ADDITIONAL TOPICS CHAPTER 11

Forecasting with economic models

Economic forecasters use large mathematical models with hundreds of equations to help them forecast real GDP. Such models are called *econometric models*. These models were first developed in the 1950s. Lawrence Klein of the University of Pennsylvania won a Nobel Prize for developing some of the first econometric models. Today, economists use high-speed computers to forecast real GDP with such models, but the basic ideas are no more difficult conceptually than those we use to find real GDP with the diagram of spending balance in this chapter. To see this, we show that finding real GDP through spending balance is equivalent to solving two equations. Once the idea is understood with two equations, the extension to hundreds of equations merely requires a computer.

The key idea behind spending balance is that two relationships, or equations, must hold simultaneously:

1. the consumption function relating income (Y) to consumption (C)
2. the income-spending identity relating income (Y) to consumption (C)

Algebra provides a way to solve such relationships simultaneously. In the language of algebra, we have two equations in two unknowns.

The first equation is the consumption function. It can be written with algebra, for example, as:

$$C = 60 + 0.6Y$$

where C is consumption and Y is income in billions of dollars. For example, if $Y = \$300$ billion, then $C = \$240$ billion $[240 = 60 + (0.6 \times 300)]$.

The second equation is the income-spending identity. When investment (I) plus government purchases (G) plus net exports (X) equals \$180 billion, the income-spending identity ($Y = C + I + G + X$) can be written as:

$$Y = C + 180$$

where we have set $I + G + X = 180$.

Spending balance occurs at the value of Y that satisfies both equations.

To solve for Y using algebra, first write the two equations next to each other:

$$C = 60 + 0.6Y$$
$$Y = C + 180$$

A two-equation model in two unknowns

Now substitute the first equation for C into the right-hand side of the second:

$$60 + 0.6Y$$
$$Y = C + 180$$

to get:

$$Y = 60 + 0.6Y + 180$$

Aggregate expenditure

Note that the right-hand side of this equation is aggregate expenditure. It shows explicitly that aggregate expenditure depends on income (Y), which is the essential idea behind the aggregate expenditure line. The left-hand side of the equation is income. Spending balance occurs when the left equals the right. Gathering all the terms in Y together on the left-hand side gives

$$0.4Y = 240$$

This tells you immediately that $Y = \$600$ billion, which is the answer. Putting $Y = 600$ back into the consumption equation gives $C = 420$.

Once one represents a model using algebra, it is possible to make interesting modifications. For example, to analyse the effect of taxes on their forecast, economists would change the consumption function to $C = 1 + 0.6(Y - T)$ where T is taxes (say $T = \$48$ billion).

Some people find algebra easier to work with than the numerical examples and the graphs. If you are one of those people, you can use this algebra to help you, but you should still learn the graphs and the numerical examples because that is how economic forecasters and other economists communicate their ideas to others.