The new estimate of the slope will be

$$B_T = \beta(S_T - S_{T-1}) + (1 - \beta)B_{T-1} = \beta(S_{25} - S_{24}) + (1 - \beta)B_{24}$$

or $$B_{25} = 0.1 \times (263.14 - 258.09) + (1 - 0.1) \times 5.51 = 5.46$$

The forecast for period 26 would be given by

$$F_{26} = 263.14 + 1 \times 5.46 = 268.60$$

and the forecast for month 30 is now

$$F_{30} = 263.14 + 5 \times 5.46 = 290.46$$

Applications (see Section 9) often require forecasts for hundreds or even thousands of items. Generating thousands of forecasts for many different time series can require significant computer time. Double exponential smoothing is very simple to implement and requires little storage and time. The accuracy is acceptable for most short-term forecasting applications.

5.2.2 OTHER METHODS. There are other methods to forecast a process with trend. Typically, they differ in how estimates of the constant and slope are determined. For example, the double moving average method is similar to double exponential smoothing; it estimates the constant by a standard moving average and the slope by a moving average of the previous estimates of the slope, corrected for the constant.

Regression, with time as the independent variable, can also be used. Let d_t be the demand in period $t, t = 1, 2, \ldots, T$. Because the independent variable is a time index, the regression equations simplify, becoming

$$\hat{b} = \frac{\left(T\sum_{t=1}^{T} td_t - \frac{1}{2}\big(T(T+1)\big)\sum_{t=1}^{T} d_t\right)}{\frac{1}{6}\big(T^2(T+1)(2T+1)\big) - \frac{1}{4}\big(T^2(T+1)^2\big)}$$

and $$\hat{a} = \left(\frac{1}{T}\sum_{t=1}^{T} d_t\right) - \left[\frac{\hat{b}}{2}(T+1)\right]$$

Because $\hat{a}$ is computed for time zero, to bring it to the current time T we have to add $\hat{b}T$ to it. Then the forecast made at time t for k periods ahead would be

$$F_{t+k} = \hat{a} + \hat{b}k$$

Care should be taken in using regression to forecast trend processes with time as the independent variable. There may not be an underlying cause and effect, or even correlation, between time and the dependent variable. Sales may be increasing over time, but time is not causing the increase; good economic conditions may cause the increase in sales. If the economy turns sour, sales likely will decrease, but a regression model with time as the independent variable will continue to predict an increase for some time. To forecast with time-based regression, we must extrapolate from our observed region, which is known to be dangerous. Even so, time-based regression is still used.

5.3 Seasonal Process

Outdoor Furniture makes swings. People typically buy more swings in the warmer months than they do in the cooler months, so sales change with the seasons. Suppose Outdoor