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**

**1) (10 points) Forecasting:** The monthly data for about 160 StoneAge parts ([StoneAge Waterblast Tools](https://www.stoneagetools.com/)) over a three-year period are available online. Why don’t we try to forecast just **Part 90** for the next period (January of 2018/period 37)? This data is on Row 88 of the spreadsheet from Columns F to AO. a) Forecast period 37 using the Naïve method, Moving Averages with **N = 12** (*not* *N =2, this is different from other examples we have done*), Exponential Smoothing and Linear Regression. Program MS Excel to do the calculations for you, don’t try to do this by hand, and ***round your final answers to integers***. Hint: I’ve done the forecast for Naïve for you and it might be a good idea to copy the 36 data points and paste them into a separate sheet vertically using the Transpose function.

|  |  |  |
| --- | --- | --- |
| Method | FC | MAD |
| Naïve | 84 |  |
| MA(**12**) |  |  |
| ES |  |  |
| LR |  |  |

b) Draw a scatter diagram of the data and paste it here. Do you see any obvious patterns?

c)Draw a “Sparkline” of the data and insert the cell here. (Sparklines are found

under the Insert tab and can be very handy. If you’re on Mac you might not have

this option; break down and use a PC if you must to accomplish this.)

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

d) At the top in columns AZ, BA, BB, BC and BD, five different measures of error are listed. You know what MAD is, google what the other four abbreviations stand for and list them here.

**Extra Credit(s):**  In cell BD88, the MAD is listed as 45.65. This is a little less than any of the MADs you calculated above. Figure out what forecasting method they used to get this value. [This is hard, I don’t know the answer, but will be super impressed if you figure it out.] Similarly, they list forecasts for January through December of 2018 in columns BF through BQ; how did they calculate these? Figure out how they calculated these 12 values. GOOD LUCK!!!

**2) (10 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 (old) data*, let’s help Ska forecast 2013…

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

**b)** Forecast demand for each month and the total for 2013 using linear regression. What is your best estimate for total sales in 2013? Note: This table is *transposed* compared to the seasonality example we looked at in class – in this case, you will be forecasting horizontally.

**c)** Graph the monthly data *and* forecasts (preferably in a different color) in **chronological order** to display the seasonal pattern. Insert the graph here.

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

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **9** | **10** | **11** | **12** | **13** | **Slope** |
| **January** | $203,481 | $277,782 | $329,313 | $385,117 |  |  |
| **February** | $180,674 | $235,592 | $333,726 | $401,677 |  |  |
| **March** | $238,095 | $366,604 | $352,353 | $436,746 |  |  |
| **April** | $242,372 | $284,723 | $371,315 | $545,876 |  |  |
| **May** | $298,188 | $387,369 | $622,500 | $669,204 |  |  |
| **June** | $314,763 | $449,907 | $574,599 | $592,670 |  |  |
| **July** | $347,825 | $440,999 | $528,422 | $673,534 |  |  |
| **August** | $352,121 | $495,822 | $633,860 | $574,901 |  |  |
| **September** | $330,011 | $417,577 | $422,091 | $646,399 |  |  |
| **October** | $314,756 | $460,234 | $540,636 | $737,822 |  |  |
| **November** | $231,514 | $325,238 | $323,034 | $549,011 |  |  |
| **December** | $225,591 | $335,135 | $385,686 | $440,188 |  |  |
| **Total** |  |  |  |  |  |  |

**Extra Credit:** Forecast demand for each month in 2013 *using all the data simultaneously* with the =forecast.ets() function in MS Excel. Good luck!