

## TIME SERIES PATTERNS NOTES

The objective of time series analysis is to uncover a pattern in the time series and then extrapolate said pattern into the future.

- Time Series Patterns
  - o Horizontal Pattern
  - o Trend Pattern
  - o Seasonal Pattern
  - o Trend and Seasonal Pattern
  - o Cyclical Pattern
  - o Identifying Time Series Patterns

**Time Series** – A sequence of observations on a variable measured at successive points in time over successive periods of time. Measurements may be taken in any normal intervals, meaning intervals of a day, a week, a year, etc. If the behavior of said time series is expected to continue and is consistent, it can be used as a forecasting method.

**Horizontal Pattern** – Exists when the data fluctuates randomly around a constant mean over time.

- Stationary Time Series
  - o Denotes a time series where the statistical properties are independent of time.
- A time series plot for stationary time series will always exhibit a horizontal pattern with random fluctuations.

**Trend Pattern** – Shows gradual shifts or movements to relatively higher or lower values over a longer period of time.

- Long Term Factors
- o Improving technology
  - o Population increases or decreases
  - o Changes in competitive landscape
  - o Changes in consumer preferences

**Seasonal Pattern** – Recurring patterns over successive periods of time

- Pool memberships sales would peak in summer months like June, July, August. Sales would decline significantly during winter months like November, December, and January.
- Time series plot exhibits a seasonal pattern over a one year period as well as durations under one year.
  - o Traffic during the early morning vs traffic during afternoon / evening times

**Trend and Seasonal Patterns** – Some time series include both trend and seasonal patterns

- Quarterly sales chart

**Cyclical Pattern** – A cyclical pattern exists if the time series plot shows an alternating sequence of points above and below the trendline that lasts for more than one year.

- Example: Periods of moderate inflation followed by periods of rapid inflation can lead to a time series that alternates below and above a generally increasing trendline.
- Trend Cycle Effects are the combination of long term effects and cyclical effects.