

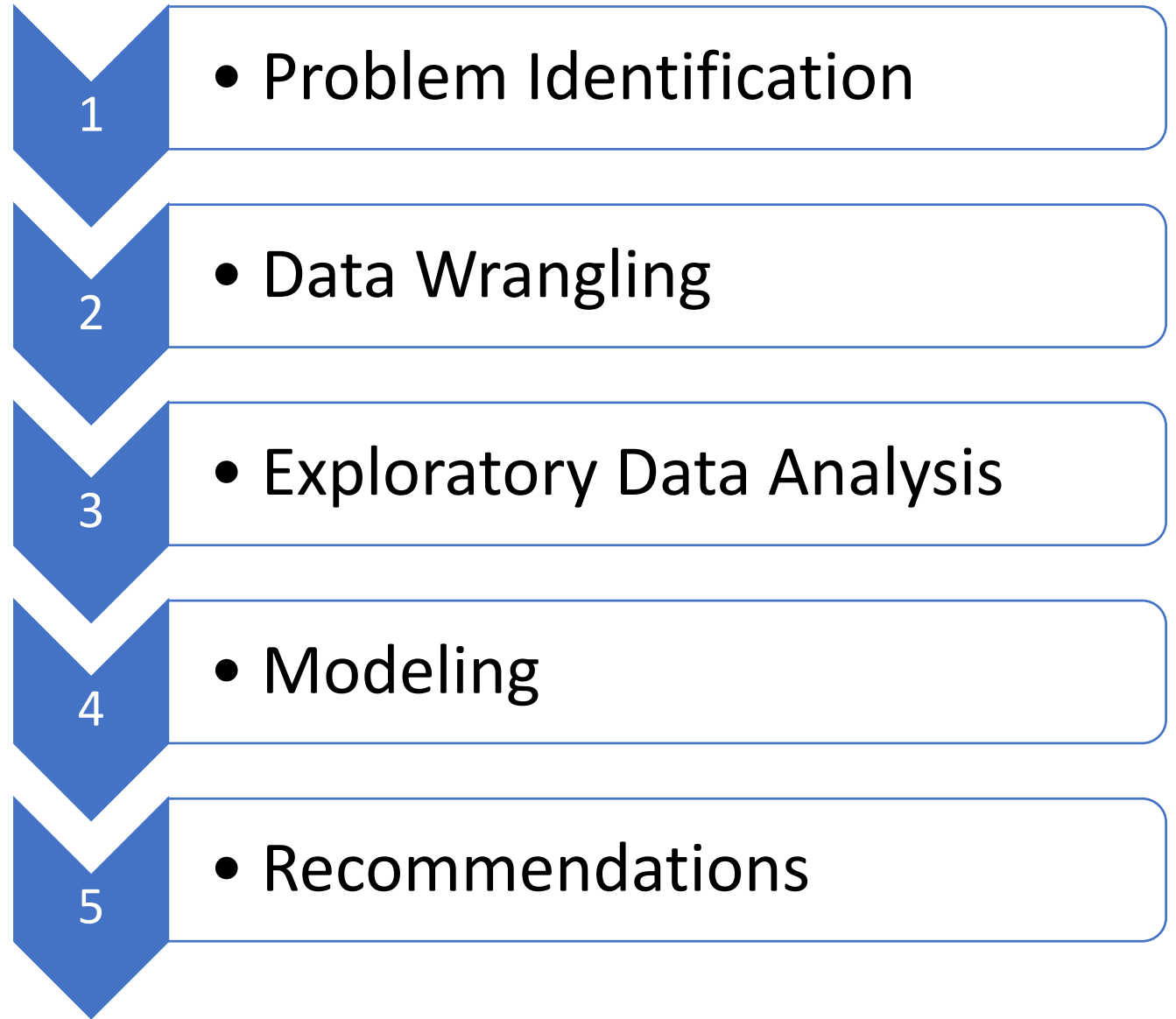


Times Series Analysis as function of the Oil Price

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Methodology



Problem Identification




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Predicting stock price is challenging due to different external factors that make this variable to move unexpectedly. This is a problem for traders or investors at the time to make investment decisions

Create a model able to predict how different stocks may move by taking into consideration the oil price, and time to solve this problem.

Why Oil?

It is believed this commodity has highly influence on how the economy would move.

Why JKS, AAL and TSLA?

Select stocks with supposedly different relation with oil.

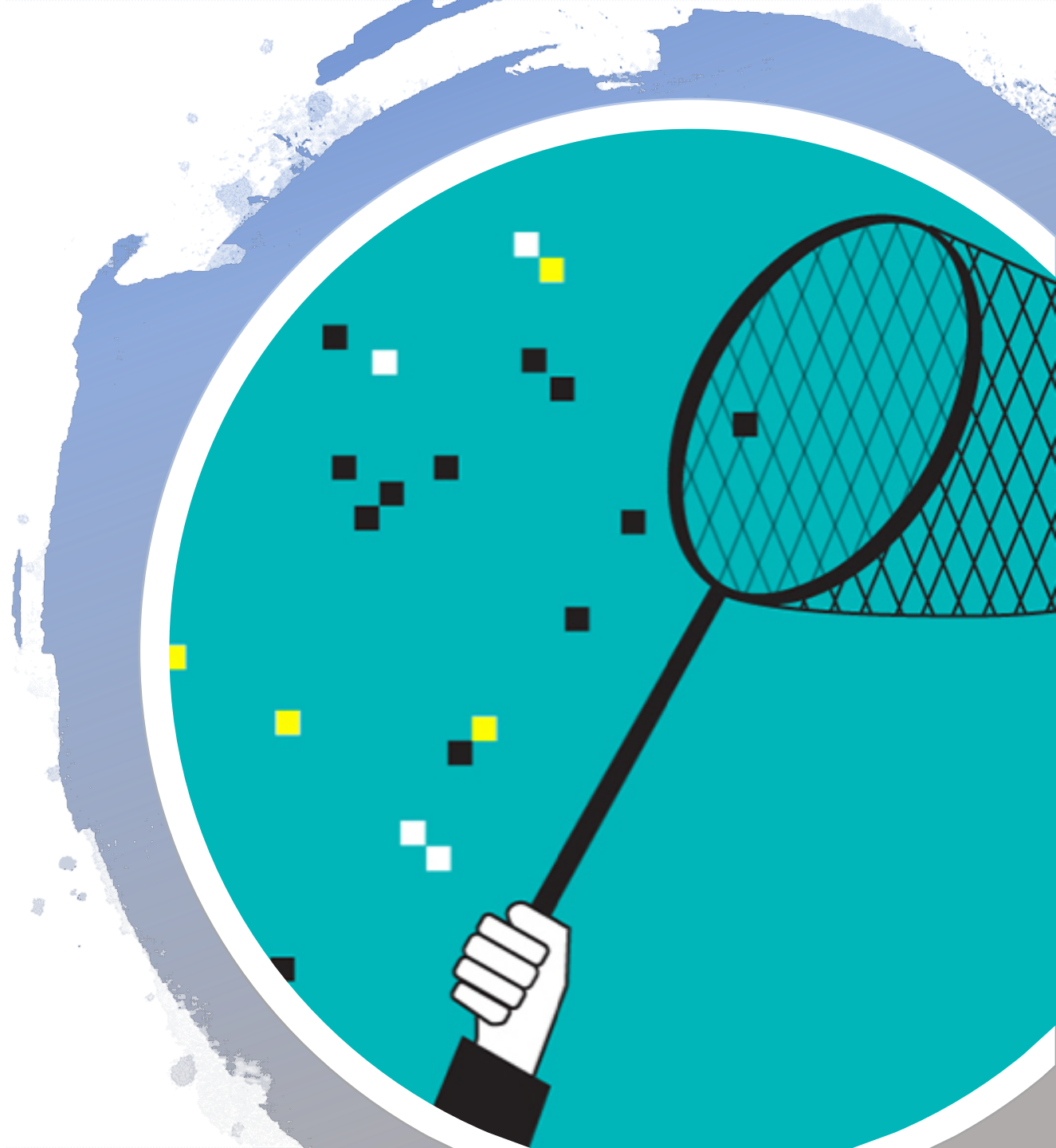
Jinko Solar → Uncorrelated

American Airlines → High correlation

Tesla → Negative Correlation

Data Wrangling

- Collect the data
- Merge the data frames
- Sort by date



Exploratory Data Analysis

- Tesla stock price tendency is to increase.
- Oil Price has a high volatility.
- JKS and AAL seemed to have low volatility behavior on their stock price.



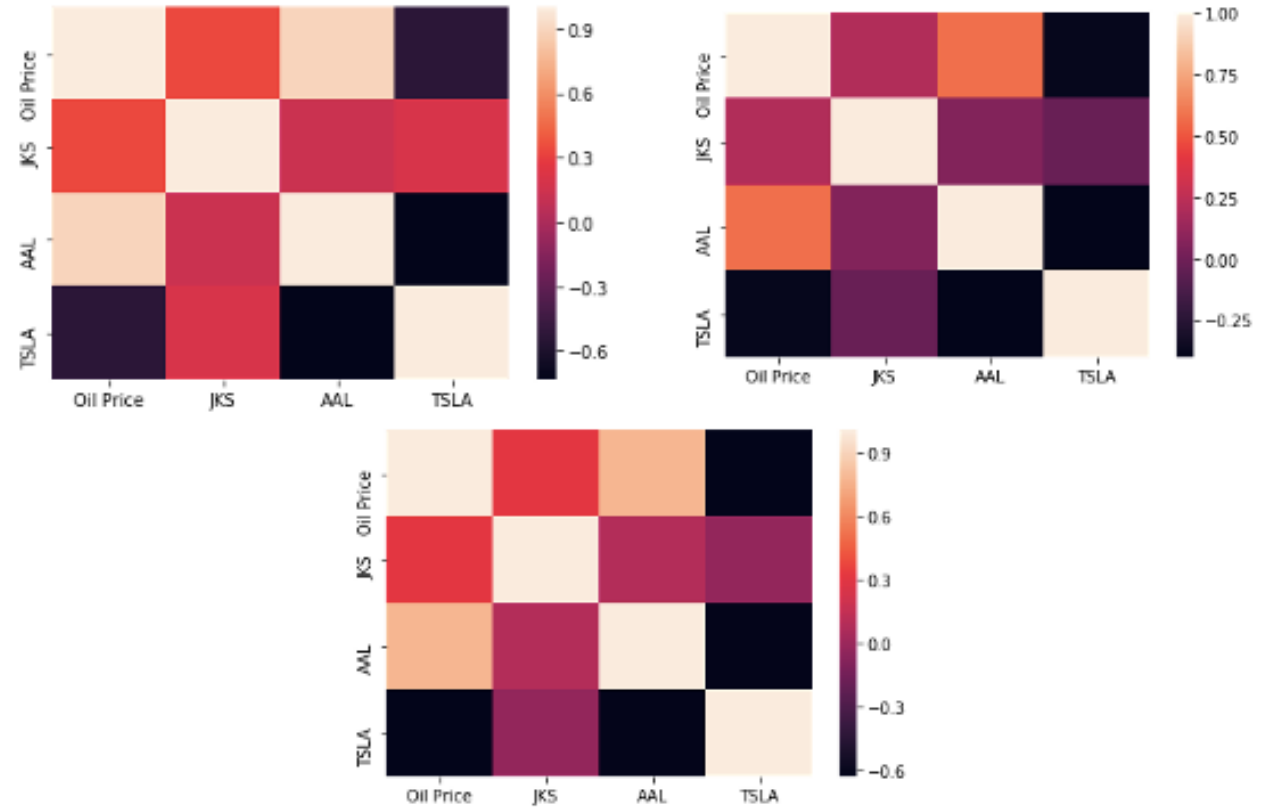
Correlation matrix

From right to left

A) *Pearson Correlation.*

B) *Kendall Correlation.*

C) *Spearman Correlation*



Autocorrelation Plots

From right to left

A) Oil Price

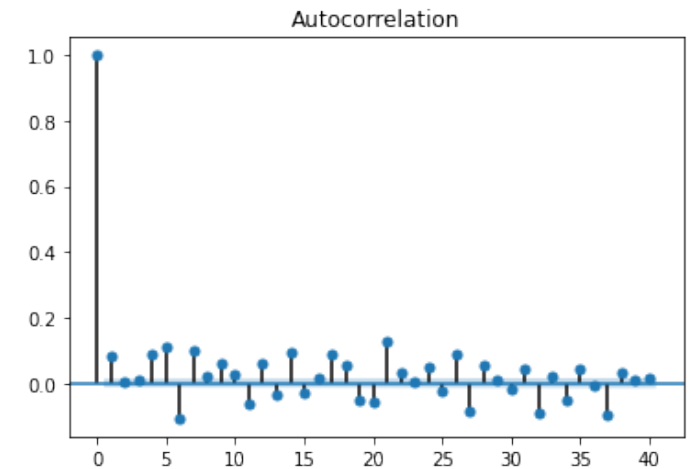
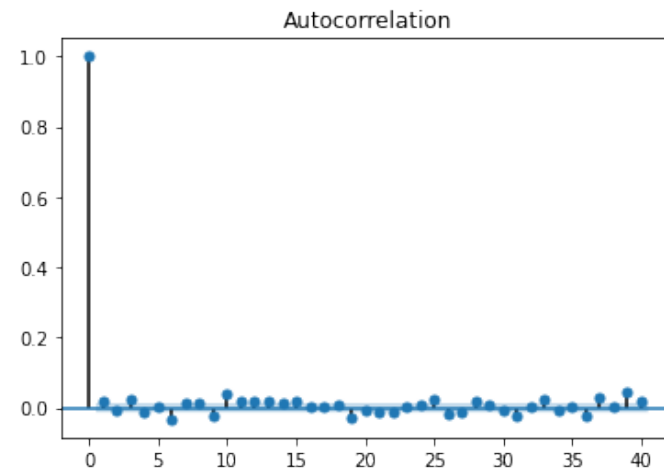
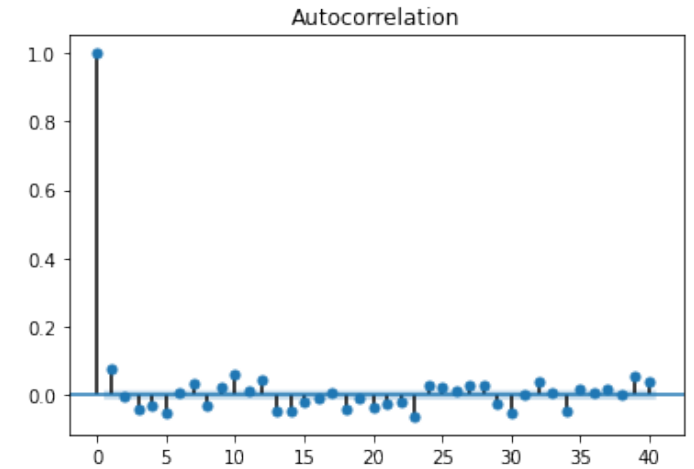
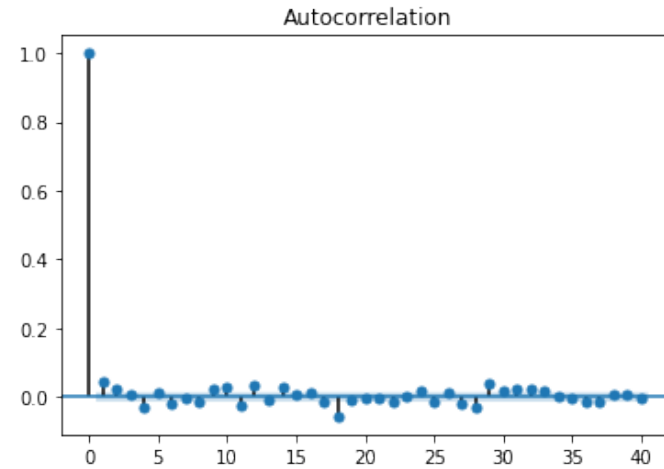
B) JKS

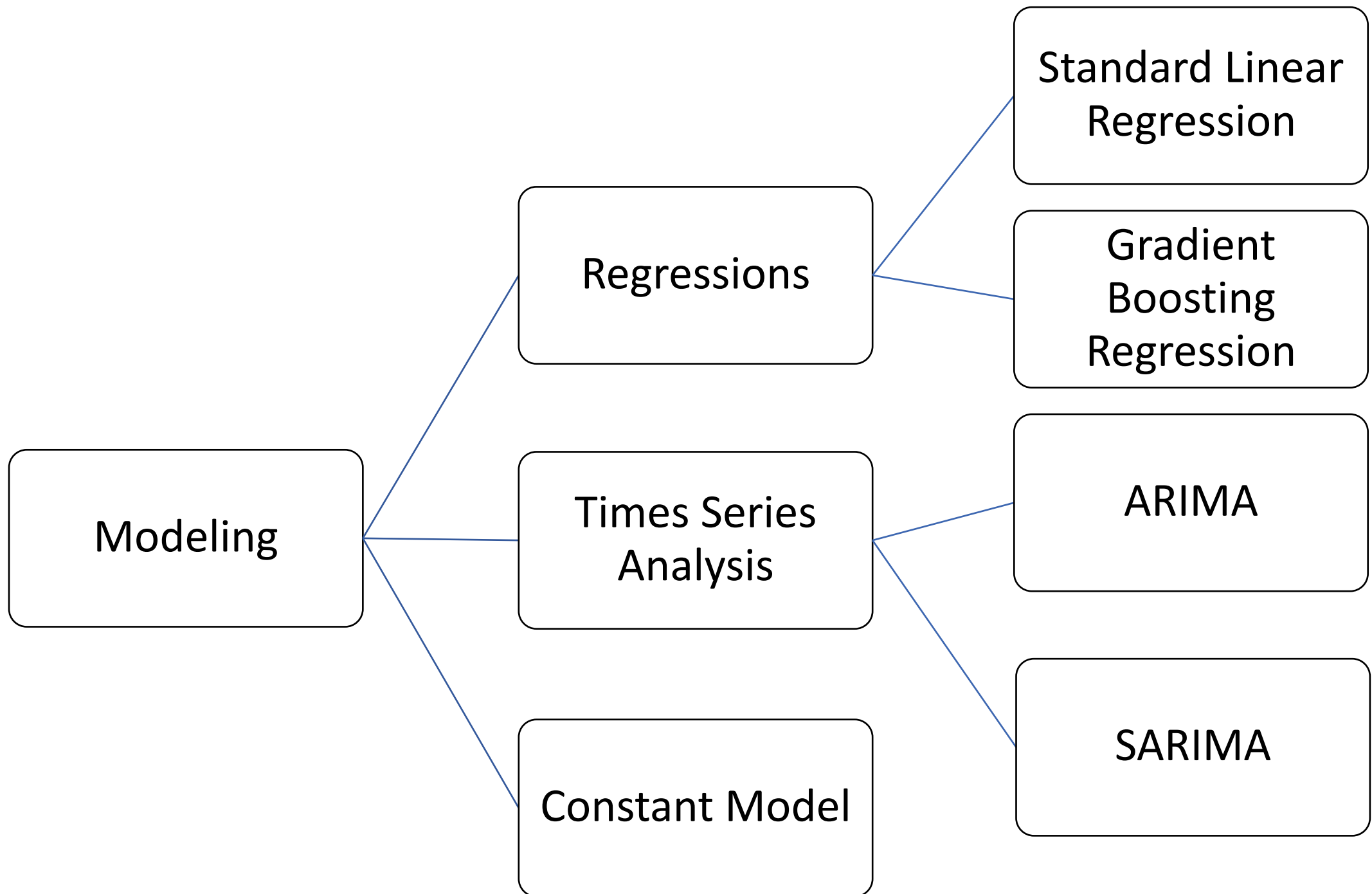
C) AAL

D) TSLA

Insight:

Order 0 for the times series analysis

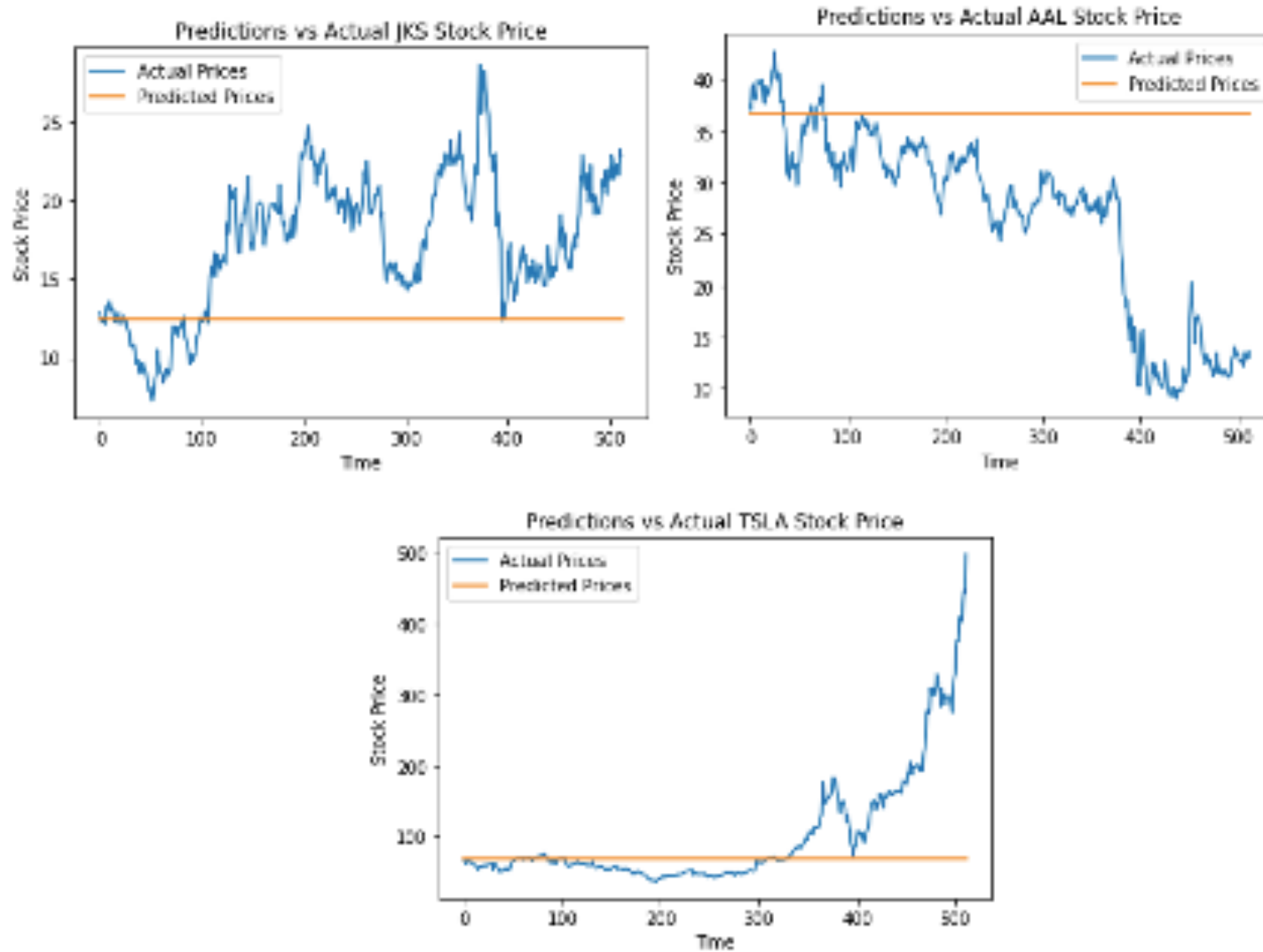




Constant Model

Stock	Mean Squared Error
JKS	42.87
AAL	179.19
TSLA	1755.65

Constant Model Performances



Regression Models

Standard Linear Regression

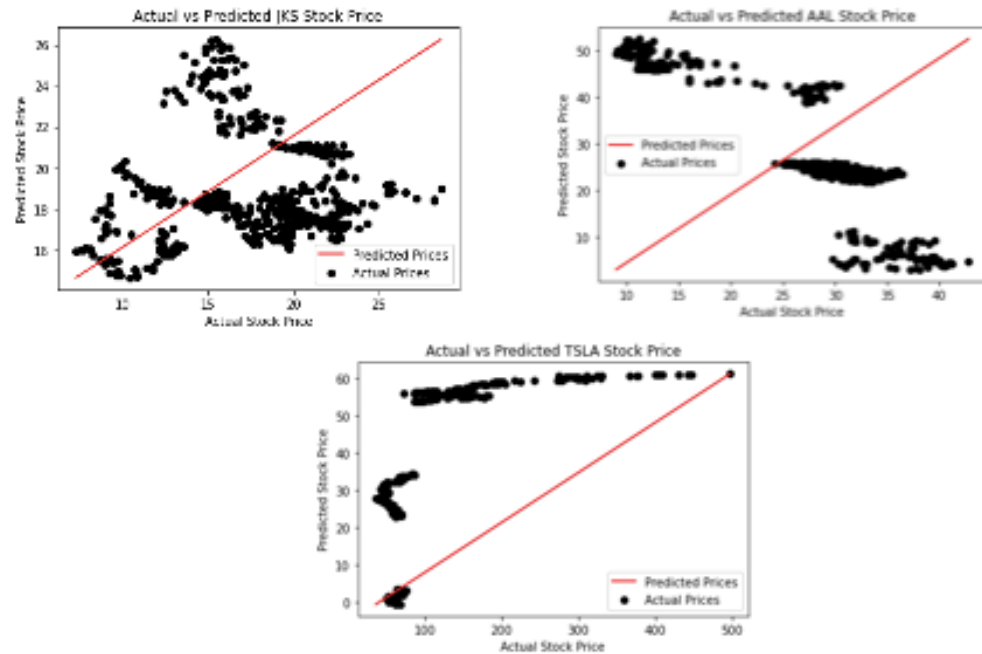
Stocks	Mean Squared Error without Standardization	Mean Squared Error with Standardization
JKS	30.82	26.20
AAL	1080.34	520.90
TSLA	6511.29	9382.89

Gradient Boosting Regressor

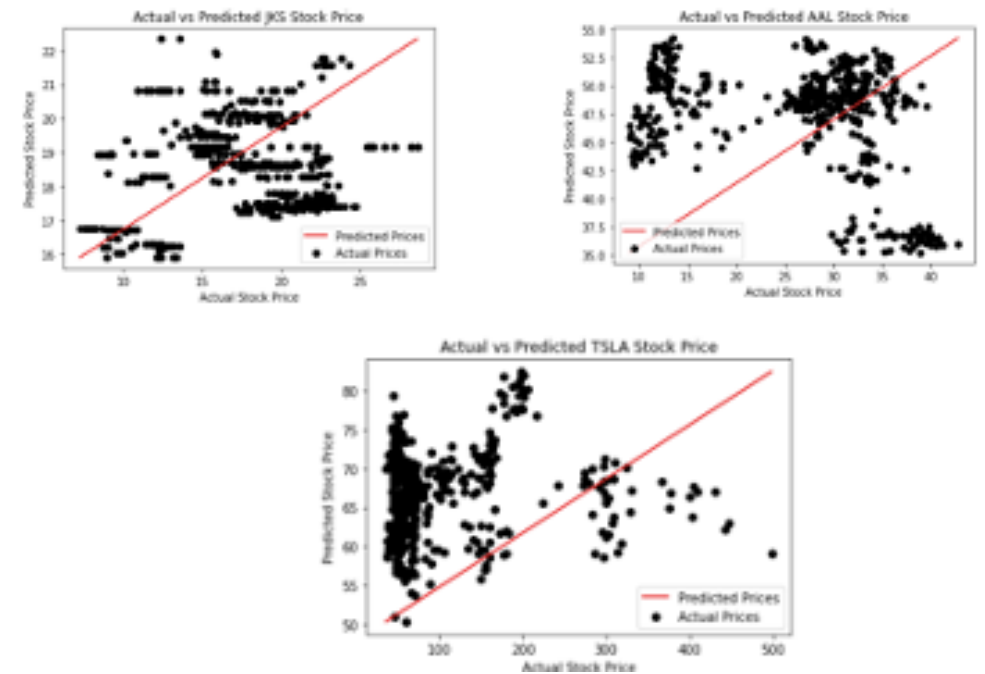
Stocks	Mean Squared Error without Standardization	Mean Squared Error with standardization
JKS	20.23	20.27
AAL	548.56	548.55
TSLA	7862.27	7875.37

Regression Models Performances

Standard Linear Regression



Gradient Boosting Regression

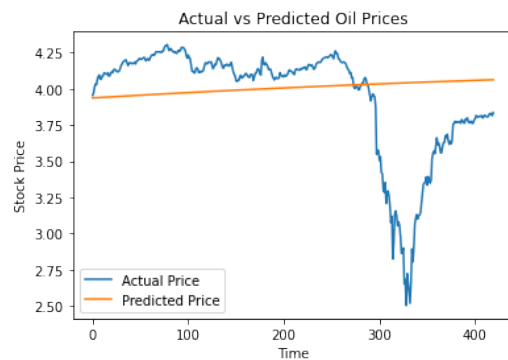


Times Series Models

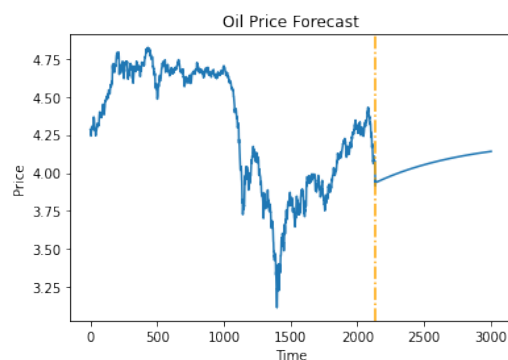
Stocks	ARIMA Mean Squared Error	SARIMA Mean Squared Error
Oil Price	0.35	0.78
JKS	0.47	0.78
AAL	1.30	1.45
TSLA	2.49	8.02

ARIMA Performance and Forecast

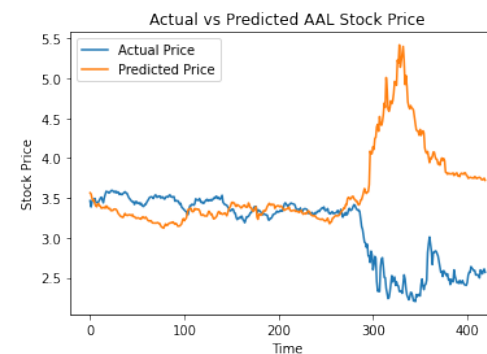
Oil Performance



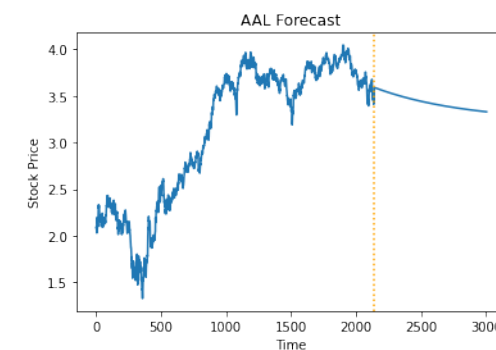
Oil Forecast



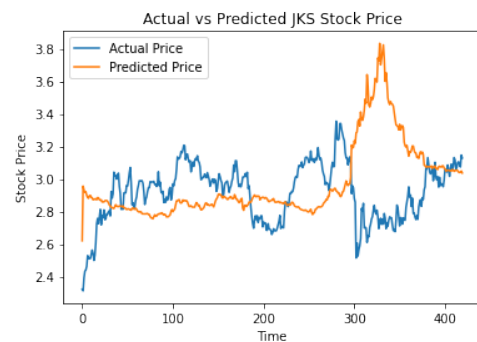
AAL Performance



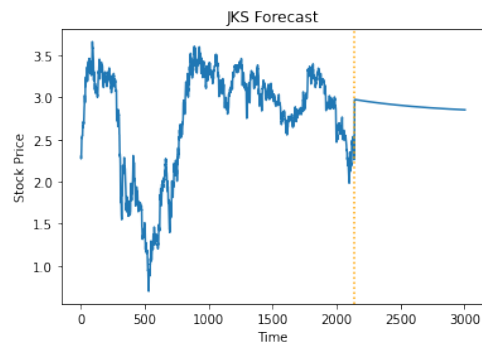
AAL Forecast



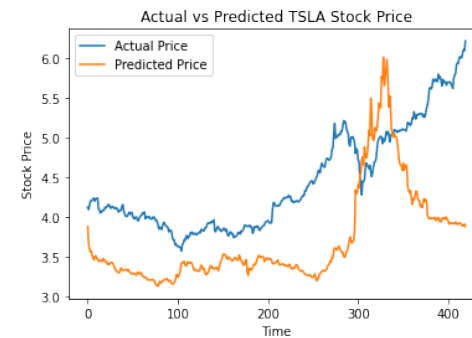
JKS Performance



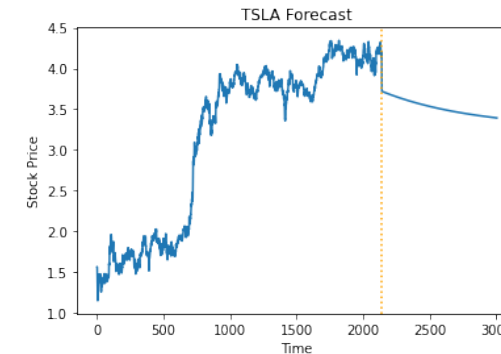
JKS Forecast



TSLA Performance

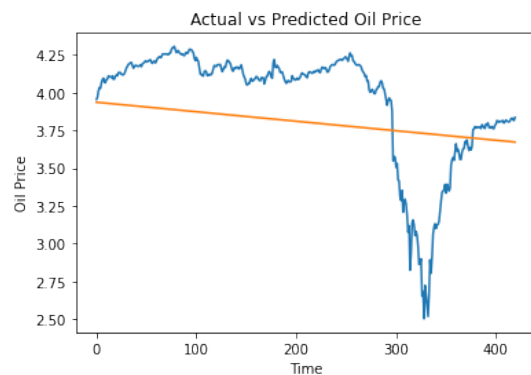


TSLA Forecast

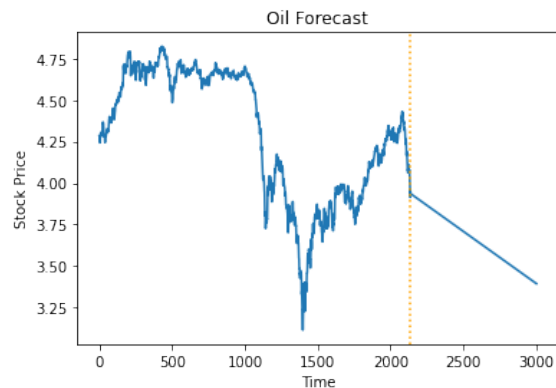


SARIMA Performance and Forecast

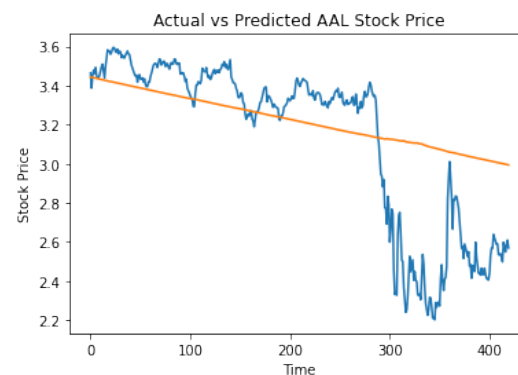
Oil Performance



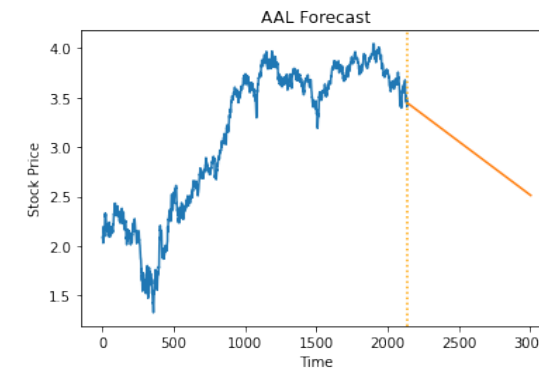
Oil Forecast



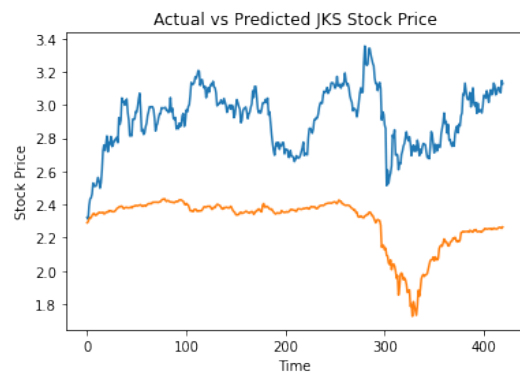
AAL Performance



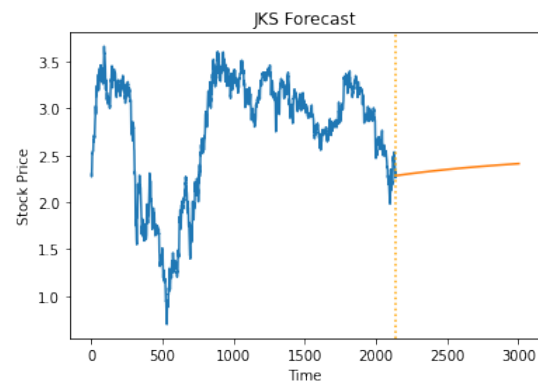
AAL Forecast



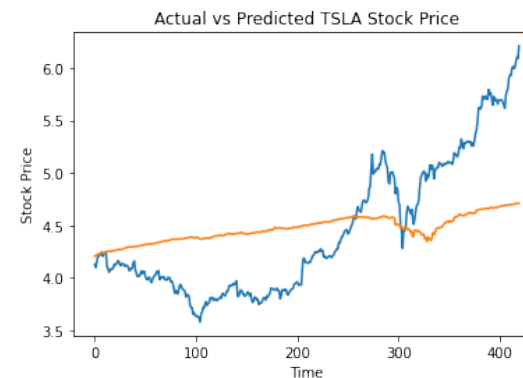
JKS Performance



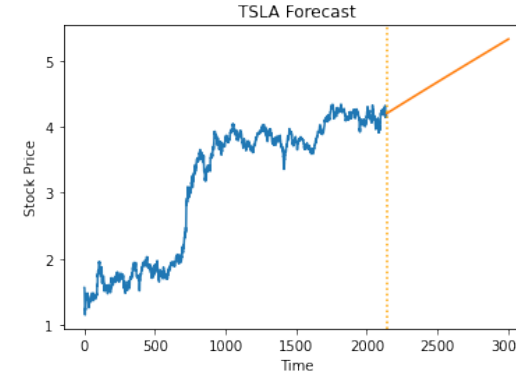
JKS Forecast



TSLA Performance



TSLA Forecast



Insights

- Times Series model had the best performance. This can be supported because of the lower mean squared error and how the model follows the trend of the stock price movement.
- Regressions model fitted well the train data but did very bad fitting the test data.
- Constant model worked as a base if a model is whether adding value or not.
- I can see some differences between ARIMA and SARIMA model predictions. While ARIMA says in some models the price is going down, SARIMA in some stocks say price goes up.

Recommendations

- JKS may be the best option to invest if you want a safe investment. American Airlines and Tesla presents more unexpected behavior.
- There is influence between the oil prices and the stocks behavior. JKS is not very correlated, but a decrease in oil price suppose an increase on the stock price. Now, if oil price decrease, American Airline's stock price decrease as well because they are highly correlated. Finally, Tesla and Oil Price have negative correlation between them, so a decrease in oil price suppose an increase on Tesla stock price.
- If oil price continues going down, it would be a better option to invest in Tesla or JKS rather than American Airlines. If oil price goes up, American Airlines may be the best option to invest in.
- Finally, we can get more accurate models if we introduce more variables for the study. To name few; electricity price for JKS and TSLA, value of currencies, population growth, etc.