Forecasting

# Forecasting vs Prediction?

* Forecasting depends upon previous target variable
* Time based continuous data (Maybe target variable can be categorical)
* Relationship is between IV and DV and also DV & DV-1, DV-2, … DV-n

Chart, line chart

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# Components of Time Series Data

1. **Level** - Trend is constant
2. **Trend** - How your time-series data is moving. Upwards, downwards, constant, fuzzy rules
3. **Seasonality** – Patterns repeat at equal interval of time. Yearly, quarterly, daily.
4. **Cyclicity** – Patterns repeat at unequal interval of time. Minimum data should be of 6 to 10 years.

A picture containing diagram

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# Analysis of Trend

Moving Averages

1. Centered MA
2. Trail MA
3. MA of MA

## Moving Averages

For finding out the clear trend. It smoothens the time series graph to make trends become more visible. Generally used only for Trend visualization and not for predictions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Window = 3** |  |  |  |  |
| **Sales Price** | **3-MA (Centered)** | **3-MA (Trail)** | **3-MA (2-MA) - Centered** | **3-MA (2-MA) - Trail** |
| 382 | NA | NA | NA | NA |
| 301 | 317.67 | NA | NA | NA |
| 270 | 267.33 | 317.67 | 292.50 | NA |
| 231 | 303.33 | 267.33 | 285.33 | 292.50 |
| 409 | 365.33 | 303.33 | 334.33 | 285.33 |
| 456 | 362.33 | 365.33 | 363.83 | 334.33 |
| 222 | 352.33 | 362.33 | 357.33 | 363.83 |
| 379 | 238.33 | 352.33 | 295.33 | 357.33 |
| 114 | 326.00 | 238.33 | 282.17 | 295.33 |
| 485 | 305.67 | 326.00 | 315.83 | 282.17 |
| 318 | 319.00 | 305.67 | 312.33 | 315.83 |
| 154 | 202.67 | 319.00 | 260.83 | 312.33 |
| 136 | 145.33 | 202.67 | 174.00 | 260.83 |
| 146 | 155.00 | 145.33 | 150.17 | 174.00 |
| 183 | 242.67 | 155.00 | 198.83 | 150.17 |
| 399 | 299.67 | 242.67 | 271.17 | 198.83 |
| 317 | 317.00 | 299.67 | 308.33 | 271.17 |
| 235 | 276.67 | 317.00 | 296.83 | 308.33 |
| 278 | 319.00 | 276.67 | 297.83 | 296.83 |
| 444 | 402.33 | 319.00 | 360.67 | 297.83 |
| 485 | 423.67 | 402.33 | 413.00 | 360.67 |
| 342 | 410.67 | 423.67 | 417.17 | 413.00 |
| 405 | 360.00 | 410.67 | 385.33 | 417.17 |
| 333 | 348.00 | 360.00 | 354.00 | 385.33 |
| 306 | 343.00 | 348.00 | 345.50 | 354.00 |
| 390 | 340.67 | 343.00 | 341.83 | 345.50 |
| 326 | 320.00 | 340.67 | 330.33 | 341.83 |
| 244 | 271.67 | 320.00 | 295.83 | 330.33 |
| 245 | 312.00 | 271.67 | 291.83 | 295.83 |
| 447 | 377.33 | 312.00 | 344.67 | 291.83 |
| 440 | 386.67 | 377.33 | 382.00 | 344.67 |
| 273 | 344.00 | 386.67 | 365.33 | 382.00 |
| 319 | NA | 344.00 | NA | 365.33 |

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Green – Low MA Window| Pink – High MA Window | Black – Original Dataset

## Forecasts using Moving Averages

* Naïve Forecast
* Average Forecast

**Naïve Forecast** 🡪 Last value is the prediction

**Average Forecast** 🡪 Take average of all the values and that will be the predictions

Chart

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Given above green line is naïve forecast while pink is average forecast

Exponential Smoothing

* Simple Exponential Smoothing
* Holts Linear Trend Smoothing
* Holts Dampened Trend Smoothing

## Simple Exponential Smoothing

* No trend and no seasonality
* No trend == Trend is constant == Level
* Weighted Forecasts. Naïve and Average Forecasts will not work.

A picture containing antenna

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Data having Trend Constant

# Analysis of Seasonality/Cyclicity

1. Exponential Smoothing
   1. Holts Winters Method
2. ARIMA