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Price Predictions Project

Introduction

In this project we are taking historical stock price data from Honeywell and preforming different regression and time series forecasting to see if we can predict the future closing stock prices of the company. In the lesson we preform exponential smoothing, adjusted exponential smoothing and a simple regression analysis. Once completed we will compare our different forecasts to the actual closing data for the company on 4/16/2018.

Analysis

**Part 1**

To begin, we are using several different smoothing parameters and the MSE of the values to determine which alpha as the most accurate forecast. To start we used the exponential smoothing formula with an alpha of .15 in one column, calculated the absolute value of the errors in the next and then squared those values in the final column. Using a sum of that columns values we calculate the MSE by taking the average of those values. For the first column with an alpha of .15 we had a MSE of 7.97. Subsequentially down the line we did the same calculations using alphas of .35, .55 and .75 with MSE’s of 4.54, 3.14 and 2.98, respectively. Because the .75 alpha value gave us the lowest MSE, we determine that this alpha provides the most accurate forecast.

**Part 2**

Using the best alpha value from part one of the exponential smoothing formula we move on to determine what additional adjustments we could make to this forecast to provide an even better model. We use the trend parameters of .15,.25,.45 and .85 and again determine the MSE of each of these adjusted exponential smoothing forecasts using the values of our original .75 alpha exponential smoothing formula. The formula for the trend uses those previous values and we determine a new adjusted exponential smoothing formula by adding those values to the original formula. By determining the error of these residuals and calculating the MSE we can compare the new values together to see which beta value on top of our previously determined alpha value gives us the most accurate results. The MSE’s in order of the previously determined successive beta values are 1.27, 1.3, 1.34 and 1.4. Since the MSE is lowest using the .15 trend parameter, we find that this formula gives us the best predicted closing value for 04/16/2018 at 146.21.

**Part 3**

Switching gears just a little, we are taking a step back from the exponential smoothing work and now completing a simple regression analysis of the Honeywell stock prices verses the subsequent periods. All together 124 periods of data are given and we use these values as the x’s in our regression analysis. The observed y’s are the 124 stock closing numbers. To begin the regression analysis, we first determine the slope and intercept of our data. Additionally, we determine the correlation and determination of the two values. The correlation number being very low tells us that the periods do not correlate well with the observed y values. For the determination, about .4 percent of the y values are the consequences of x. This again tells us that the two do not correlate well at all. We start with looking at a plot of the stock prices vs the periods.

By looking at the plot we can tell that the stock prices shifted up and down quite a bit over the 124 periods. What the equation of the line tells us is that there is a noted small increase of the stock price over time. The line does not account for much of the movement in the middle of that time period, but following the line we created based off of the historical data, we may still be able to get a good determination of the stock prices in the future. To start our calculations, we first formulate a column of the predicted Y’s using the equation provided. Next, we calculated the residuals, or the observed data minus the predicted values for each date. Using these new calculations, we can create plots of the residuals verses the predicted y values as well as the residuals vs the x values.

A histogram of the residuals is created and appears to follow a normal distribution.

The first test we run to see if the data fits a normal distribution is a normal probability plot of the residuals. To do this we copy the residual data, sort them from smallest to largest and rank the data. Using another formula, we are able to find the standard z value for a normal distribution. Comparing the standard Z value to the residuals we make this plot.

From this plot we can see that the data does follow the normal distribution somewhat but there is some difference, which matches up with what we saw in our histogram.

Next, we complete another test to see if this data follows the normal distribution. Using the histogram and frequency information from before we calculate the left and right end points, the normal probabilities, and the expected frequencies. From there we can determine our chi test statistic and p value to see what kind of a match we get. The p value confirms our hypothesis and we determine that the residuals do follow the normal distribution.

**Part 4**

To finish up we are told to look up the actual closing stock price for Honeywell for 4/16/2018 and compare it to the forecasted results we got from each of the previous questions. When looking up this information in yahoo finance I noticed the daily values that were given for us to calculate our forecasts off did not equal the data that yahoo had on their site for Honeywell. The closing amount they had for April 16th is 140.65. Since the data we used did not match up with the data on this site, it is hard to make conclusions as to which forecasting method gave us the best predictions.

Conclusions

After completing each of the forecasting methods in this project, it appears to me that the adjusted exponential smoothing formula with an alpha of .75 and a beta of .15 gave us the most well fitted model and accurate predictor of upcoming closing prices for the Honeywell company. Altogether, each of the models would have different pros and cons for the type of data that is being worked with.