Static Forecasting Examples

# Example 1: Enrollment



* Add Year 3
  + Fall, Spring, Summer
* Add Time Column
* Add De-seasonalized data column
  + Average of previous, current, and next period
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools: **Time Series Graph**
  + Click “Time Series and Forecasting”
  + Select “Time Series Graph”
  + Select Graph Format “Time Series (with labels)”
  + Check “De-seasonalized data” for Val
  + Check “Enrollment” for Val
  + Check “Time” for Lbl
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Time (independent variable)
  + Check “D” box for De-seasonalized
  + Click “OK”
* Regression Tab
  + Highlight the coefficients
  + Check p-value should be <0.05
  + R^2 is the percentage of the response variable variability that is explained by the data
  + Write the formula
    - DESEASONALIZED DATA = 33.6667 + 3.8333 \* TIME
* Add Level (0)
* Add Trend
* Add “Level” Column
  + Level = Level(0) + Trend \* Time
* Add “Seasonal Factor Estimates” Column
  + Enrollment / Level
  + Drag Down to period 6
* Add SF Fall, SF Spring, SF Summer
  + Take the average of the seasonal factor estimates by season (e.g. Fall 1 and Fall 2)
* Predict the Enrollment for Year 3
  + Level \* Seasonal Factor

# Example 2: Demand



* Add Time 9,10,11,12
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Add “De-seasonalized Data” Column
  + Sum Time 2,3,4 + 0.5\* Time 1 + 0.5\*Time 5
* Stattools: **Time Series Graph**
  + Click “Time Series and Forecasting”
  + Select “Time Series Graph”
  + Check “De-seasonalized data” and “Demand”
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Time (independent variable)
  + Check “D” box for De-seasonalized
  + Click “OK”
* Regression Tab
  + Highlight the coefficients
  + Check p-value should be <0.05
  + R^2 is the percentage of the response variable variability that is explained by the data
  + Write the formula
    - DESEASONALIZED DATA = 403.75 + 51.25 \* TIME
* Move Regression Tab into main workbook
* Add “Level” Column
  + Level = Level(0) + Trend \* Time
* Add “Seasonal Factor Estimates” Column
  + Demand / Level
  + Drag Down to period 8
* Add Seasonal Factor Column
  + SF = Avg of two seasonal factors for corresponding quarter
* Predict the Demand for Year 3
  + Level \* Seasonal Factor

# Example 3: Diagnostics

* Add “Time” Column: 1-9
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Time (independent variable)
  + Check “D” box for Demand
  + Click on the “Graphs” Tab
    - Check “Residuals vs X Values”
  + Click OK
  + Have them do the other two examples on their own

# Example 4: Exponential Growth





* Add Time 9,10,11,12
* Add Weekly Sales Column
* Add Column “Log(Weekly Sales)”
  + =LN(Weekly Sales)
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools: **Time Series and Forecasting**
  + Click “Time Series and Forecasting”
  + Select “Time Series Graph”
  + Check “Weekly Sales” and “Log Weekly Sales”
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Week (independent variable)
  + Check “D” box for Log(Weekly Sales)
  + Click on the “Graphs” Tab
    - Check “Residuals vs X Values”
  + Click OK
* Move Regression Tab into main workbook
* Create “Model” Column
  + Level = Level(0) + Trend \* Time
  + Drag down to week 12
* Weekly Sales = EXP(Model)
* Cumulative Sales = Previous cumulative + Weekly Sales
* If time permits, could do a regression and model on the original data without the log transform

# Tahoe Salt In Class



* Have them do this in class
* Add Deasonalized Demand Column
  + Average(Q3,Q4,Q1, AVERAGE((Q2,Yr0),(Q2,Yr1)))
  + Place in Q4 row
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Period t (independent variable)
  + Check “D” box for Deseasonalized Demand
  + Click on the “Graphs” Tab
    - Check “Residuals vs X Values”
  + Click OK
* Add “Model” Column
  + Level = Level(0) + Trend \* Period t
* Add “SF Estimate” Column
  + SF = Demand / Model
* Add “Quarter” and “SF” Column
  + Quarter = 1,2,3,4
  + SF = Average of all quarters; e.g. Average of all Q1s, Average of all Q2s, etc.
* Predict periods 13-16
  + Model \* SF for the appropriate quarter

# RedGirl Static Example

## Setup



## Forecast



* Do this in class per handout

## Step 1: Mixed Model

* Add Time Column
* Add Deasonalized Demand Column
  + Average(Month 2-12,AVERAGE((Mo1,Yr1),(Mo1,Yr2)))
  + Place in month 7 row
* Stattools: **Time Series Graph**
  + Click “Time Series and Forecasting”
  + Select “Time Series Graph”
  + Check “De-seasonalized data” and “Demand”
  + What is the shape of the de-seasonalized demand? May want to change the y-axes to “zoom in”
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Period t (independent variable)
  + Check “D” box for Deseasonalized Demand
  + Click on the “Graphs” Tab
    - Check “Residuals vs X Values”
    - Look at Residuals, what do you see?
      * U-shape. Multiplicative better?
  + Click OK
* Add “Model” Column
  + Level = Level(0) + Trend \* Period t
* Add “SF Estimate” Column
  + SF = Demand / Model
* Add “Quarter” and “SF” Column
  + Quarter = 1,2,3,4
  + SF = Average by Month; e.g. Average of all Month 1s, Average of all Month 2s, etc.
* Predict periods 13-16
  + Model \* SF for the appropriate quarter

## Step 2: Multiplicative Model

### Model Setup



### Forecast



* Add “Time” Column
* Add “Demand Forecast” Column
  + To be used later
* Add Column “Log(Deseasonalized Demand)”
  + =LN(Demand)
* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools: **Time Series and Forecasting**
  + Click “Time Series and Forecasting”
  + Select “Time Series Graph”
  + Check “Log Deseasonalized Demand” and “Log Demand”
  + Check shape as before
* Stattools **Regression**
  + Click Regression and Classification
  + Select “Regression”
  + Check “I” box for Week (independent variable)
  + Check “D” box for Log(Weekly Sales)
  + Click on the “Graphs” Tab
    - Check “Residuals vs X Values”
  + Click OK
  + What do you see from the residuals?
* Move Regression Tab into main workbook
* Create “Log(Model)” Column
  + Level = Level(0) + Trend \* Time
  + Fill in all years up to year 4 (add year for month 1-12 in)
* Create Column “Log(Demand)”
  + Used for estimated seasonal factors
* Add Column “Log(SF Estimate)”
  + This will be additive, b/c of exponential model
  + =Log(Demand) – Log(Model)
* Add Column “Log(SF)”
  + SF = Average Log(SF Estimates) by Month; e.g. Average of all Month 1s, Average of all Month 2s, etc.
* “Demand Forecast” for year 4 = EXP(Log(Model)+Log(SF))
* Compare the forecasts

Adaptive Forecasting Notes

# Example 5: Penne Pasta



## Moving Average

* Add Week 6, 7 and 8
* Add Column “Moving Average”
  + Week 6 = average(Weeks 2-5)
  + Week 7 = average(Weeks 3-6)
* Add Week 7 Demand = 300
* Week 8 Moving Average Column
  + =Average(Weeks 4-7)

## Simple Exponential Smoothing

* Add Cell alpha
  + =0.1
* Add Column “Simple Exp”
  + Week 6 = Moving Avg Cell for Week 6
  + Week 7 = alpha \* Week 6 + (1-alpha)\*Demand Week 6
  + Week 8 = same

# Example 6 Holt’s Method



* Forecast for # Months from Now
  + Level + Trend \* Month
  + Drag to the right
* Level Estimate: Month 1
  + =alpha \* (Demand from Period 1) + (1-alpha) \* (Level + Trend Period 0)
* Trend Estimate: Month 1
  + =beta \* (Level Month 1 – Level Month 0) + (1-beta) \* Trend Month 0
* Forecast for # Months from Now
  + Level + Trend \* Month
  + Drag to the right

# Example 7: Winter’s



* Next Period Forecast
  + (Level + Trend) \* Seasonal Factor (1.5)
* 2 Periods Ahead Forecast
  + (Level + 2\*Trend)\*Seasonal Factor(0.5)
* Updated level
  + = 𝛼× (observed demand / seasonal factor)+(1−𝛼)× (previous level + previous trend)
* Updated trend
  + = 𝛽× (updated level – previous level) (1−𝛽)× previous tend
* Updated seasonal factor
  + = 𝛾× (observed demand / new level)+(1−𝛾)× previous value of seasonal factor
* Drag down forecast for next period and 2 periods ahead
* Drag Down all columns Level Estimate to 2 periods ahead forecast

# Example 8 Red Girl



* Stattools: **Data Set Manager**
  + Highlight the data table
  + Click “Data Set Manager”
  + Click OK
* Stattools: **Time Series and Forecasting**
  + Check “Demand”
  + Number of Forecasts: 12 (one year)
  + Select “Exponential Smoothing (Winter’s)”
  + Use either “Optimize parameters” or input
    - alpha = 0.2, beta = 0.2, gamma = 0.1
  + Click “Time Scale” Tab
    - Select “Monthly”
  + Click ok
* Stattools: **Time Series and Forecasting**
  + Run again with optimized parameters
* Stattools: **Time Series and Forecasting**
  + Run again with Holdouts = 10