Unit 3
Aggregate Expenditure and Equilibrium Output

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In this unit, students could:

- Explain the principles of the Keynesian theory of consumption.
- Explain the difference between planned investment and actual investment.
- Understand how planned investment is affected by the interest rate.
- Explain how equilibrium output is determined.
- Describe the multiplier process and use the multiplier equation to calculate changes in equilibrium.

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1. The Keynesian Theory of Consumption
2. Planned Investment (*I*) versus Actual Investment
3. Planned Investment and the Interest Rate (*r*)
4. The Determination of Equilibrium Output (Income)
5. The Multiplier

Preliminary

aggregate output The total quantity of goods and services produced (or supplied) in an economy in a given period.

aggregate income The total income received by all factors of production in a given period.

In any given period, there is an exact equality between aggregate output (production) and aggregate income. You should be reminded of this fact whenever you encounter the combined term **aggregate output (income) (*Y*)**.

aggregate output (income) (*Y*) A combined term used to remind you of the exact equality between aggregate output and aggregate income.

From the outset, you must think in "real terms." Output *Y* refers to the quantities of goods and services produced, not the dollars circulating in the economy.
Also, we are taking as fixed for purposes of this chapter and the next the interest rate (r) and the overall price level (P).

The Keynesian Theory of Consumption

We all recognize that for consumption as a whole, as well as for consumption of most specific categories of goods and services, consumption rises with income.

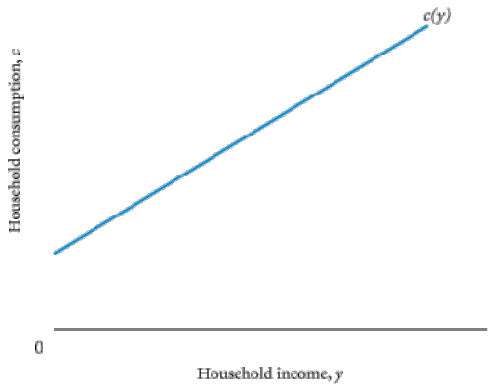
While Keynes recognized that many factors, including wealth and interest rates, play a role in determining consumption levels in the economy, in his classic *The General Theory of Employment, Interest, and Money*, *current income played the key role.*

This simple observation plays a large role in helping us understand the workings of the aggregate economy.

Household's Consumption and Income

consumption function The relationship between consumption and income.

A consumption function for an individual household shows the level of consumption at each level of household income.



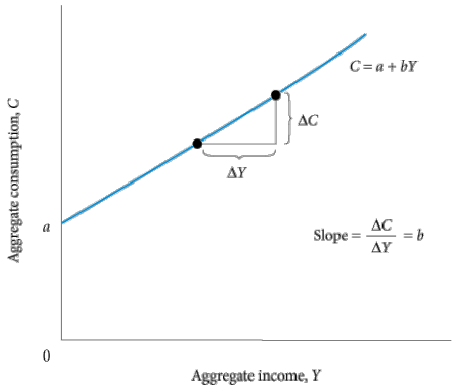
Aggregate Consumption Function

With a straight line consumption curve, we can use the following equation to describe the curve:

$$C = a + bY$$

The aggregate consumption function shows the level of aggregate consumption at each level of aggregate income.
The upward slope indicates that higher levels of income lead to higher levels of consumption spending.

marginal propensity to consume (*MPC*)
That fraction of a change in income that is consumed, or spent.



$$\text{marginal propensity to consume} \equiv \text{slope of consumption function} \equiv \frac{\Delta C}{\Delta Y}$$

Aggregate Saving

- **aggregate saving (S)** The part of aggregate income that is not consumed.

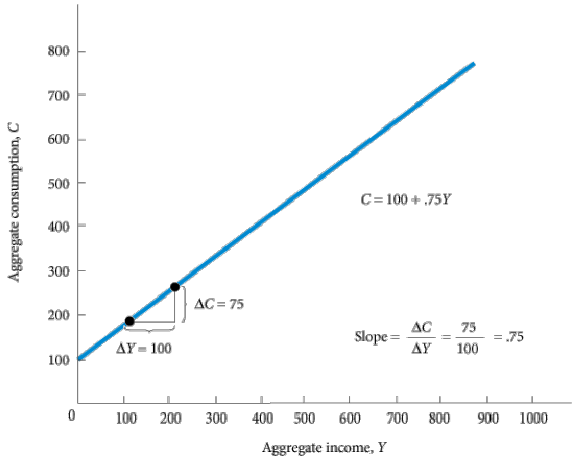
$$S \equiv Y - C$$

- **marginal propensity to save** (MPS) That fraction of a change in income that is saved.
- Because the MPC and the MPS are important concepts, it may help to review their definitions.
  - **The marginal propensity to consume (MPC)** is the fraction of an increase in income that is consumed (or the fraction of a decrease in income that comes out of consumption).
  - **The marginal propensity to save (MPS)** is the fraction of an increase in income that is saved (or the fraction of a decrease in income that comes out of saving).

Example of Consumption Function

Let aggregate consumption function $C = 100 + .75Y$

Aggregate Income, Y	Aggregate Consumption, C
0	100
80	160
100	175
200	250
400	400
600	550
800	700
1,000	850

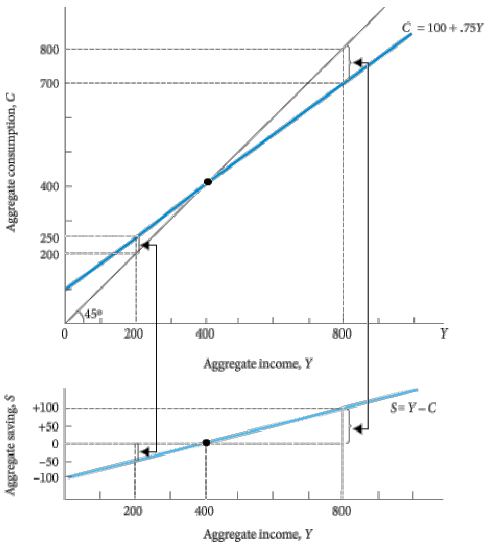


In this simple consumption function, consumption is 100 at an income of zero.
As income rises, so does consumption.
For every 100 increase in income, consumption rises by 75.
The slope of the line is .75.

Deriving the Saving Function from the Consumption Function

Because $S \equiv Y - C$, it is easy to derive the saving function from the consumption function.
A 45° line drawn from the origin can be used as a convenient tool to compare consumption and income graphically.
At $Y = 200$, consumption is 250.
The 45° line shows us that consumption is larger than income by 50.
Thus, $S \equiv Y - C = -50$.
At $Y = 800$, consumption is less than income by 100.
Thus, $S = 100$ when $Y = 800$.

Y AGGREGATE INCOME	– C AGGREGATE CONSUMPTION	= S AGGREGATE SAVING
0	100	-100
80	160	-80
100	175	-75
200	250	-50
400	400	0
600	550	50
800	700	100
1,000	850	150



Other Determinants of Consumption

- The assumption that consumption depends only on income is obviously a simplification.
- In practice, the decisions of households on how much to consume in a given period are also affected by their wealth, by the interest rate, and by their expectations of the future.
  - Households with higher wealth are likely to spend more, other things being equal, than households with less wealth.
  - Lower interest rates are likely to stimulate spending.
  - If households are optimistic and expect to do better in the future, they may spend more at present than if they think the future will be bleak.

ECONOMICS IN PRACTICE

Behavioral Biases in Saving Behavior

Economists have generally assumed that people make their saving decisions rationally, just as they make other decisions about choices in consumption and the labor market.

Saving decisions involve thinking about trade-offs between present and future consumption.

Recent work in behavioral economics has highlighted the role of psychological biases in saving behavior and has demonstrated that seemingly small changes in the way saving programs are designed can result in big behavioral changes.

For example, in studying retirement systems, researchers have found that simply changing the enrollment process from an opt-in structure to an opt-out system in which people are automatically enrolled unless they check the "no" box dramatically increases enrollment in retirement pension plans. Behavioral economists argue that people find this option attractive because it is easier for them to commit to making sacrifices tomorrow than it is for them to make those sacrifices today.

THINKING PRACTICALLY

1. The Save More Tomorrow Plans encourage people to save more by committing themselves to future action. Can you think of examples in your own life of similar commitment devices you use?

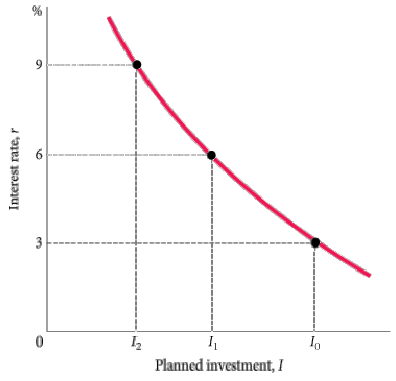
Planned Investment (I) versus Actual Investment

- **planned investment (I)** Those additions to capital stock and inventory that are planned by firms.
  - A firm's inventory is the stock of goods that it has awaiting sale.
- **actual investment** The actual amount of investment that takes place; it includes items such as unplanned changes in inventories.
  - If a firm overestimates how much it will sell in a period, it will end up with more in inventory than it planned to have.
  - We will use I to refer to planned investment, not necessarily actual investment.

Planned Investment and the Interest Rate (r)

Increasing the interest rate, *ceteris paribus*, is likely to reduce the level of planned investment spending. When the interest rate falls, it becomes less costly to borrow and more investment projects are likely to be undertaken.

Planned investment spending is a negative function of the interest rate. An increase in the interest rate from 3 percent to 6 percent reduces planned investment from I_0 to I_1.



Other Determinants of Planned Investment

- The decision of a firm on how much to invest depends on, among other things, its expectation of future sales.
- The optimism or pessimism of entrepreneurs about the future course of the economy can have an important effect on current planned investment. Keynes used the phrase animal spirits to describe the feelings of entrepreneurs.
- For now, we will assume that planned investment simply depends on the interest rate.

The Determination of Equilibrium Output (Income)

equilibrium Occurs when there is no tendency for change. In the macroeconomic goods market, equilibrium occurs when planned aggregate expenditure is equal to aggregate output.

planned aggregate expenditure (*AE*) The total amount the economy plans to spend in a given period. Equal to consumption plus planned investment:

$$AE \equiv C + I.$$

Because AE is, by definition, $C + I$, equilibrium can also be written:

Equilibrium: $Y = C + I$

$Y > C + I$

aggregate output > planned aggregate expenditure

$C + I > Y$

planned aggregate expenditure > aggregate output

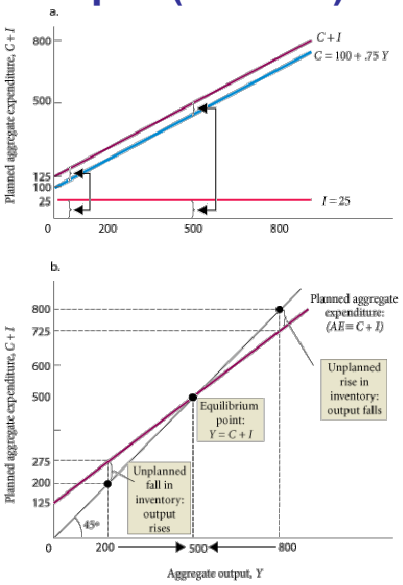
Deriving the Planned Aggregate Expenditure Schedule and Finding Equilibrium. The Figures in Column 2 Are Based on the Equation $C = 100 + .75Y$.

(1) Aggregate Output (Income) (Y)	(2) Aggregate Consumption (C)	(3) Planned Investment (I)	(4) Planned Aggregate Expenditure (AE) $C + I$	(5) Unplanned Inventory Change $Y - (C + I)$	(6) Equilibrium? ($Y = AE$?)
100	175	25	200	– 100	No
200	250	25	275	– 75	No
400	400	25	425	– 25	No
500	475	25	500	0	Yes
600	550	25	575	+ 25	No
800	700	25	725	+ 75	No
1,000	850	25	875	+ 125	No

The Determination of Equilibrium Output (Income)

Equilibrium occurs when planned aggregate expenditure and aggregate output are equal. Planned aggregate expenditure is the sum of consumption spending and planned investment spending.

The planned aggregate expenditure function crosses the 45° line at a single point, where Y = 500. (The point at which the two lines cross is sometimes called the *Keynesian cross*.)



Let us find the equilibrium level of output (income) algebraically.

$$Y = C + I$$

$$C = 100 + .75Y$$

$$I = 25$$

The Saving/Investment Approach to Equilibrium

Because aggregate income must be saved or spent, by definition, $Y \equiv C + S$, which is an identity. The equilibrium condition is $Y = C + I$, but this is not an identity because it does not hold when we are out of equilibrium. By substituting $C + S$ for Y in the equilibrium condition, we can write:

$$C + S = C + I$$

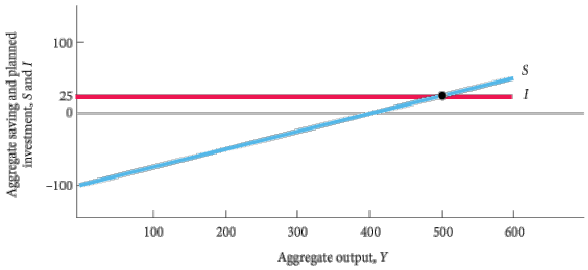
Because we can subtract C from both sides of this equation, we are left with:

$$S = I$$

Thus, only when planned investment equals saving will there be equilibrium.

The *S* = *I* Approach to Equilibrium

Aggregate output is equal to planned aggregate expenditure only when saving equals planned investment (*S* = *I*).
Saving and planned investment are equal at *Y* = 500.



Adjustment to Equilibrium

The adjustment process will continue as long as output (income) is below planned aggregate expenditure.

If firms react to unplanned inventory reductions by increasing output, an economy with planned spending greater than output will adjust to equilibrium, with *Y* higher than before.

If planned spending is less than output, there will be unplanned increases in inventories. In this case, firms will respond by reducing output. As output falls, income falls, consumption falls, and so on, until equilibrium is restored, with *Y* lower than before.

As Figure shows, at any level of output above Y = 500, such as Y = 800, output will fall until it reaches equilibrium at Y = 500, and at any level of output below Y = 500, such as Y = 200, output will rise until it reaches equilibrium at Y = 500.

The Multiplier

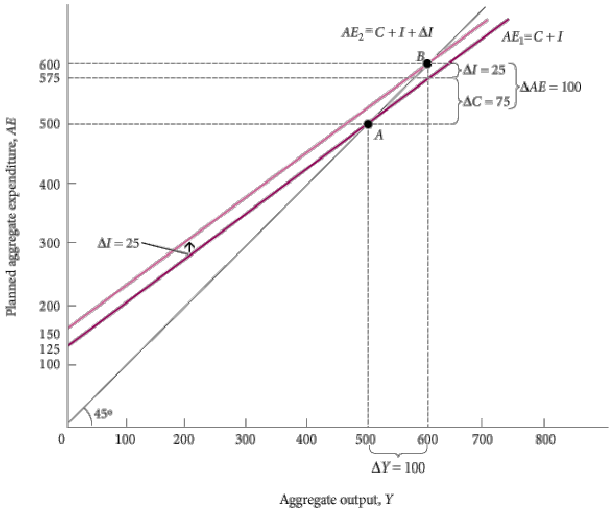
multiplier The ratio of the change in the equilibrium level of output to a change in some exogenous variable.

exogenous variable A variable that is assumed not to depend on the state of the economy—that is, it does not change when the economy changes.

The size of the multiplier depends on the slope of the planned aggregate expenditure line. The steeper the slope of this line, the greater the change in output for a given change in investment.

The Multiplier as Seen in the Planned Aggregate Expenditure Diagram

At point *A*, the economy is in equilibrium at *Y* = 500.
When *I* increases by 25, planned aggregate expenditure is initially greater than aggregate output.
As output rises in response, additional consumption is generated, pushing equilibrium output up by a multiple of the initial increase in *I*.
The new equilibrium is found at point *B*, where *Y* = 600.
Equilibrium output has increased by 100 (600 - 500), or *four times* the amount of the increase in planned investment.



The Multiplier Equation

Recall that the marginal propensity to save (*MPS*) is the fraction of a change in income that is saved. It is defined as the change in *S* (ΔS) over the change in income (ΔY):

$$MPS = \frac{\Delta S}{\Delta Y}$$

Because ΔS must be equal to ΔI for equilibrium to be restored, we can substitute ΔI for ΔS and solve:

$$MPS = \frac{\Delta I}{\Delta Y} \quad \text{Therefore,} \quad \Delta Y = \Delta I \times \frac{1}{MPS}$$

It follows that

$$\text{multiplier} \equiv \frac{1}{MPS}, \quad \text{or} \quad \text{multiplier} \equiv \frac{1}{1 - MPC}$$

ECONOMICS IN PRACTICE

The Paradox of Thrift

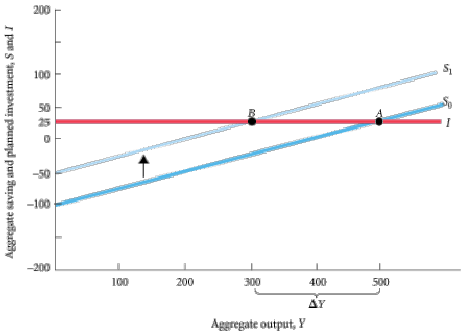
An interesting paradox can arise when households attempt to increase their saving.

An increase in planned saving from S_0 to S_1 causes equilibrium output to decrease from 500 to 300.

The decreased consumption that accompanies increased saving leads to a contraction of the economy and to a reduction of income.

But at the new equilibrium, saving is the same as it was at the initial equilibrium.

Increased efforts to save have caused a drop in income but no overall change in saving.



THINKING PRACTICALLY

1. Draw a consumption function corresponding to S_0 and S_1 and describe what is happening.

The Size of the Multiplier in the Real World

In considering the size of the multiplier, it is important to realize that the multiplier we derived in this chapter is based on a *very* simplified picture of the economy.

First, we have assumed that planned investment is exogenous. Second, we have thus far ignored the role of government, financial markets, and the rest of the world in the macroeconomy.

The size of the multiplier is reduced when tax payments depend on income (as they do in the real world); when we consider Fed behavior regarding the interest rate; when we add the price level to the analysis; and when imports are introduced.

In reality, the size of the multiplier is about 2. That is, a sustained increase in exogenous spending of $10 billion into the U.S. economy can be expected to raise real GDP over time by about $20 billion.