Assumptions and Simplifications

The simplifying assumptions underpinning the aggregate expenditures model reflect the economic conditions that were prevalent during the Great Depression. As discussed in this chapter's Last Word, Keynes created the model during the middle of the Great Depression in the hopes of understanding both why the Great Depression had happened as well as how it might be ended.

The most fundamental assumption behind the aggregate expenditures model is that prices in the economy are fixed. In the terminology of Chapter 23, the aggregate expenditures model is an extreme version of a sticky price model. In fact, it is a stuck-price model since prices cannot change at all.

Keynes made this assumption because the economy during the Great Depression was operating far below its potential output. Real GDP in the United States declined by 27 percent from 1929 to 1933 and the unemployment rate rose to 25 percent. Thousands of factories sat idle, gathering dust and producing nothing because nobody wanted to buy their output. To Keynes, this massive unemployment of labor and capital meant that even if a sudden increase in demand occurred, prices were unlikely to rise at all because the massive oversupply of productive resources would keep prices low. Consequently, he focused his attention on how the economy might reach an equilibrium in a situation in which prices were likely to be stuck for a while.

His solution involves realizing that even if prices are stuck, firms will still be able to receive feedback from the markets about how much they should produce. With prices stuck, this feedback obviously cannot come in the form of changing prices. Instead, it comes in the form of unplanned changes in firm inventory levels. As we will explain, these changes can guide firms to an equilibrium level of GDP. Crucially, this equilibrium level of GDP can be well below a nation's potential output—meaning that the aggregate expenditures model can explain the situation of massive unemployment that the economy found itself in during the Great Depression.

But the aggregate expenditures model is not just of historical interest. It can be used fruitfully even today because, as we explained in Chapter 23, prices in the modern economy are very sticky and sometimes nearly stuck in the short run. As a result, the aggregate expenditures model can help us understand how the modern economy is likely to initially adjust to various economic shocks, including changes in things such as tax rates, government spending, consumption expenditures, and investment spending.

We will build up the aggregate expenditures model in simple stages. Let's first look at aggregate expenditures and equilibrium GDP in a *private closed economy* —one without international trade or government. Then we will "open" the "closed" economy to exports and imports and also convert our "private" economy to a more realistic "mixed" economy that includes government purchases (or, more loosely, "government spending") and taxes.

In addition, until we introduce taxes into the model, we will assume that real GDP equals disposable income (DI). For instance, if $500 billion of output is produced as GDP, households will receive exactly $500 billion of disposable income that they can then consume or save. And finally, unless specified otherwise, we will assume (as Keynes did) that the economy has excess production capacity and unemployed labor so that an increase in aggregate expenditures will increase real output and employment but not raise the price level.

Consumption and Investment Schedules

In the private closed economy, the two components of aggregate expenditures are consumption, C, and gross investment, I_g. Because we examined the *consumption schedule* (Figure 27.2a) in the previous chapter, there is no need to repeat that analysis here. But to add the investment decisions of businesses to the consumption plans of households, we need to construct an investment schedule showing the amounts business firms collectively intend to invest—their **planned investment**—at each possible level of GDP. Such a schedule represents the investment plans of businesses in the same way the consumption schedule represents the consumption plans of households. In developing the investment schedule, we will assume that this planned investment is independent of the level of current disposable income or real output.

Suppose the investment demand curve is as shown in Figure 28.1a and the current real interest rate is 8 percent. This means that firms will spend $20 billion on investment goods. Our assumption tells us that this $20 billion of investment will occur at both low and high levels of GDP. The line I_g in Figure 28.1b shows this graphically; it is the economy's **investment schedule.** You should not confuse this investment schedule I_g with the investment demand curve ID in Figure 28.1a. The investment schedule shows the amount of investment forthcoming at each level of GDP. As indicated in Figure 28.1b, the interest rate and investment demand curve together determine this amount ($20 billion). Table 28.1 shows the investment schedule in tabular form. Note that investment (I_g) in column 2 is $20 billion at all levels of real GDP.

FIGURE 28.1 (a) The investment demand curve and (b) the investment schedule. (a) The level of investment spending (here, $20 billion) is determined by the real interest rate (here, 8 percent) together with the investment demand curve *ID*. (b) The investment schedule I_g relates the amount of investment ($20 billion) determined in (a) to the various levels of GDP.

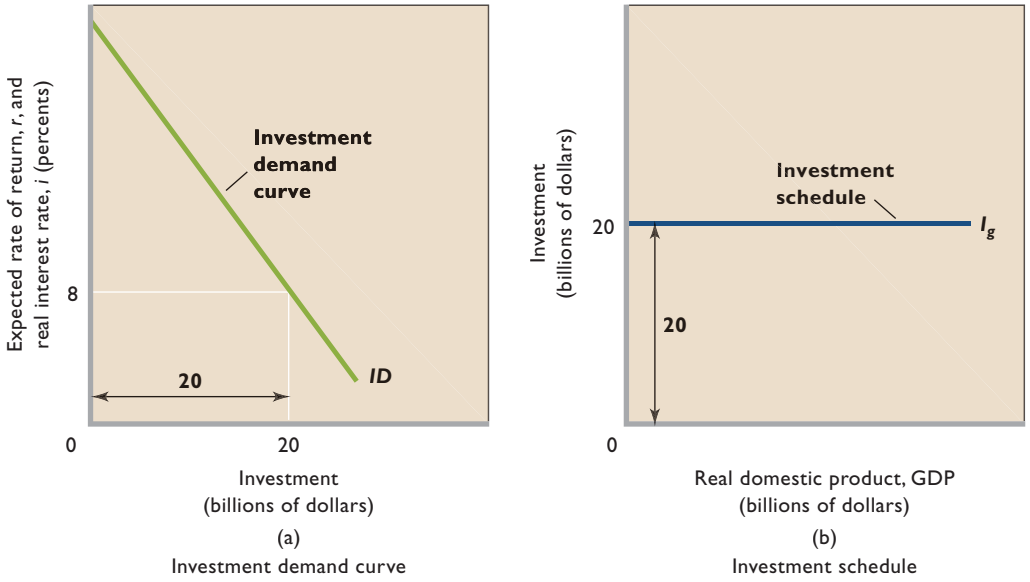

TABLE 28.1 The Investment Schedule (in Billions)

(1) Level of Real Output and Income	(2) Investment (I_g)
$370	$20
390	20
410	20
430	20
450	20
470	20
490	20
510	20
530	20
550	20

Equilibrium GDP: $C + I_g = GDP$

Now let's combine the consumption schedule of Chapter 27 and the investment schedule here to explain the equilibrium levels of output, income, and employment in the private closed economy.

Tabular Analysis

Columns 2 through 5 in Table 28.2 repeat the consumption and saving schedules of Table 27.1 and the investment schedule of Table 28.1.

Real Domestic Output

Column 2 in Table 28.2 lists the various possible levels of total output—of real GDP—that the private sector might produce. Producers are willing to offer any of these 10 levels of output if they can expect to receive an identical level of income from the sale of that output. For example, firms will produce $370 billion of output, incurring $370 billion of costs (wages, rents, interest, and normal profit costs) only if they believe they can sell that output for $370 billion. Firms will offer $390 billion of output if they think they can sell that output for $390 billion. And so it is for all the other possible levels of output.

Aggregate Expenditures

In the private closed economy of Table 28.2, aggregate expenditures consist of consumption (column 3) plus investment (column 5). Their sum is shown in column 6, which along with column 2 makes up the **aggregate expenditures schedule** for the private closed economy. This schedule shows the amount ($C + I_g$) that will be spent at each possible output or income level.

At this point we are working with *planned investment*—the data in column 5, Table 28.2. These data show the amounts firms plan or intend to invest, not the amounts they actually will invest if there are unplanned changes in inventories. More about that shortly.

TABLE 28.2 Determination of the Equilibrium Levels of Employment, Output, and Income: A Closed Private Economy

(1) Possible Levels of Employment, Millions	(2) Real Domestic Output (and Income) (GDP = DI),* Billions	(3) Consumption (*C*), Billions	(4) Saving (*S*), Billions	(5) Investment (I_g), Billions	(6) Aggregate Expenditures ($C + I_g$), Billions	(7) Unplanned Changes in Inventories, (+ or −)	(8) Tendency of Employment, Output, and Income
(1) 40	$370	$375	$−5	$20	$395	$−25	Increase
(2) 45	390	390	0	20	410	−20	Increase
(3) 50	410	405	5	20	425	−15	Increase
(4) 55	430	420	10	20	440	−10	Increase
(5) 60	450	435	15	20	455	−5	Increase
(6) ***65***	***470***	***450***	***20***	***20***	***470***	***0***	***Equilibrium***
(7) 70	490	465	25	20	485	+5	Decrease
(8) 75	510	480	30	20	500	+10	Decrease
(9) 80	530	495	35	20	515	+15	Decrease
(10) 85	550	510	40	20	530	+20	Decrease

*If depreciation and net foreign factor income are zero, government is ignored and it is assumed that all saving occurs in the household sector of the economy, then GDP as a measure of domestic output is equal to NI, PI, and DI. This means that households receive a DI equal to the value of total output.

Equilibrium GDP

Of the 10 possible levels of GDP in Table 28.2, which is the equilibrium level? Which total output is the economy capable of sustaining?

The equilibrium output is that output whose production creates total spending just sufficient to purchase that output. So the equilibrium level of GDP is the level at which the total quantity of goods produced (GDP) equals the total quantity of goods purchased ($C + I_g$). If you look at the domestic output levels in column 2 and the aggregate expenditures levels in column 6, you will see that this equality exists only at $470 billion of GDP (row 6). That is the only output at which economy-wide spending is precisely equal to the amount needed to move that output off the shelves. At $470 billion of GDP, the annual rates of production and spending are in balance. There is no overproduction, which would result in a piling up of unsold goods and consequently cutbacks in the production rate. Nor is there an excess of total spending, which would draw down inventories of goods and prompt increases in the rate of production. In short, there is no reason for businesses to alter this rate of production; $470 billion is the **equilibrium GDP.**

Disequilibrium

No level of GDP other than the equilibrium level of GDP can be sustained. At levels of GDP *less than* equilibrium, spending always exceeds GDP. If, for example, firms produced $410 billion of GDP (row 3 in Table 28.2), they would find it would yield $405 billion in consumer spending. Supplemented by $20 billion of planned investment, aggregate expenditures ($C + I_g$) would be $425 billion, as shown in column 6. The economy would provide an annual rate of spending more than sufficient to purchase the $410 billion of annual production. Because buyers would be taking goods off the shelves faster than firms could produce them, an unplanned decline in business inventories of $15 billion would occur (column 7) if this situation continued. But businesses can adjust to such an imbalance between aggregate expenditures and real output by stepping up production. Greater output will increase employment and total income. This process will continue until the equilibrium level of GDP is reached ($470 billion).

The reverse is true at all levels of GDP *greater than* the $470 billion equilibrium level. Businesses will find that these total outputs fail to generate the spending needed to clear the shelves of goods. Being unable to recover their costs, businesses will cut back on production. To illustrate: At the $510 billion output (row 8), business managers would find spending is insufficient to permit the sale of all that output. Of the $510 billion of income that this output creates, $480 billion would be received back by businesses as consumption spending. Though supplemented by $20 billion of planned investment spending, total expenditures ($500 billion) would still be $10 billion below the $510 billion quantity produced. If this imbalance persisted, $10 billion of inventories would pile up (column 7). But businesses can adjust to this unintended accumulation of unsold goods by cutting back on the rate of production. The resulting decline in output would mean fewer jobs and a decline in total income.

WORKED PROBLEMS

W 28.1
Equilibrium GDP

keygraph

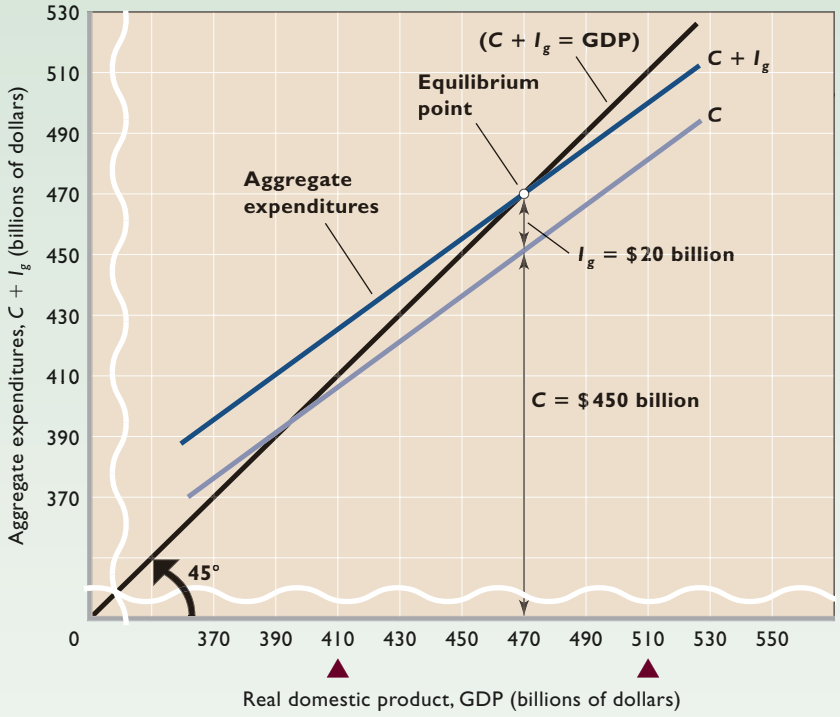

FIGURE 28.2 Equilibrium GDP. The aggregate expenditures schedule, $C + I_g$, is determined by adding the investment schedule I_g to the upsloping consumption schedule C. Since investment is assumed to be the same at each level of GDP, the vertical distances between C and $C + I_g$ do not change. Equilibrium GDP is determined where the aggregate expenditures schedule intersects the 45° line, in this case at $470 billion.

QUICK QUIZ FOR FIGURE 28.2

1. In this figure, the slope of the aggregate expenditures schedule $C + I_g$:
   - **a.** increases as real GDP increases.
   - **b.** falls as real GDP increases.
   - **c.** is constant and equals the MPC.
   - **d.** is constant and equals the MPS.
2. At all points on the 45° line:
   - **a.** equilibrium GDP is possible.
   - **b.** aggregate expenditures exceed real GDP.
   - **c.** consumption exceeds investment.
   - **d.** aggregate expenditures are less than real GDP.
3. The $490 billion level of real GDP is not at equilibrium because:
   - **a.** investment exceeds consumption.
   - **b.** consumption exceeds investment.
   - **c.** planned $C + I_g$ exceeds real GDP.
   - **d.** planned $C + I_g$ is less than real GDP.
4. The $430 billion level of real GDP is not at equilibrium because:
   - **a.** investment exceeds consumption.
   - **b.** consumption exceeds investment.
   - **c.** planned $C + I_g$ exceeds real GDP.
   - **d.** planned $C + I_g$ is less than real GDP.

Answers: 1. c; 2. a; 3. d; 4. c

Graphical Analysis

We can demonstrate the same analysis graphically. In **Figure 28.2 (Key Graph)** the 45° line developed in Chapter 27 now takes on increased significance. Recall that at any point on this line, the value of what is being measured on the horizontal axis (here, GDP) is equal to the value of what is being measured on the vertical axis (here, aggregate expenditures, or $C + I_g$). Having discovered in our tabular analysis that the equilibrium level of domestic output is determined where $C + I_g$ equals GDP, we can say that the 45° line in Figure 28.2 is a graphical statement of that equilibrium condition.

Now we must graph the aggregate expenditures schedule onto Figure 28.2. To do this, we duplicate the consumption schedule C in Figure 27.2a and add to it vertically the constant $20 billion amount of investment I_g from Figure 28.1b. This $20 billion is the amount we assumed firms plan to invest at all levels of GDP. Or, more directly, we can plot the $C + I_g$ data in column 6, Table 28.2.

Observe in Figure 28.2 that the aggregate expenditures line $C + I_g$ shows that total spending rises with income and output (GDP), but not as much as income rises. That is true because the marginal propensity to consume—the slope of line C—is less than 1. A part of any increase in income will be saved rather than spent. And because the aggregate expenditures line $C + I_g$ is parallel to the consumption line C, the slope of the aggregate expenditures line also equals the MPC for the economy and is less than 1. For our particular data, aggregate expenditures rise by $15 billion for every $20 billion increase in real output and income because $5 billion of each $20 billion increment is saved. Therefore, the slope of the aggregate expenditures line is .75 (= $\Delta\$15/\Delta\$20$).

The equilibrium level of GDP is determined by the intersection of the aggregate expenditures schedule and the 45° line. This intersection locates the only point at which aggregate expenditures (on the vertical axis) are equal to GDP (on the horizontal axis). Because Figure 28.2 is based on the data in Table 28.2, we once again find that equilibrium output is $470 billion. Observe that consumption at this output is $450 billion and investment is $20 billion.

It is evident from Figure 28.2 that no levels of GDP *above* the equilibrium level are sustainable because at those levels $C + I_g$ falls short of GDP. Graphically, the aggregate expenditures schedule lies below the 45° line in those situations. At the $510 billion GDP level, for example, $C + I_g$ is only $500 billion. This underspending causes inventories to rise, prompting firms to readjust production downward, in the direction of the $470 billion output level.

Conversely, at levels of GDP *below* $470 billion, the economy wants to spend in excess of what businesses are producing. Then $C + I_g$ exceeds total output. Graphically, the aggregate expenditures schedule lies above the 45° line. At the $410 billion GDP level, for example, $C + I_g$ totals $425 billion. This excess spending causes inventories to fall below their planned level, prompting firms to adjust production upward, in the direction of the $470 billion output level. Once production reaches that level, it will be sustained there indefinitely unless there is some change in the location of the aggregate expenditures line.

INTERACTIVE GRAPHS
G 28.1
Equilibrium GDP

Other Features of Equilibrium GDP

We have seen that $C + I_g$ = GDP at equilibrium in the private closed economy. A closer look at Table 28.2 reveals two more characteristics of equilibrium GDP:

- Saving and *planned* investment are equal.
- There are no *unplanned* changes in inventories.

Saving Equals Planned Investment

As shown by row 6 in Table 28.2, saving and planned investment are both $20 billion at the $470 billion equilibrium level of GDP.

Saving is a **leakage** or withdrawal of spending from the economy's circular flow of income and expenditures. Saving is what causes consumption to be less than total output or GDP. Because of saving, consumption by itself is insufficient to remove domestic output from the shelves, apparently setting the stage for a decline in total output.

However, firms do not intend to sell their entire output to consumers. Some of that output will be capital goods sold to other businesses. Investment—the purchases of capital goods—is therefore an **injection** of spending into the income-expenditures stream. As an adjunct to consumption, investment is thus a potential replacement for the leakage of saving.

If the leakage of saving at a certain level of GDP exceeds the injection of investment, then $C + I_g$ will be less than GDP and that level of GDP cannot be sustained. Any GDP for which saving exceeds investment is an above-equilibrium GDP. Consider GDP of $510 billion (row 8 in Table 28.2). Households will save $30 billion, but firms will plan to invest only $20 billion. This $10 billion excess of saving over planned investment will reduce total spending to $10 billion below the value of total output. Specifically, aggregate expenditures will be $500 billion while real GDP is $510 billion. This spending deficiency will reduce real GDP.

Conversely, if the injection of investment exceeds the leakage of saving, then $C + I_g$ will be greater than GDP and drive GDP upward. Any GDP for which investment exceeds saving is a below-equilibrium GDP. For example, at a GDP of $410 billion (row 3 in Table 28.2), households will save only $5 billion, but firms will invest $20 billion. So investment exceeds saving by $15 billion. The small leakage of saving at this relatively low GDP level is more than compensated for by the larger injection of investment spending. That causes $C + I_g$ to exceed GDP and drives GDP higher.

Only where $S = I_g$—where the leakage of saving of $20 billion is exactly offset by the injection of planned investment of $20 billion—will aggregate expenditures ($C + I_g$) equal real output (GDP). That $C + I_g$ = GDP equality is what defines the equilibrium GDP. **(Key Question 2)**

No Unplanned Changes in Inventories

As part of their investment plans, firms may decide to increase or decrease their inventories. But, as confirmed in line 6 of Table 28.2, there are no **unplanned changes in inventories** at equilibrium GDP. This fact, along with

$C + I_g$ = GDP, and $S = I_g$ is a characteristic of equilibrium GDP in the private closed economy.

Unplanned changes in inventories play a major role in achieving equilibrium GDP. Consider, as an example, the $490 billion *above-equilibrium* GDP shown in row 7 of Table 28.2. What happens if firms produce that output, thinking they can sell it? Households save $25 billion of their $490 billion DI, so consumption is only $465 billion. Planned investment—which includes *planned* changes in inventories—is $20 billion (column 5). So aggregate expenditures ($C + I_g$) are $485 billion and sales fall short of production by $5 billion. Firms retain that extra $5 billion of goods as an *unplanned* increase in inventories (column 7). It results from the failure of total spending to remove total output from the shelves.

Because changes in inventories are a part of investment, we note that *actual investment* is $25 billion. It consists of $20 billion of planned investment *plus* the $5 billion unplanned increase in inventories. Actual investment equals the saving of $25 billion, even though saving exceeds planned investment by $5 billion. Because firms cannot earn profits by accumulating unwanted inventories, the $5 billion unplanned increase in inventories will prompt them to cut back employment and production. GDP will fall to its equilibrium level of $470 billion, at which unplanned changes in inventories are zero.

Now look at the *below-equilibrium* $450 billion output (row 5, Table 28.2). Because households save only $15 billion of their $450 billion DI, consumption is $435 billion. Planned investment by firms is $20 billion, so aggregate expenditures are $455 billion. Sales exceed production by $5 billion. This is so only because a $5 billion unplanned decrease in business inventories has occurred. Firms must *disinvest* $5 billion in inventories (column 7). Note again that actual investment is $15 billion ($20 billion planned *minus* the $5 billion decline in inventory investment) and is equal to saving of $15 billion, even though planned investment exceeds saving by $5 billion. The unplanned decline in inventories, resulting from the excess of sales over production, will encourage firms to expand production. GDP will rise to $470 billion, at which unplanned changes in inventories are zero.

When economists say differences between investment and saving can occur and bring about changes in equilibrium GDP, they are referring to planned investment and saving. Equilibrium occurs only when planned investment and saving are equal. But when unplanned changes in inventories are considered, investment and saving are always equal, regardless of the level of GDP. That is true because actual investment consists of planned investment and unplanned investment (unplanned changes in inventories). Unplanned changes in inventories act as a balancing item that equates the actual amounts saved and invested in any period.

Changes in Equilibrium GDP and the Multiplier

In the private closed economy, the equilibrium GDP will change in response to changes in either the investment schedule or the consumption schedule. Because changes in the investment schedule usually are the main source of instability, we will direct our attention toward them.

Figure 28.3 shows the effect of changes in investment spending on the equilibrium real GDP. Suppose that the expected rate of return on investment rises or that the real interest rate falls such that investment spending increases by $5 billion. That would be shown as an upward shift of the investment schedule in Figure 28.1b. In Figure 28.3, the $5 billion increase of investment spending will increase aggregate expenditures from $(C + I_g)_0$ to $(C + I_g)_1$ and raise equilibrium real GDP from $470 billion to $490 billion.

If the expected rate of return on investment decreases or if the real interest rate rises, investment spending will decline by, say, $5 billion. That would be shown as a downward shift of the investment schedule in Figure 28.1b and a downward shift of the aggregate expenditures schedule from $(C + I_g)_0$ to $(C + I_g)_2$ in Figure 28.3. Equilibrium GDP will fall from $470 billion to $450 billion.

In our examples, a $5 billion change in investment spending leads to a $20 billion change in output and income. So the *multiplier* is 4 (= $20/$5). The MPS is .25, meaning that for every $1 billion of new income, $.25 billion of new saving occurs. Therefore, $20 billion of new income is needed to generate $5 billion of new saving. Once that increase in income and saving occurs, the economy is back in equilibrium—$C + I_g$ = GDP; saving and investment are equal; and there are no unplanned changes in inventories. You can see, then, why the multiplier is equal to 1/MPS and that the multiplier process is an integral part of the aggregate expenditures model. (A brief review of Table 27.3 and Figure 27.8 will be helpful at this point.)

QUICK REVIEW 28.1

- In a private closed economy, equilibrium GDP occurs where aggregate expenditures equal real domestic output ($C + I_g$ = GDP).
- At equilibrium GDP, saving equals planned investment ($S = I_g$) and unplanned changes in inventories are zero.
- Actual investment consists of planned investment plus unplanned changes in inventories (+ or −) and is always equal to saving in a private closed economy.
- Through the multiplier effect, an initial change in investment spending can cause a magnified change in domestic output and income.