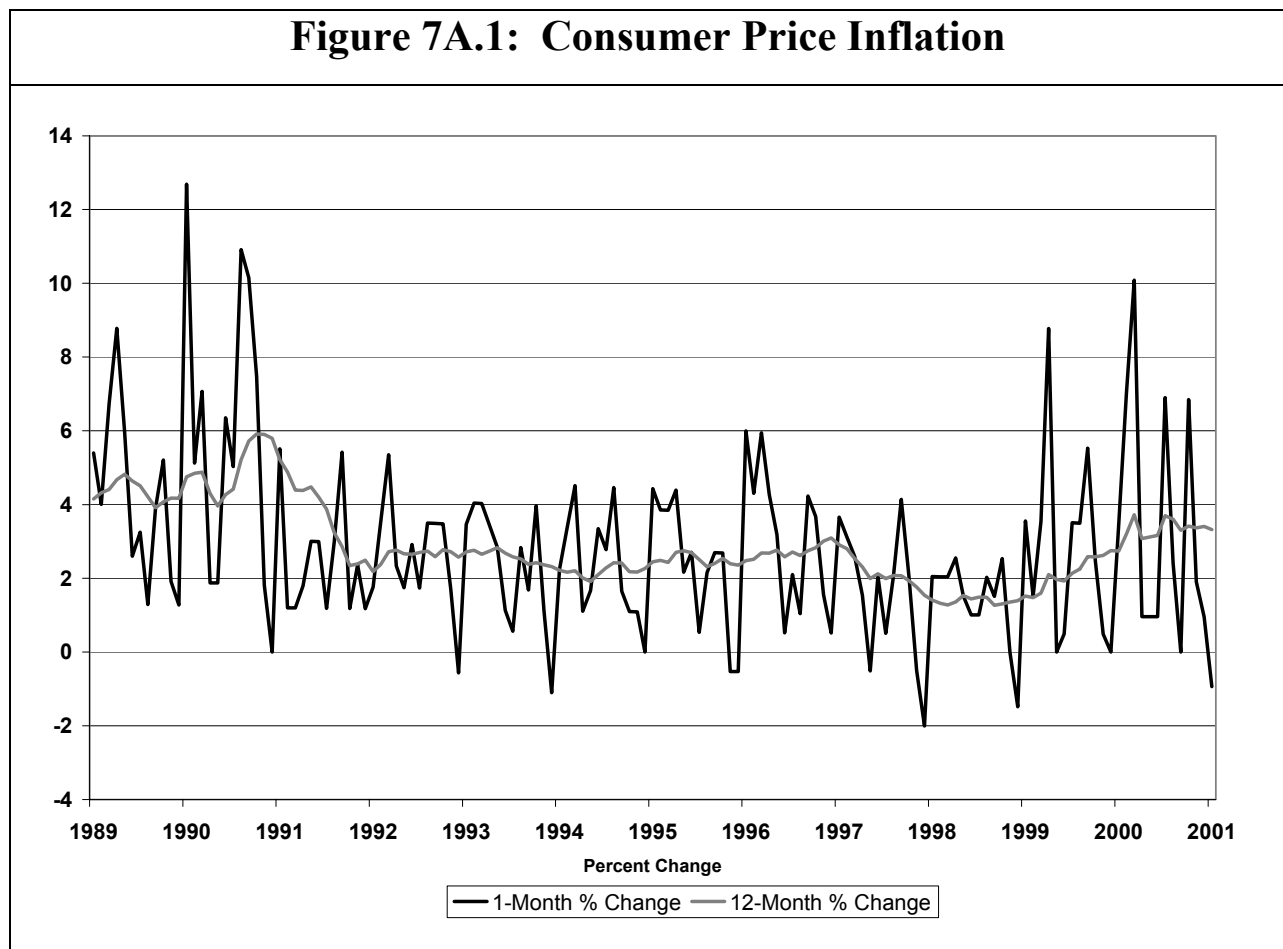


Making Informative Graphs

A Single Series

Drawing figures carefully can make them very informative. When looking at one particular series, like inflation or growth, this is usually straightforward. You put the data into a spreadsheet program, compute percentage changes, and then plot the results. Even then, though, you do have to decide whether to compute the percentage change from the previous month or quarter, or the percentage change from the same month or quarter one year earlier. Computing monthly or quarterly percentage changes usually makes the figure very choppy and difficult to read, so it is standard to compute the much smoother changes from a year earlier.



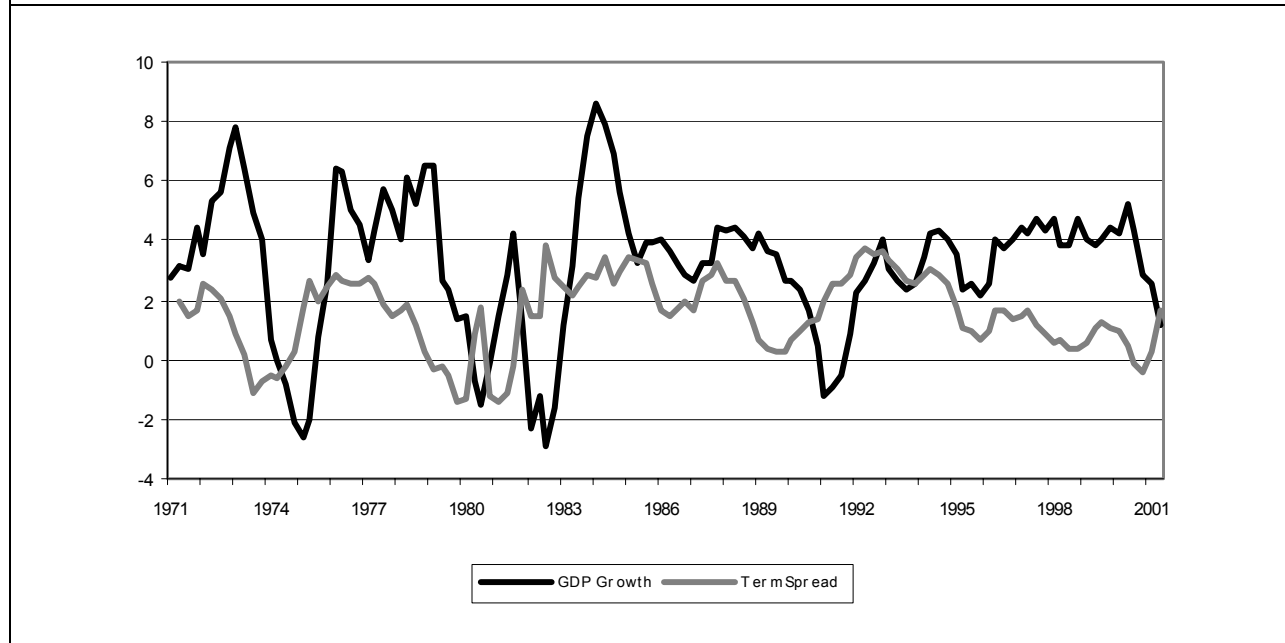
To see the alternatives, look at Figure 7A.1. This figure plots inflation in the U.S. Consumer price index from 1989 to 2000 (the same period Figures 7.8 and 7.9 in the *Tools of the Trade* box

on pages 166-167 of Chapter 7). It includes both the change in the index on a monthly basis, at an annual rate, and the change in the index from the same month one year earlier. The first of these is the very jagged black line, while the second is the much smoother gray line. When looking at a chart of inflation data, we are normally interested in the trend in inflation. The smoother gray line, representing the change from 12 months earlier, gives us a much better indication of this.

Two Series on the Same Chart: Rescaling Data

Things can get much more difficult if you wish to compare two series graphically. When working with series that have roughly the same scale and range, this is straightforward. Figure 7.2 in the text (page 155) shows the pattern for various interest rates, all of which move together over the same range. When series do not have the same scale, however, things get a bit more complicated. Let us look in some detail at the construction of Figures 7.10B and 7.11B (pages 169 and 171, respectively). These two plots contain information both on GDP growth and on interest-rate spreads. We can use Figure 7.11B to illustrate the difficulties involved.

First, plot the data without rescaling the data on the slope of the term structure. Figure 7A.2 shows the result. The problem with this figure is immediately evident. The two lines are centered in different places and have different ranges. GDP growth, the black line, has a mean of 3.21 and a range from approximately -3 to +9, while the term structure slope has a mean of 1.98 with a range of 1 to less than 4. As a result, the fact that these two series really do move together is not at all evident. But we know that the two series move together, with the term spread falling some quarters before GDP.

Figure 7A.2: The Term Spread and GDP Growth

Making a figure that reveals the relationship between GDP growth and the term spread requires that we follow two steps. First, we need to rescale the term spread to have the same mean and range as the GDP data. Second, we need to change the timing so that the peaks of the two series line up.

In order to rescale the term spread, follow these four simple steps:

1. Subtract the mean of the term-spread series from each value. ($\overline{Spread} = 1.98$)
2. Divide the result by the standard deviation of the term spread. (St. Dev (Spread) = 0.0465.)
3. Multiply by the standard deviation of GDP growth. (St. Dev (GDP) = 0.21.)
4. Add the mean of GDP growth. ($\overline{GDP} = 3.21$.)

Here is the formula:

$$\text{Rescaled Spread} = \left[\frac{\text{St.Dev.}(GDP)}{\text{St.Dev.}(Spread)} (Spread - \overline{Spread}) \right] + \overline{GDP} \quad .$$

Figure 7A.3 shows the result of the rescaling. Now the gray and black lines have the same range and centering. It is becoming much clearer that there is a relationship. In fact, we can now see that the gray line is peaking before the black line, implying that the term spread can forecast GDP growth. When the term spread peaks, it appears that GDP growth will peak several quarters later. By looking at the correlation of GDP with the term spread several quarters earlier, we can see that the forecasts are best about four quarters ahead. This means that we need to shift the gray line to the right. The result is Figure 7.11B.

