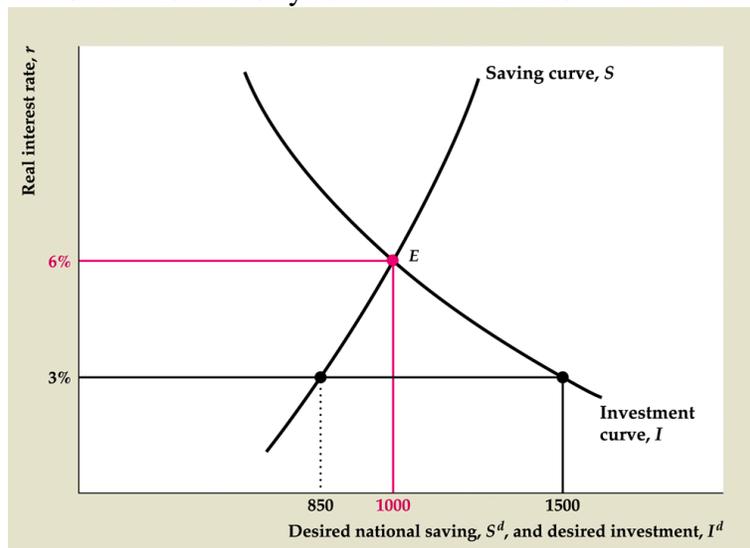
The Equilibrium Expected Real Rate of Interest

Suppose that:

$$Y < C^d + I^d + G$$

or, equivalently:

$$S^d < I^d$$

There is not enough output for everyone to buy what they desire. How will the interest rate adjust? At a higher interest rate, firms would want to invest less and individuals would reduce desired current consumption (increase saving), bringing desired spending and output together. So the real interest rate will rise.

Shifting Saving and Investment Curves

Whenever something other than the interest rate makes desired saving change, the saving curve will shift.

> For example, a temporary increase in government spending for a war would decrease desired national saving, shifting the saving curve to the left and increasing the real rate of interest.

Similarly, when something other than the interest rate changes desired investment, the investment curve will shift.

> For example, a new invention may increase the expected marginal product of capital, increasing the desired capital stock and investment.