

# 8 [23]

---

## Aggregate Expenditure and Equilibrium Output

### **C**hapter objectives:

1. Describe the relationship between consumption and income. Define the marginal propensity to consume (*MPC*) and the marginal propensity to save (*MPS*).
2. Explain how actual investment and intended investment differ. Describe the role of inventory change in establishing equilibrium in the economy.
3. Derive and graph the planned aggregate expenditure (*AE*) function. State why its slope has a value of less than one. Describe the adjustment process when planned aggregate expenditure differs from aggregate output. Use the expenditure and output approach and the saving/investment (leakages/injections) approach to specify the meaning of equilibrium in the model.
4. Analyze the effects on the macroeconomy of a change in planned investment or consumption. Describe the role of the multiplier in the inventory-adjustment process and, given *MPC*, derive the numerical value of the multiplier.
5. Describe the reasoning behind the paradox of thrift and explain what is paradoxical.

Give yourself plenty of time to understand the model developed in this chapter—it’s the basis for what comes later. Can you prove that aggregate output does equal aggregate income? Can you confirm that income must equal consumption plus saving? Given the consumption function diagram, can you draw the related saving function diagram? Can you derive the consumption and saving equations? Can you see how unplanned inventory changes “balance” expenditures and output? Can you see why a \$100 change in investment is “multiplied”? If not, work through this chapter again.

»» LEARNING TIP: Don’t skip over the introductory material on pp. 139-140 [451-452]. This easily-missed little section sets the scene and establishes the structure of the macroeconomy (goods-and-services and money markets leading to aggregate demand and the labor market leading to aggregate supply) analyzed in Chapters 8-14 (23-29). The figure on page 139 [451] will be referenced throughout.◀

**BRAIN TEASER:** Do a thought experiment. Suppose your after-tax monthly income rose by \$100. What would you do with the extra money? How much would you spend; how much would you

save? Calculate your marginal propensity to consume and your marginal propensity to save. Calculate the expenditure multiplier. Case, Fair and Oster observe that the actual expenditure multiplier for the American economy is about 1.4. Can you explain the apparent discrepancy?



### OBJECTIVE 1:

Describe the relationship between consumption and income. Define the marginal propensity to consume ( $MPC$ ) and the marginal propensity to save ( $MPS$ ).

In the complete model of the economy, aggregate expenditure ( $AE$ ) is found by adding:  $C + I + G + (EX - IM)$ . That formula now simplifies to  $AE = C + I$  because the model in this chapter has only two sectors (household and business) and only one market (goods-and-services). (page 142 [454])

For households, income ( $Y$ ) is split between consumption ( $C$ ) and saving ( $S$ ). Determinants of aggregate *consumption* include

- i. Household income
- ii. Household wealth
- iii. Interest rates
- iv. Household expectations about the future

The Index of Consumer Confidence is a closely watched variable—as confidence sags about our future income, so does consumer spending, especially on durable goods. (page 145 [457])

If your monthly salary increases by \$100, your consumption rises too, but by something less than \$100. How much of the extra \$100 you choose to spend depends on your *marginal propensity to consume* ( $MPC$ ). If you spend \$80,  $MPC$  is  $80/100 = 0.8$ . *Marginal propensity to save* ( $MPS$ ) is  $20/100 = 0.2$  because any income not spent is saved (\$20 out of \$100). Clearly,  $MPC + MPS$  must sum to one (100% of any extra income must be spent or saved). (page 143 [455])

◆◆ LEARNING TIP: Keep in mind that we are considering “real” variables, not nominal ones. Although it is convenient to talk in terms of dollar amounts of consumption, income or output, ultimately real quantities prevail rather than prices.◆

◆◆ LEARNING TIP: In Chapter 9 (24), we introduce taxes. This affects the calculation of  $MPC$  and  $MPS$ . You’ll find the transition easier if you read the denominator term, “change in income,” as “change in disposable (after-tax) income.” In this chapter, the former term is identical with the latter (with no taxes, all income is disposable income); in Chapter 9 (24),  $MPC$  and  $MPS$  will be based on the change in disposable income.◆

The Keynesian consumption function shows the relationship between consumption spending and income; its slope (“rise” over “run”) is the value of  $MPC$  (“change in consumption” over “change in income” or  $\Delta C/\Delta Y$ ). For simplicity, Keynes assumed a straight-line relationship. Algebraically, the consumption function is:

$$C = a + bY \quad (\text{page 144 [456]})$$

A similar function, the saving function, can be developed because consumption and saving are related activities. Given income, the amount consumed determines the amount saved and *vice versa*.

**Note:** You can calculate  $MPS$  (and, therefore,  $MPC$ ) quickly if you have the intercept value ( $a$ ) and the income value ( $Y$ ) where the consumption function intersects the  $45^\circ$  line.  $MPS = a/Y$ . Use this “trick” in Practice Question 6 to confirm your answer.

**Graphing Pointer:** The  $45^\circ$  line is a reference line that helps you to read the graph. Use the  $45^\circ$  line to determine when saving is zero (or positive or negative) when the consumption function is

drawn. Saving is zero when consumption crosses the 45° line. In this and subsequent chapters, the 45° line will help you to determine equilibrium aggregate output. Check your understanding of this in Practice Question 5.

---

**Practice**

---

1. Aggregate consumption will certainly increase if
  - (a) income increases and wealth decreases.
  - (b) income increases and interest rates decrease.
  - (c) interest rates increase and household wealth increases.
  - (d) interest rates increase and consumer confidence about the future strengthens.

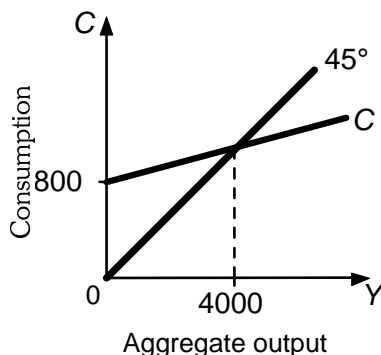
ANSWER: (b) Lower interest rates reduce the cost of borrowing. Refer to p. 145 [457].
  
2. Given the income level, saving is directly (positively) related to
  - (a) interest rates and wealth, and inversely (negatively) related to households' expectations about the future.
  - (b) interest rates, and inversely (negatively) related to wealth and households' expectations about the future.
  - (c) households' expectations about the future, and inversely (negatively) related to interest rates and wealth.
  - (d) wealth, and inversely (negatively) related to interest rates and households' expectations about the future.

ANSWER: (b) Higher interest rates encourage saving. As wealth increases and households become richer, and/or as households' expectations about the future improve, consumption increases. Given the income level, though, saving must decrease if consumption increases. Refer to p. 145 [457].
  
3. When  $MPC$  is 0.75,  $MPS$  is
  - (a) 0.25.
  - (b) 0.75.
  - (c) 3.00.
  - (d) 4.00.

ANSWER: (a)  $MPC + MPS = 1$ . Refer to p. 143 [455].
  
4. The consumption function is  $C = 200 + 0.9Y$ . The saving function is
  - (a)  $S = 200 - 0.1Y$ .
  - (b)  $S = -200 - 0.1Y$ .
  - (c)  $S = 200 - 0.9Y$ .
  - (d)  $S = -200 + 0.1Y$ .

ANSWER: (d) Recall that  $Y = C + S$ . The equations must sum to  $Y$ . The first term must be negative because consumption is positive. Also, recall that saving increases as income increases—the second term must be positive.

Use the following diagram to answer the next three questions.



5. When income equals 4,000, consumption equals \_\_\_\_\_ and saving equals \_\_\_\_\_ .
- 4,000; 0
  - 3,200; 800
  - 4,000; 4,000
  - 2,000; 2,000

ANSWER: (a) The 45° line shows all the points at which the variable on the vertical axis equals the variable on the horizontal axis, in this case, where  $C = Y$ . If  $Y = 4,000$ ,  $C = 4,000$ . If all income is being spent, saving must be zero.

6. The equation for this consumption function is
- $C = 800 + 0.75Y$ .
  - $C = 800 + 0.8Y$ .
  - $C = 4,000 + 0.75Y$ .
  - $C = 4,000 + 0.8Y$ .

ANSWER: (b) The intercept term (a) is 800. As income increases from 0 to 4,000, consumption increases from 800 to 4,000, an increase of 3,200.  $MPC = \text{change in consumption}/\text{change in income} = \Delta C/\Delta Y = 3,200/4,000 = 0.8$ .

**Note:** When the consumption (saving) function intercepts the vertical axis, the associated value indicates the level of consumption (saving), which is independent of income. If income = 0, this level of spending (saving) would still exist.

7. If income is 6,000, consumption is \_\_\_\_\_ and saving is \_\_\_\_\_ .
- 4,800; 1,200
  - 5,600; 400
  - 5,200; 1,000
  - 6,000; 0

ANSWER: (b) When  $Y = 4,000$ ,  $C = 4,000$  and  $S = 0$ .  $MPC = 0.8$ . As income increases by 2,000 (from 4,000 to 6,000), consumption will increase by  $2,000 \times 0.8$ , or 1,600. Consumption will total 5,600 ( $4,000 + 1,600$ ). We know that  $Y = C + S$ , therefore  $S = Y - C$ .  $S = 6,000 - 5,600 = 400$ . Option (c) cannot be correct because  $C + S$  must equal income ( $Y$ ), and  $5,200 + 1,000$  does not equal 6,000. ■

**ECONOMICS IN PRACTICE:** On page 147 [459], the textbook looks at saving behavior. Saving is rather like exercise or studying for exams—we know it's a good thing to do, but we still might not

wish to do it. Essentially, it's a trade-off between current enjoyment and future enjoyment. Keynes famously remarked, "In the long run we're all dead." If our focus is purely short run, we're unlikely to save. In order to increase the likelihood of saving, either the benefit from current consumption must be reduced or the gain from future consumption must be increased. Can you think of some ways that the trade-off could be adjusted to encourage additional saving? Include government policies if you wish.

**ANSWER:** Higher interest rates encourage additional saving. Reduced taxes on interest income or schemes to defer taxes, such as IRAs (Individual Retirement Accounts) are government policy options. Higher taxes on consumption may also stimulate saving. Simply having funds automatically contributed to saving reduces the conscious effort ("cost") involved in saving and is a successful way to accumulate wealth. In addition, saving for a particular short-term or long-term goal makes it easier to forgo current consumption. Reductions in the risk involved in saving (less fear of bank default or loss of the value of investments because of oversight of the financial system) will prompt more households to surrender current consumption. Finally, a society in which saving is emphasized as a virtue is likely to produce thrifty behavior.



### OBJECTIVE 2:

Explain how actual investment and intended investment differ. Describe the role of inventory change in establishing equilibrium in the economy.

Planned investment ( $I$ ) is assumed to remain constant as output level changes—investment graphs as a horizontal line. However, *actual investment* can differ from *planned investment* because of unplanned changes in the level of inventories. (page 146 [458])

»» LEARNING TIP: Investment is one of the most difficult concepts to learn. Economists use the word differently from others. Investment does *not* mean saving, not even financial investment although, in this model, saving and investment are equal when the system is in equilibrium. Investment is the purchase of new machinery and buildings (productive capacity) and changes in inventory levels. In contrast, if you save you are *not* purchasing.☛

Note that firms buy more than investment goods. They hire workers, for example. To count this expenditure would be double counting—the wages are used by households for consumption and saving.

»» LEARNING TIP: In this model, actual investment will *always* equal saving but that, *only in equilibrium*, will planned investment equal saving. In equilibrium, unplanned inventory investment will be zero.☛

If aggregate output exceeds (is less than) consumption and planned investment, there will be an unplanned increase (decrease) in inventory investment. (For an example, refer to Application 3.) (page 148 [460])

**Unplanned Inventory Change and Equilibrium:** Unplanned inventory changes draw the economy into equilibrium. Call expenditures “demand” and output “supply” for the moment. When “demand” is more than current “supply,” firms must sell their previously accumulated inventory. Emptying shelves are the signal to increase production.

When “demand” is less than “supply,” unsold production piles up—the signal to cut output.

Firms feel no pressure to adjust production levels (i.e., there is equilibrium) only when “demand” equals “supply.”

Also, when unplanned inventory change is not zero (either positive or negative), the actual level of investment differs from the level managers wish to have. If, for example, actual investment is “too low,” managers will boost production to compensate.

◆◆◆ LEARNING TIP: An economic system requires some mechanism to drive it towards equilibrium. In the market for coffee, the equilibrating mechanism is price. In our model, price is fixed and the equilibrating mechanism is unplanned inventory change. When unplanned inventory change occurs, it is a signal to adjust output. ◆

---

### Practice

---

8. Investment refers to
- the purchase of new stock in a company.
  - the purchase of new or existing stock in a company.
  - the creation of capital stock.
  - the stock of accumulated saving.

ANSWER: (c) Investment is the addition to the capital stock. Financial transactions are excluded from GDP—review Chapter 6 (21).

9. The change in inventories is
- production minus sales.
  - sales minus production.
  - a value equal to or greater than zero, but cannot be negative.
  - consumption minus saving.

ANSWER: (a) Refer to p. 146 [458]. ■



#### OBJECTIVE 3:

Derive and graph the planned aggregate expenditure (*AE*) function. State why its slope has a value of less than one. Describe the adjustment process when planned aggregate expenditure differs from aggregate output. Use the expenditure and output approach and the saving/investment (leakages/injections) approach to specify the meaning of equilibrium in the model.

Planned aggregate expenditure is the sum of consumption and planned investment at each income level. Because planned investment is assumed to be constant at each income level, the *AE* function is an upward sloping line whose slope equals *MPC*. (page 147 [459])

- ◆◆◆ **LEARNING TIP:** Sometimes you'll find understanding easier if you think about "output," and sometimes about "income." For example, "When unplanned inventory reductions occur, output level will rise" is more obvious than "When unplanned inventory reductions occur, income level will rise." However, "Output is split between consumption and saving" is much less intuitive than "Income is split between consumption and saving."◆

Equilibrium occurs when planned aggregate expenditure equals aggregate output (income)—i.e., when  $C + I = C + S$ . Only then does planned investment equal actual investment—there is no unplanned inventory change.

**Getting to Equilibrium:** If output is less than planned expenditures ( $Y < C + I$ ), inventory levels unexpectedly decrease below the desired level. Firms respond by increasing production. Higher production results in higher income and, given  $MPC$ , greater consumption spending. Spending increases, but at a slower rate than output increases. Eventually, the two will be equal.

If output exceeds planned expenditures ( $Y > C + I$ ), inventory levels are unexpectedly added to. Firms respond rising levels of unsold output by decreasing production. Lower production results in lower income and, given  $MPC$ , less consumption spending. Spending falls, but at a slower rate than output falls. Eventually, the two will be equal.

In each case, how big a change in output level is needed to achieve equilibrium depends on the value of the multiplier. (page 151 [463])

The conditions necessary for equilibrium can be stated in different ways.

- (a) If actual and planned investment differ, the economy is not in equilibrium.  
Equilibrium condition: planned investment must equal actual investment.
- (b) Aggregate planned expenditure must equal aggregate output (income).  
Therefore,  $C + I = C + S$ .  
Equilibrium condition: planned investment must equal planned saving.
- (c) Because, in equilibrium, planned investment must equal actual investment  
Equilibrium condition: unplanned investment must equal zero.

There's no requirement that the equilibrium level of production will be enough to provide full employment to the economy's workers.

**Note:** Unlike most other curves you have seen, the consumption, investment, saving, and  $AE$  functions are all shown to increase by moving vertically upward (not to the right).

Graphically, equilibrium must occur where the  $AE$  function crosses the  $45^\circ$  line. The  $45^\circ$  line plots all the points where spending equals output—i.e., all the points where equilibrium might occur.

### Practice

Use the following table to answer the next six questions.

Output	Consumption	Investment	Planned Aggregate Expenditure	Unplanned Change in Inventory
2,000	2,100	400	_____	_____
3,000	2,850	400	_____	_____
4,000	3,600	400	_____	_____
5,000	4,350	400	_____	_____
6,000	5,100	400	_____	_____
7,000	5,850	400	_____	_____

10. Complete the planned aggregate expenditure column in the preceding table.

ANSWER: Refer to the following table.

<b>Output</b>	<b>Consumption</b>	<b>Investment</b>	<b>Planned Aggregate Expenditure</b>	<b>Unplanned Change in Inventory</b>
2,000	2,100	400	2,500	-500
3,000	2,850	400	3,250	-250
4,000	3,600	400	4,000	0
5,000	4,350	400	4,750	+250
6,000	5,100	400	5,500	+500
7,000	5,850	400	6,250	+750

11. Equilibrium output level is

- (a) 3,000.
- (b) 4,000.
- (c) 5,000.
- (d) 6,000.

ANSWER: (b) Equilibrium occurs where output equals planned aggregate expenditure.

12. Complete the unplanned change in inventory column in the preceding table.

ANSWER: Refer to Question 10 for the completed table. Unplanned change in inventory is the difference between output and planned aggregate expenditure.

13. In the preceding table,  $MPC$  is

- (a) 0.6.
- (b) 0.75.
- (c) 0.8.
- (d) 0.9.

ANSWER: (b)  $MPC = \Delta C / \Delta Y$ . Every time income rises by 1,000, consumption rises by 750.

14. When income level is 0, consumption is

- (a) 0.
- (b) 250.
- (c) 600.
- (d) 1,000.

ANSWER: (c) When income is 2,000, consumption is 2,100. If income decreases by 2,000 and  $MPC$  is 0.75, consumption will decrease by 1,500.

15. When output is 6,000, firms will

- (a) increase production.
- (b) decrease production.
- (c) increase planned investment.
- (d) decrease planned investment.

ANSWER: (b) Output exceeds planned aggregate expenditure and inventories are too high. Firms would cut production. ■



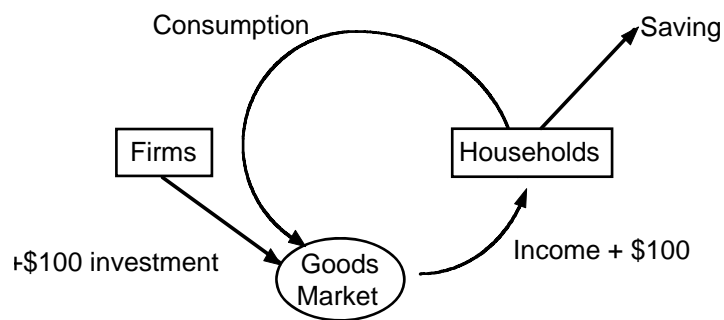
**OBJECTIVE 4:**

Analyze the effects on the macroeconomy of a change in planned investment or consumption. Describe the role of the multiplier in the inventory-adjustment process and, given  $MPC$ , derive the numerical value of the multiplier.

The *multiplier* measures the extent to which the output level will change given a particular initial change in the level of spending. It's calculated by the formula:  $1/(1 - MPC)$  or  $1/MPS$ . (p. 153 [465])

◆◆◆ **LEARNING TIP:** You might find the subsequent material easier if you focus more on the  $1/MPS$  formula. The strength of the multiplier depends on how rapidly spending power leaks out of the circular flow diagram. This is even more obvious when leakages other than saving (taxes, imports) make their appearance.◆

One way to visualize the multiplier is to use the following circular flow diagram.



Households split their income into consumption expenditures and saving. Some investment also takes place. Suppose  $MPC$  is 0.9 and  $MPS$  is 0.1. If, for example, firms indulge in an extra \$100 of investment spending, then income rises by \$100. Trace through the circular flow—consumption rises by \$90, \$81, \$72.90, and so on. Where is the rest going? It's leaking away into saving (nonspending).

The same \$100 increase in investment, with a lower  $MPC$ , such as 0.5, gives a *less*-substantial expansion in spending because the extra income drains away more quickly. The multiplier is smaller, right?

The expansion is less if spending power drains away more rapidly—if  $MPS$  is relatively high. The multiplier value is linked negatively to  $MPS$  and positively to  $MPC$ .

An increase in investment (or consumption) generates extra income. Extra income, however, stimulates consumption and saving— $MPC$  and  $MPS$  determine how much consumption and saving will rise. Extra consumption generates more new income. The process of “spend-earn income-spend” runs out of steam as progressively more of the extra dollars leak away into saving. (page 151 [463])

◆◆◆ **LEARNING TIP:** As shown in the textbook, the multiplier model works given a change in investment, but it is more general than that. The analysis works for any component of planned aggregate expenditure—in this chapter, consumption and investment and, in Ch. 9 (24), government spending.◆

**Example:** If planned investment increases, the  $AE$  line shifts upwards. At the initial output level, inventories unexpectedly fall. As firms boost production to restore desired inventory levels, income and consumption rise, and the economy moves to the point where the new (higher)  $AE$  function crosses the  $45^\circ$  line. Now tell the same story using the saving/investment (leakages/injections) approach.

- ◆◆◆ LEARNING TIP: Memorize the two multiplier formulas given on p. 153 [465]. Also, memorize the likely values for the multiplier that might show up on a test. These are:

<i>MPC</i>	<i>MPS</i>	Multiplier
0.50	_____	2.0
0.60	_____	2.5
0.75	_____	4.0
0.80	_____	5.0
0.90	_____	10.0

For practice, fill in the *MPS* values and confirm the multiplier values using both formulas. ◀

### Practice

By comparing the two cases that follow, you should get a good idea about how the multiplier operates.

CASE 1: ARBOC. In Arboc, *MPC* is 0.9. The economy is in equilibrium. Suddenly, there is a 100-opek increase in investment spending, which creates 100 opeks of extra income. The income is split 90:10 between new consumption and new saving. The new consumption spending generates additional income.

New Expenditure	New Income	=	New Consumption	+	New Saving
100.00	100.00	=	90.00	+	10.00
90.00	90.00	=	81.00	+	9.00
81.00	81.00	=	72.90	+	8.10
72.90	72.90	=	65.61	+	7.29
65.61	65.61	=	59.05	+	6.56
.	.		.		.
.	.		.		.
.	.		.		.
1,000.00	1,000.00	=	900.00	+	100.00

This process goes through many “rounds,” only the first five of which are given. The final row gives the total results.

#### Notes

- The initial “injection” of spending is 100; ultimately this will all become new saving. Indeed, the opeks must continue to circulate (generating more income and expenditure) until all of the “extra” 100 opeks have leaked into saving (non-consumption). *The leakage must equal the injection.* The multiplier’s strength depends on how rapidly the injection of extra spending leaks away.
- We know that income equals consumption plus investment. Income increased by 1,000, consumption increased by 900, and investment increased by 100.

CASE 2: ARBEZ. In Arbez, *MPC* is 0.8. The economy is in equilibrium. Suddenly, there is a 100 bandu increase in investment spending, which creates 100 bandu of extra income. Income is split 80:20 between new consumption and new saving.

- Complete the following table.

<b>New Expenditure</b>	<b>New Income</b>	=	<b>New Consumption</b>	+	<b>New Saving</b>
100.00		=		+	
		=		+	
		=		+	
		=		+	
		=		+	
·	·		·		·
·	·		·		·
·	·		·		·
500.00	500.00	=	400.00	+	100.00

ANSWER: Refer to the following table.

<b>New Expenditure</b>	<b>New Income</b>	=	<b>New Consumption</b>	+	<b>New Saving</b>
100.00	100.00	=	80.00	+	20.00
80.00	80.00	=	64.00	+	16.00
64.00	64.00	=	51.20	+	12.80
51.20	51.20	=	40.96	+	10.24
40.96	40.96	=	32.77	+	8.19
·	·		·		·
·	·		·		·
·	·		·		·
500.00	500.00	=	400.00	+	100.00

#### Notes

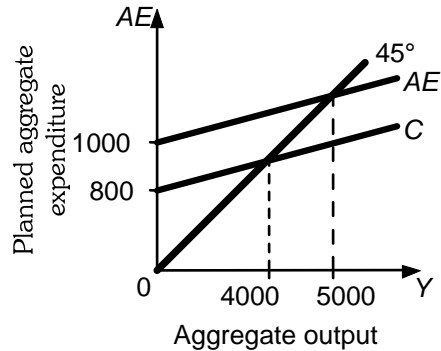
- As in Case 1, the initial “injection” of spending leaks away to saving; ultimately all of this injection of spending ends up as new saving.
- Income increases by 500, consumption increases by 400, and investment increases by 100.
- The expansion in income is less in Case 2 (the multiplier is smaller) because  $MPC$  is smaller ( $MPS$  is greater). The extra 100 units of spending leak away into saving more slowly in Case 1 and are recycled more frequently.

Remember: The steeper the  $AE$  curve, the higher the value of the multiplier. Can you figure out why?

- The formula for the multiplier is
  - $1/MPC$ .
  - $1/MPS$ .
  - $1/(1 - MPS)$ .
  - $1/(1 + MPS)$ .

ANSWER: (b) Refer to p. 153 [465] for the two versions of the multiplier formula.

Use the following diagram, which builds on the previous diagram, to answer the next five questions.



18. The level of investment in this economy is
- 200.
  - 800.
  - 1,000.
  - 5,000

ANSWER: (a)  $AE = C + I$ . When  $Y = 0$ ,  $AE = 1,000$ , and  $C = 800$ .

19. The slope of the  $AE$  function is
- 0.6.
  - 0.75.
  - 0.8.
  - 0.9.

ANSWER: (c) The slope of the  $AE$  function depends on  $MPC$ . Question 6 determined that  $MPC$  is 0.8. If we refer to the  $AE$  function by itself, we get the same result. Spending increases by 4,000 (from 1,000 to 5,000) as income increases from 0 to 5,000.

20. The multiplier has a value of
- 4.
  - 5.
  - 8.
  - 10.

ANSWER: (b) The multiplier formula is  $1/(1 - MPC)$ .  $MPC$  is 0.8.

21. If planned investment increases by 100, equilibrium output level will increase by \_\_\_\_\_. In equilibrium, saving will equal \_\_\_\_\_.
- 100; 200
  - 100; 300
  - 500; 200
  - 500; 300

ANSWER: (d) The multiplier is 5. Equilibrium output will increase by 500 ( $100 \times 5$ ). In equilibrium, saving equals investment. Recall that investment was 200 and rose further by a 100. Alternatively, because  $MPS$  is 0.2 (can you see why?), an increase in income of 500 will cause a 100 increase in saving.

22. When the output level is 4,000, unplanned inventories will
- increase by 1,000.
  - increase by 200.

- (c) decrease by 1,000.
- (d) decrease by 200.

ANSWER: (d) At an output level of 5,000, planned aggregate expenditure is 5,000. If income falls by 1,000, consumption falls only by 800 because  $MPC$  is 0.8. Therefore, we know that, at an output level of 4,000, planned aggregate expenditure is 4,200. Planned aggregate expenditure is 200 more than output and inventories will decrease accordingly.

23. If the slope of the  $AE$  function became steeper,  $MPC$  would become \_\_\_\_\_ and the multiplier would become \_\_\_\_\_.
- (a) larger; larger
  - (b) larger; smaller
  - (c) smaller; larger
  - (d) smaller; smaller

ANSWER: (a) Refer to Case A and Case B above. ■



#### OBJECTIVE 5:

Describe the reasoning behind the paradox of thrift and explain what is paradoxical.

The *paradox of thrift* shows that attempts to increase saving (an upward shift in the saving function and a downward shift in the consumption function) will be fruitless. Total saving won't change, but the economy will suffer a decrease in output (income) level. (page 154 [466])

**Note:** The paradox of thrift is inevitable, given our model. Investment is constant and, when equilibrium is achieved, saving *must* equal that value. As long as investment behavior does not change, saving can neither increase nor decrease.

**ECONOMICS IN PRACTICE:** On page 154 [466], the textbook raises the issue of the “paradox of thrift.” At first sight, this result may seem enough to persuade you that Keynes must have got it wrong somewhere! After all, as children we are taught that it is wise to save (if not fun). Economists show that there is a clear link between saving and economic growth. There are, in fact, *two* components to the paradox of thrift—one involving the level of income (production) and the other involving the level of saving in the economy. Assuming that households decide to save more, what does our model predict will happen to (i) income and (ii) saving?

**ANSWER:** Given more saving initially, consumption will decrease, pulling down the level of income as the economy adjusts to its new equilibrium—thriftiness seems to reduce our standard of living. Saving will remain unchanged (although the distribution of saving may change)—trying to save more appears impossible.

**ECONOMICS IN PRACTICE (CONTINUED):** In part, the result is due to the assumption that planned investment is constant. If saving and investment must be equal in equilibrium, and investment is constant, then the level of saving *can't* change. However, do you think that the level of planned investment is fixed, or do you think that, as production increases, investment will also increase? If so, does the paradoxical result disappear?

**ANSWER:** Evidence shows that planned investment does increase as the economy grows. That means that planned investment must decrease as the economy shrinks. An increase in saving (decrease in spending) will make the economy (and investment) shrink. The final equilibrium level

of saving, therefore, will be *lower* than the initial level. Injecting some realism into the model makes the paradoxical result more intense!

**ECONOMICS IN PRACTICE (CONTINUED):** At this point, it is a natural reaction to give up on Keynes. However, during the Great Depression, households did cut consumption and the economy did contract. As the textbook indicates, there is a resolution, and it comes through financial markets. How might increased saving stimulate increased investment?

**ANSWER:** Higher supplies of funds (saving) in financial markets should reduce the price (interest rate) of those funds. Cheaper loans should encourage more borrowing by businesses for investment purposes. More on this in Chapter 12 (27). Finally, as you'll discover in Chapter 13 (28), as demand in the economy declines, the aggregate price level will decrease, encouraging additional expenditures.

---

### Practice

---

24. Refer to the table used in Practice Question 10. The economy is in equilibrium. If saving increases by 100, equilibrium output will decrease by \_\_\_\_\_ and consumption will decrease by \_\_\_\_\_.
- (a) 100; 100
  - (b) 100; 400
  - (c) 400; 100
  - (d) 400; 400

**ANSWER:** (d) *MPC* is 0.75 (Question 13); the multiplier is 4. If saving increases by 100, consumption decreases by 100 and output decreases by 400 ( $100 \times 4$ ). When output (income) decreases by 400, consumption is reduced by an additional 300. The total decrease in consumption is 400.

25. If households increase saving, the paradox of thrift indicates that, in equilibrium, consumption will \_\_\_\_\_ and output will \_\_\_\_\_.
- (a) decrease; increase
  - (b) decrease; decrease
  - (c) not increase; increase
  - (d) not increase; decrease

**ANSWER:** (b) The increase in saving causes consumption to decrease. The decrease in consumption spending will make equilibrium output decrease. As income falls, consumption falls even more. ■

### SUMMARY: EQUILIBRIUM CONDITIONS

Equilibrium can be described in several ways. Learn them all!

$$\begin{aligned}
 \text{Planned aggregate expenditure} &= \text{aggregate output (income)} \\
 C + S &= C + I \\
 S &= I \\
 \text{Planned investment} &= \text{actual investment} \\
 \text{Unplanned inventory change} &= 0
 \end{aligned}$$

Note: As the model is extended in later chapters, all but the first of these conditions will be modified.

**BRAIN TEASER SOLUTION:** If you're like most people, you'd end up spending most of the extra dollars. Often, households save about 5% of the additional income received and spend the rest.  $MPS$  is 0.05,  $MPC$  is 0.95, and the multiplier is 20. Clearly, the multiplier model in the present chapter has omitted some ingredients. Taxes, which increase as income increases, drain some dollars from the "spend-earn income-spend" process. As demand increases, rising prices and higher interest rates choke off spending. Some dollars are spent overseas.

### PRACTICE TEST

#### I. MULTIPLE-CHOICE QUESTIONS

Select the option that provides the single best answer.

- \_\_\_\_\_ 1.  $MPC$  is \_\_\_\_\_ divided by \_\_\_\_\_
- consumption, income.
  - change in consumption, income.
  - change in consumption, change in income.
  - consumption, change in income.
- \_\_\_\_\_ 2. The larger the value of  $MPC$ , the
- larger the value of the multiplier.
  - steeper the slope of the saving function.
  - smaller the value of the multiplier.
  - flatter the slope of the consumption function.

Use the following table to answer the next three questions.

Income	Consumption	Investment
2,000	1,800	1,000
3,000	2,600	1,000
4,000	3,400	1,000
5,000	4,200	1,000
6,000	5,000	1,000
7,000	5,800	1,000

- \_\_\_\_\_ 3. The equilibrium income level is \_\_\_\_\_ and the equilibrium saving level is \_\_\_\_\_.
- 7,000; 200
  - greater than 7,000; 1,000
  - 6,000; 1,000
  - 1,000; 100

- \_\_\_\_\_ 4. The *MPS* is \_\_\_\_\_ and the multiplier is \_\_\_\_\_ .  
 (a) 0.1; 10  
 (b) 0.2; 5  
 (c) 0.2; 10  
 (d) 0.1; 5
- \_\_\_\_\_ 5. If planned saving suddenly rises by 100, then, at the new equilibrium, income will \_\_\_\_\_ . Eventually, saving will \_\_\_\_\_ .  
 (a) fall by 100; fall by 100  
 (b) fall by 500; not change  
 (c) fall by 500; fall by 100  
 (d) fall by 100; not change

Use the following table to answer the next three questions.

Income	Consumption
0	100
100	180
200	260
300	340
1,000	900
2,000	1,700

- \_\_\_\_\_ 6. Referring to the equation  $C = a + bY$ , the value of “*a*” is \_\_\_\_\_ .  
 (a) 0  
 (b) 20  
 (c) 80  
 (d) 100
- \_\_\_\_\_ 7. Marginal propensity to consume is \_\_\_\_\_ .  
 (a) 80  
 (b) 0.2  
 (c) 0.8  
 (d) 0.9
- \_\_\_\_\_ 8. An increase in investment of \$100 would \_\_\_\_\_ income by \_\_\_\_\_ .  
 (a) raise; 500  
 (b) raise; 100  
 (c) lower; 500  
 (d) lower; 100
- \_\_\_\_\_ 9. The economy is in equilibrium at an output level of 2,000. Now planned investment increases. At the initial output level, all of the following are true EXCEPT  
 (a) aggregate expenditure is greater than aggregate output.  
 (b) saving is less than planned investment.  
 (c) inventory levels are rising unexpectedly.  
 (d) consumption level has remained unchanged.
- \_\_\_\_\_ 10. A decrease in *MPS* would



- (a) cause the consumption function to shift upwards, all along its length.  
 (b) cause the consumption function to shift downwards, all along its length.  
 (c) cause the consumption function to rotate upwards, pivoting where it meets the vertical axis.  
 (d) have no effect on the consumption function.
- \_\_\_\_\_ 11. In our model,  $MPC$  must be less than \_\_\_\_\_ and  $MPS$  must exceed \_\_\_\_\_ .  
 (a) one; one  
 (b) one; zero  
 (c) zero; one  
 (d) zero; zero
- \_\_\_\_\_ 12. If planned investment suddenly decreases, the  $AE$  line will shift \_\_\_\_\_ and equilibrium saving will \_\_\_\_\_ .  
 (a) upward; increase  
 (b) upward; decrease  
 (c) downward; increase  
 (d) downward; decrease
- \_\_\_\_\_ 13. Equilibrium occurs when aggregate output is equal to planned \_\_\_\_\_ plus planned \_\_\_\_\_ .  
 (a) consumption; saving  
 (b) consumption; investment  
 (c) investment; saving  
 (d) inventories; investment
- \_\_\_\_\_ 14. Aggregate output is currently less than planned aggregate expenditure. We can predict that inventory levels are unexpectedly \_\_\_\_\_ and saving is \_\_\_\_\_ than planned investment.  
 (a) increasing; greater  
 (b) increasing; less  
 (c) decreasing; greater  
 (d) decreasing; less
- \_\_\_\_\_ 15. Which of the following statements is true?  
 (a) Savings is the difference between current income and current consumption.  
 (b) When expenditures are high, saving is less than actual investment.  
 (c) Saving is a flow variable: savings is a stock variable.  
 (d) When the interest rate falls, saving increases and consumption decreases.
- \_\_\_\_\_ 16. If income is zero, consumption will be  
 (a) positive.  
 (b) zero, because you can't spend what you don't have.  
 (c) zero, because consumption and saving must sum to equal income.  
 (d) unknown—it depends on the slope of the consumption function.
- \_\_\_\_\_ 17. As consumer uncertainty in the future increases, consumption will \_\_\_\_\_ and saving will \_\_\_\_\_ .

- (a) increase; increase
- (b) increase; decrease
- (c) decrease; increase
- (d) decrease; decrease

\_\_\_\_\_ 18. Firms have the least control over

- (a) inventory levels.
- (b) production levels.
- (c) planned investment.
- (d) purchases of new equipment.

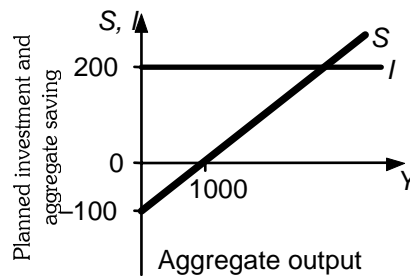
\_\_\_\_\_ 19. *MPC* equals 0.9. Consumers receive an extra \$100 of income. We can say that

- (a) the consumption function has moved upwards.
- (b) the consumption function has moved downwards.
- (c) consumption spending increases by \$100.
- (d) saving increases by \$10.

\_\_\_\_\_ 20. *MPC* equals 0.9. Planned investment is 100 and equilibrium income level is 1,000. If income were at 800, what would be the level of **saving**?

- (a) 100
- (b) 90
- (c) 80
- (d) 70

Use the following diagram to answer the next five questions.



\_\_\_\_\_ 21. The equation for this consumption function is

- (a)  $C = 100 + 0.8Y$ .
- (b)  $C = 100 + 0.9Y$ .
- (c)  $C = 200 + 0.8Y$ .
- (d)  $C = 200 + 0.9Y$ .

\_\_\_\_\_ 22. The multiplier value is

- (a) 0.9.
- (b) 8.
- (c) 9.
- (d) 10.

\_\_\_\_\_ 23. The equilibrium output level is

- (a) 200.

- (b) 1,000.
- (c) 3,000.
- (d) 4,000.

- \_\_\_\_\_ 24. If investment decreases by 50, equilibrium output will decrease by \_\_\_\_\_ and consumption will decrease by \_\_\_\_\_.
- (a) 200, 450
  - (b) 200, 500
  - (c) 500, 450
  - (d) 500, 500
- \_\_\_\_\_ 25. The equation for this saving function is
- (a)  $S = 100 + 0.1Y$ .
  - (b)  $S = 100 + 0.9Y$ .
  - (c)  $S = -100 + 0.1Y$ .
  - (d)  $S = -100 + 0.9Y$ .

## II. APPLICATION QUESTIONS

1. The Arbezani Minister of Macroeconomics gives you the following data about Arbez.

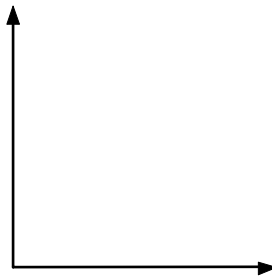
$$C = 300 + 0.75Y \quad (1)$$

$$I = 200 \quad (2)$$

$$AE = C + I \quad (3)$$

$$AE = Y \quad (4)$$

- (a) Calculate the marginal propensity to consume and the marginal propensity to save.
- (b) Derive the algebraic formula for the saving function.
- (c) What are the four conditions necessary for the economy to be in equilibrium?
- (d) Using your knowledge of the model, confirm that each equilibrium condition is consistent with the others.
- (e) Solve for equilibrium income. Calculate equilibrium income.
- (f) Graph equations (3) and (4) in the following diagram.



- (g) If GDP were 1,200, unplanned inventory accumulation would be how much?
- (h) If GDP were 2,200, unplanned inventory accumulation would be how much?
- (i) Based on these results, make up a rule relating the direction of unplanned inventory change, the 45° line, and the expenditure function.
- (j) How much saving will occur if GDP is 1,200?
- (k) How much saving will occur if GDP is 2,200?
- (l) Calculate the value of the multiplier.

When the economy is at the natural rate of unemployment, the output level is 2,800.

(m) How much would investment have to change to create full employment?

The economy is at its original equilibrium income level. Now, because of a surge in consumer optimism, consumption increases by 100 at each income level.

(n) Inventories are changing by how much? Are they rising or falling?

(o) Calculate the new equilibrium income level.

(p) Calculate the new equilibrium consumption level.

(q) Calculate the new equilibrium saving level.

(r) Calculate the new equilibrium investment level.

(s) Explain the result that has emerged regarding the net amount of change in the level of saving.

2. Most of the ideas associated with the consumption function are quite intuitive. Try to prove to yourself that the theory reflects common sense. The following questions cover many of the main points about consumption and saving that are dealt with in this chapter.

(a) Suppose you have received a \$100 per week wage increase (after tax). Would you spend:

(i) All of the extra \$100?

(ii) Some of the extra \$100?

(iii) None of the extra \$100?

(b) Would you save:

(i) All of the extra \$100?

(ii) Some of the extra \$100?

(iii) None of the extra \$100?

(c) The level of disposable income affects the amount spent and saved. Do you agree or disagree with the following statements?

(i) Other things, as well as income, affect how much I spend and save.

(ii) If I increase my personal consumption expenditures, I will have less available to save.

(iii) If I had no current income, I'd still try to buy food and other necessities.

(iv) Poor households spend a bigger proportion of their income than rich households do.

(d) Given my income level, if I increase my personal spending by \$1, my saving will \_\_\_\_\_ (increase/decrease) by \_\_\_\_\_ (more than/less than/exactly) a dollar.

In most other cases you should find yourself agreeing with the textbook's theory of consumption and saving.

3. Ask (or pretend to ask) five persons the following question:

“You are a typical consumer with an after-tax income of \$100 per week. How much of your income will you set aside as saving?”

Now ask yourself (the owner of a small business):

How much of your expected value of production (which you forecast to be \$500 per week) will you plan to plow back into the firm? (Remember you have employees and other bills to pay!)

Enter the results of the two questions in the following table.

Saving	Investment
--------	------------

There’s no single “right” answer—it depends on preferences, wealth, and so on. It’s unlikely saving and planned investment will be equal. Suppose saving totals \$15 and planned investment equals \$20.

- (a) Which is greater:  $C + I$  or  $C + S$ ?
- (b) Which is greater: planned aggregate expenditure or aggregate output?
- (c) Will firms be able to meet the planned demand for output, given their current level of production?
- (d) What will happen?
- (e) Write the formula for actual investment.
- (f) Calculate actual investment.

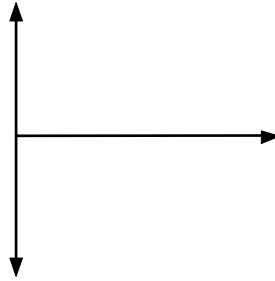
So actual investment is forced to the saving level!

4. “Investment is equal to 100. Consumption is equal to income.  $MPC$  equals 0.9.”

- (a) Saving is equal to \_\_\_\_\_ .
- (b) “Currently, the marginal propensity to save equals zero.” (True/False)
- (c) Currently, the economy \_\_\_\_\_ (is/is not) in equilibrium. Aggregate expenditure is \_\_\_\_\_ (greater than/less than) aggregate output.
- (d) Calculate the value of the multiplier.
- (e) Unplanned inventory change is \_\_\_\_\_ (positive/negative).
- (f) To establish equilibrium, output level will have to \_\_\_\_\_ (rise/fall) by \_\_\_\_\_ , in which case consumption will \_\_\_\_\_ (rise/fall) by \_\_\_\_\_ and saving will \_\_\_\_\_ (rise/fall) by \_\_\_\_\_ .

Now suppose that the income level (where consumption equals income) is 1,000.

- (g) When income equals zero, consumption will equal \_\_\_\_\_ and saving will equal \_\_\_\_\_ .
- (h) Calculate the formula for the consumption function.
- (i) Algebraically, confirm your results from (f) above, and calculate the equilibrium income level.
- (j) Sketch the saving-investment diagram, showing the slope of the saving function, the present income level (1,000) and the equilibrium income level.

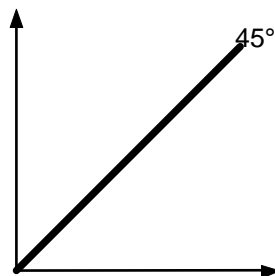


5. (a) Fill in the blanks in the following table, based on the model given in the text.

Income	Consumption	Saving	Investment	Expenditures
0				
100	180			
200	260			
300			20	
400				
500				
600				
700				

$MPC = \underline{\hspace{2cm}}$        $MPS = \underline{\hspace{2cm}}$       multiplier =  $\underline{\hspace{2cm}}$

- (b) The equilibrium output level is  $\underline{\hspace{2cm}}$ .
- (c) Algebraically, determine the consumption function.
- (d) Confirm your answer to (b) algebraically.
- (e) When income level is 300, there will be unplanned inventory  $\underline{\hspace{2cm}}$  (accumulation/decumulation) while, at an income level of 700, inventories will unexpectedly  $\underline{\hspace{2cm}}$  (increase/decrease).
- (f) Graph the *AE* function on the following 45° line diagram. Show the income range in which inventories will be rising unexpectedly and the income range in which they will be falling.



- (g) If investment increases by 50, by how much would equilibrium output level increase?
- (h) Consumption and saving would increase by  $\underline{\hspace{2cm}}$  and  $\underline{\hspace{2cm}}$  respectively.
- (i) The final value of saving would be  $\underline{\hspace{2cm}}$  and investment would be  $\underline{\hspace{2cm}}$ .
- (j) Confirm your results for (g), (h), and (i) algebraically.

- (k) The economy's equilibrium income level is 850. Suppose that 1,000 is the level of production that would provide full employment. How much more would investment have to rise in order to achieve full employment? \_\_\_\_\_
6. Suppose that the consumption function does *not* graph as a straight line, but rather increases at a decreasing rate (flattening off). Given your knowledge of the relationships between consumption, saving, and income, could you now draw the saving function? What sort of slope would it have? What would be happening to the value of the multiplier as income level increased?
7. We have modeled investment as remaining constant as output level increases. Suppose, more realistically, that investment increases as income level rises. What would happen to the slope of the *AE* curve? What would happen to the value of the multiplier?

### PRACTICE TEST SOLUTIONS

#### *I. Solutions to Multiple-Choice Questions*

1. (c) Refer to p. 143 [455] for the definition.
2. (a) The multiplier formula is  $1/(1 - MPC)$ . Refer to p. 153 [465].
3. (c) Equilibrium occurs where income equals consumption plus investment, at 6,000. In equilibrium,  $S = I$ , so saving must equal 1,000. Alternatively, when income is 6,000 and consumption is 5,000, saving must be 1,000.
4. (b) When the income level changes by 1,000 (from 3,000 to 4,000, for example), consumption increases by 800 (from 2,600 to 3,400). The additional 200 is saved.  $MPS = \text{change in saving}/\text{change in income} = \Delta S/\Delta Y = 200/1,000 = 0.2$ . The multiplier  $= 1/MPS = 1/0.2 = 5$ .
5. (b) If saving rises by 100, consumption must fall initially by 100, given the income level. The multiplier is 5. The final change in equilibrium income is 500 (i.e.,  $100 \times 5$ ). If income falls by 500 and the *MPC* is 0.8, consumption will fall by an additional 400. The total decrease in consumption is 500.
6. (d) In the equation, "*bY*" is the portion of consumption that responds to changes in income. When income is zero, consumption is 100.
7. (c) When the income level changes by 100 (from 200 to 300, for example), consumption increases by 80 (from 180 to 260).  $MPC = \text{change in consumption}/\text{change in income} = \Delta C/\Delta Y = 80/100 = 0.8$ .
8. (a) If expenditure increases, then equilibrium income will increase. The multiplier is 5 because *MPC* is 0.8. The multiplier equals  $1/(1 - MPC)$ . Income, then, will increase by 500 (i.e.,  $100 \times 5$ ).
9. (c) Because the demand for goods has risen, inventory levels will be drawn down.

10. (c) *MPS* is the slope of the saving function. A decrease in *MPS* requires an increase in *MPC*. An increase in *MPC* will cause the slope of the consumption function to become steeper.
11. (b) If income increases by 100, our theory assumes that we consume some quantity less than 100 and save some positive quantity.
12. (d) Investment is a part of aggregate expenditure. A decrease in investment will decrease *AE*, shifting the line downward. In equilibrium,  $S = I$ . If investment falls, saving must fall too.
13. (b) In equilibrium,  $Y = C + I$ . Refer to p. 148 [460].
14. (d) If aggregate output is less than planned aggregate expenditure, then demand is high. Inventory levels will be falling. Because spending is high, saving is low and will be less than planned investment.
15. (c) *Savings* is the accumulation of saving from past periods; it is a stock, while saving is a process (a flow). Saving *always* equals actual investment. When the interest rate falls, saving decreases and consumption increases.
16. (a) The slope of the consumption function is irrelevant in this question. Consumption is positive even when income is zero because it is necessary to buy food, housing, and other staples of life. Without income, this is financed by “dissaving.”
17. (c) When future prospects are less clear, households tend to hold back on purchases, saving more of their current income.
18. (a) Firms choose output levels and set up investment programs, but their inventory levels are affected by sales which are dependent on the whims of their customers.
19. (d) An increase in income will not shift the consumption function—there will be a movement along it. If *MPC* is 0.6, *MPS* is 0.1. A \$100 increase in income will generate a \$10 increase ( $\$100 \times 0.1$ ) in saving.
20. (c) Equilibrium income level is 1,000 and planned investment is 100. In equilibrium, consumption must be 900 and saving must be 100. If income falls by 200, consumption falls by 180 ( $200 \times 0.9$ ) and saving falls by 20 ( $200 \times 0.1$ ). Saving will be 80.
21. (b) The intercept term (a) is 100 because income is zero and  $C + S$  must equal this. As income increases from zero to 1,000, saving increases from  $-100$  to 0, an increase of 100.  $MPS = \text{change in saving}/\text{change in income} = \Delta S/\Delta Y = 100/1,000 = 0.1$ .  $MPC = 1 - MPS$ .
22. (d) The multiplier equals  $1/(1 - MPC)$ .
23. (c) In equilibrium, saving must equal investment and, therefore, must equal 200. For saving to increase by 300 (from  $-100$  to 200), income must increase by 3,000 (from zero) if *MPS* is 0.1.



24. (c) Expenditure decreases by 50. The multiplier is 10. Equilibrium output will decrease by 500 ( $50 \times 10$ ). Because  $MPC$  is 0.9, consumption will decrease by 450 ( $500 \times 0.9$ ). Saving will fall by 50 ( $500 \times MPS$ ), causing saving to be 150 and to be equal to investment.
25. (c)  $S = Y - C = Y - (100 + 0.9Y) = -100 + 0.1Y$ .

## II. Solutions to Application Questions

1. (a)  $MPC = 0.75$ . Equation 1 tells us that, as income ( $Y$ ) increases by 100, consumption increases by 75.  $MPS = 0.25$ . Recall that  $MPC + MPS = 1$ . Alternatively, as income ( $Y$ ) increases by 100 and consumption increases by 75, the remaining 25 must be saved.
- (b)  $S = -300 + 0.25Y$ .
- (c) The equilibrium conditions are:

$$\text{Planned aggregate expenditure} = \text{aggregate output (income)} \quad (1)$$

$$C + S = C + I$$

$$\text{PLANNED SAVING} = \text{PLANNED INVESTMENT} \quad (2)$$

$$S = I$$

$$\text{Planned investment} = \text{actual investment} \quad (3)$$

$$\text{Unplanned inventory change} = 0 \quad (4)$$

- (d) If, in equilibrium, equation (1) holds, then (2) must also hold because  $AE$  is defined as consumption plus investment and  $Y$  is defined as consumption plus saving. Similarly, canceling the “consumptions,” we can derive (3).

We know that actual investment always equals planned investment plus unplanned inventory change. In equilibrium, unplanned inventory change is zero (5), therefore equation (4) is consistent. If actual investment equals planned investment plus zero, then actual investment equals planned investment.

- (e)  $Y = C + I$  (in equilibrium)

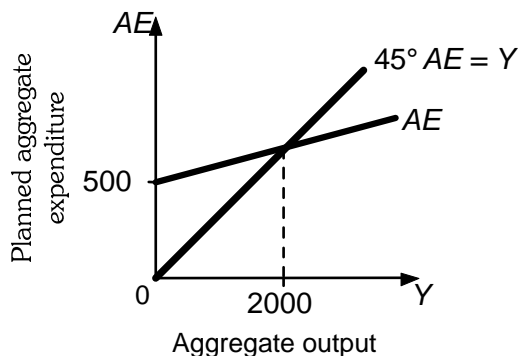
$$Y = 300 + 0.75Y + 200 = 500 + 0.75Y$$

$$Y - 0.75Y = 500$$

$$0.25Y = 500$$

$$Y = 2,000$$

- (f) Refer to the diagram following.



- (g) 200 decrease in inventories. Demand (1,400) exceeds production (1,200).  
 (h) 50 increase in inventories. Production (2,200) exceeds demand (2,150).  
 (i) At income levels where the  $AE$  line is above the  $45^\circ$  line, unplanned inventory change will be negative (e.g., when  $Y = 1,200$ ); at income levels where the  $AE$  line is below the  $45^\circ$  line, unplanned inventory change will be positive (e.g., when  $Y = 2,200$ ).  
 (j)  $C = 300 + 0.75Y$ .  $Y = 1,200$ .  $C = 300 + 0.75(1,200) = 1,200$ .  $S = Y - C = 0$ .  
 (k)  $C = 300 + 0.75Y$ .  $Y = 2,200$ .  $C = 300 + 0.75(2,200) = 1,950$ .  $S = Y - C = 250$ .  
 (l) An autonomous 100-unit increase in expenditure causes a 400 increase in equilibrium income. The multiplier is 4.00.

Check: Multiplier =  $1/(1 - MPC) = 1/0.25 = 4.00$

- (m)  $\Delta Y = m \times \Delta I$ .  $m = 4$  and  $\Delta Y = 800$ , therefore  $\Delta I = 200$ .  
 (n) Inventories are falling by 100 as producers use previously produced output to meet the unexpected demand.  
 (o)  $Y = C + I$  (in equilibrium)

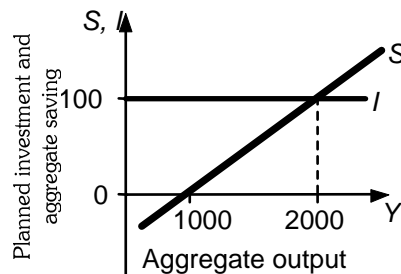
$$\begin{aligned} Y &= 400 + 0.75Y + 200 = 600 + 0.75Y \\ Y - 0.75Y &= 600 \\ 0.25Y &= 600 \\ Y &= 2,400 \end{aligned}$$

- (p) When  $Y = 2,400$ ,  $C = 400 + 0.75(2,400) = 2,200$   
 (q) When  $Y = 2,400$ ,  $S = -400 + 0.25(2,400) = 200$   
 Check:  $Y = C + S$ ;  $2,400 = 2,200 + 200$   
 (r)  $I$  is unchanged at 200. Note that, in equilibrium,  $S = I$ .  
 (s) Saving has remained unchanged. In equilibrium,  $S = I$ , and  $I$  has remained unchanged.

2. (a) some (probably most, in fact)  
 (b) some  
 If you answered “all” for (i) you should have answered “none” for (ii). Such answers indicate you’re not “typical”—most folks try to set some saving aside. Groups who don’t are the young (who may have high initial expenses and low incomes) and the retired (who don’t earn much).  
 (c) You probably “agree” with all of these statements.  
 The “other things” in (i) and the logic behind (iv) will be developed in Chapter 12 (27).  
 (d) If I increase my personal spending by \$1, my saving will *decrease* by *exactly* \$1.  
 If you missed this one, reread the first few pages of the chapter!
3. (a)  $C + I$  exceeds  $C + S$  because  $I$  exceeds  $S$ .

- (b) aggregate expenditure
- (c) No
- (d) Firms will have to reduce their inventories unexpectedly.
- (e) Actual investment = planned investment + unplanned inventory change.
- (f)  $15 = 20 + -5$ .

- 4.
- (a) Zero. If consumption equals income, no income can be saved.
  - (b) False. Because  $MPC$  equals 0.9, we can say that  $MPS$  equals 0.1.
  - (c) is not; greater than.
  - (d) 10. Multiplier =  $1/(1 - MPC) = 1/0.1 = 10$ .
  - (e) negative. Planned aggregate expenditure exceeds aggregate output.
  - (f) rise; 1,000; rise; 900; rise; 100. The “gap” between planned aggregate expenditure and aggregate output is 100. The multiplier is 10. Equilibrium income will fall by 1,000.  $MPC$  is 0.9. Given the increase in income, consumption will increase by  $1,000 \times 0.9$ .  $MPS$  is 0.1. Given the increase in income, saving will increase by  $1,000 \times 0.1$ .
  - (g) 100; -100. If income changes from zero to 1,000, consumption increases by 900 to 1,000 (because  $MPC$  is 0.9). We know, therefore, that consumption is  $(1,000 - 900)$  when income level is zero. Because income equals consumption plus saving, saving must equal -100.
  - (h)  $C = 100 + 0.9Y$ .
  - (i)  $Y = C + I$   
 $= 100 + .9Y + 100$   
 $= 200 + .9Y$   
 $Y - .9Y = 200$   
 $.1Y = 200$   
 $Y = 2,000$
  - (j) Refer to the diagram following.



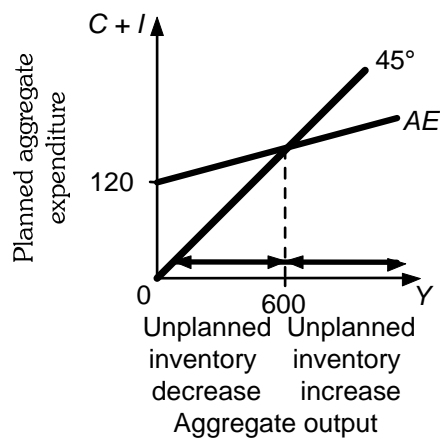
5. (a) Refer to the following table. When income rises by 100 (from 100 to 200), consumption rises by 80 (from 180 to 260).  $MPC$ , therefore, is 0.8.  $MPC + MPS = 1$ , therefore  $MPS = 0.2$ . Given  $MPC$ , the consumption column can be filled in.

Given income and consumption, saving can be derived by subtraction. Investment is assumed to be constant at 20. The expenditure column is derived by adding consumption and investment.

Income	Consumption	Saving	Investment	Expenditures
0	100	-100	20	120
100	180	-80	20	200
200	260	-60	20	280
300	340	-40	20	360
400	420	-20	20	440
500	500	0	20	520
600	580	20	20	600
700	660	40	20	680

$$MPC = 0.8 \quad MPS = 0.2 \quad \text{multiplier} = 5$$

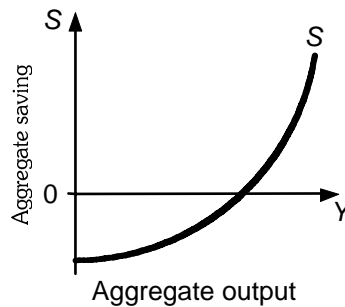
- (b) 600. Equilibrium occurs where planned expenditure equals income (and where saving equals investment).
- (c)  $C = 100 + 0.8Y$
- (d)  $Y = 100 + .8Y + 20$   
 $.2Y = 120$   
 $Y = 600$
- (e) decumulation; increase
- (f) Refer to the following diagram.



- (g) 250. The multiplier is 5.
- (h) 200; 50. Consumption increases by  $0.8 \times \Delta Y$ . Saving increases by  $0.2 \times \Delta Y$ .
- (i) 70; 70. In equilibrium these two values must be equal.  
 $Y = 100 + 0.8Y + 70$

- (j)  $0.2Y = 170$   
 $Y = 850$   
 $C = 100 + 0.8Y$   
 $= 100 + 0.8(850) = 780$   
 At  $Y = 600$ ,  $C$  was 580 (Refer to the preceding table.)  
 $S = Y - C = 850 - 780 = 70$ .  
 At  $Y = 600$ ,  $S$  was 20 (Refer to the preceding table.)
- (k) 30. The economy's equilibrium income level is 850, 150 short of the goal. The multiplier is 5, so an autonomous 30-unit increase, multiplied by 5, will hit the target.

6. The slope of the consumption function is  $MPC$  and the slope of the saving function is  $MPS$ . We know that  $MPC + MPS$  equals one.  $MPC$  decreases as the slope of the consumption function becomes flatter, so  $MPS$  must increase and the slope of the saving function must become progressively steeper. The value of the multiplier is given by the formula:  $1/MPS$ . As  $MPS$  increases, the size of the multiplier will decrease as income level increases. In fact, the effect of this weakened multiplier can be shown graphically. The same vertical increase in aggregate spending will push the economy's equilibrium income level less far when the slope of the  $AE$  curve is decreasing.



7. The  $AE$  function is the total of the consumption function and the investment function. In the original model, the slope of  $AE$  is determined solely by the slope of the consumption function—i.e.,  $MPC$ . However, the slope of the  $AE$  curve is properly interpreted as the change in spending (from both sources) that occurs as income changes. If investment also

increases, as income increases, the  $AE$  curve will become steeper. The value of the multiplier will increase too; in the more complex model we'll be developing in later chapters, the multiplier formulas we have devised are incomplete. In fact, the effect of this strengthened multiplier can be shown graphically. The same vertical increase in aggregate spending will push the economy's equilibrium income level farther as the  $AE$  curve becomes steeper.

