Total : 40

9

6. a. i. Nominal GDP is the total value of goods and services measured at current prices. Therefore,

$$\begin{aligned}\text{Nominal GDP}_{2000} &= (P^{2000}_{\text{cars}} \times Q^{2000}_{\text{cars}}) + (P^{2000}_{\text{bread}} \times Q^{2000}_{\text{bread}})\\ &= (\$50{,}000 \times 100) + (\$10 \times 500{,}000)\\ &= \$5{,}000{,}000 + \$5{,}000{,}000\\ &= \$10{,}000{,}000.\end{aligned}$$

$$\begin{aligned}\text{Nominal GDP}_{2010} &= (P^{2010}_{\text{cars}} \times Q^{2010}_{\text{cars}}) + (P^{2010}_{\text{bread}} \times Q^{2010}_{\text{bread}})\\ &= (\$60{,}000 \times 120) + (\$20 \times 400{,}000)\\ &= \$7{,}200{,}000 + \$8{,}000{,}000\\ &= \$15{,}200{,}000.\end{aligned}$$

1.5

1

ii. Real GDP is the total value of goods and services measured at constant prices. Therefore, to calculate real GDP in 2010 (with base year 2000), multiply the quantities purchased in the year 2010 by the 2000 prices:

$$\begin{aligned}\text{Real GDP}_{2010} &= (P^{2000}_{\text{cars}} \times Q^{2010}_{\text{cars}}) + (P^{2000}_{\text{bread}} \times Q^{2010}_{\text{bread}})\\ &= (\$50{,}000 \times 120) + (\$10 \times 400{,}000)\\ &= \$6{,}000{,}000 + \$4{,}000{,}000\\ &= \$10{,}000{,}000.\end{aligned}$$

1

Real GDP for 2000 is calculated by multiplying the quantities in 2000 by the prices in 2000. Since the base year is 2000, real GDP_{2000} equals nominal GDP_{2000}, which is \$10,000,000. Hence, real GDP stayed the same between 2000 and 2010. 1.5

iii. The implicit price deflator for GDP compares the current prices of all goods and services produced to the prices of the same goods and services in a base year. It is calculated as follows:

$$\text{Implicit Price Deflator}_{2010} = \frac{\text{Nominal GDP}_{2010}}{\text{Real GDP}_{2010}}.$$

Using the values for Nominal GDP_{2010} and real GDP_{2010} calculated above:

$$\begin{aligned}\text{Implicit Price Deflator}_{2010} &= \frac{\$15{,}200{,}000}{\$10{,}000{,}000}\\ &= 1.52.\end{aligned}$$

1

This calculation reveals that prices of the goods produced in the year 2010 increased by 52 percent compared to the prices that the goods in the economy sold for in 2000. (Because 2000 is the base year, the value for the implicit price deflator for the year 2000 is 1.0 because nominal and real GDP are the same for the base year.) 0.5

iv. The consumer price index (CPI) measures the level of prices in the economy. The CPI is called a fixed-weight index because it uses a fixed basket of goods over time to weight prices. If the base year is 2000, the CPI in 2010 is an average of prices in 2010, but weighted by the composition of goods produced in 2000. The CPI_{2010} is calculated as follows:

$$\begin{aligned}\text{CPI}_{2010} &= \frac{(P^{2010}_{\text{cars}} \times Q^{2000}_{\text{cars}}) + (P^{2010}_{\text{bread}} \times Q^{2000}_{\text{bread}})}{(P^{2000}_{\text{cars}} \times Q^{2000}_{\text{cars}}) + (P^{2000}_{\text{bread}} \times Q^{2000}_{\text{bread}})}\\ &= \frac{(\$60{,}000 \times 100) + (\$20 \times 500{,}000)}{(\$50{,}000 \times 100) + (\$10 \times 500{,}000)}\\ &= \frac{\$16{,}000{,}000}{\$10{,}000{,}000}\\ &= 1.6.\end{aligned}$$

1

This calculation shows that the price of goods purchased in 2010 increased by 60 percent compared to the prices these goods would have sold for in 2000. The CPI for 2000, the base year, equals 1.0. 0.5

b. The implicit price deflator is a Paasche index because it is computed with a changing basket of goods; the CPI is a Laspeyres index because it is computed with a fixed basket of goods. From (5.a.iii), the implicit price deflator for the year 2010 is 1.52, which indicates that prices rose by 52 percent from what they were in the year 2000. From (5.a.iv.), the CPI for the year 2010 is 1.6, which indicates that prices rose by 60 percent from what they were in the year 2000.

2/

If prices of all goods rose by, say, 50 percent, then one could say unambiguously that the price level rose by 50 percent. Yet, in our example, relative prices have changed. The price of cars rose by 20 percent; the price of bread rose by 100 percent, making bread relatively more expensive.

As the discrepancy between the CPI and the implicit price deflator illustrates, the change in the price level depends on how the goods' prices are weighted. The CPI weights the price of goods by the quantities purchased in the year 2000. The implicit price deflator weights the price of goods by the quantities purchased in the year 2010. The quantity of bread consumed was higher in 2000 than in 2010, so the CPI places a higher weight on bread. Since the price of bread increased relatively more than the price of cars, the CPI shows a larger increase in the price level.

c. There is no clear-cut answer to this question. Ideally, one wants a measure of the price level that accurately captures the cost of living. As a good becomes relatively more expensive, people buy less of it and more of other goods. In this example, consumers bought less bread and more cars. An index with fixed weights, such as the CPI, overestimates the change in the cost of living because it does not take into account that people can substitute less expensive goods for the ones that become more expensive. On the other hand, an index with changing weights, such as the GDP deflator, underestimates the change in the cost of living because it does not take into account that these induced substitutions make people less well off.

1/

10

7. a. The consumer price index uses the consumption bundle in year 1 to figure out how much weight to put on the price of a given good:

$$\mathrm{CPI}^2 = \frac{(P^2_{\text{red}} \times Q^1_{\text{red}}) + (P^2_{\text{green}} \times Q^1_{\text{green}})}{(P^1_{\text{red}} \times Q^1_{\text{red}}) + (P^1_{\text{green}} \times Q^1_{\text{green}})}$$

$$= \frac{(\$2 \times 10) + (\$1 \times 0)}{(\$1 \times 10) + (\$2 \times 0)}$$

$$= 2.$$

2/

According to the CPI, prices have doubled.

b. Nominal spending is the total value of output produced in each year. In year 1 and year 2, Abby buys 10 apples for $1 each, so her nominal spending remains constant at $10. For example,

$$\text{Nominal Spending}_2 = (P^2_{\text{red}} \times Q^2_{\text{red}}) + (P^2_{\text{green}} \times Q^2_{\text{green}})$$

$$= (\$2 \times 0) + (\$1 \times 10)$$

$$= \$10.$$

2/

c. Real spending is the total value of output produced in each year valued at the prices prevailing in year 1. In year 1, the base year, her real spending equals her nominal spending of $10. In year 2, she consumes 10 green apples that are each valued at their year 1 price of $2, so her real spending is $20. That is,

$$\begin{aligned}\text{Real Spending}_2 &= (P^1_{\text{red}} \times Q^2_{\text{red}}) + (P^1_{\text{green}} \times Q^2_{\text{green}})\\ &= (\$1 \times 0) + (\$2 \times 10)\\ &= \$20.\end{aligned}$$

2

Hence, Abby's real spending rises from $10 to $20.

d. The implicit price deflator is calculated by dividing Abby's nominal spending in year 2 by her real spending that year:

$$\begin{aligned}\text{Implicit Price Deflator}_2 &= \frac{\text{Nominal Spending}_2}{\text{Real Spending}_2}\\ &= \frac{\$10}{\$20}\\ &= 0.5.\end{aligned}$$

2

Thus, the implicit price deflator suggests that prices have fallen by half. The reason for this is that the deflator estimates how much Abby values her apples using prices prevailing in year 1. From this perspective green apples appear very valuable. In year 2, when Abby consumes 10 green apples, it appears that her consumption has increased because the deflator values green apples more highly than red apples. The only way she could still be spending $10 on a higher consumption bundle is if the price of the good she was consuming feel.

e. If Abby thinks of red apples and green apples as perfect substitutes, then the cost of living in this economy has not changed—in either year it costs $10 to consume 10 apples. According to the CPI, however, the cost of living has doubled. This is because the CPI only takes into account the fact that the red apple price has doubled; the CPI ignores the fall in the price of green apples because they were not in the consumption bundle in year 1. In contrast to the CPI, the implicit price deflator estimates the cost of living has halved. Thus, the CPI, a Laspeyres index, overstates the increase in the cost of living and the deflator, a Paasche index, understates it. This chapter of the text discusses the difference between Laspeyres and Paasche indices in more detail.

2

(6)

4. The effect of a government tax increase of \$100 billion on (a) public saving, (b) private saving, and (c) national saving can be analyzed by using the following relationships:

$$\begin{aligned}\text{National Saving} &= [\text{Private Saving}] + [\text{Public Saving}]\\ &= [Y - T - C(Y - T)] + [T - G]\\ &= Y - C(Y - T) - G.\end{aligned}$$

a. **Public Saving**—The tax increase causes a 1-for-1 increase in public saving. T increases by \$100 billion and, therefore, public saving increases by \$100 billion. 1

b. **Private Saving**—The increase in taxes decreases disposable income, $Y - T$, by \$100 billion. Since the marginal propensity to consume (MPC) is 0.6, consumption falls by $0.6 \times \$100$ billion, or \$60 billion. Hence, 2

$$\Delta\text{Private Saving} = -\$100b - 0.6(-\$100b) = -\$40b.$$

Private saving falls \$40 billion.

c. **National Saving**—Because national saving is the sum of private and public saving, we can conclude that the \$100 billion tax increase leads to a \$60 billion increase in national saving.

Another way to see this is by using the third equation for national saving expressed above, that national saving equals $Y - C(Y - T) - G$. The \$100 billion tax increase reduces disposable income and causes consumption to fall by \$60 billion. Since neither G nor Y changes, national saving thus rises by \$60 billion. 1

d. **Investment**—To determine the effect of the tax increase on investment, recall the national accounts identity:

$$Y = C(Y - T) + I(r) + G.$$

Rearranging, we find 2

$$Y - C(Y - T) - G = I(r).$$

The left-hand side of this equation is national saving, so the equation just says the national saving equals investment. Since national saving increases by \$60 billion, investment must also increase by \$60 billion.

10

6. a. Private saving is the amount of disposable income, $Y - T$, that is not consumed:

$$\begin{aligned} S^{\text{private}} &= Y - T - C \\ &= 5{,}000 - 1{,}000 - (250 + 0.75(5{,}000 - 1{,}000)) \\ &= 750. \end{aligned}$$

2

Public saving is the amount of taxes the government has left over after it makes its purchases:

$$\begin{aligned} S^{\text{public}} &= T - G \\ &= 1{,}000 - 1{,}000 \\ &= 0. \end{aligned}$$

2

Total saving is the sum of private saving and public saving:

$$\begin{aligned} S &= S^{\text{private}} + S^{\text{public}} \\ &= 750 + 0 \\ &= 750. \end{aligned}$$

1

b. The equilibrium interest rate is the value of r that clears the market for loanable funds. We already know that national saving is 750, so we just need to set it equal to investment:

$$\begin{aligned} S &= I \\ 750 &= 1{,}000 - 50r \end{aligned}$$

Solving this equation for r, we find:

$$r = 5\%.$$

1

c. When the government increases its spending, private saving remains the same as before (notice that G does not appear in the S^{private} above) while government saving decreases. Putting the new G into the equations above:

$$S^{\text{private}} = 750$$

1

$$\begin{aligned} S^{\text{public}} &= T - G \\ &= 1{,}000 - 1{,}250 \\ &= -250. \end{aligned}$$

1

Thus,

$$\begin{aligned} S &= S^{\text{private}} + S^{\text{public}} \\ &= 750 + (-250) \\ &= 500. \end{aligned}$$

1

d. Once again the equilibrium interest rate clears the market for loanable funds:

$$\begin{aligned} S &= I \\ 500 &= 1{,}000 - 50r \end{aligned}$$

Solving this equation for r, we find:

$$r = 10\%.$$

1

5

7. To determine the effect on investment of an equal increase in both taxes and government spending, consider the national income accounts identity for national saving:

$$\begin{aligned} \text{National Saving} &= [\text{Private Saving}] + [\text{Public Saving}] \\ &= [Y - T - C(Y - T)] + [T - G]. \end{aligned}$$

We know that Y is fixed by the factors of production. We also know that the change in consumption equals the marginal propensity to consume (MPC) times the change in disposable income. This tells us that

$$\begin{aligned} \Delta\text{National Saving} &= [-\Delta T - (MPC \times (-\Delta T))] + [\Delta T - \Delta G] \\ &= [-\Delta T + (MPC \times \Delta T)] + 0 \\ &= (MPC - 1)\,\Delta T. \end{aligned}$$

1

The above expression tells us that the impact on saving of an equal increase in T and G depends on the size of the marginal propensity to consume. The closer the MPC is to 1, the smaller is the fall in saving. For example, if the MPC equals 1, then the fall in consumption equals the rise in government purchases, so national saving $[Y - C(Y - T) - G]$ is unchanged. The closer the MPC is to 0 (and therefore the larger is the amount saved rather than spent for a one-dollar change in disposable income), the greater is the impact on saving. Because we assume that the MPC is less than 1, we expect that national saving falls in response to an equal increase in taxes and government spending.

additional 1 point for reasoning

The reduction in saving means that the supply of loanable funds curve shifts to the left in Figure 3–3. $\underbrace{\text{The real interest rate rises}}_{1.5}$, $\underbrace{\text{and investment falls}}_{1.5}$.

Figure 3–3