Time Series Profile Based on Pegel's and Gardner's Classification (cont.)

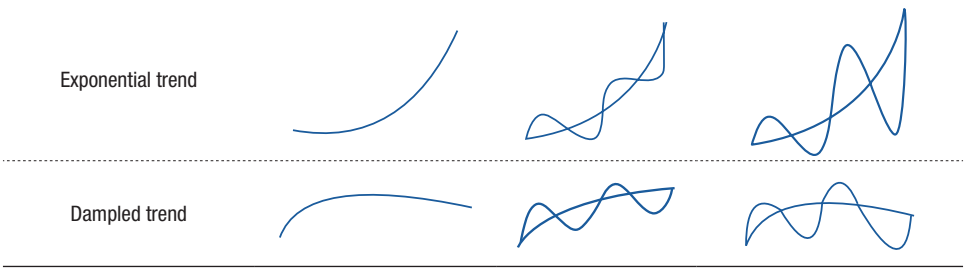


Figure 15.1.8

15.1 Exercises

Basic Concepts

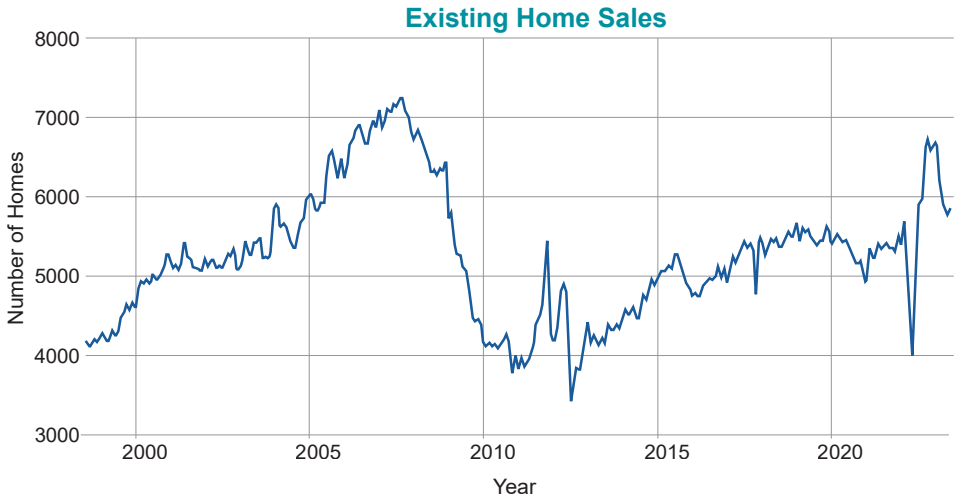
1. What is the difference between seasonal variation and cyclical variation?
2. What is timeframe?
3. Give three examples of business variables that can be represented using a time series plot.
4. What is stationary data?
5. Give three examples of seasonal data in the business world.
6. Suppose a variable is exhibiting a significant upward trend over time. What type of time series data would this represent?
7. What are two ways to determine the best time series method to make a forecast?

Exercises

Data

The data set can be found by visiting stat.hawkeslearning.com and navigating to **Discovering Business Statistics, Second Edition > Data Sets > Border Crossings**.

8. Use the Border Crossings data set. Plot the truck crossings across the U.S.-Canada border at Detroit, MI and identify any time series patterns. Look at the data at the following time frequencies and explain your findings: monthly and yearly.
9. Use the Border Crossings data set. Plot the passenger vehicle crossings across the U.S.-Canada border at Detroit, MI and identify any time series patterns. Look at the data in the following time frequencies and explain your findings: monthly and yearly.
10. Use the Border Crossings data set. Plot the truck and passenger vehicle crossings across the U.S.-Mexico border at Laredo, TX and identify any time series patterns. Look at the data in the following time frequencies and explain your findings: monthly and yearly. In addition, compare the findings with the border crossings at Detroit, MI.
11. What patterns does the existing (not new) home sales time series plot depict?



12. Use the Monthly Average Retail Gas Prices data set, which includes the average gas prices in the U.S. from April 1993 to July 2021.

a. What patterns do you see in the data?

b. Is monthly the right frequency to explore the data, or would you prefer quarterly or yearly? Explain your reasons.

13. Use the Mortgage Rates data set, which includes the yearly mortgage rate in the U.S. from 1971. Currently, there is a belief that the mortgage rate is at an all-time low; do you agree? What is the current trend showing?

Data

The data set can be found by visiting stat.hawkeslearning.com and navigating to **Discovering Business Statistics, Second Edition > Data Sets > Monthly Average Retail Gas Prices**.

Data

The data set can be found by visiting stat.hawkeslearning.com and navigating to **Discovering Business Statistics, Second Edition > Data Sets > Mortgage Rates**.

15.2 Moving Averages

Simple Moving Average (SMA)

The first method we are going to talk about is the **Simple Moving Average (SMA)**. The simple moving average method uses several values (two or more) from the recent past to develop a forecast. It is a smoothing technique because we are taking two to three observations, or even more, and predicting one. Therefore, we are averaging these observations and smoothing out some of the variability.

When we are using the simple moving average, we actually compute the average from a chosen window of points and the resulting average is the forecast for that next period of time. The wider the window of points, the smoother the fit will be, because we are using more observations and turning them into one, thereby smoothing out the variability.

Definition

Simple Moving Average (SMA)

The **simple moving average (SMA)**, uses the average of several values (two or more) from the recent past to develop a forecast.

Formula

Simple Moving Average

MA_n denotes the **moving average** over n periods, and it is the sum of the most recent n data values in the time series divided by the number of periods (n) that we use to calculate that moving average.

$$MA_n = \frac{\sum_{i=1}^{n} D_i}{n}$$

where n = the number of periods used to compute the moving average and

D_i = the actual data value of the time series in period i.