BOEING STOCK VOLATILITY

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What is Volatility?

- Historical volatility (HV) is the volatility experienced by the underlying stock, stated in terms of annualized standard deviation as a percentage of the stock price. Historical volatility is helpful in comparing the volatility of one stock with that of another stock or to the stock itself over a period.
- Implied volatility is often interpreted as the market's expectation for the future volatility of a stock. Implied volatility can be derived from the price of an option. Specifically, implied volatility is the expected future volatility of the stock that is implied by the price of the stock's options.
- Higher volatility corresponds to a higher probability of a declining market, while lower volatility corresponds to a higher probability of a rising market. Investors can use this data on long term stock market **volatility** to align their portfolios with the associated expected returns.

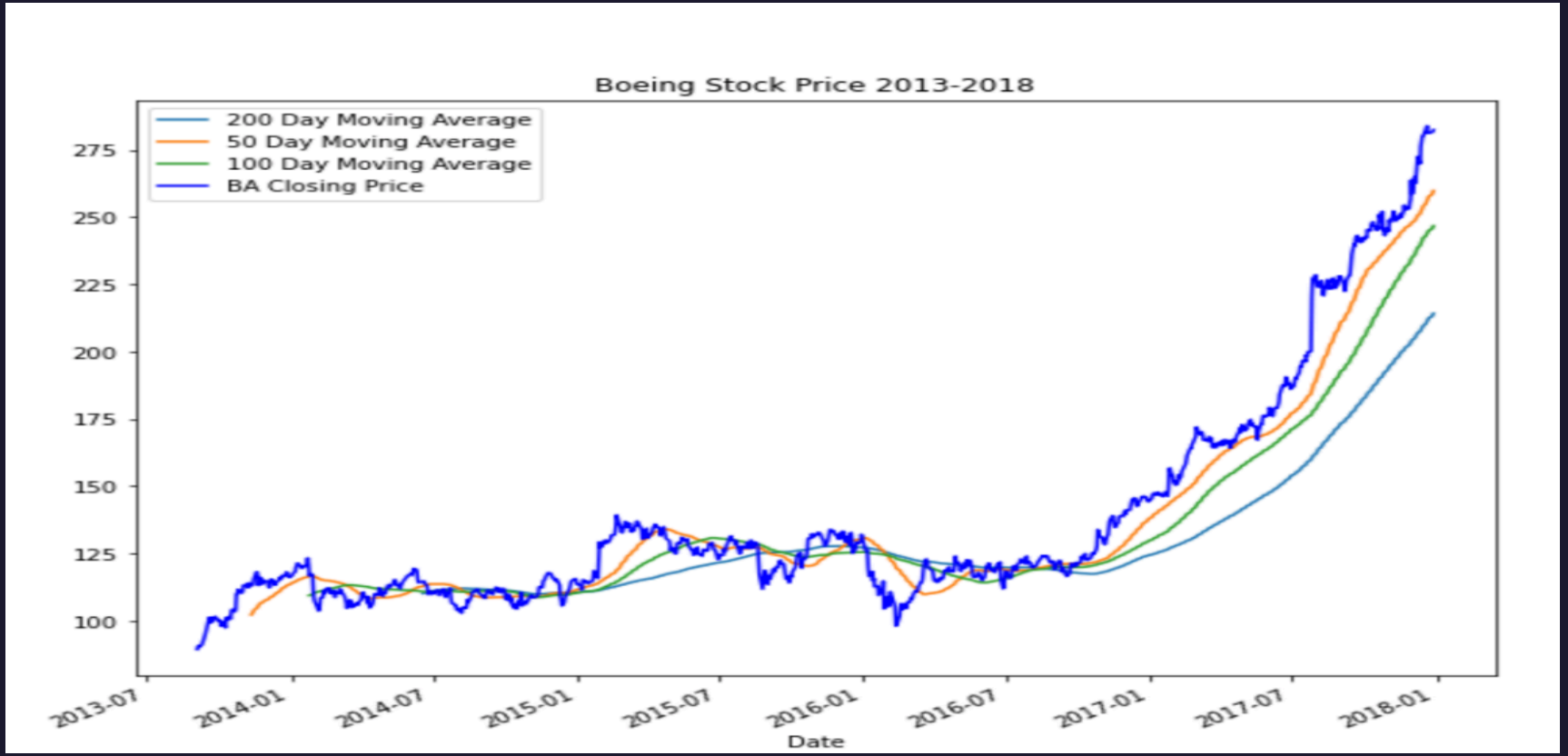
Methodology

- Obtain the data and wrangle it to make sure the data is cleaned up
- Do an Exploratory Data Analysis to make insights and conclusions in various ways
- Use that data make a time-series analysis
- Build predictive Machine Learning models
- Attempt to make a useful recommendation to a client or organization

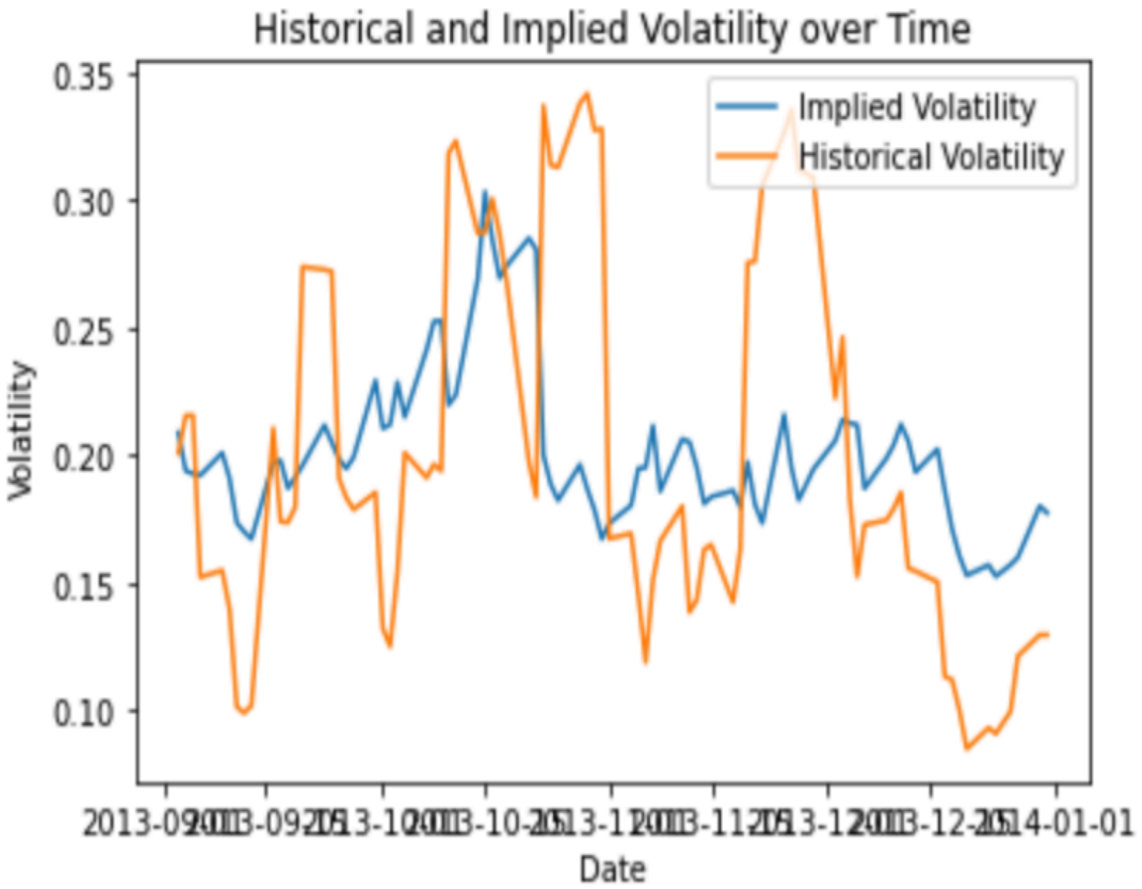
Where is my data coming from?

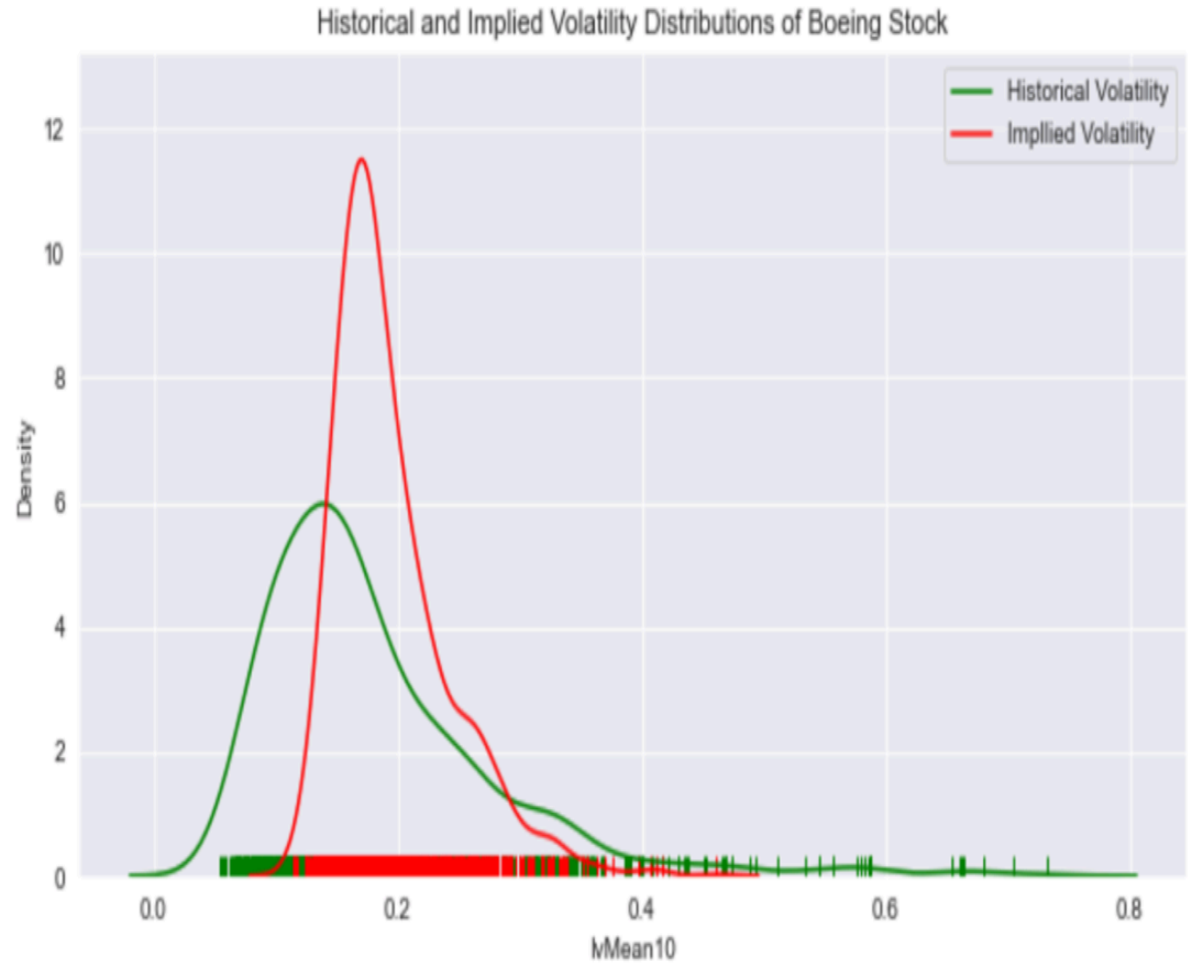
- Quandl is a marketplace for financial, economic, and alternative data delivered in modern formats for today's analysts.
- Found the Boeing stock info that includes closing price, volume, high, low etc.
- Found the Boeing option info that includes historical and implied volatility at various different maturity lengths
- Merge the two datasets to see it as one
- Remove any null values to have cleaned up data

Boeing Stock Price 2013-2017

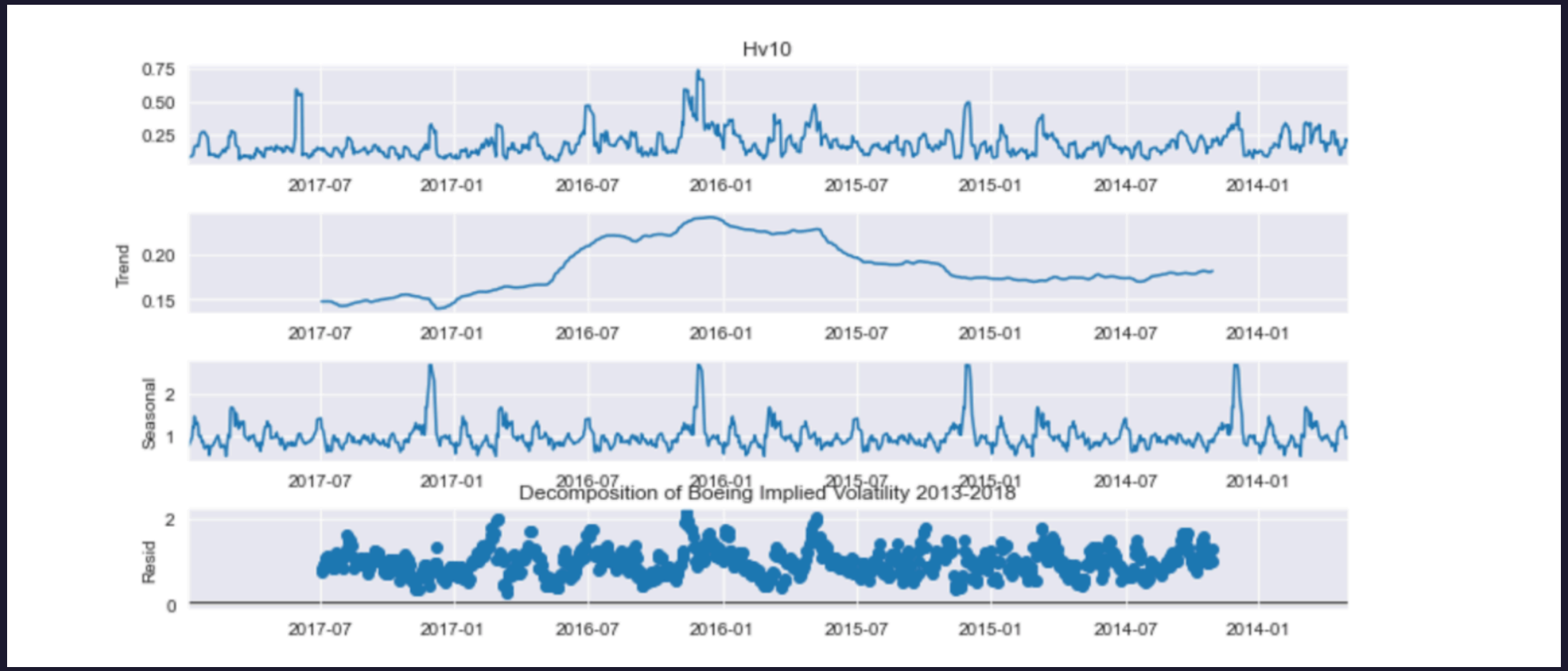


Implied and Historical Volatility

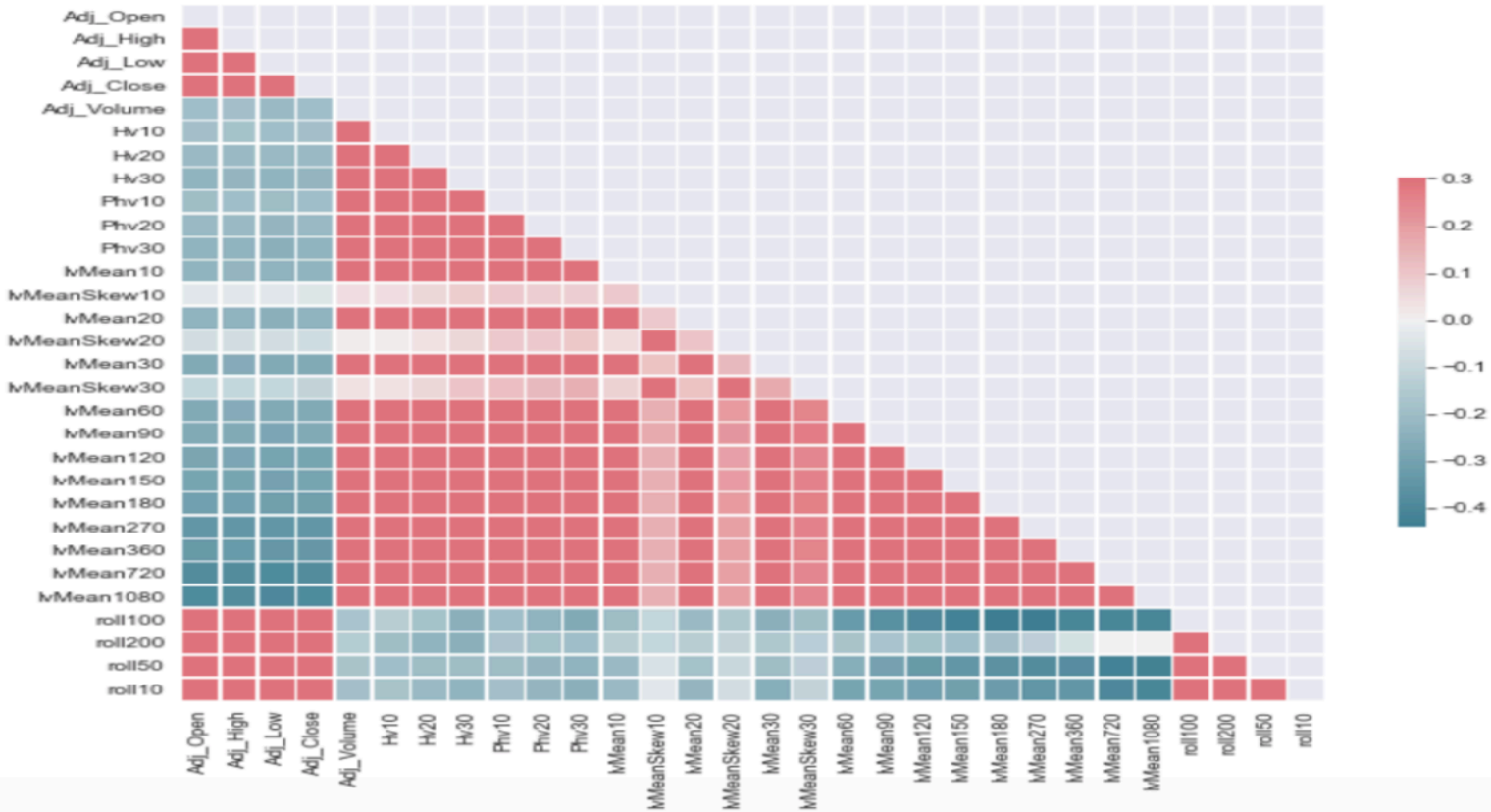




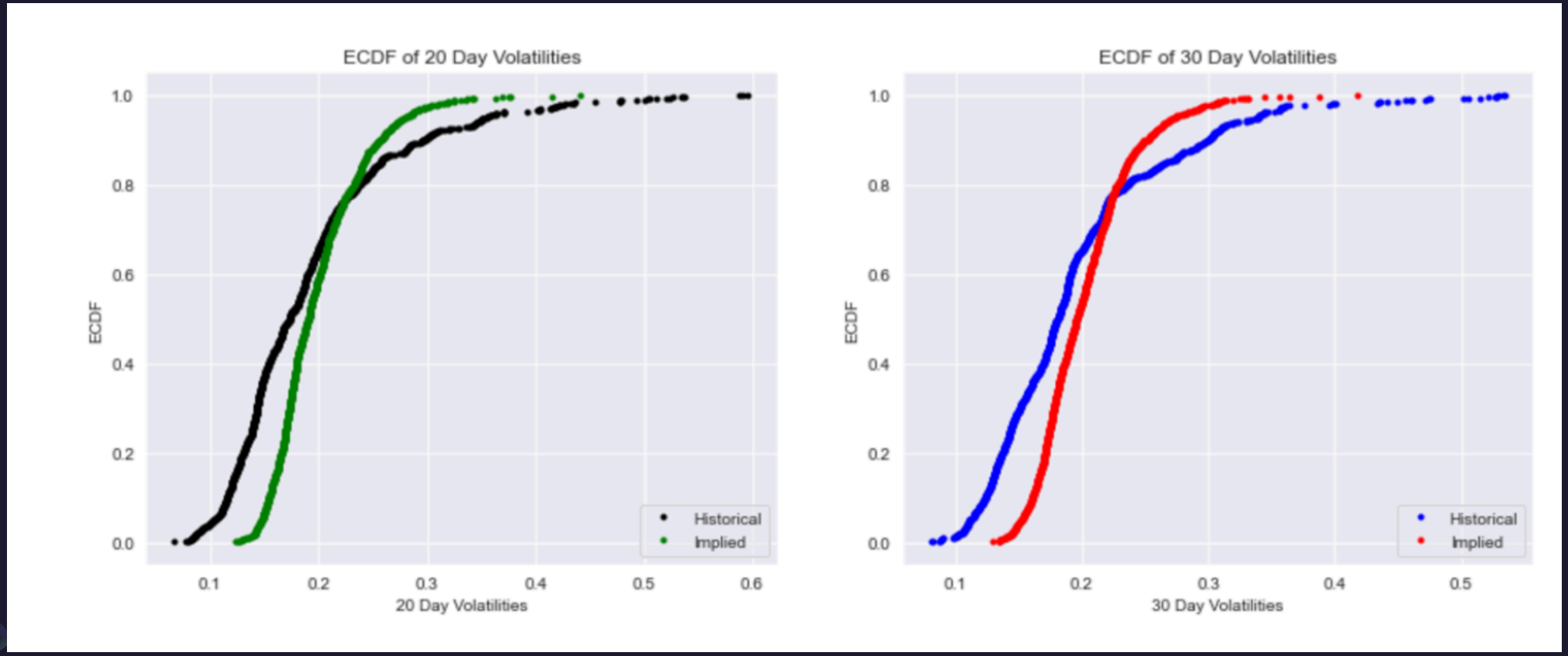
Seasonal Trends



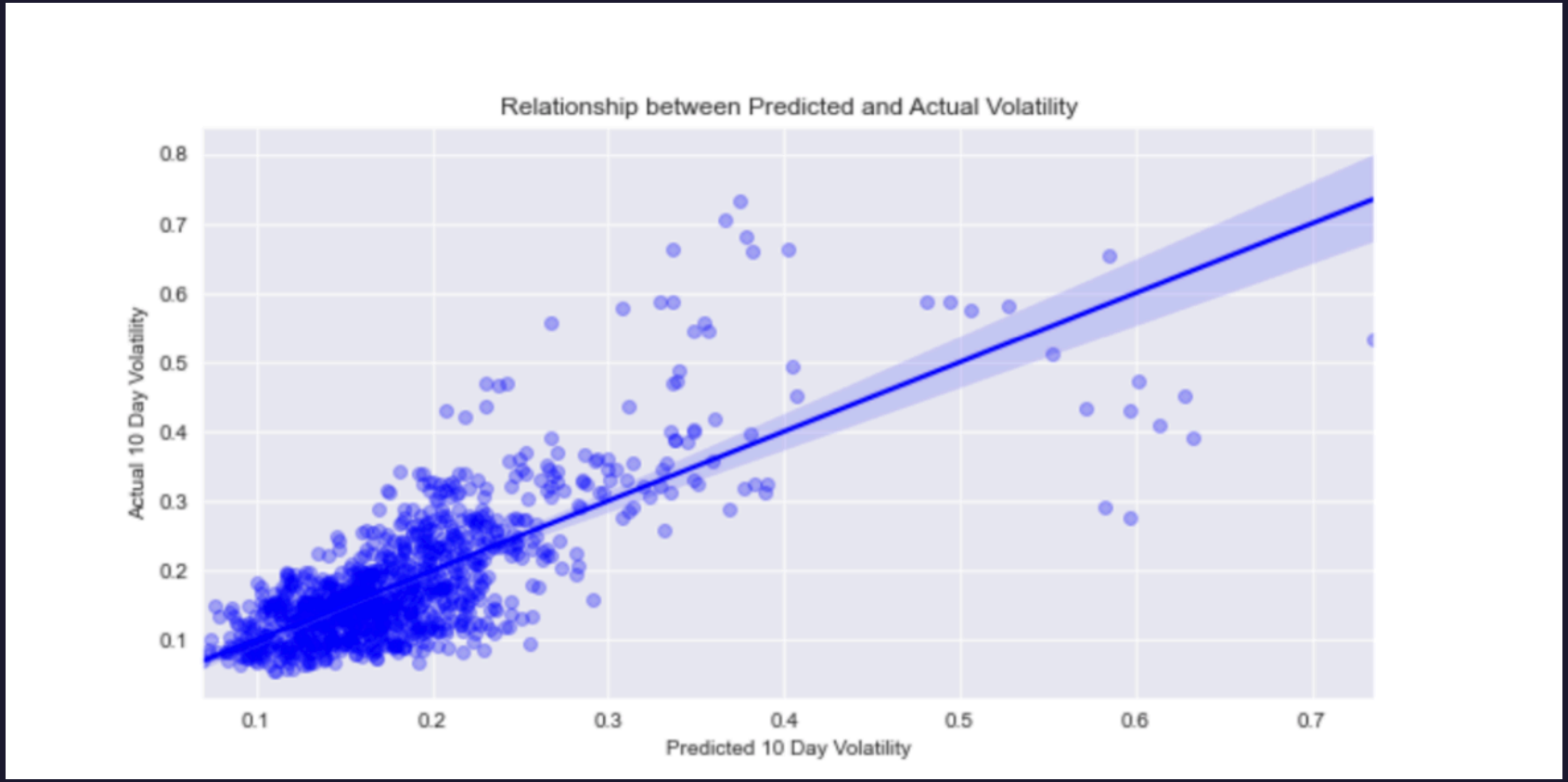
Heatmap Correlations



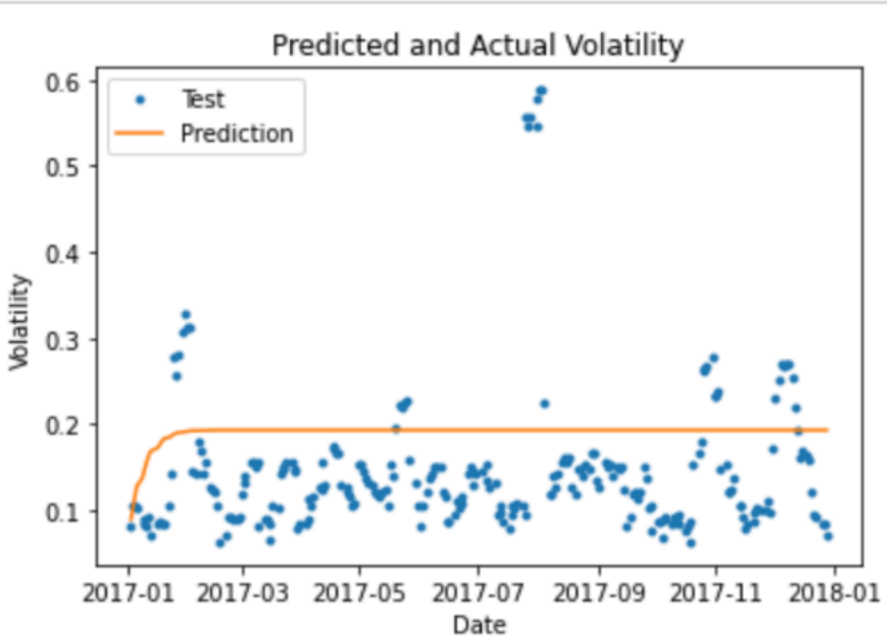
ECDF of 20 and 30 Day Volatilities

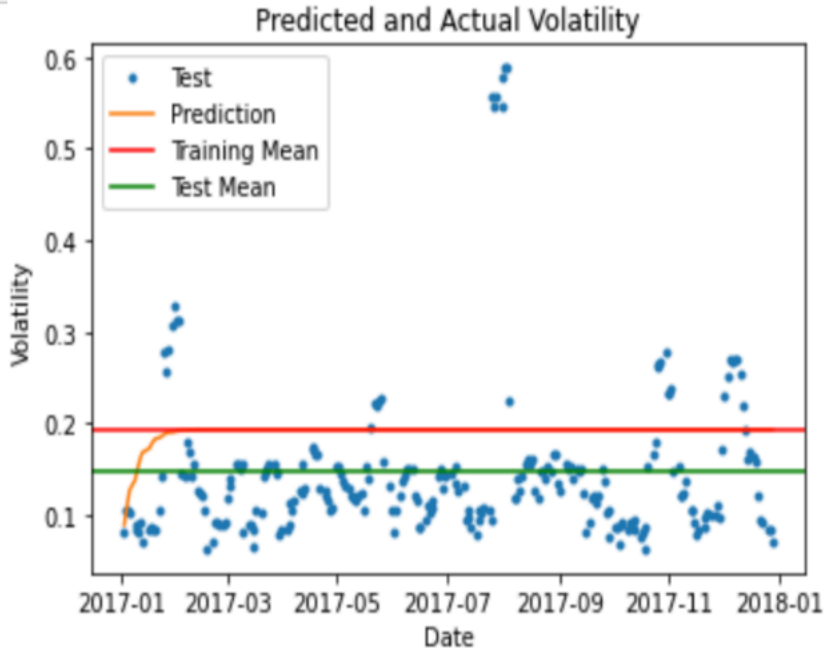


Regression between Predicted and Actual Volatility



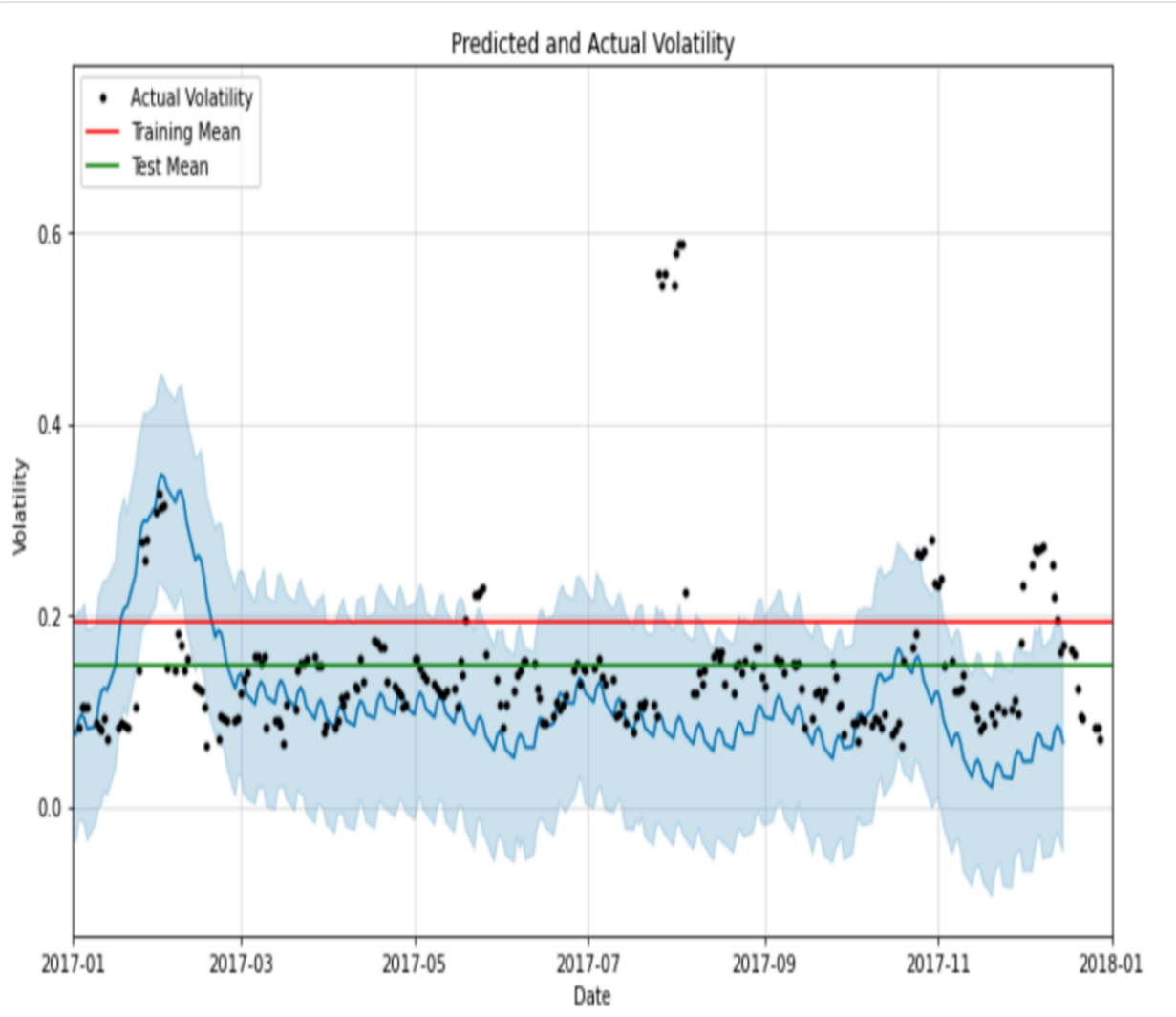
Baseline auto-ARIMA model

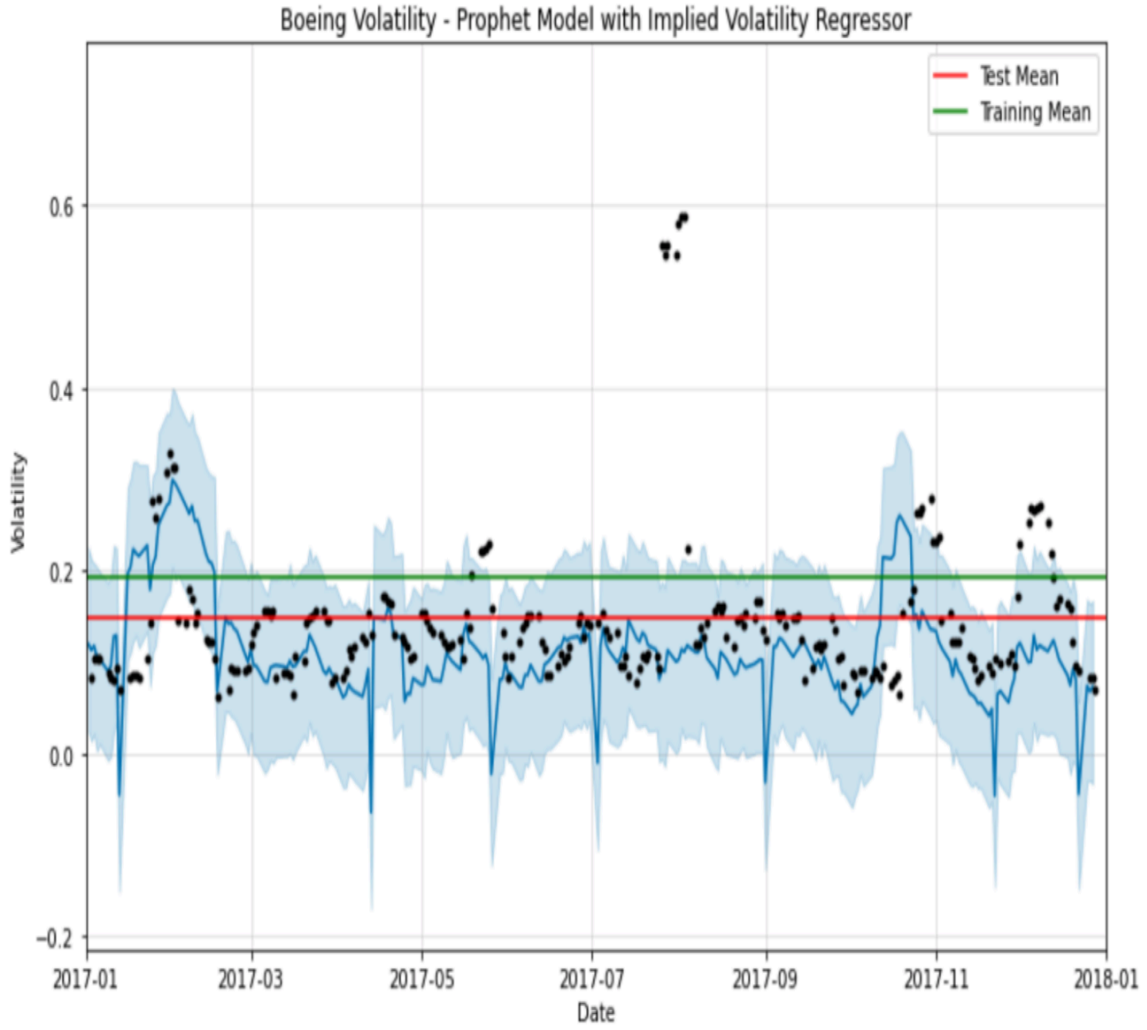




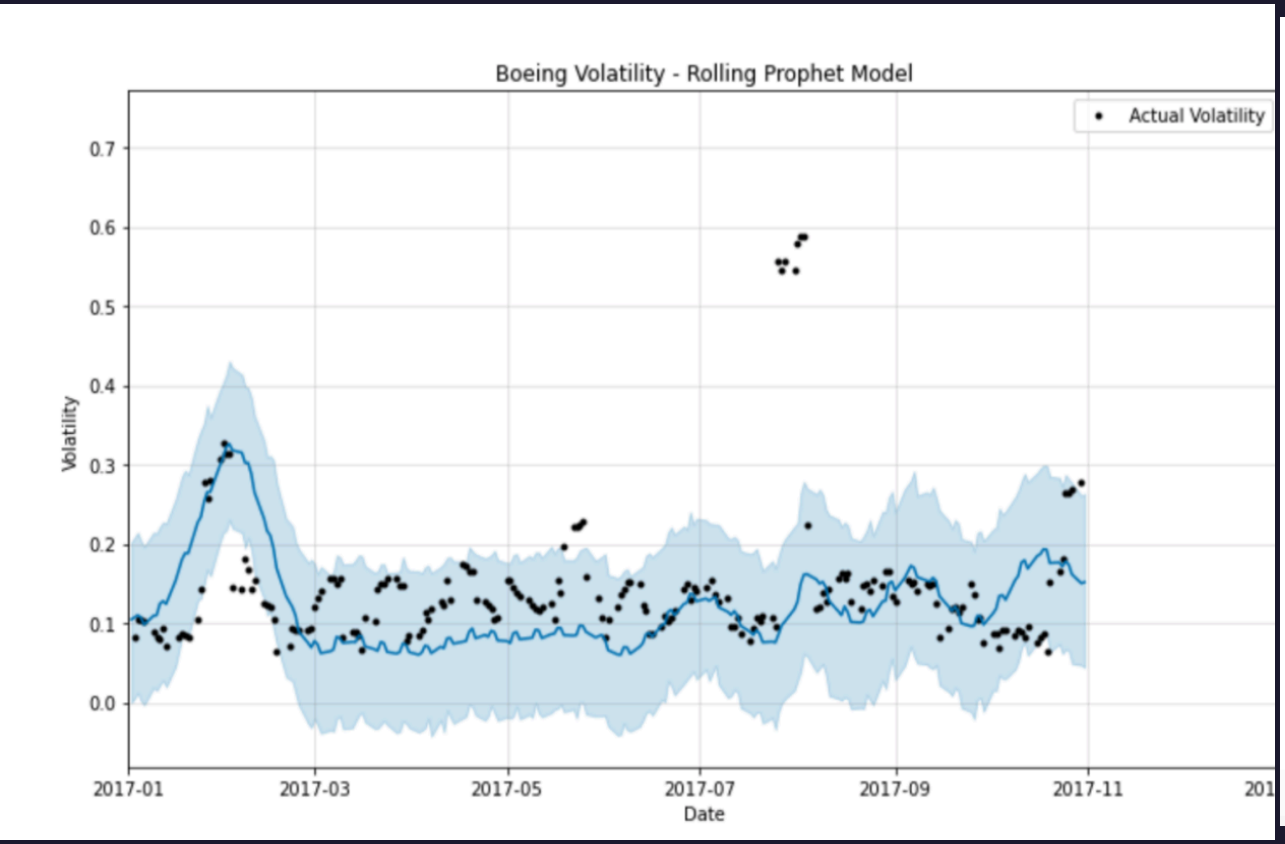
The next model that I used was the Facebook Prophet model. Prophet is a procedure for

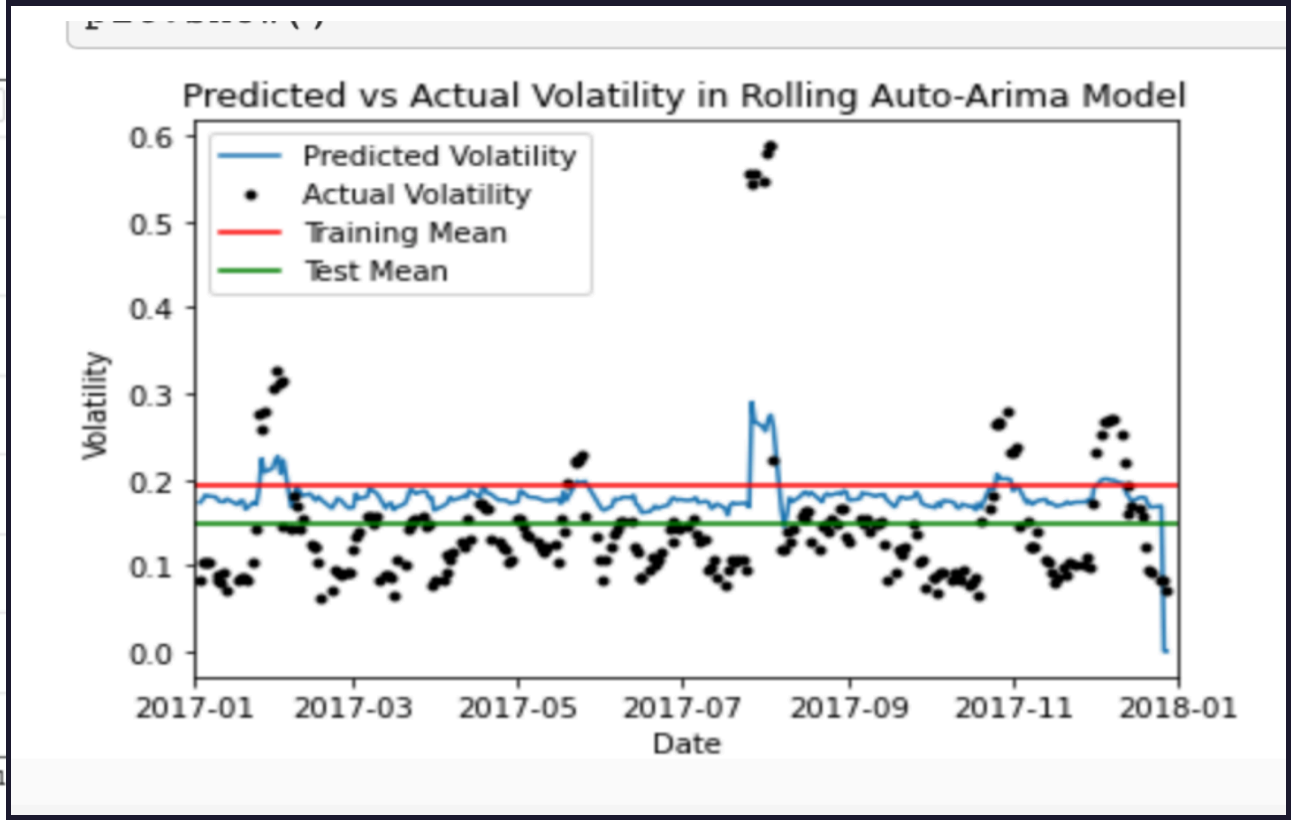
Facebook Prophet Models



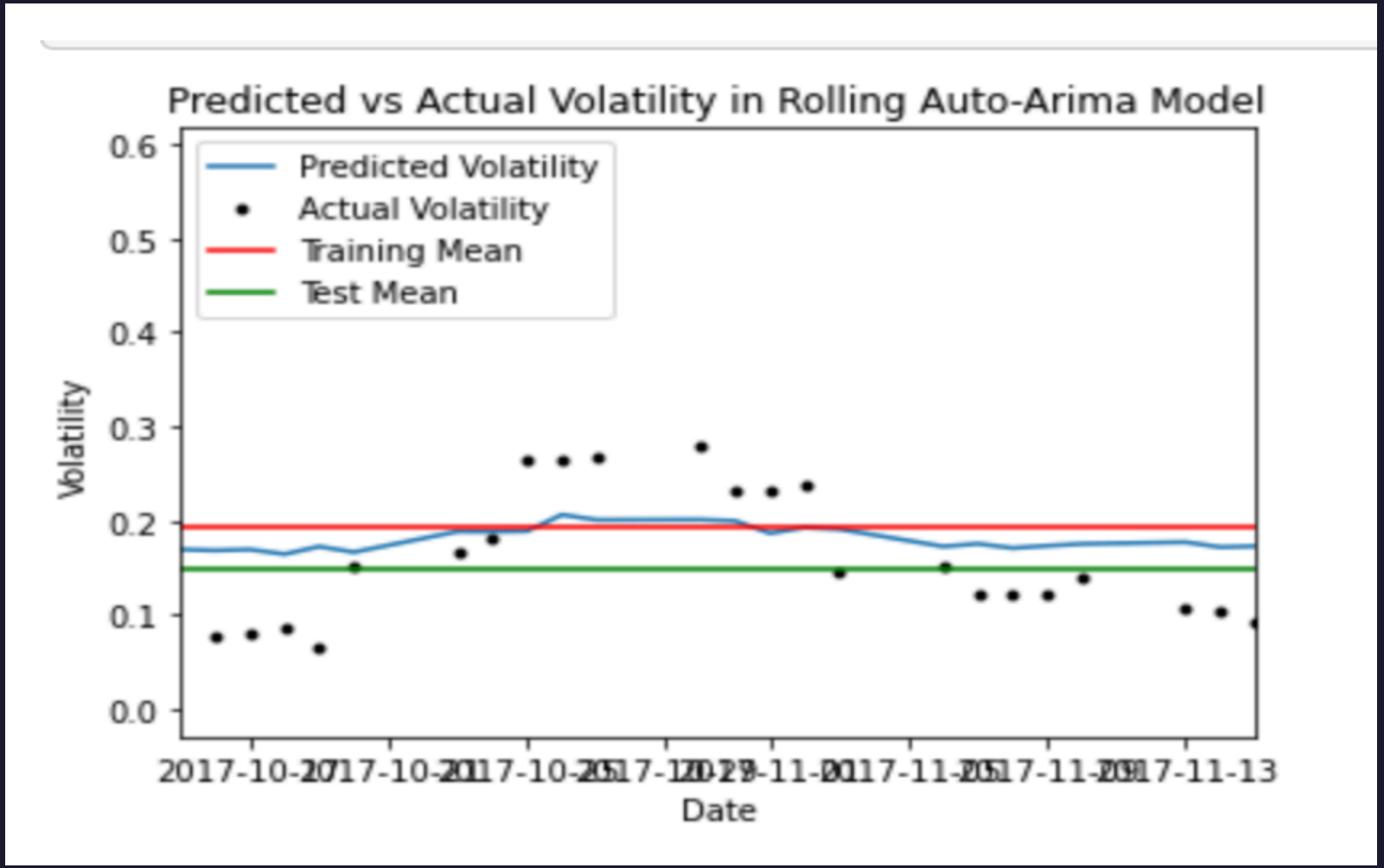


10-Day Rolling Models





Direction of Volatility in a Year



Model Conclusions

	A	B	C	D
1	Model		RMSE	R-Squared
2				
3	Auto ARIMA baseline model		0.097	-0.221
4	Auto ARIMA rolling 10 day		0.079	0.174
5	Prophet with Implied Volatility Regressor		0.103	-0.356
6	Prophet Rolling		0.102	-0.206
7	Auto ARIMA Rolling 1 Day Window		0.045	0.75

Future Work and Recommendations

- Add more features to improve the predictive accuracy of forecasts going forward
- Apply a different training to test set ratio, a shorter training set could be a better predictor
- The model was unable to predict greater accuracy than the mean of test set
- However, we were able to make useful insights to where a client can see directions of volatility and seasonal patterns

Thank You!

- https://github.com/ejnuss95/Springboard/tree/master/Capstone%20Boeing

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