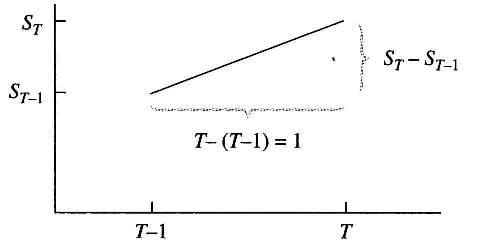

FIGURE 4-11
Estimating the slope

Note that the forecast for k periods in the future consists of the estimate for the constant plus a correction for the trend.

We must make a choice of two smoothing parameters, α and β, for double exponential smoothing. Comments regarding the choice of α for single smoothing are valid for both parameters here.

To implement double smoothing at time T, we need values of S_{T-1} and B_{T-1}. There are many ways to do this; we will discuss a simple one. First divide the data into two equal groups, and compute the average of each. This average is centered at the midpoint of the interval; if there were 12 points in the group, the average would be centered at 6.5. The difference in the two averages is the change in demand from the middle of each data set. To convert this difference to an estimate of the slope, divide it by the number of time periods separating the two averages. Then to get an estimate of the intercept, use the overall average plus the slope estimate per period times the number of periods from the midpoint to the current period. This process is easier to see by using an example.

Example 4-3. Double exponential smoothing. Develop a forecast of computer paper sales for months 25 and 30. If demand for month 25 is 259, update parameters and give forecasts for months 26 and 30.

Solution. Consider the data of Table 4-10. First, compute the averages of months 1 to 12, and 13 to 24. They are 156.08 and 222.25, respectively. The increase in average sales for the twelve-month period is 66.17(= 222.25 − 156.08). Dividing this number by twelve gives 5.51, the average increase per month. Thus the estimate of the slope at time 24 will be $B_{24} = 5.51$. To get an estimate of the intercept, calculate the overall average of the 24 points, which is 189.16. This average is centered at month 12.5. To bring it up to the current time add the trend adjustment of 5.51 cases per month times (24 − 12.5) months. Our estimate of the intercept is

$$S_{24} = 189.16 + 5.51(24 - 12.5) = 258.09$$

Once we have our initial values, we can forecast for future periods. The forecast for period 25 is

$$F_{25} = S_{24} + 1 \times B_{24} = 258.09 + 1 \times 5.51 = 263.60$$

Similarly, forecasting for period 30 gives

$$F_{30} = 258.09 + 6 \times 5.51 = 291.17$$

When actual demand for month 25 is known, we update our estimates. If the actual demand for month 25 is 259, and $\alpha = \beta = 0.1$, the new estimate of the intercept will be

$$S_T = \alpha d_T + (1 - \alpha) S_{T-1} = \alpha d_{25} + (1 - \alpha)(S_{24} + B_{24})$$

or $$S_{25} = 0.1 \times 259 + (1 - 0.1) \times (258.09 + 5.51) = 263.14$$