by: Kyle Powers

LSTM Stock Prediction Model

Project: Predict Tomorrow's Stock Price

- Created 3 models for 28 stocks using exogenous data sources that I thought could have an impact on broader capital markets
  - 1) LSTM Model Prediction w/ exogenous variables and feature engineering
  - 2) LSTM Model Prediction using only 1,3,5,21,35 day return variables
  - 3) Facebook Prophet Prediction
- Sources: Quandl, Alpha-vantage, University of Michigan Surveys, data.gov, Google.com

Data and Features

Feature Engineering:

- Daily Stock data

20 Variations of each days volume, high low, close including:

- Percent change
- 3,10,35 day moving average, standard deviation and percent change
- High-low difference

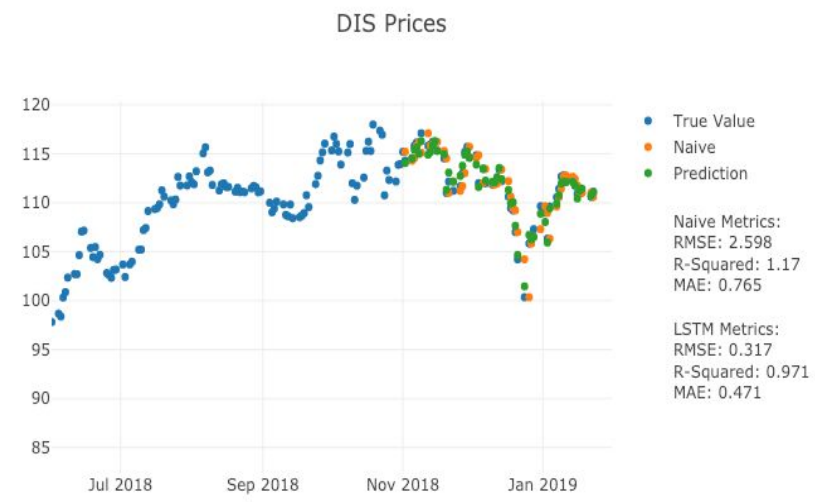
Exogenous Economic Data:

- Consumer Sentiment Report (Monthly)
- Consumer Market Confidence Report (Monthly)
- Change in Home Values During the Past Year (Monthly)
- Gold Prices (Daily)
- Ten-year Treasury yield (Daily)
- Consumer-Price-Index (Inflation) (Monthly)
- S&P 500 Composite Prices (Daily)
- Crude Oil Futures (Daily)
- Current Market Value of Primary Residence (Monthly)*
- Probability of Real Income Gains During the Next 5 Years (Monthly)*

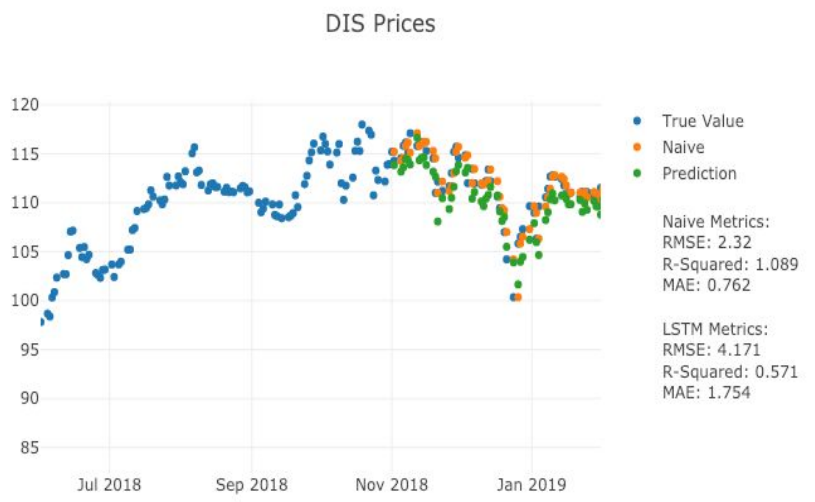
*University of Michigan Survey Data

DISNEY (DIS)

All Features



Minimal Features



Best model results: DIS RMSE reduced significantly with Economic variables

Facebook Prophet:

r2_score:

0.95376558183

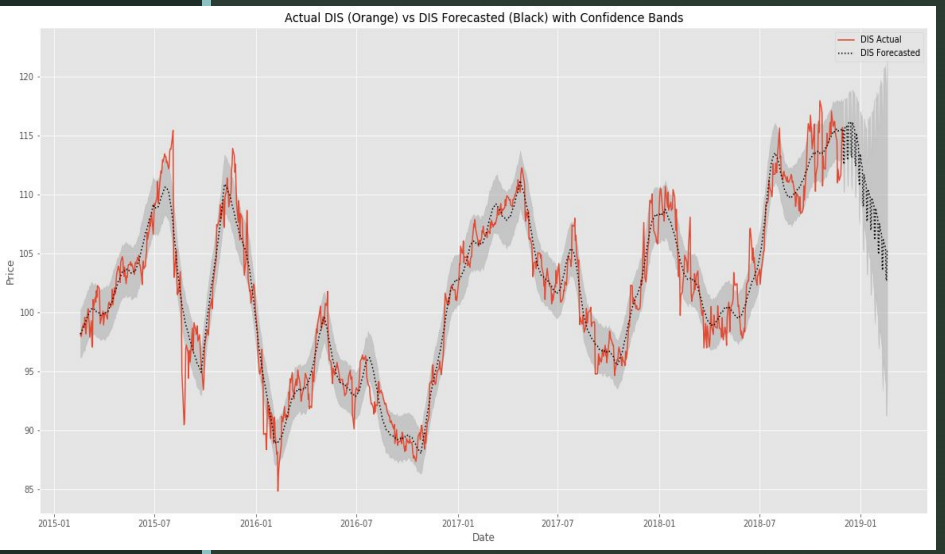
mean_squared_error:

2.508954195

mean_absolute_error:

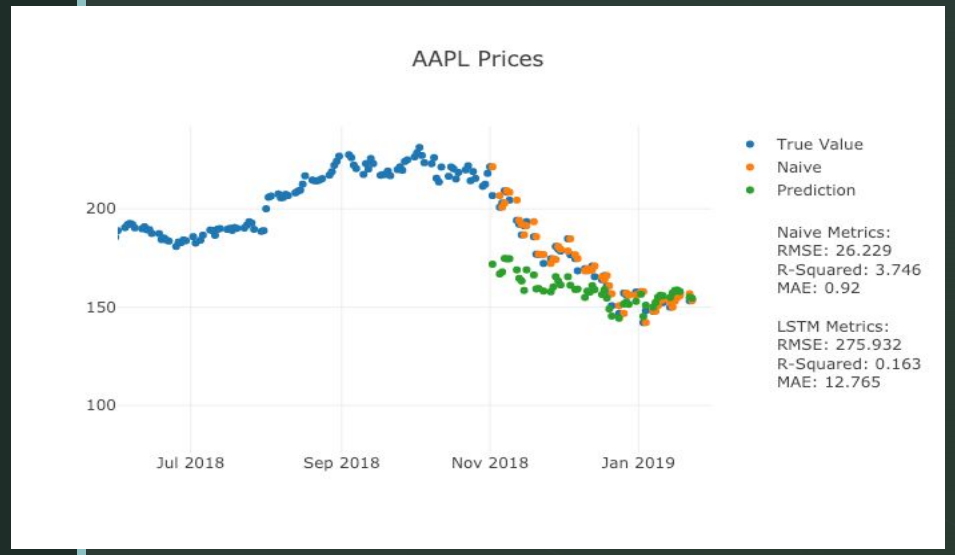
1.268912

Facebook Prophet



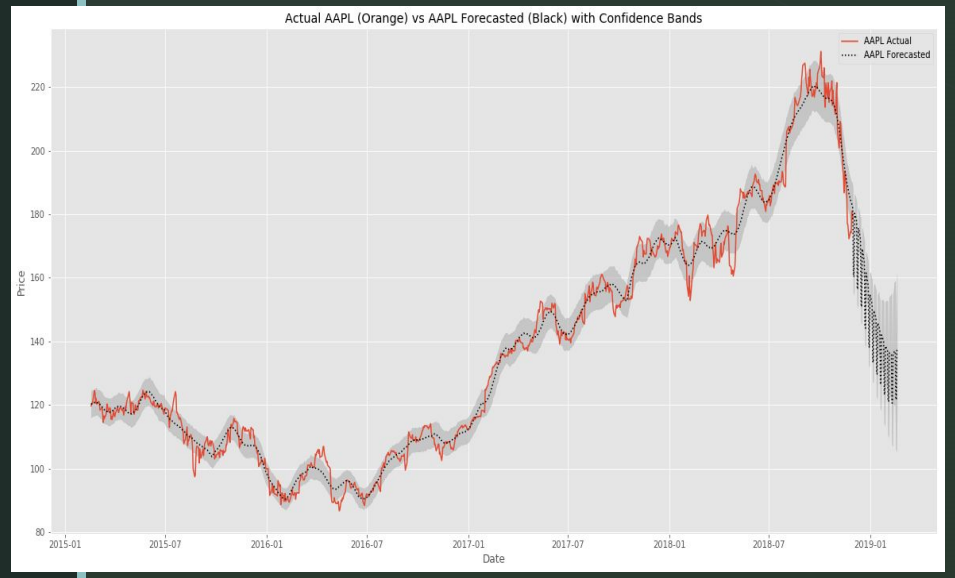
Facebook Prophet

Apple AAPL) All Features

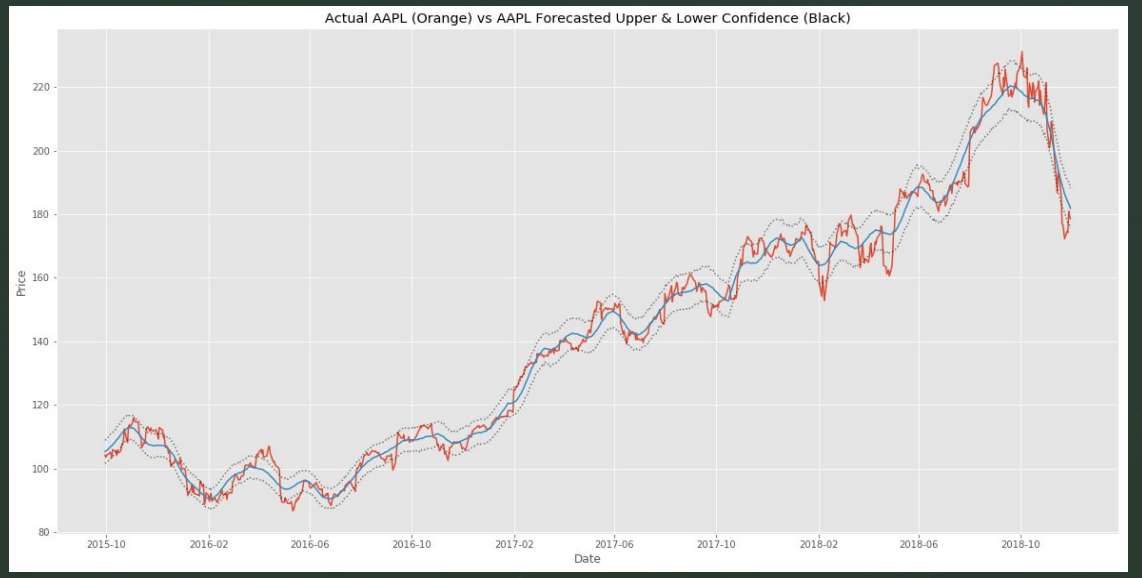


Minimal Features

Facebook Prophet



Facebook Prophet

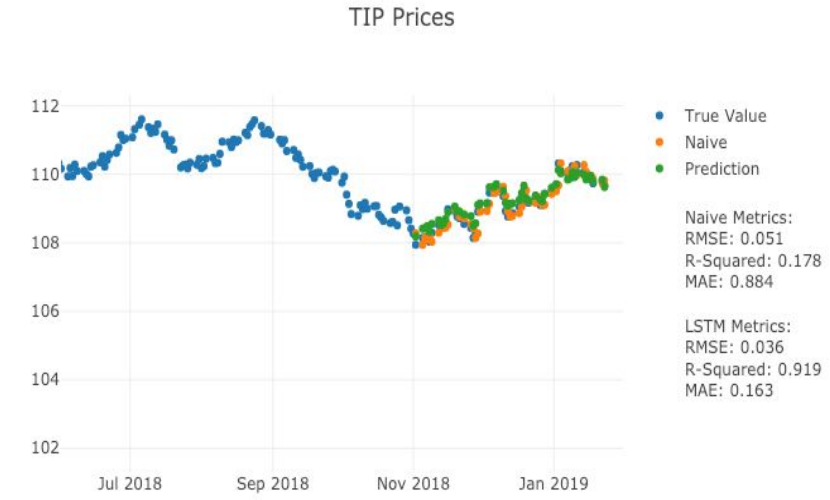


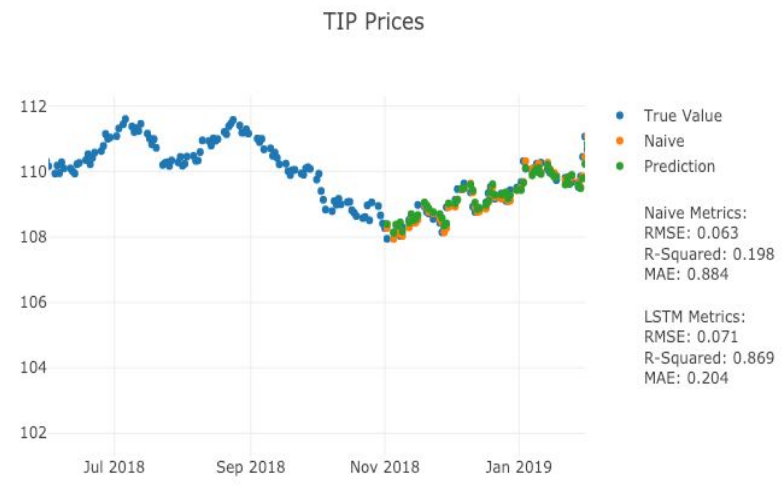
All Features

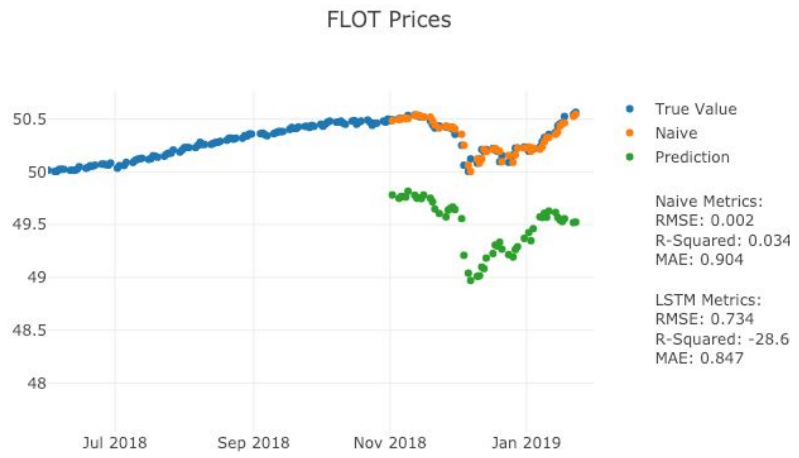
Minimal Features

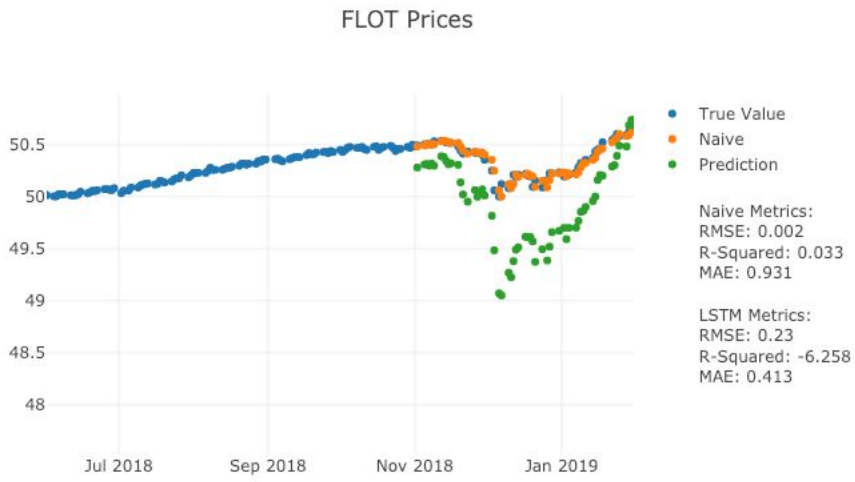
Facebook Prediction

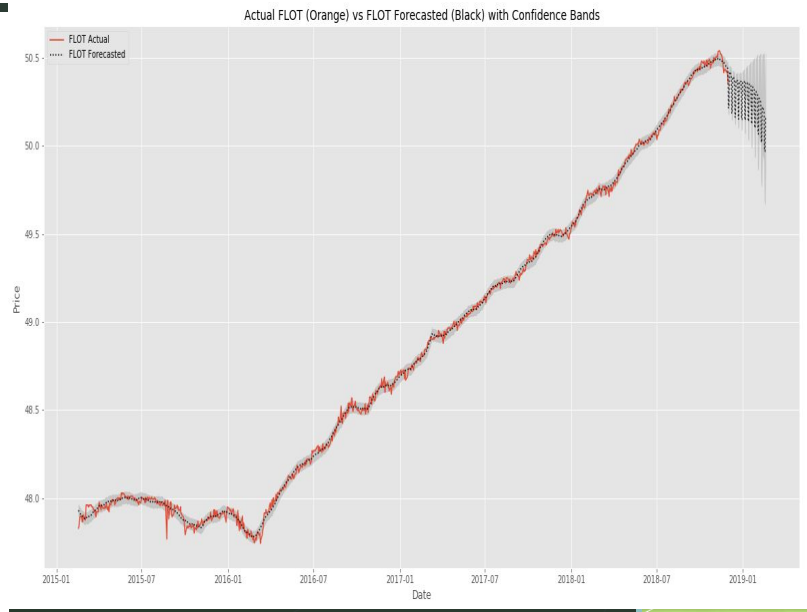
WORSE MODEL FLOT:
Interest Rates increased in December and the yield curve inverted. Model expected prices to decline but the increase was already priced in by the market.

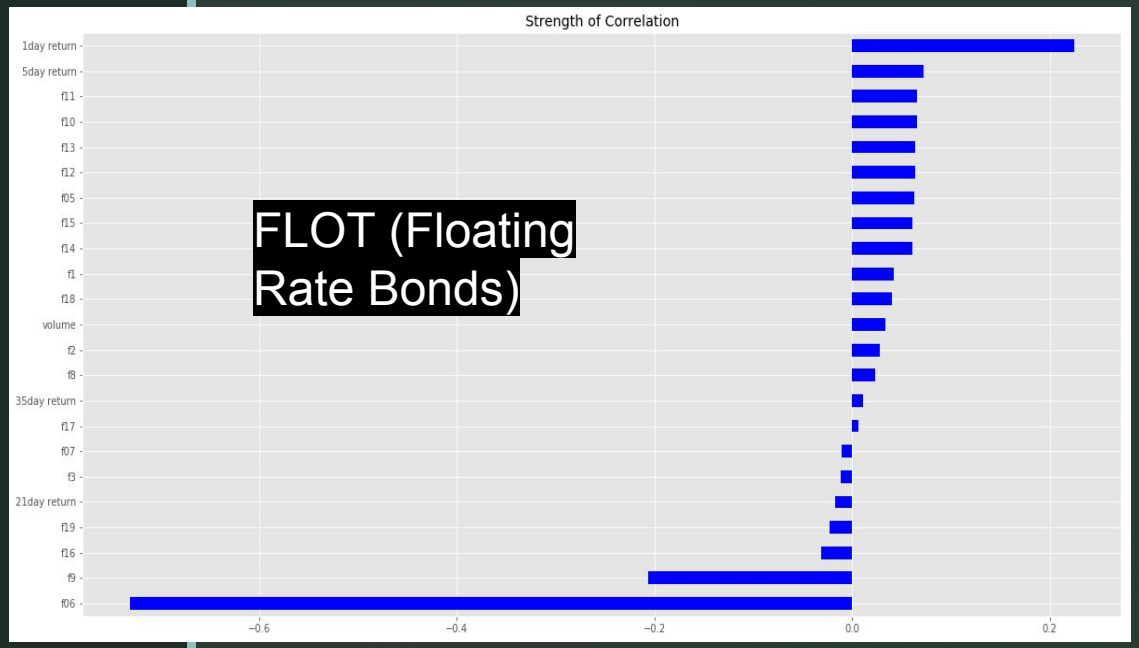




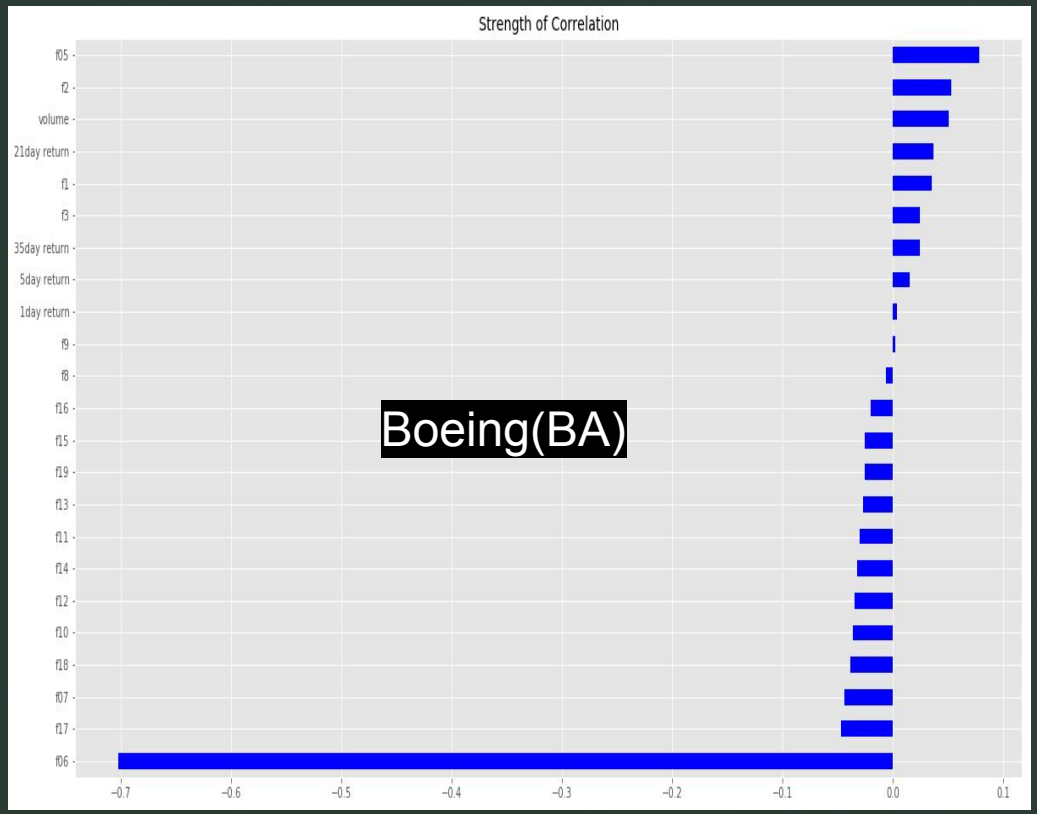




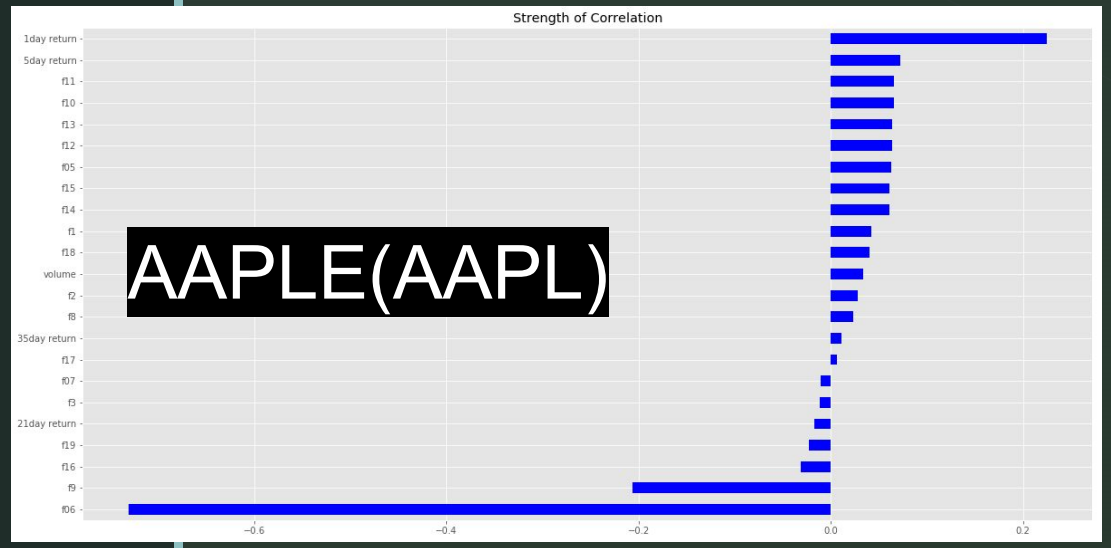




FLOT (Floating Rate Bonds)



Boeing(BA)

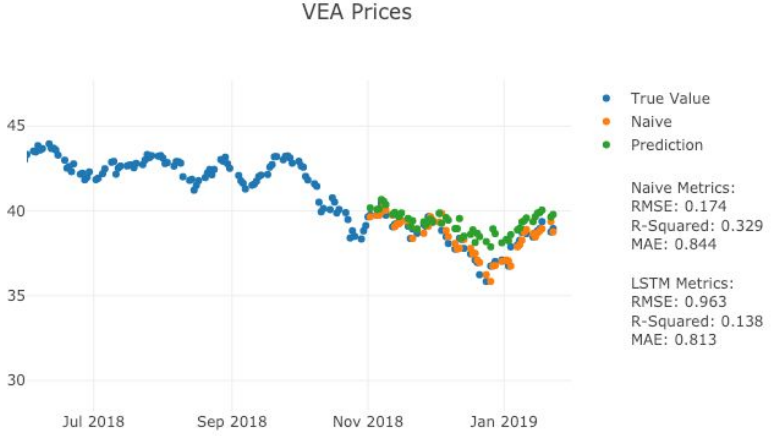


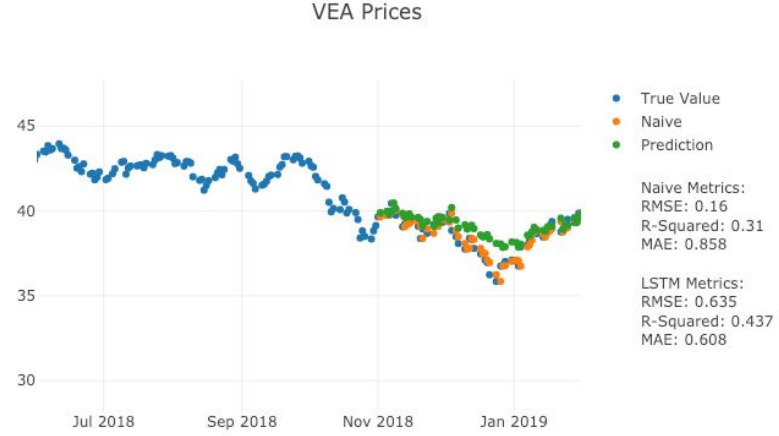
AAPLE(AAPL)

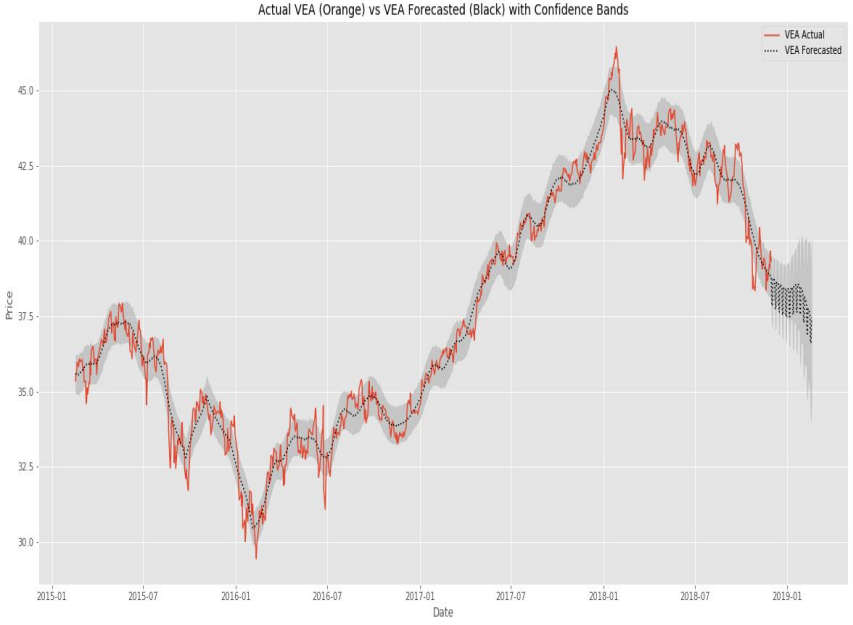
All **Features**

Minimal Features

Facebook Prediction







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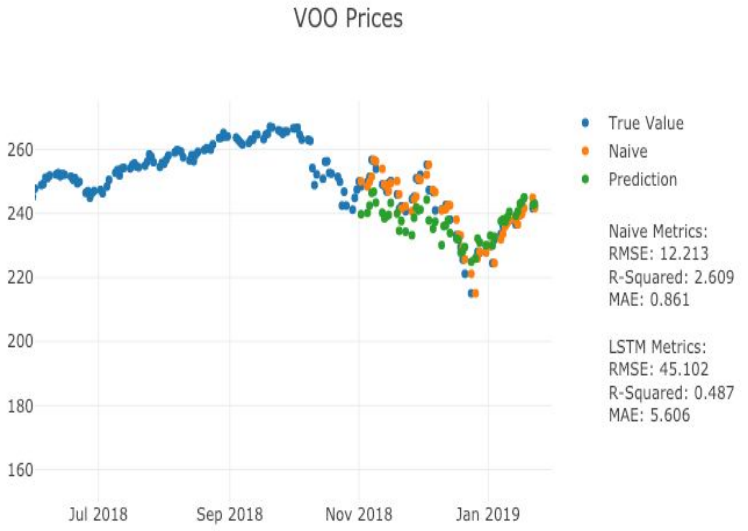

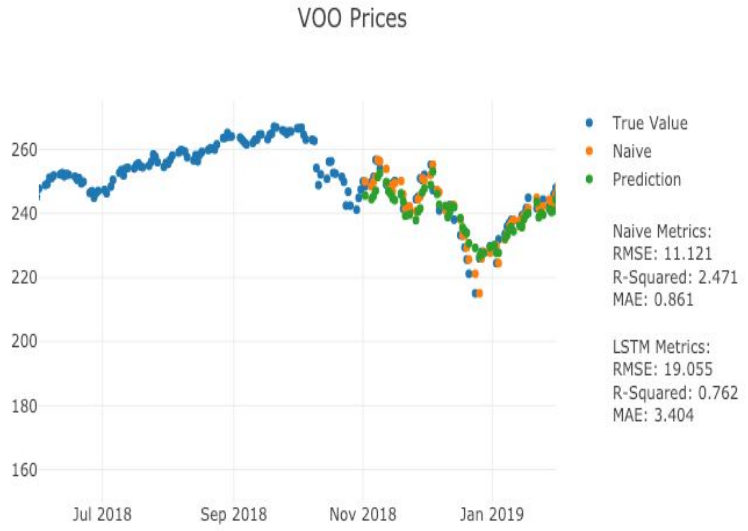

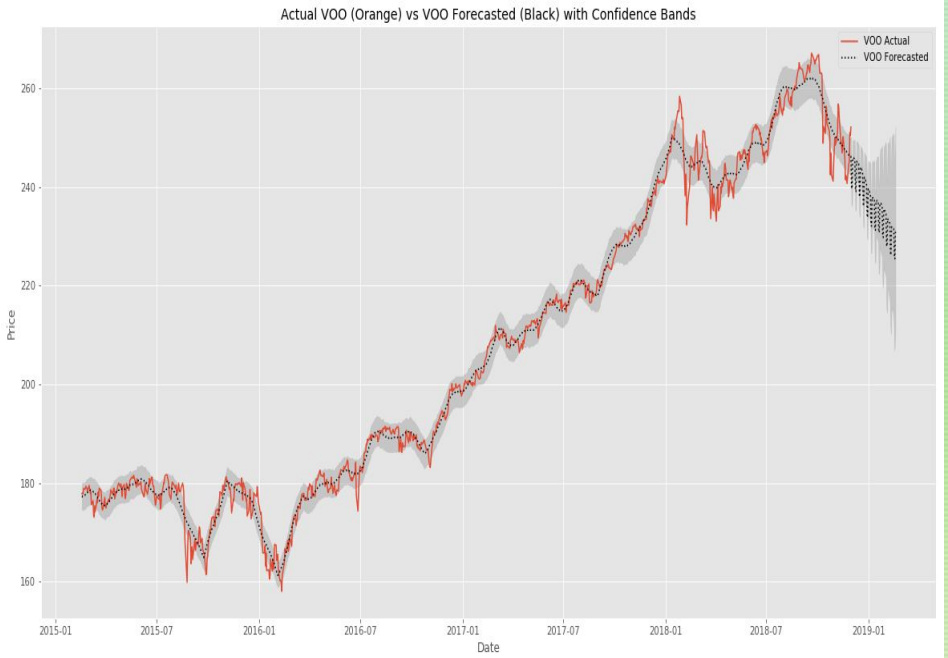

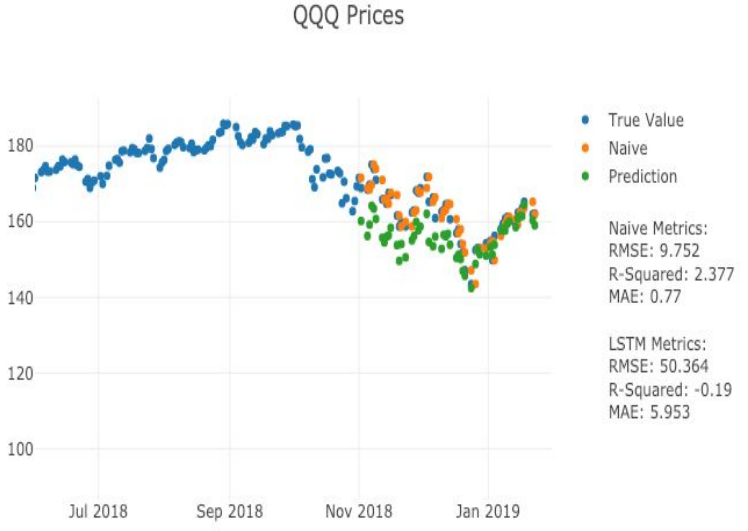

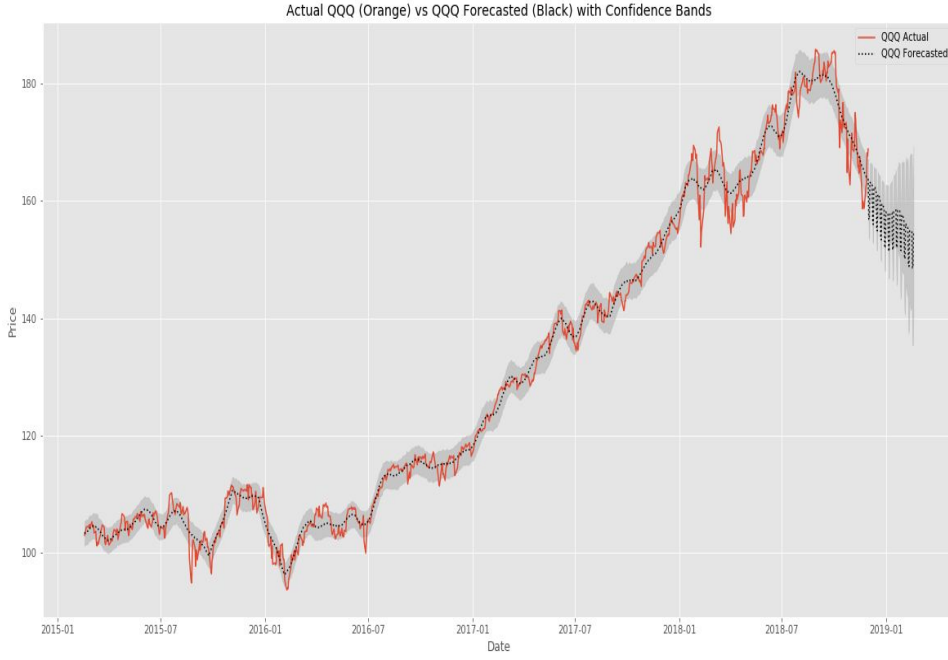

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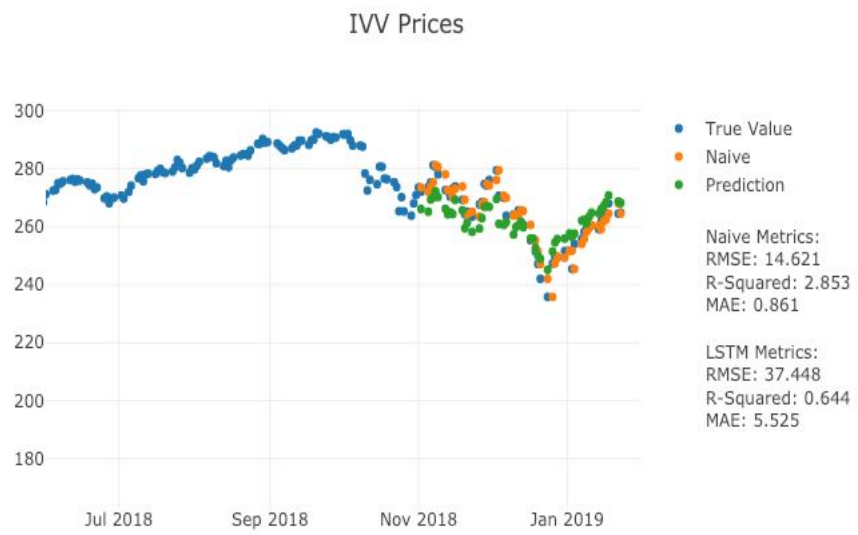

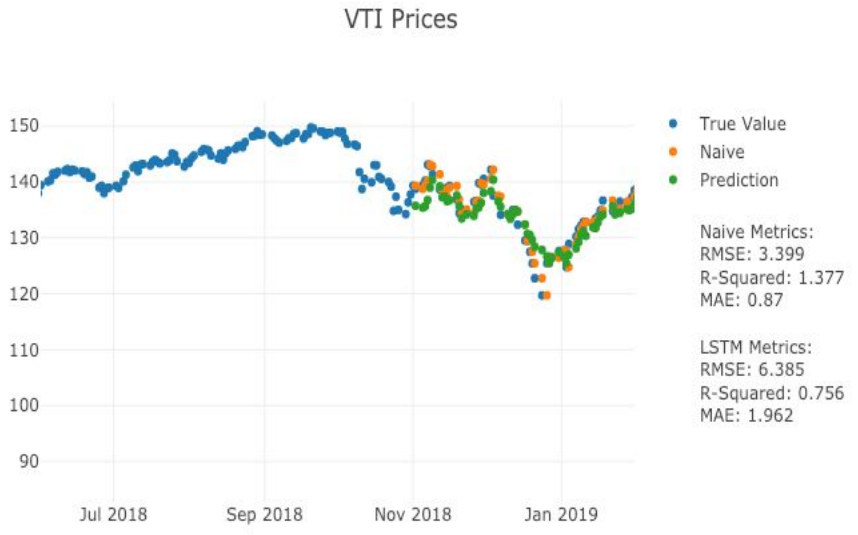

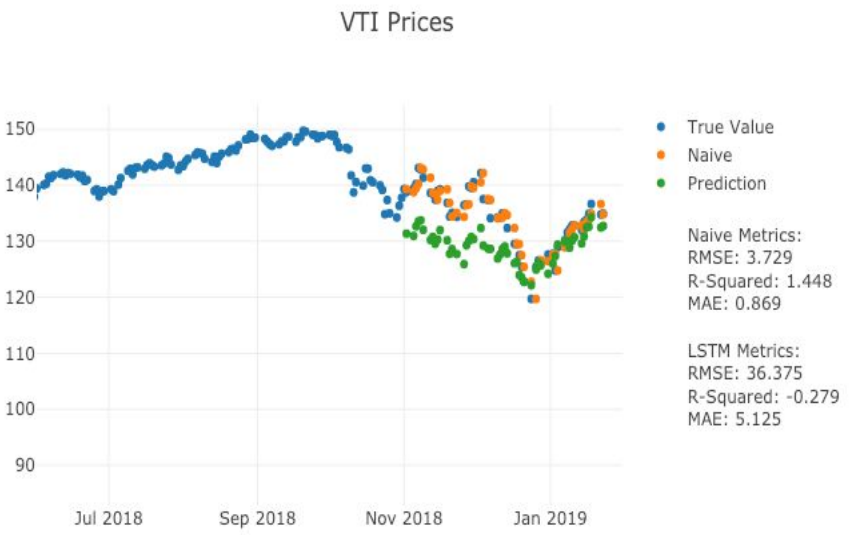

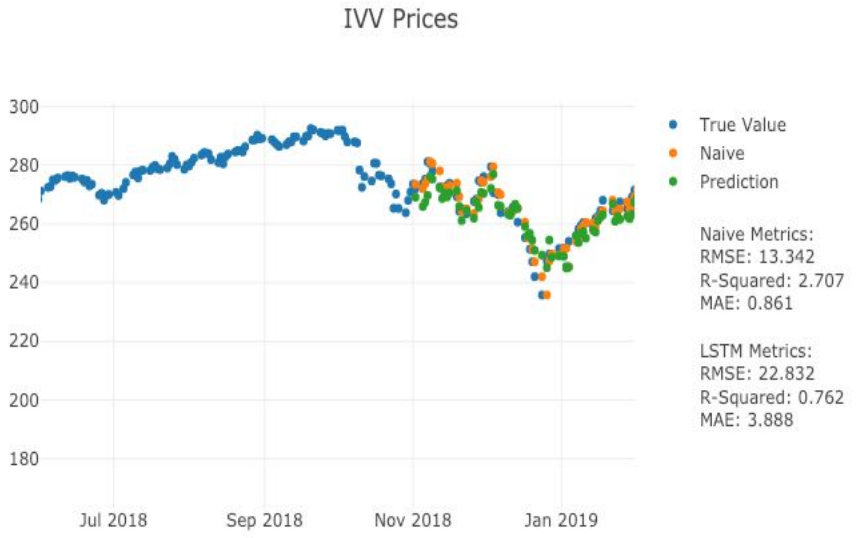

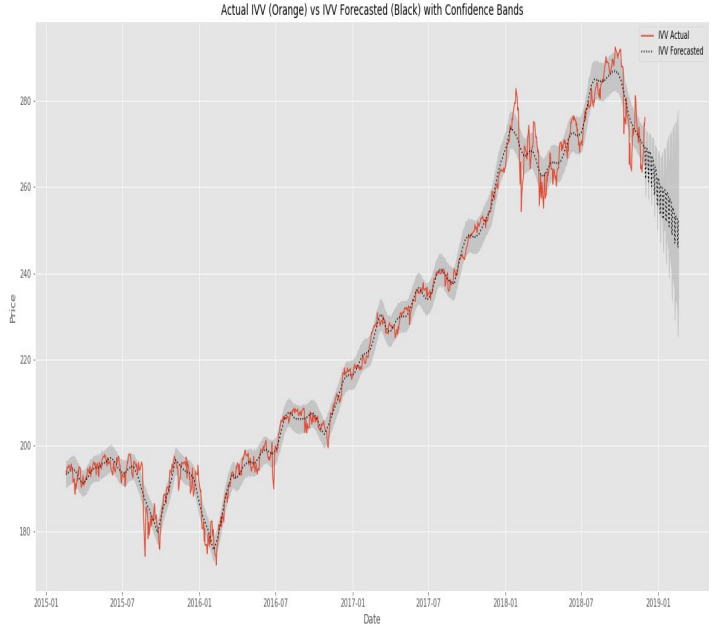

All **Features**

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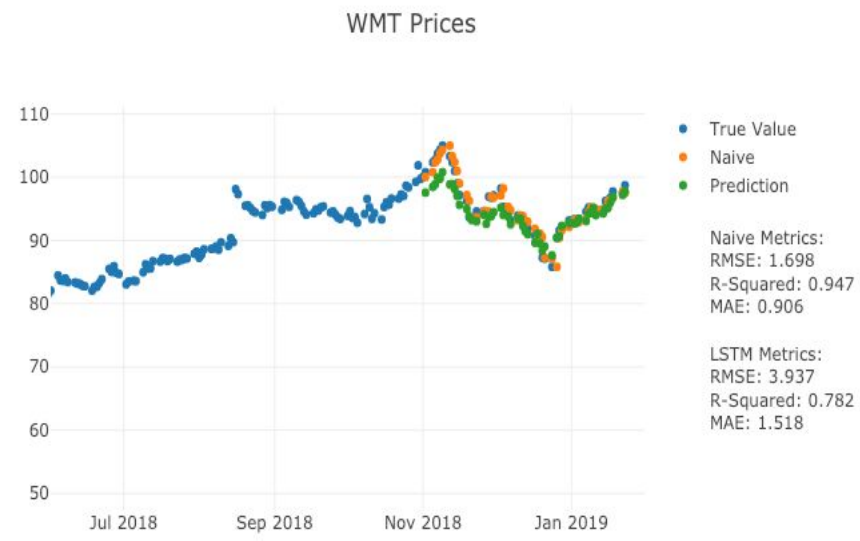
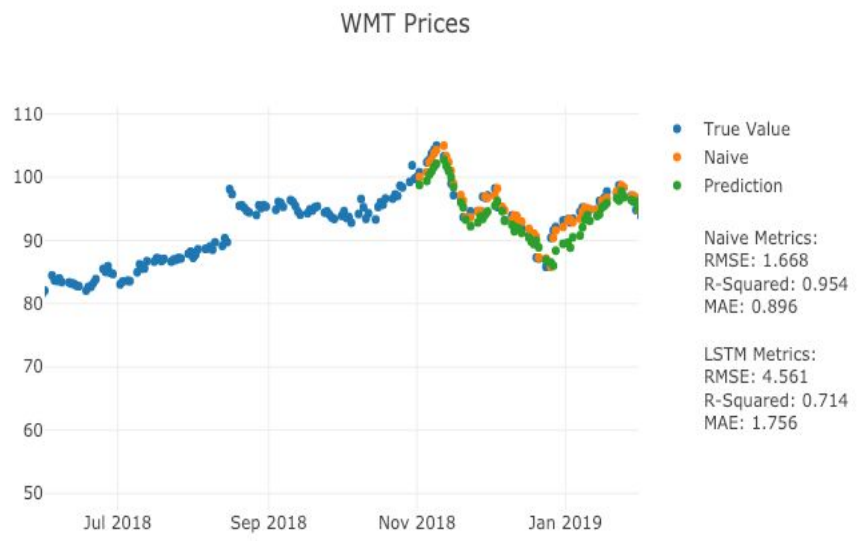
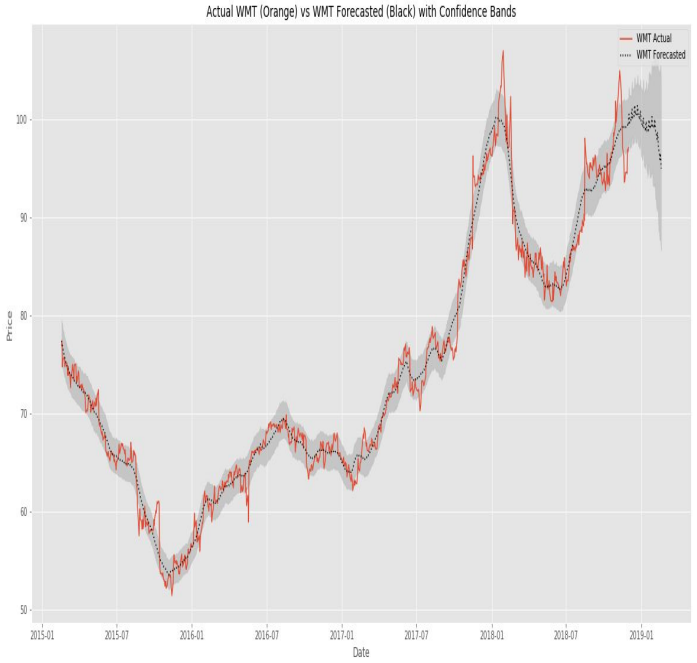
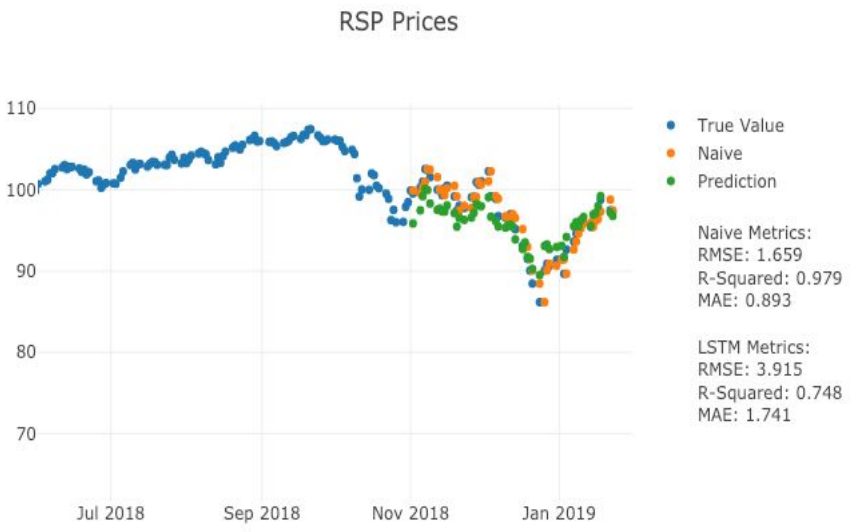
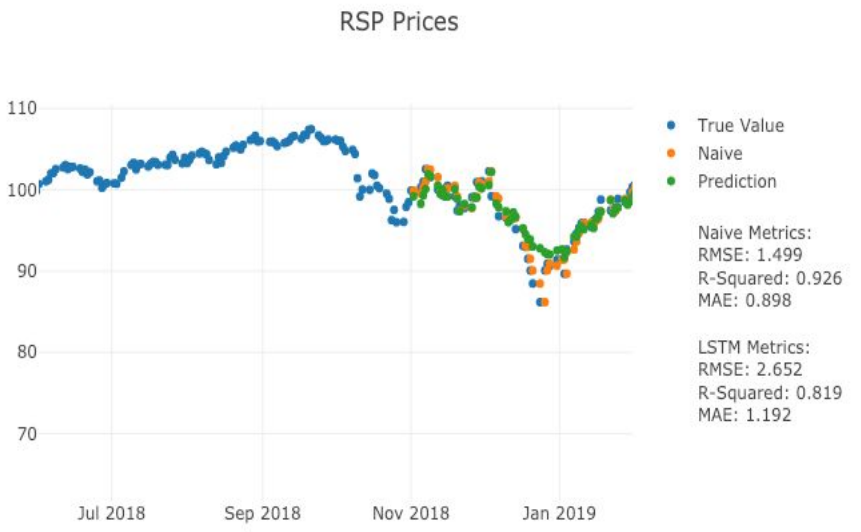
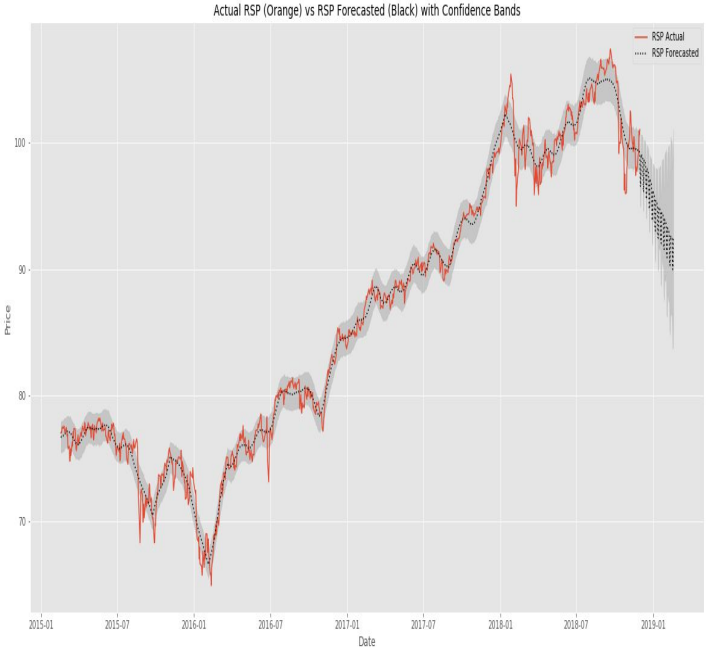








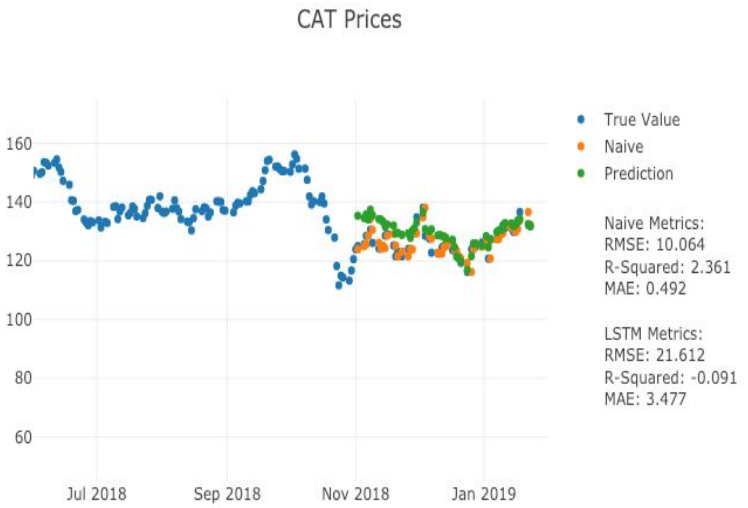


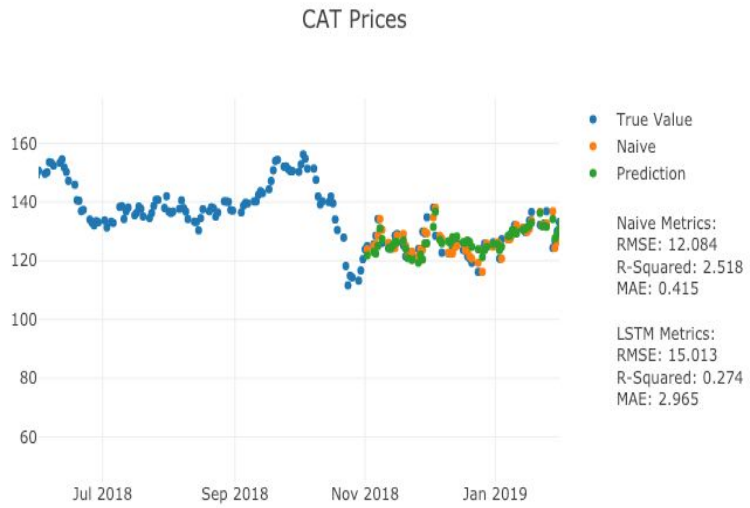


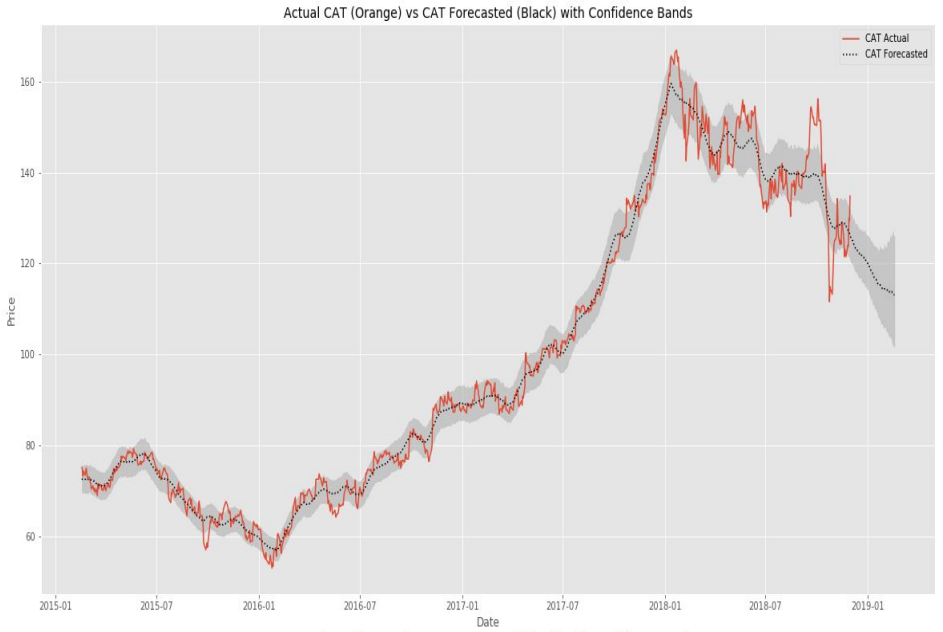
All **Features**

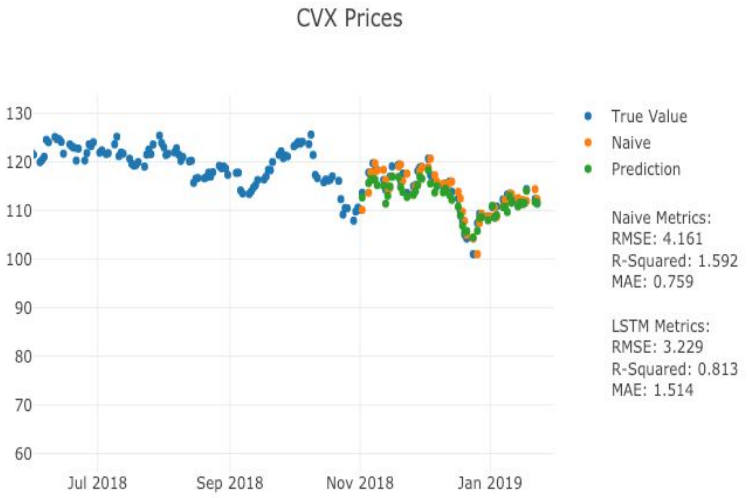
Minimal Features

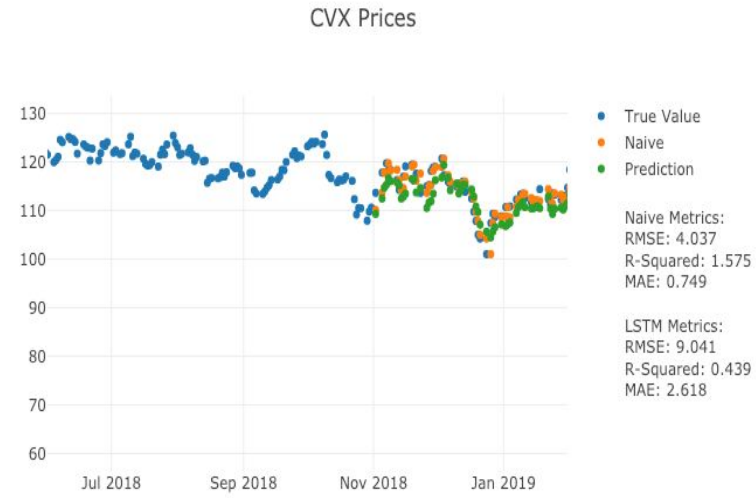
Facebook Prediction

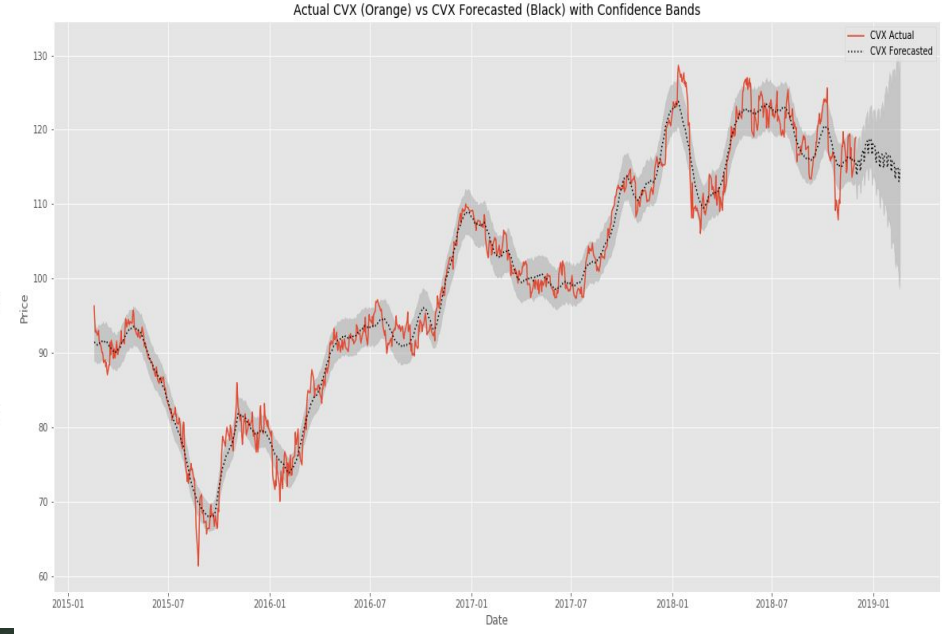








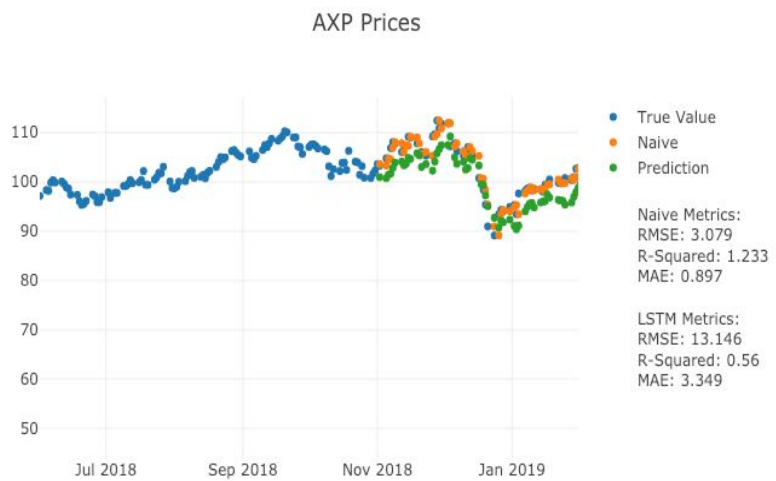


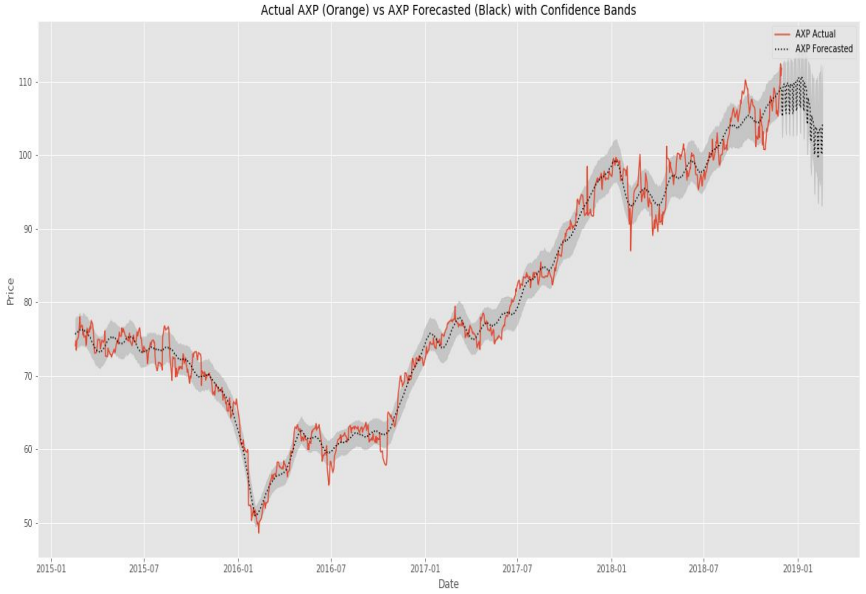


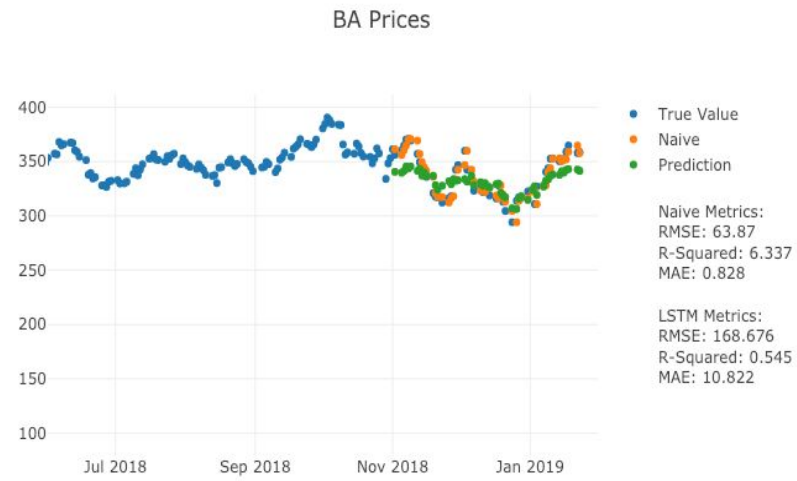
All **Features**

Minimal Features

Facebook Prediction







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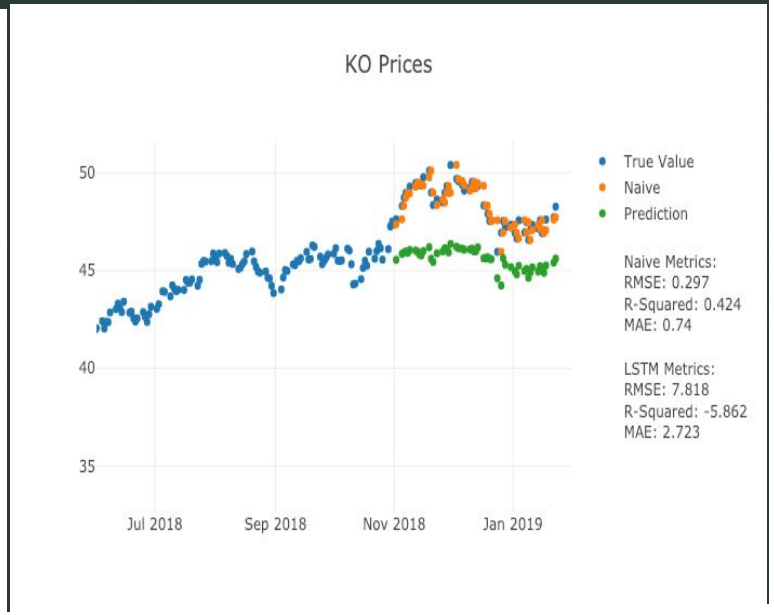

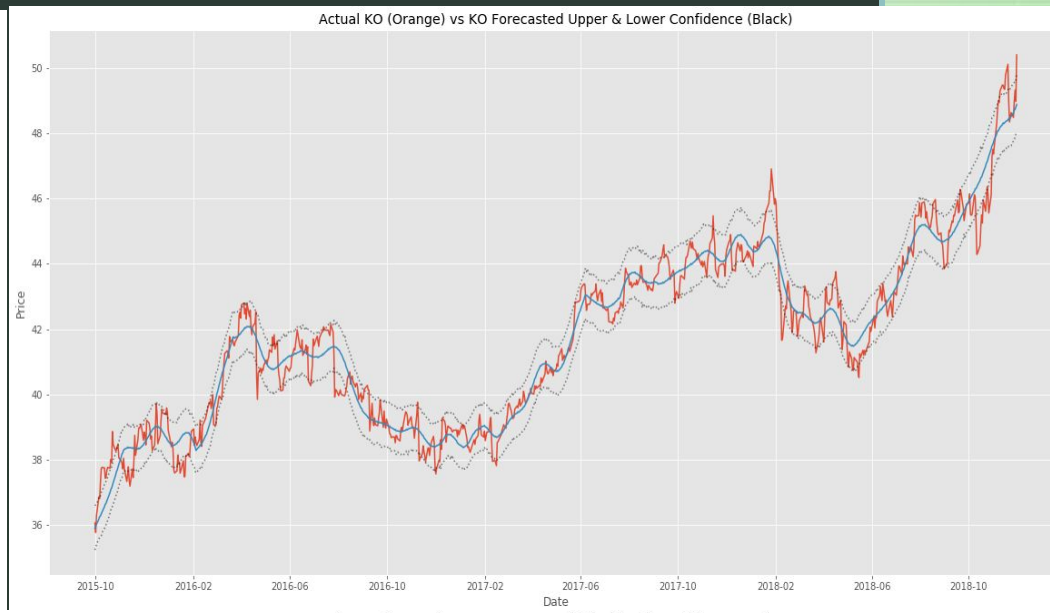

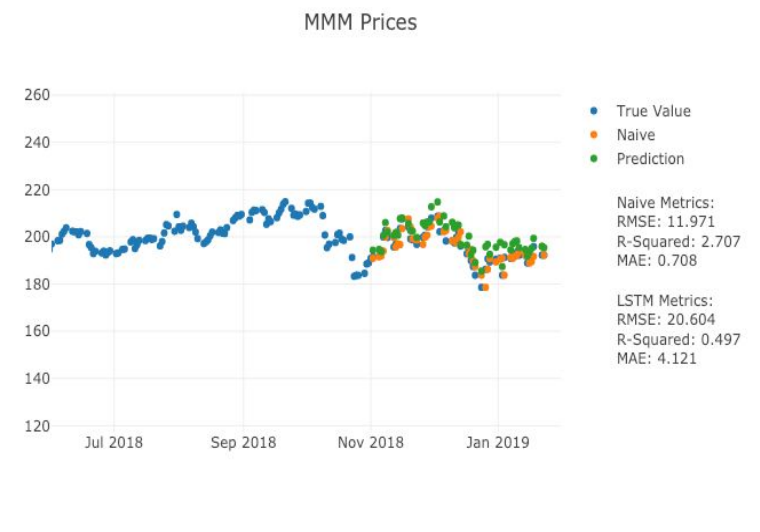

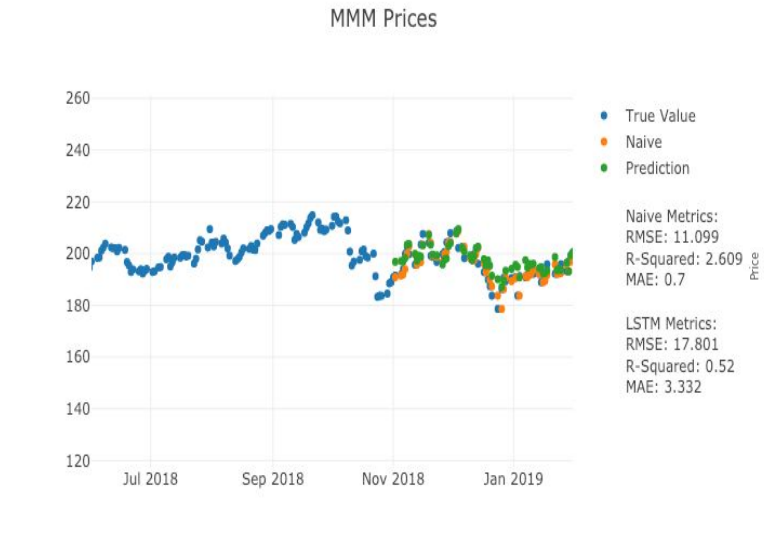

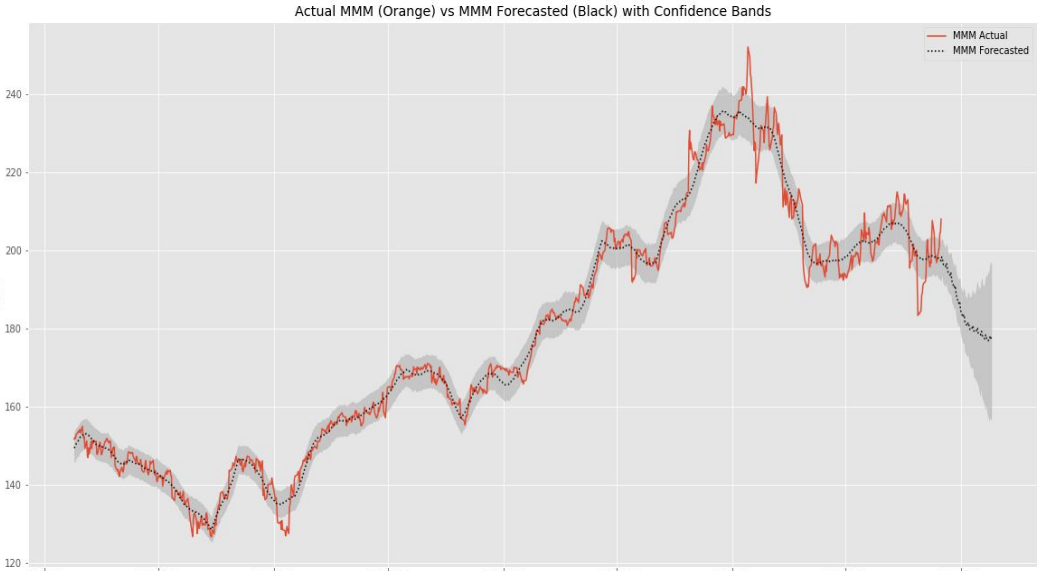

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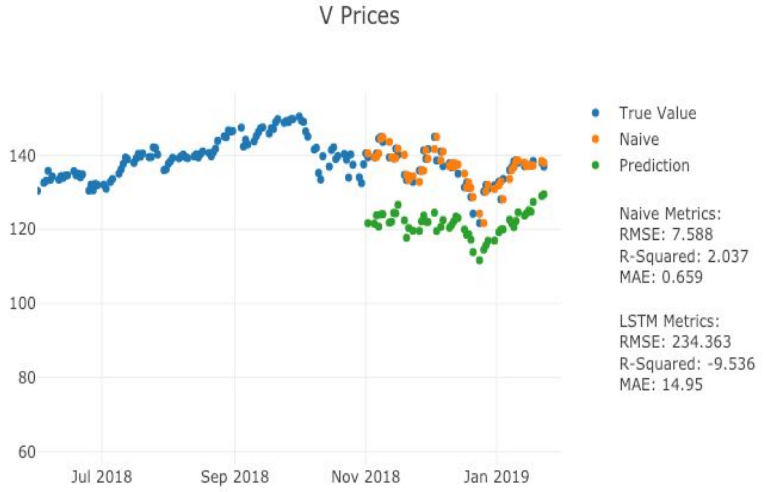
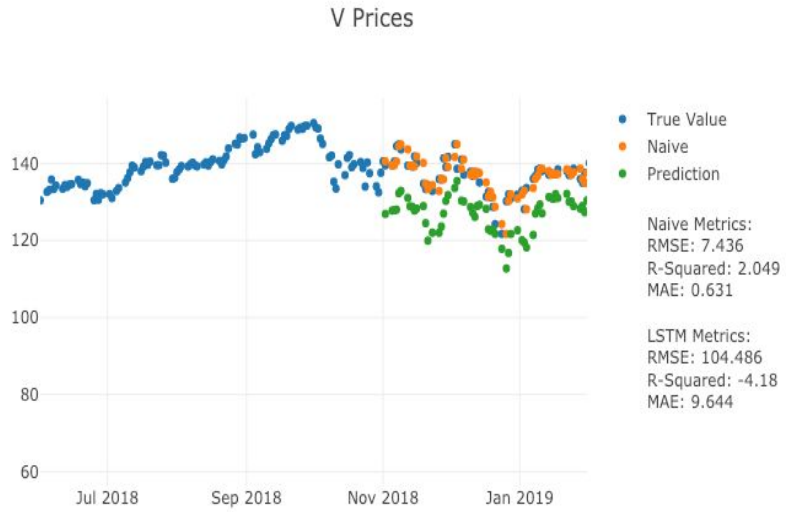
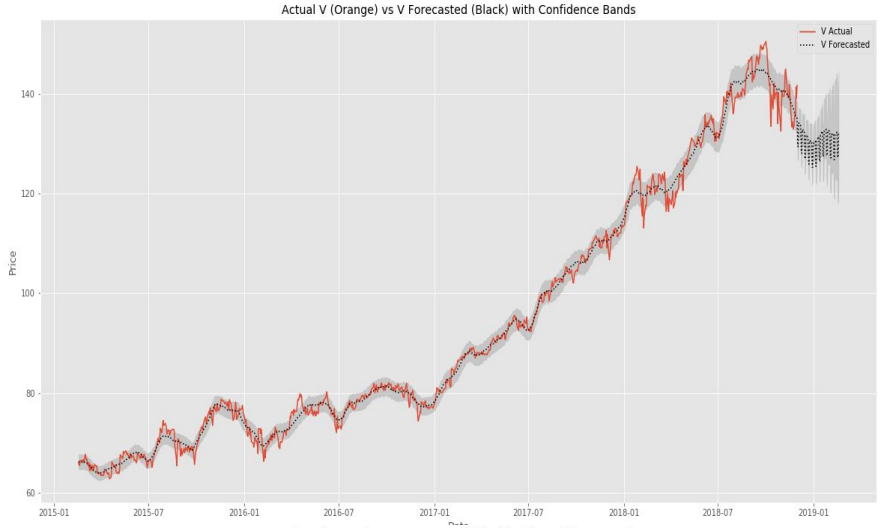
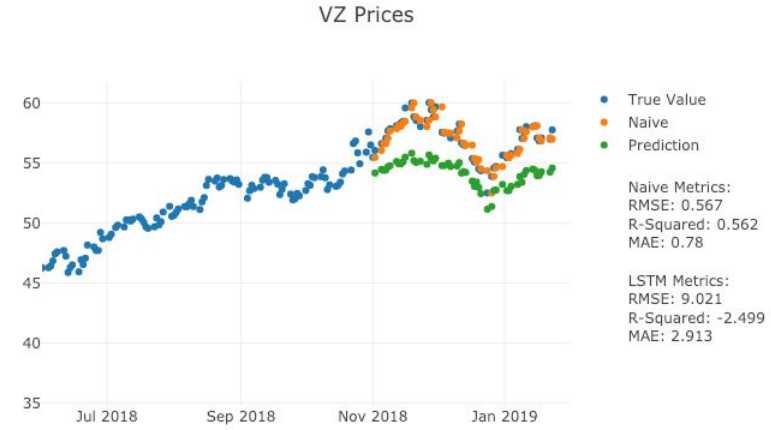
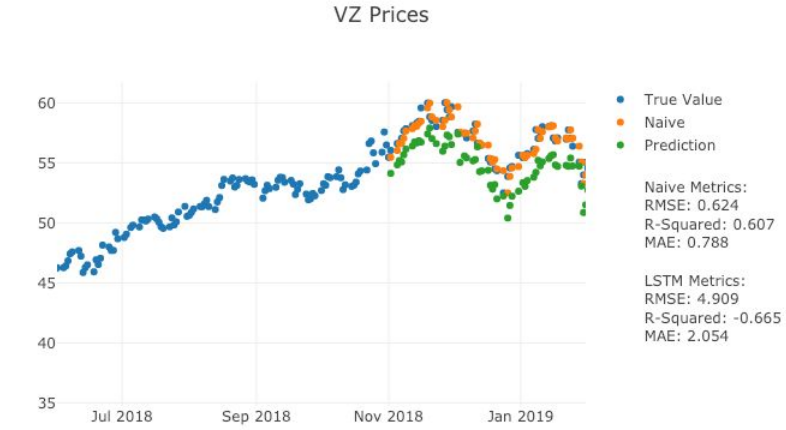
Facebook Prediction

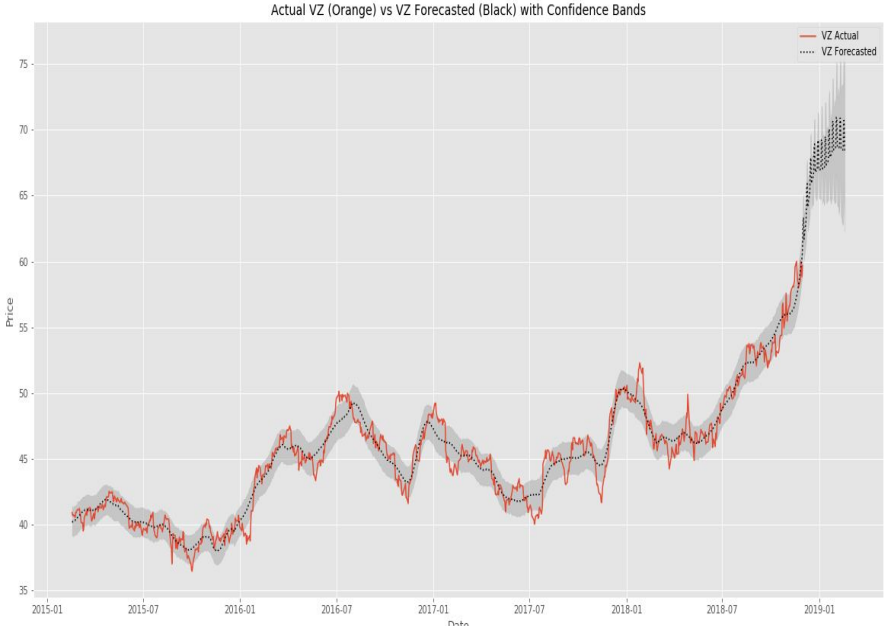




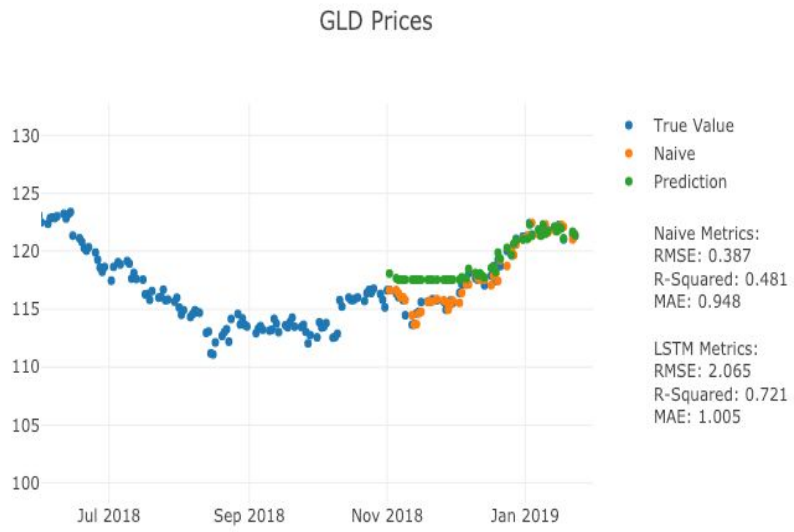


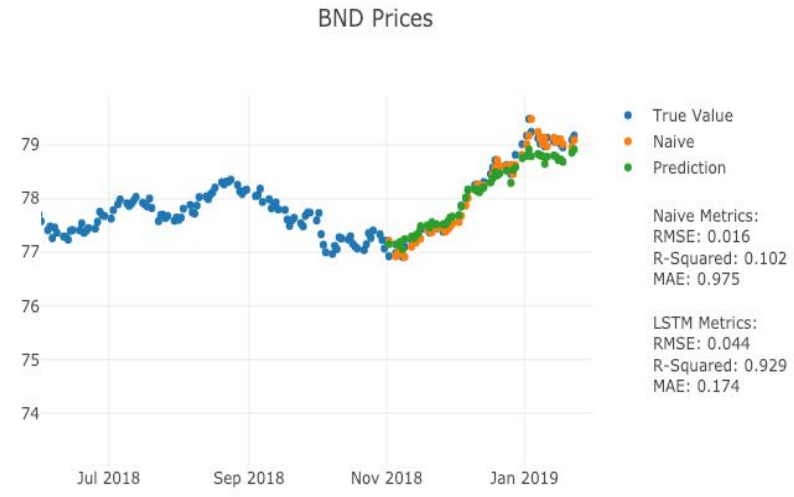




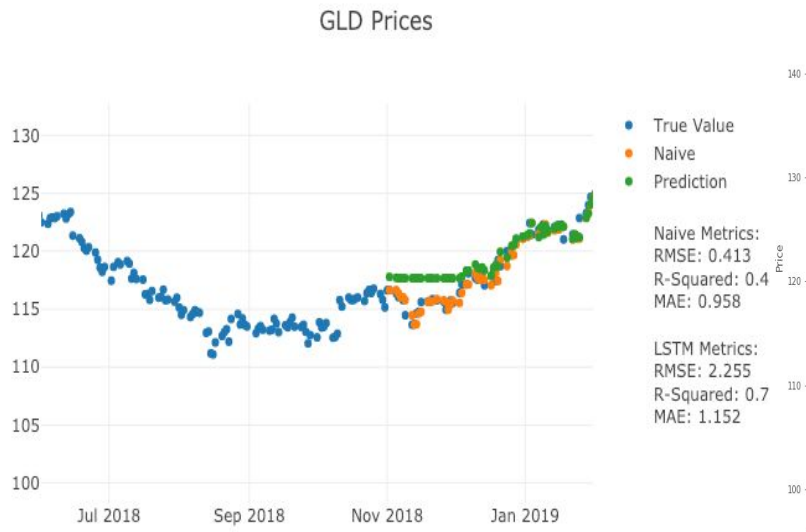


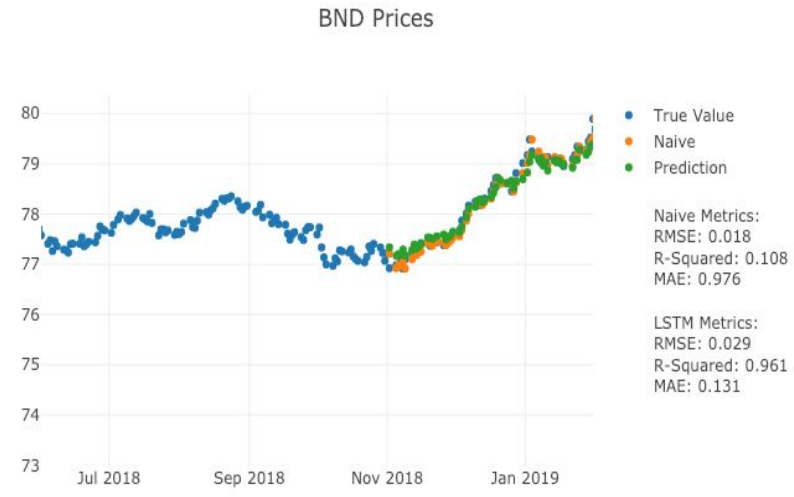
All Features



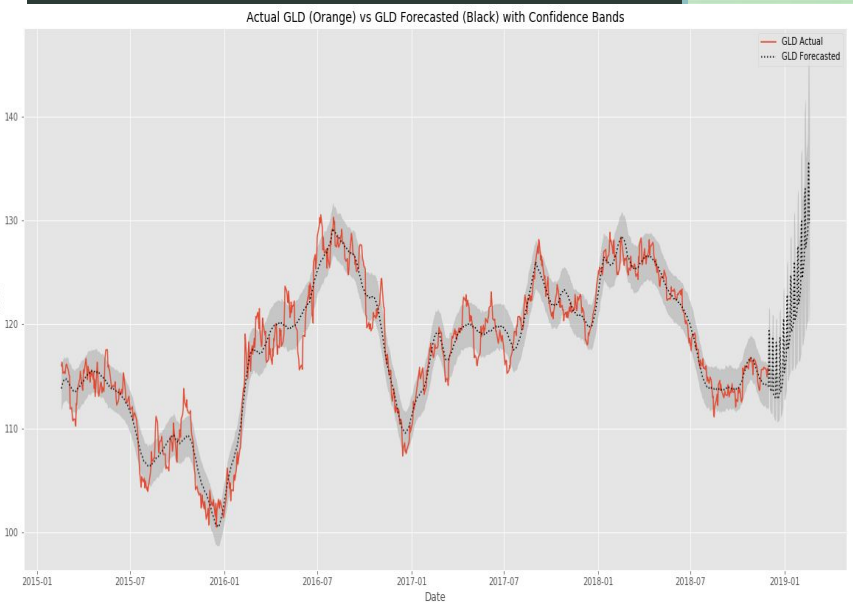


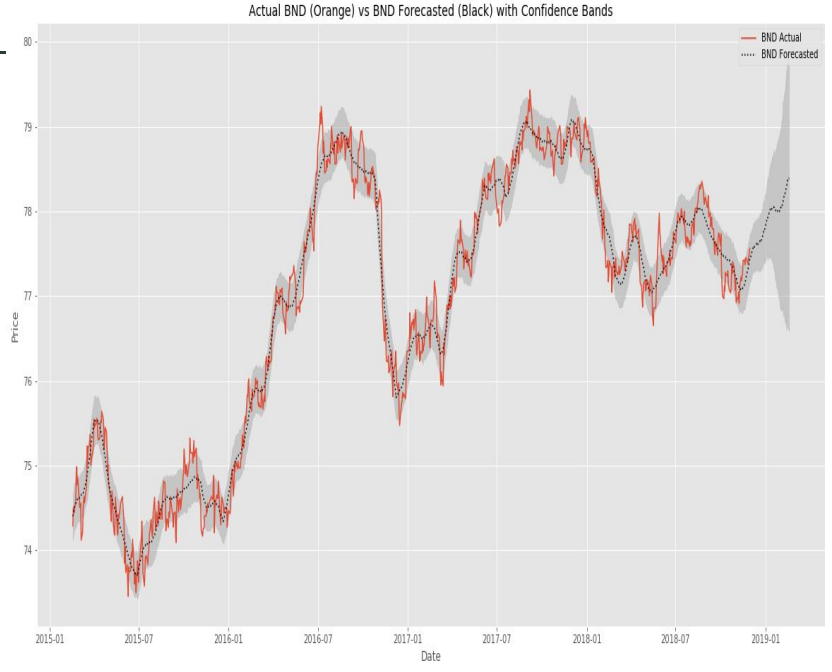
Minimal Features





Facebook Prediction

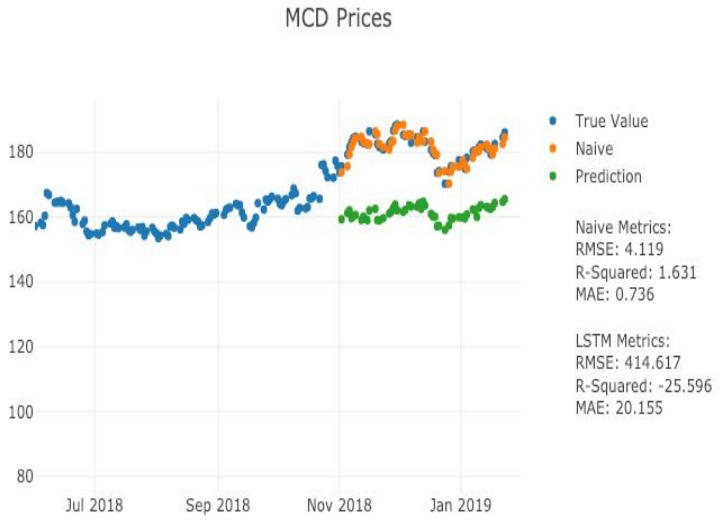


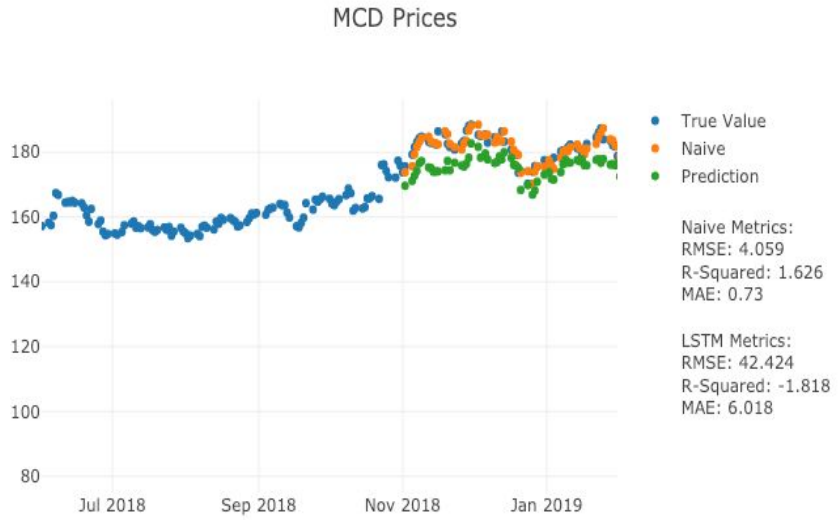


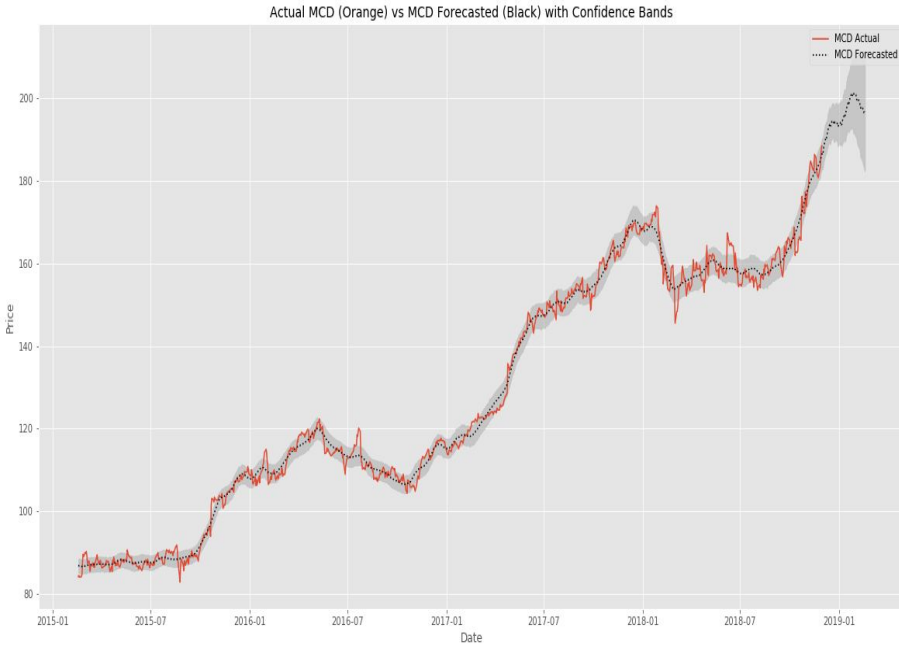
All **Features**

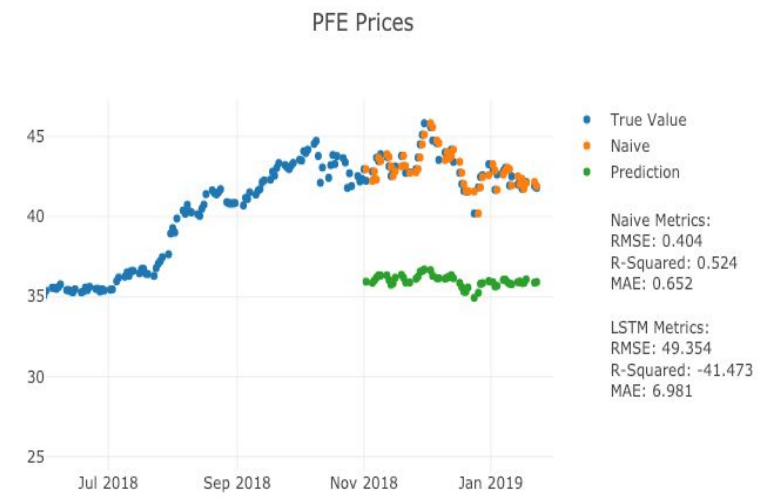
Minimal Features

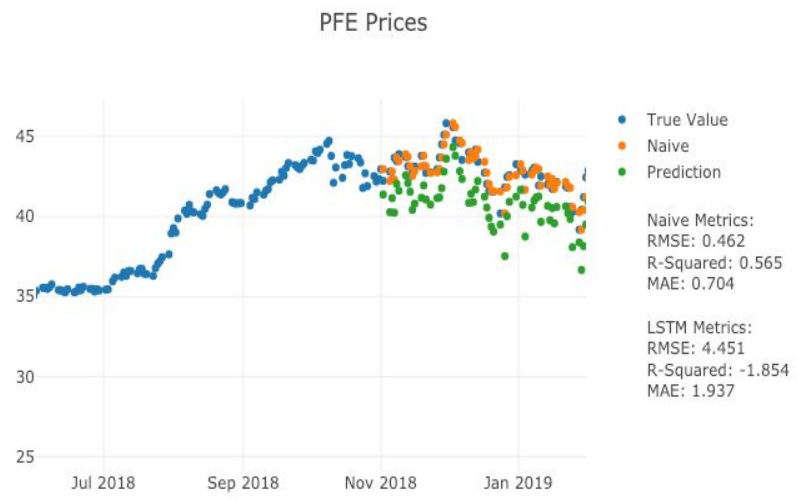
Facebook Prediction

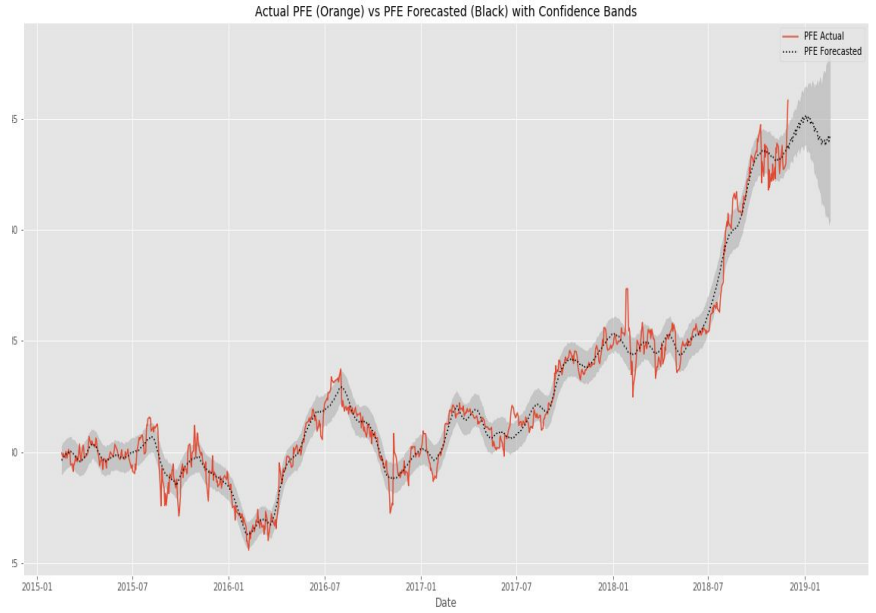












Looking forward

- 1)Look at longer batch windows or predictions further out, because a lot of the economic data is monthly and doesn't have a large meaning on prediction tomorrow's data unless a new report came out. Also a lot of technical indicators are better predictors or medium/longer term trends
  - (Largest correlation to prediction was 1 and 5 day performance for most models)
  - Consistent top correlations: percent change in volume over prior day (log) and difference in volume change (Would like to expand on volume variables)
- 2) Implement NLP on Social Media and 10Q-10K statements to see impacts on stock performance given sentiment regarding stocks
- 3) Add pre-market future data as variables to assess if the stock is likely to close higher or lower before the market opens
- 4) Additional Feature Engineering on Exogenous Data