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Statistics 525: IE Group 5

2/27/2021

Final Report: Apple Stock Volatility

The focus of this report is the volatility of Apple stock returns. Volatility on the stock market is measured using the standard deviation to signal how tightly the price of a stock is grouped about the moving average (MA). The primary mode of assessing market volatility is the CBOE Volatility Index (VIX). The VIX detects market volatility by calculating the implied volatility (IV) in the prices of a basket of put and call options on the S&P 500 Index. A high VIX reading marks periods of higher stock market volatility, while low readings mark periods of lower volatility. Generally speaking, when the VIX rises, the S&P 500 drops, making the VIX an effective tool for measuring investor risk and informing investor decisions. For this reason, estimating future market volatility is highly desirable.

Several studies have been conducted to investigate which trends or related factors are the best indicators for the projected volatility of a stock. Economic factors at both regional and national levels, such as tax and interest rate policies, can significantly contribute to the directional change of the market and greatly influence volatility. One study aimed to assess the volatility-predicting value of Twitter sentiment in conjunction with macroeconomic variables. It found that Twitter sentiment--namely influencers tweeting about a topic and thereby increasing network attention--explains a small part of market volatility that is outside the scope of macroeconomic factors. The results concluded that forecasting volatility ranges within a confidence interval were most effective. Further, the trend prediction models performed poorly in anticipating downtrends and failed to predict unusually large peaks of volatility.

Another publication from Embry-Riddle Aeronautical University titled “Using Multiple Linear Regression to Estimate Volatility in the Stock Market” revealed interesting results. It asserts that the primary tool to estimate volatility today is the CBOE VIX, which fails to show any warnings of a potential crash. The study used deterministic variables of GDP, Money Supply, and Unemployment Index to create regression models for the S&P 500 price. After checking for cross-correlation between independent variables and removing the least deterministic variables until the desired tolerance was reached, they settled on a final regression model comparing the S&P 500 price with the S&P 500 from 1991-2018. The results were that no model could accurately predict the S&P 500 one year in advance. However, the volatility models can be used to de-disk a portfolio before a financial crash.

In summary, it seems that an accurate and long-term prediction of stock volatility is extremely difficult to determine.

In the coming weeks, we plan to construct several linear regression models that will assess how different combinations of these predictor variables best fit the returned Apple volatility. We believe that the VIX and previous 30-day volatility for Apple, Google, Amazon, and the S&P 500 will best predict the returned volatility of Apple.

The dataset includes 503 measurements of the volatility of Apple stock returns (the response variable) over the coming 30 days. These measurements were taken at the end of every trading day between January 1, 2018, and January 1, 2020. The first variable, the date, quantifies the number of days since January 1, 2018. Another 8 variables represent the closing prices and log-returns of Apple, Amazon, Google, and the S&P 500 each day. The next subset of variables includes the log return volatility over the past 30 days for each of those four stocks. The final four variables are the CBOE volatility index (VIX) and the equity VIX on Apple, Google, and Amazon. This report will examine how the observed volatility of Apple stock returns over the next 30 days is correlated with these measures of past and projected stock performance. This data was gathered from FRED and Yahoo using the "quantmod" package for R, https://www.quantmod.com.

Works Cited Page

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