

Stocks Close Price Prediction

Using LSTM
Alexiou Dimitris
Fotopoulos Spyros



Introduction

- Huge increase in interest from the financial sector about Deep Learning applications
- A small edge in this sector can be translated into large gains
- Approached by an Actively Managed Fund
- Active Fund aims to beat the average market index
- Take advantage of small short-term price fluctuations
- Predict the next day Close price of a stock using as predictors the previous day metrics

Input Data

- Historical daily data from companies that are now included in S&P500 from 1980 to 2018
- 25 of those stocks chosen
- Various stages of cleaning and reformatting using Bash and Python
- Transformed using MinMaxScaler to scale and normalize the data into the range [0,1]

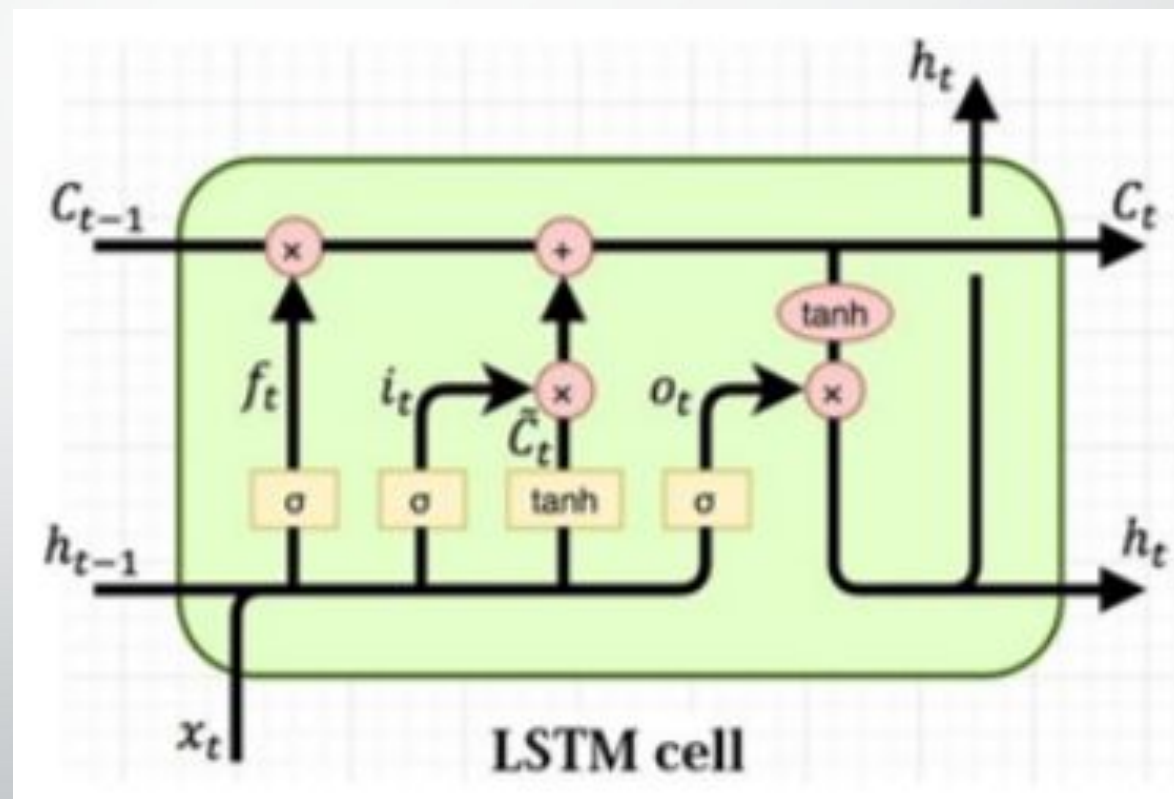


Recurrent Neural Networks

- RNNs are multi-layer type of networks that use internal memory in order to process sequential data
- LSTM is a type of RNN
- LSTM have proved to be one of the most powerful and effective models in processing sequential data
- RNN are suffering from vanishing gradient
- LSTM solve this problem with different approach in its architecture

LSTM

- Forget Gate
- Input Gate
- Output Gate
- Cell State



Design & Implementation

- 3 Different Approaches
- We wanted to examine if the previous values are affected the output in a positive or negative way
- 3D Tensors (No. of sequences, length of sequence, No. of features)
- "All-In" (1,n,5)
- "Window" (n/4,4,5)
- "MLP" (n,1,5)
- Used one stock to train each model
- Then used that model to make predictions on other stocks

Optimization

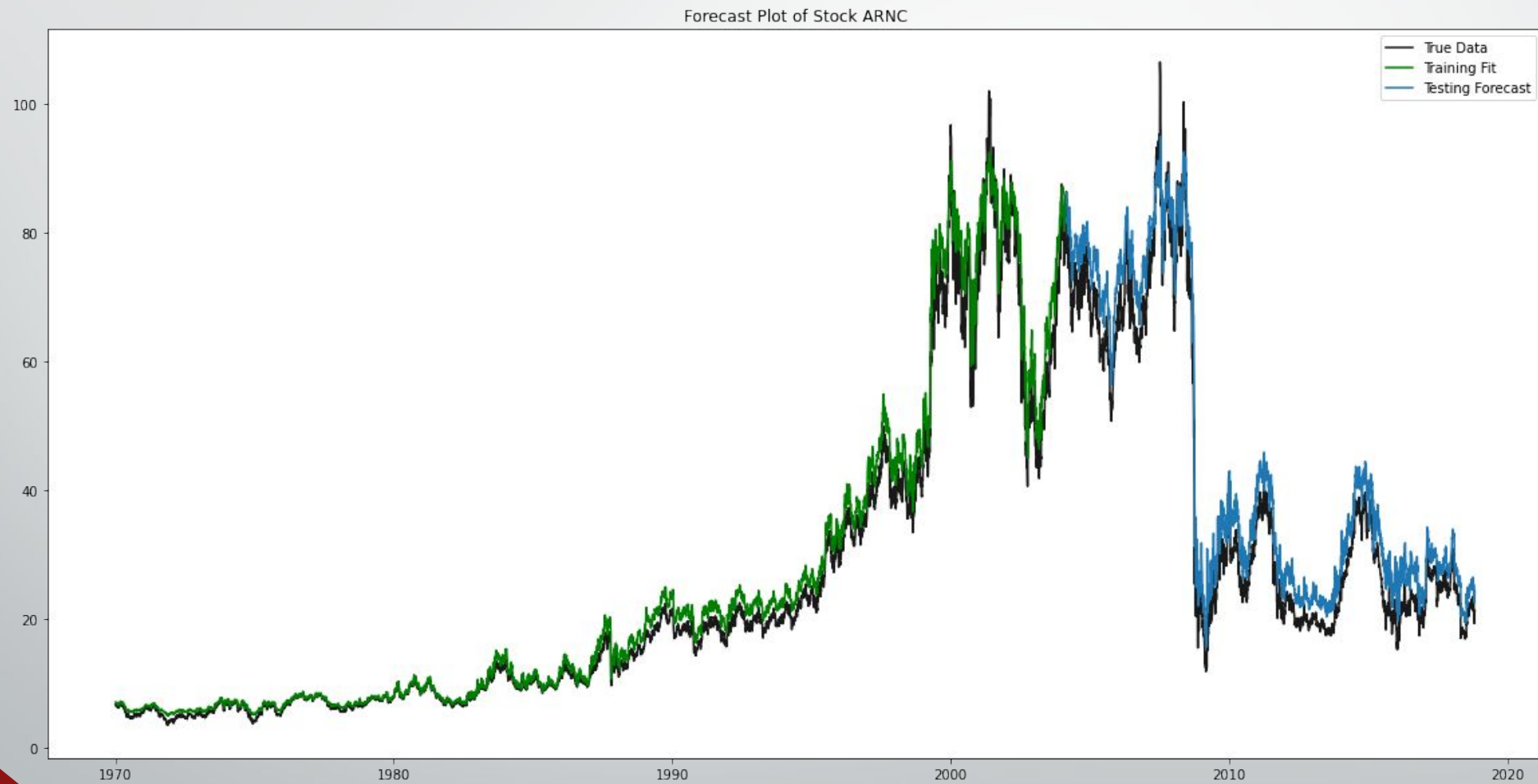
- Hyper-parameters optimized using Talos library using the following for 100 epochs

	Range Searched	Results
Number of units of the first LSTM Layer	[8,16,32]	8
Number of units of the second LSTM Layer	[8,16,32]	16
Number of units of the third LSTM Layer	[8,16,32]	32
Dropout	[0,1 0,2]	0,1

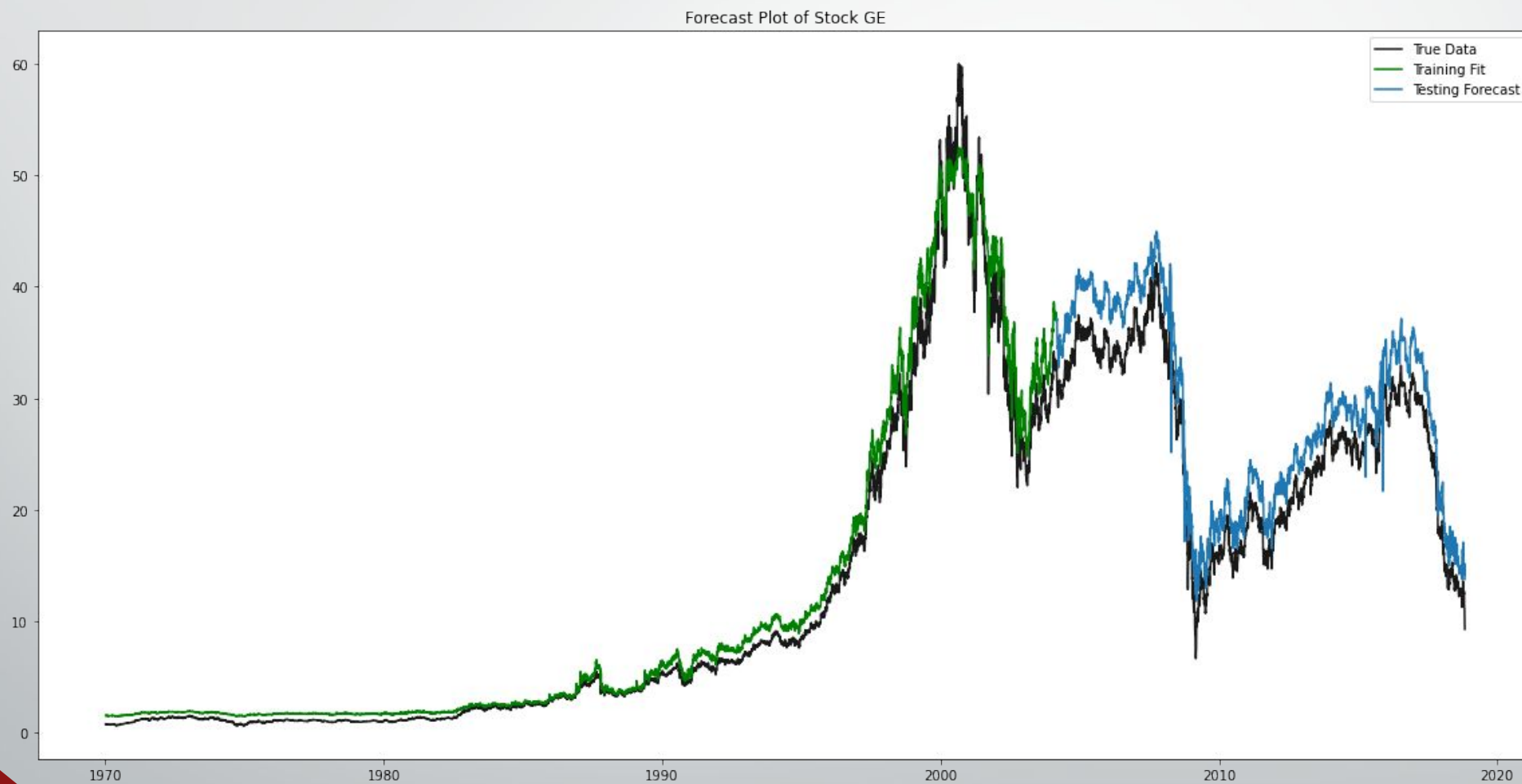
RMSE

Stock	MLP	Window	All In
ARNC	0.0220	0.0368	0.0488
GE	0.0609	0.0328	0.0430
IBM	0.0524	0.0633	0.0467
MSFT	0.0482	0.0384	0.0420
AAPL	0.0598	0.0365	0.0450

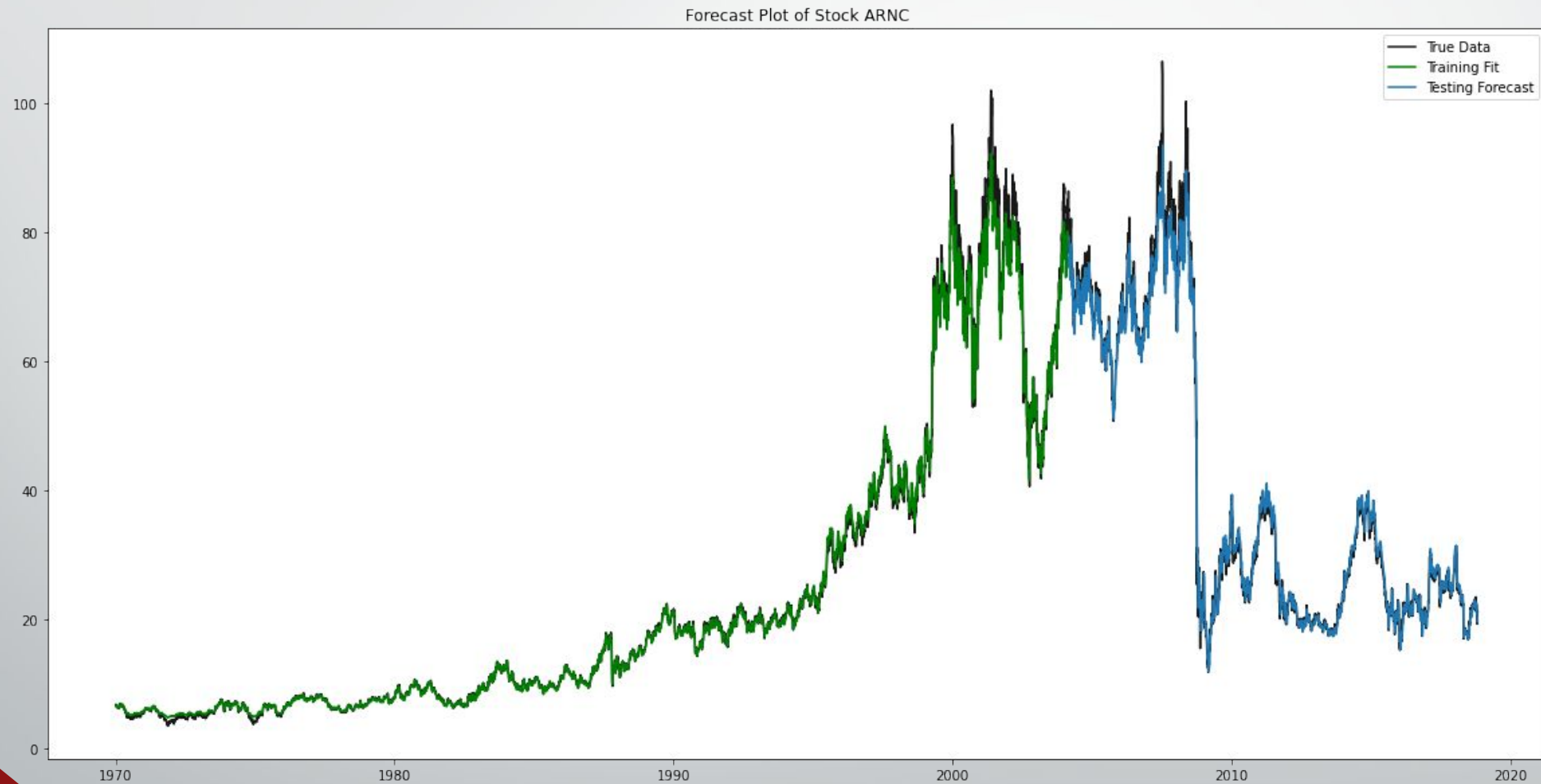
Results: "MLP" ARNC



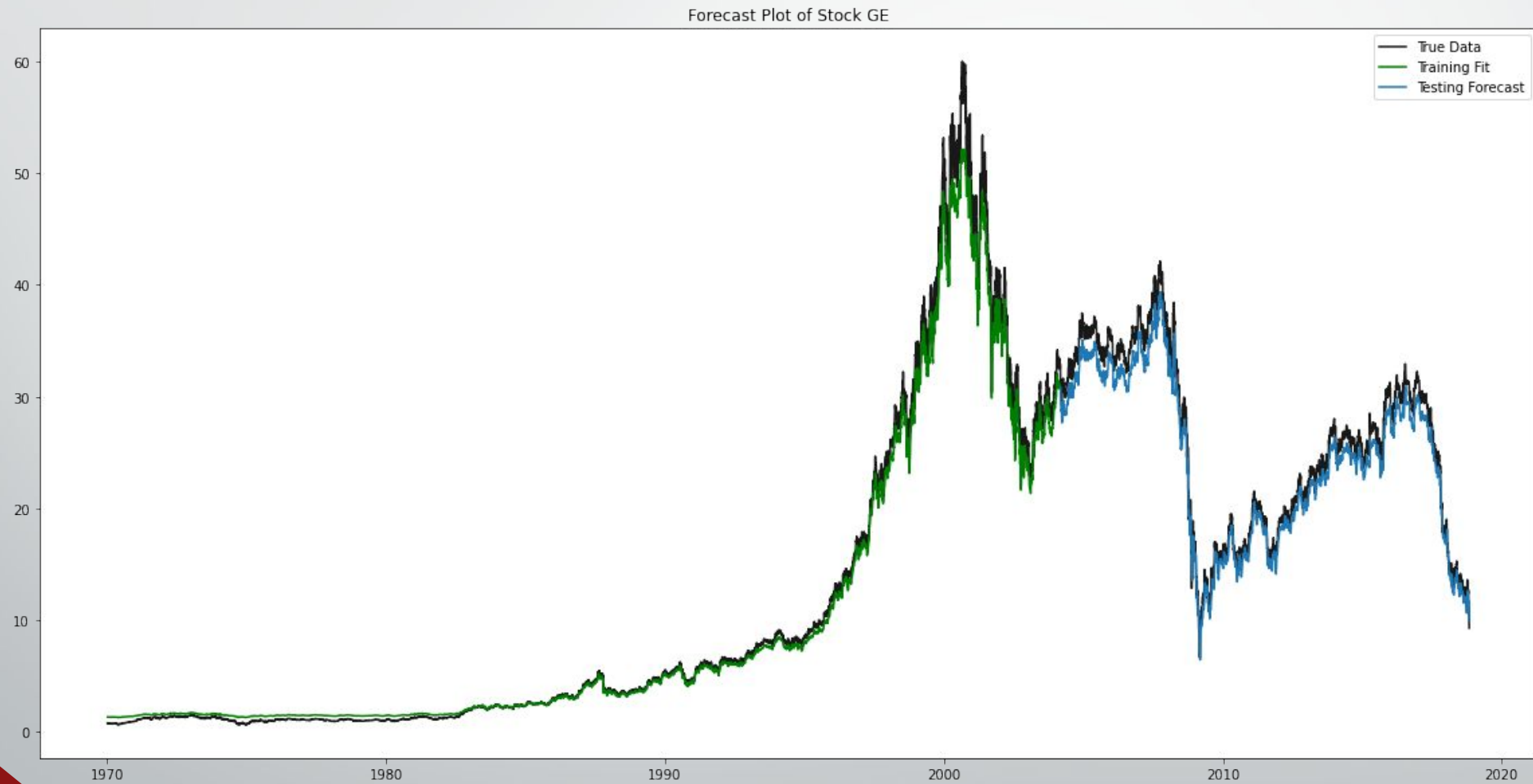
Results: "MLP" GE



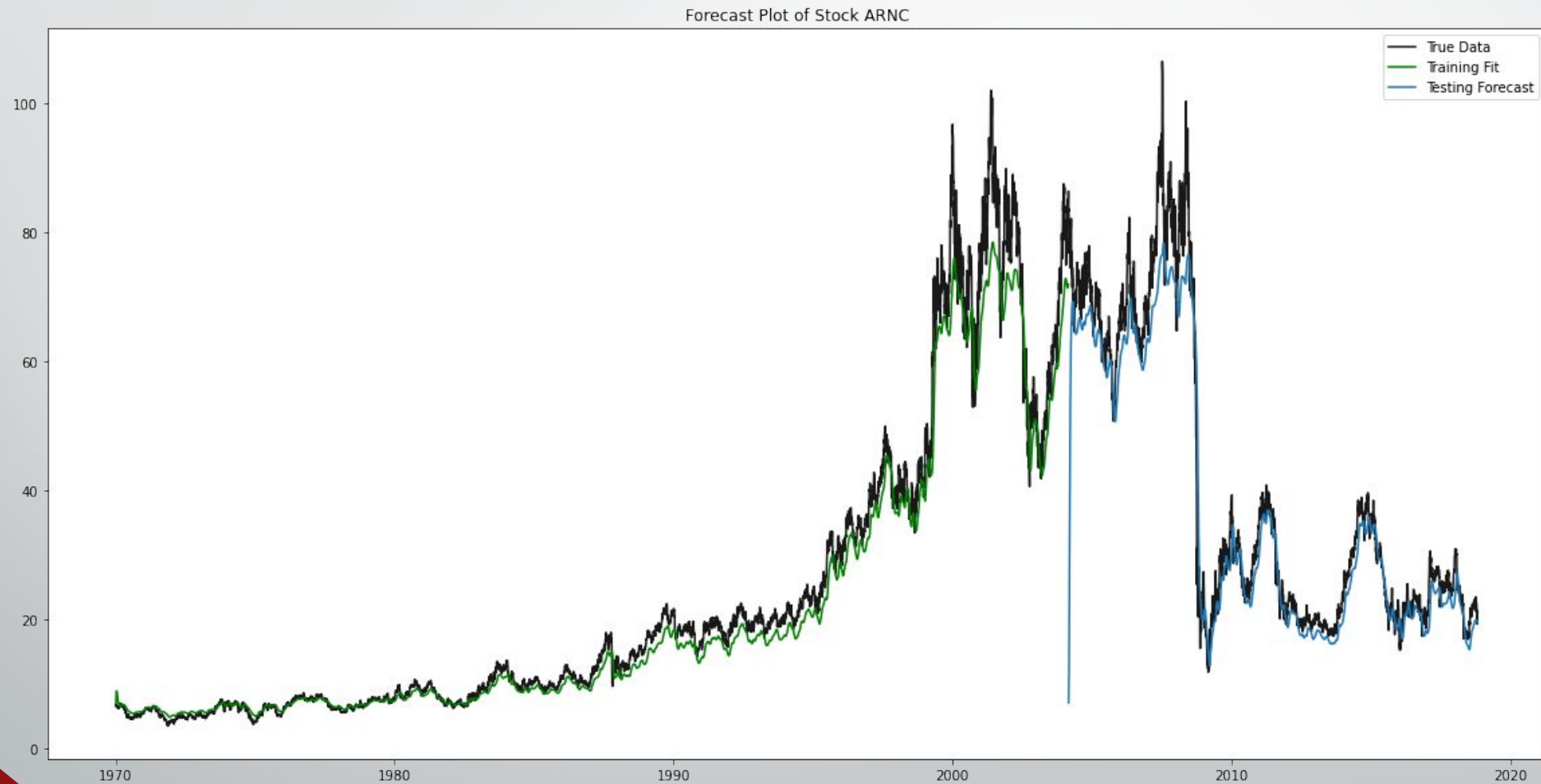
Results: "Window" ARNC



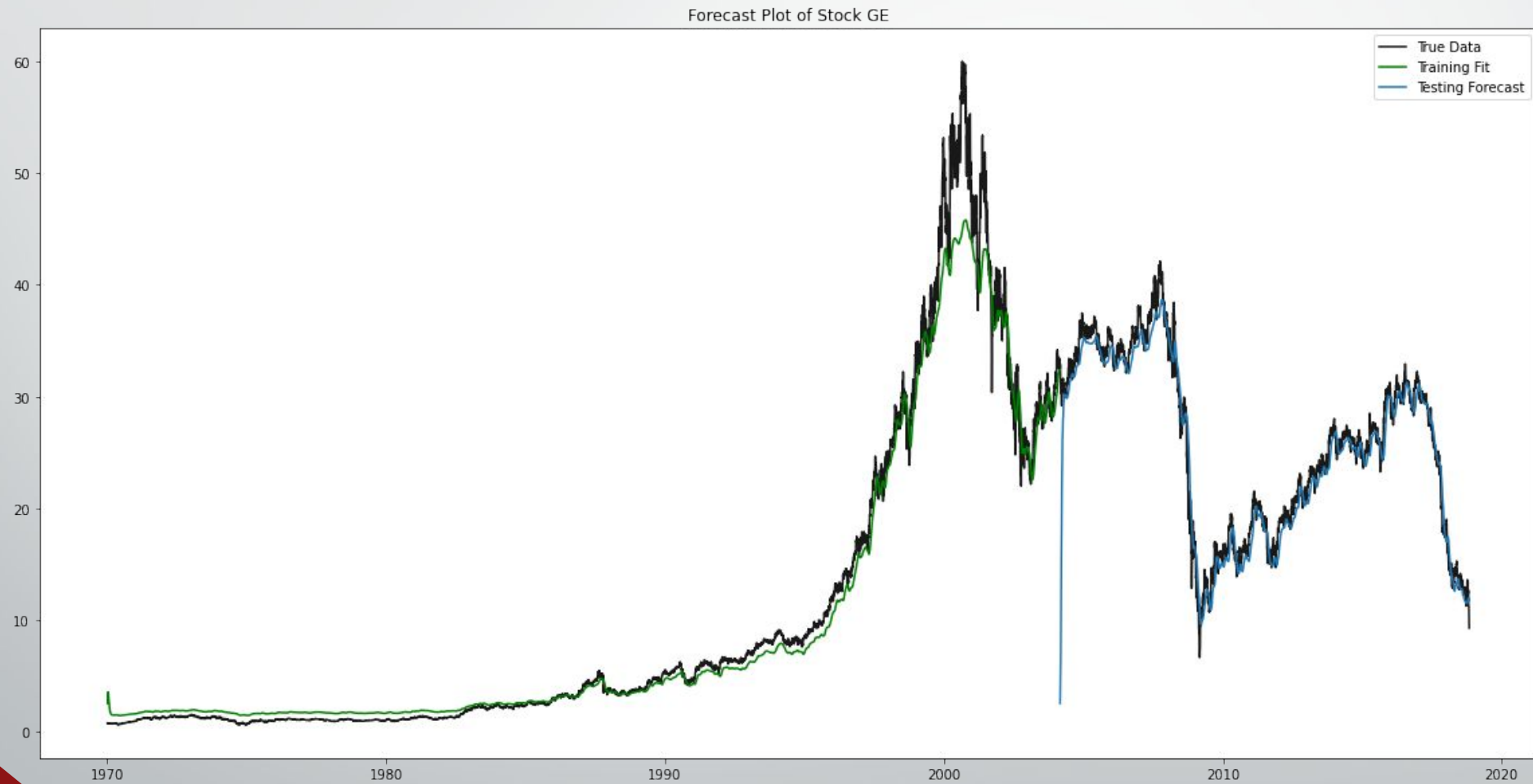
Results: "Window" GE



Results: "All-In" ARNC



Results: "All-In" GE





Any Questions?