Predicting the Stock Price

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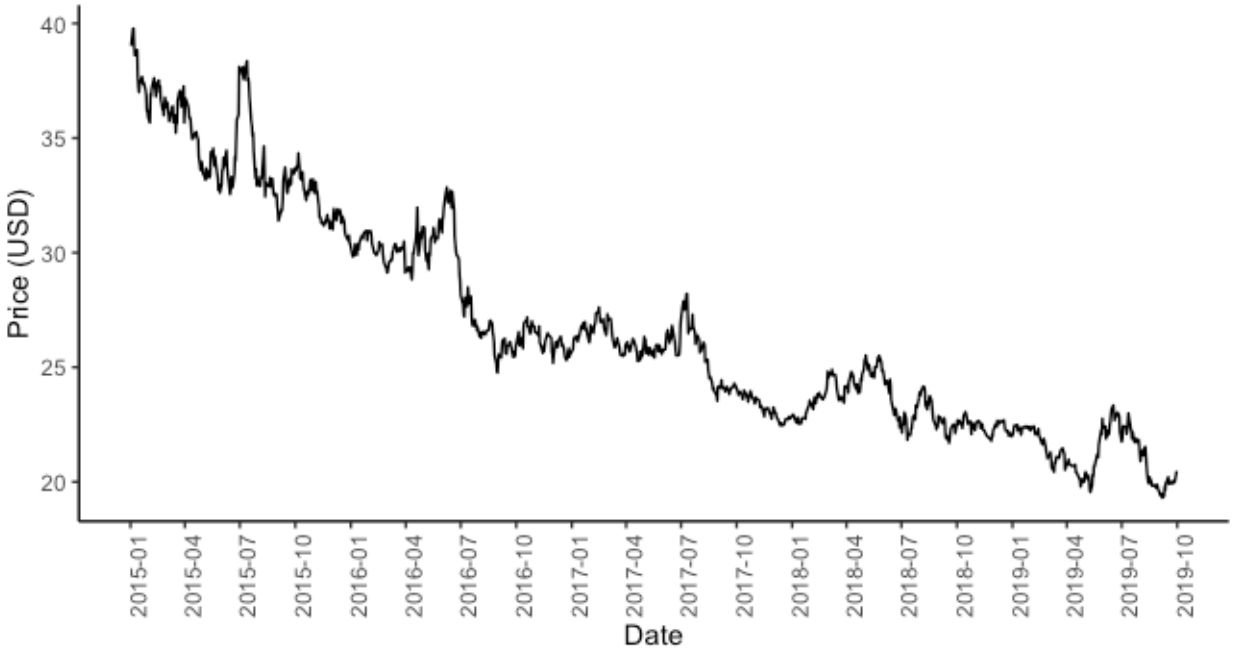
An academic project that strives to establish the best statistical model to track the past and predict the future price of a stock

I. Introduction

One topic widely discussed in the financial outlets is quantitative investment strategies. In other words, an investment approach that uses advanced mathematical modeling, computer systems, and data analysis to predict the future price of an asset.

In this blog, we are going to elaborate on our simplistic quantitative approach to estimate the stock price of Company A for the next ten days, given its price for the last four and a half years.

II. Data



This graph represents the price of the Company's A stock from January 2015 to September 2019. Based only on this information we tried to construct a statistical model. As Jim Simons, a famous investor, would say, "past performance is the best predictor of future behavior."

A quick look at our data indicates some interesting facts. First, the price of the stock seems to be decreasing over the years. Second, every year in August/September, we see a spike in the stock price. This spike could have been caused by several factors, such as yearly earnings release, seasonal product demand, or even yearly product lifecycle. Finally, the price of the stock seems to vary more in the first two years. Assuming that company is becoming more mature with a more stable cash flow profile, this is an expected trend. In order to "neutralize" this last phenomenon, we used the logarithmic function.

III. Model

Given that we previously established a declining trend for the stock price, a part of our chosen model should take this aspect into consideration. As a result, we decide to use differencing to "neutralize" this decline in the stock price. In addition, since we also believe that today stock price could be predicted by knowing its price yesterday, we used what statisticians would call an autoregressive model of order one – AR(1). "Adding" both ideas together we have our final model ARMA(1,1,0).

In order to validate our chosen model, we decided to do some tests. The most worthwhile to mention is the mean squared error (MSE), which consists of taking the average difference of the real price of the stock and the predicted one. Logically, a lower MSE indicates a better model. Fortunately, we were able to get a considerably low value of approximately 0.0065.

IV. Prediction

Days	10/01	10/02	10/03	10/04	10/07	10/08	10/09	10/10	10/11	10/14
Price ($)	20.47	20.45	20.44	20.43	20.42	20.41	20.40	20.39	20.38	20.37

On the table above, we can see the predicted price of the Company's A stock on the first ten business days of October. This estimated price was given by the statistical model discussed in section III. Even though the model seems to be accurate, the predicted value could be off due to a multitude of "external" factors. For instance, a change on the overnight rate by the Federal Reserve System, trade tariffs, political instability…

In order to better visualize what is happening with Company's A stock price, we plotted our estimated values together with the last year to date (YTD) data – first predicted value pointed by a red arrow.

V. Conclusion

In this blog article, we hope to show that the concepts behind quantitative investment strategies are not hard to grasp or even apply. Nevertheless, getting extremely accurate results is an entirely different story, given the enormous number of underline factors that can influence an asset price.