Name(s) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You may work together in teams of up to three students on this assignment as long as all students put in an equal amount of effort. No freeloaders!

**BA 353: Take Home Exam 1**

Hardcopy due on Friday 5/10.

**1) (5 points)** **Forecasting:** The monthly data for about 160 StoneAge parts over a three-year period are available online. Why don’t we try to forecast just **Part 121** for the next period (January of 2018/period 37)? This data is on Row 119 of the spreadsheet from Columns F to AO. Forecast period 37 using the Naïve method, Moving Averages with **N = 12** (*not* N =2 as we’ve done in class), Linear Regression and Exponential Smoothing with α = ½ (like you did on ICE 3). Program MS Excel to do the calculations for you, don’t try to do this by hand, and *round your final answers to one decimal place*.

|  |  |  |
| --- | --- | --- |
| Method | FC | MAD |
| Naïve |  |  |
| MA(**12**) |  |  |
| LR |  |  |
| ES(½) |  |  |

According to MAD, which forecast is the best bet for period 37?

**Extra Credit:** Explain what cells BD119 an BF119 are and explicitly where they came from.

**Extra Extra Credit:** We used α = ½ in class but really α, *the smoothing constant*, can be any number between 0 and 1. Which value of α minimizes the MAD and using this α what are the forecast and MAD?

**2) (5 points) Seasonality:** The data in the table below (and available online) represent monthly gross sales for Ska Brewing Company from 2009 to 2012. This is *real data*, let’s help Ska forecast 2013…

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **January** | **February** | **March** | **April** | **May** | **June** | **July** | **August** | **September** | **October** | **November** | **December** | **Total** |
| **9** | $193,481 | $170,674 | $228,095 | $232,372 | $288,188 | $304,763 | $337,825 | $342,121 | $320,011 | $304,756 | $221,514 | $235,591 |  |
| **10** | $267,782 | $225,592 | $356,604 | $274,723 | $377,369 | $439,907 | $430,999 | $485,822 | $407,577 | $450,234 | $315,238 | $345,135 |  |
| **11** | $319,313 | $323,726 | $342,353 | $361,315 | $612,500 | $564,599 | $518,422 | $623,860 | $412,091 | $530,636 | $313,034 | $395,686 |  |
| **12** | $375,117 | $391,677 | $426,746 | $535,876 | $659,204 | $582,670 | $663,534 | $564,901 | $636,399 | $727,822 | $539,011 | $450,188 |  |
| **13** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Slope** |  |  |  |  |  |  |  |  |  |  |  |  |  |

**a)** Sum up the totals for each year and fill in the blanks above.

**b)** Forecast demand for each month and the total for 2013 using linear regression.

**c)** Graph the data, including the forecasts from part **b)** in **chronological order** to display the seasonal pattern. **Print** this out and attach it.

**d)** Determine the slope for each month and fill in the blanks above. According to the slopes, which **two** months are growing the fastest (at about the same rate)?

**e)** Interpret i) the slope for the two fastest growing month(s) **and** ii) the annual slope.

**Extra Credit:** Predict the twelve months of 2013 using all data at once with the new =forecast.ets() function in Excel.