Top Smartphone Companies Analysis

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Contents

Introduction

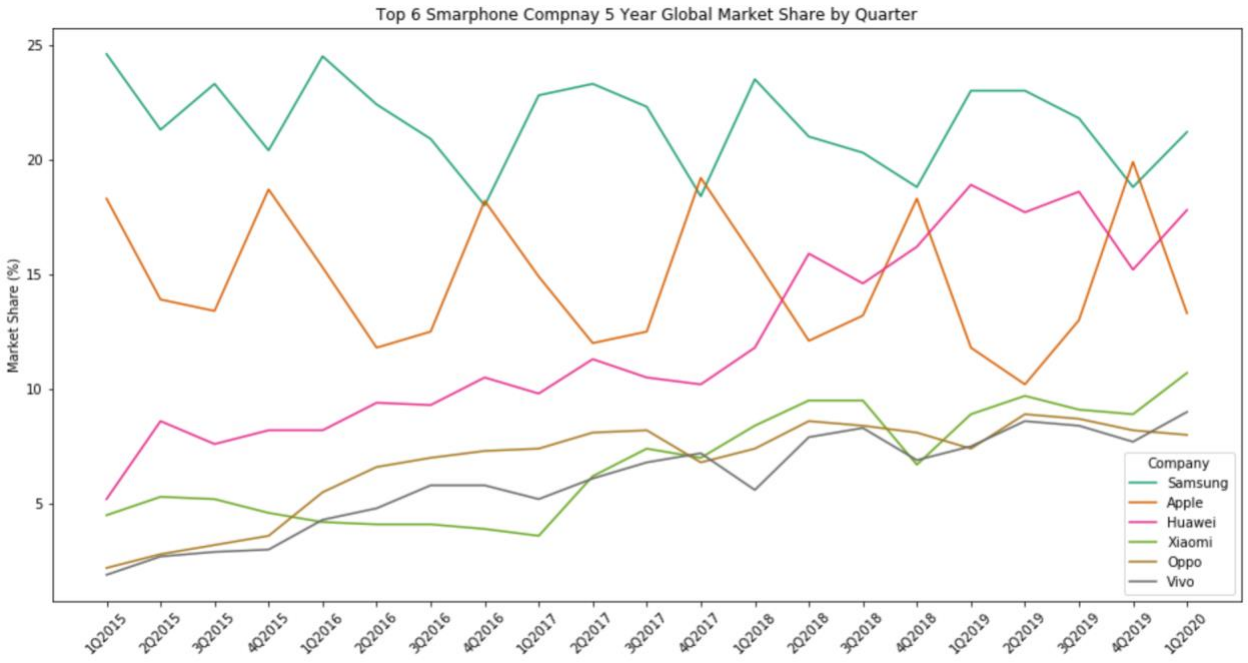
The following research is conducted on top 6 smartphone companies instead of top 5 (in terms of global market share). Throughout the recent years OPPO and Vivo has been constantly battling for the fifth place on the chart and I believe it would be a good idea to include both of them in the research.

As of Q1 2020, the top 6 smartphone companies are Samsung, Huawei, Apple, Xiaomi, OPPO and Vivo. Out of the six, four are based in China (Huawei, Xiaomi, OPPO and Vivo), one in South Korea (Samsung) and one in the U.S. (Apple).

For each of the forecast conducted in this research two methods (Auto-ARIMA and Linear Regression) are applied individually and compared thereafter.

Because all six companies launch more than one smartphone each year, in this research a “flagship model” is treated as “the best, most powerful and advancedly-designed smartphone model that a given manufacturer produces in the year”. The price of a given flagship model refers to the staring price of the model with the most basic configuration.

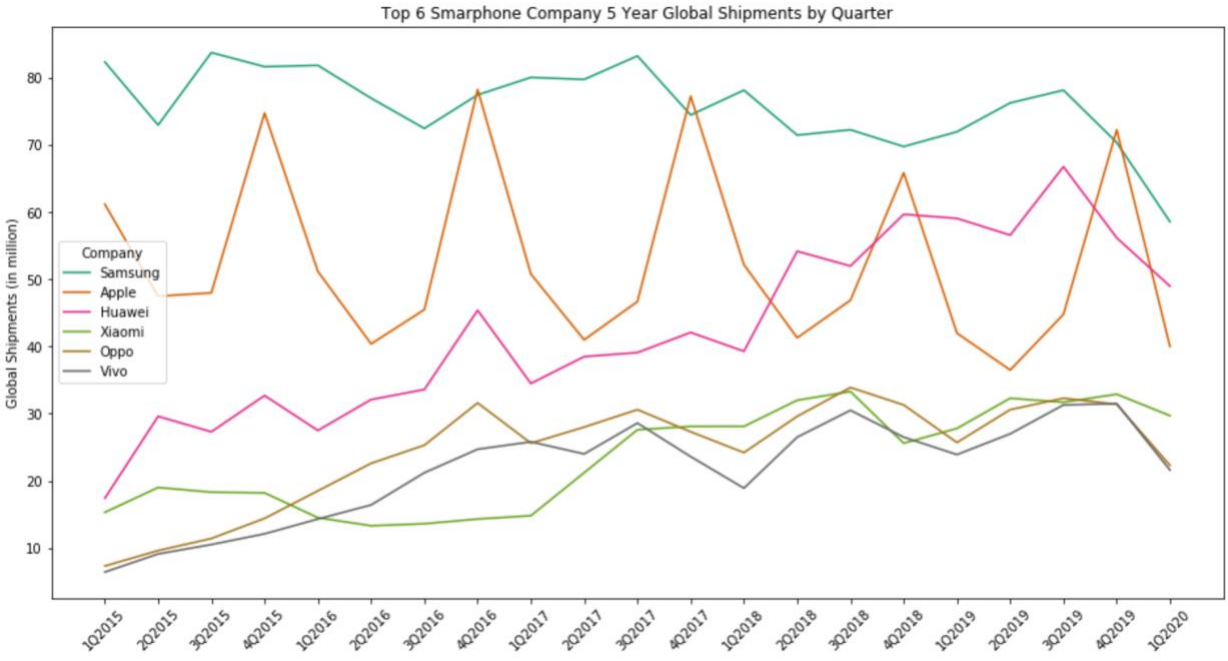
5-Year Quarterly Market Share



During the past 5 years Samsung has been able to maintain a quarterly market share between around 20~25% while Apple is fluctuating between 10% and 20%. Huawei sees an obvious uptrend until 2019 when the growth slowed down quite a bit. Xiaomi, OPPO and Vivo have been growing at a very similar rate and the rank between the three changes frequently.

Seasonality is very apparent for Samsung and Apple and relatively weaker for the rest four. The Apple's market share curve always peaks in Q4 because Apple constantly launches its new flagship phones in this time period of the year. It is also very noteworthy that every year the peaks of Apple's curve always happen to meet the valleys of Samsung's curve.

5-Year Quarterly Shipments

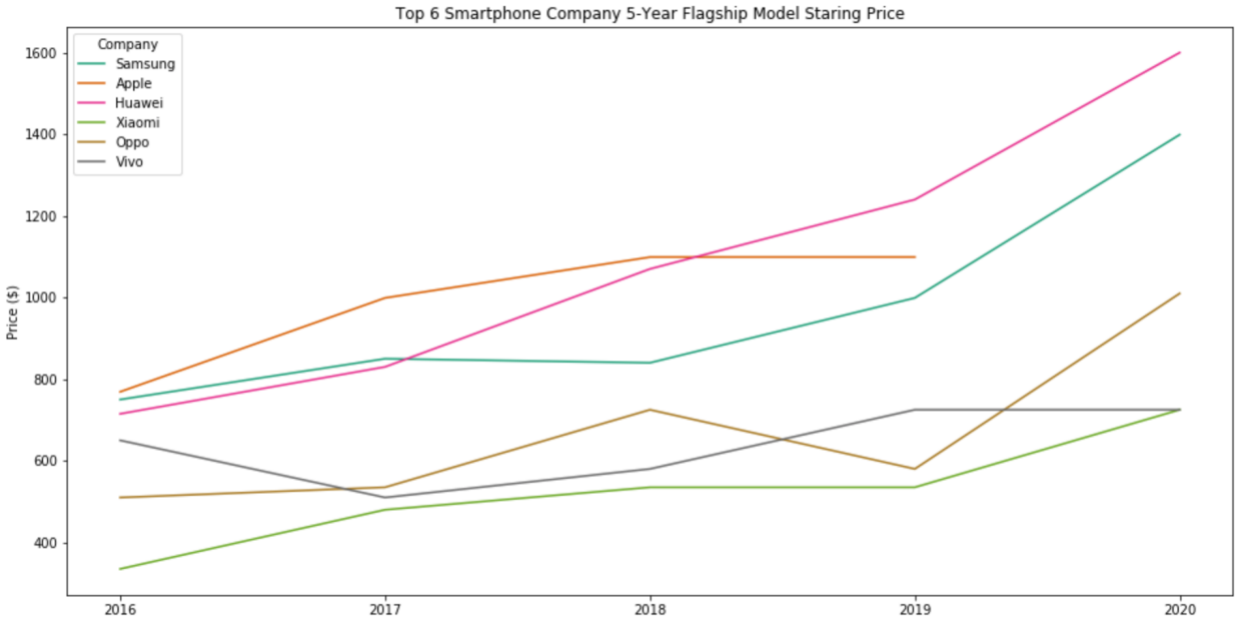


For total number of phones produced I used the quarterly shipment of each company. Samsung sees an overall downward trend in recent years while Apple ‘s shipment fluctuates quite a lot within the range of 40 to 80 million units. Huawei has been growing at a decent rate before Q4 2019, after which its global shipment plummeted. Xiaomi, OPPO and Vivo continues their fight for the fourth place.

Latest Flagship Model from Each Company

- Samsung: Galaxy S20 Ultra, launched in February 2020, starting at $1,399 (US Market).
- Apple: iPhone 11 Pro Max, launched in September 2019, starting at $1,099 (US Market).
- Huawei: P40 Pro Plus, launched in March 2020, starting at around $1,600 (Chinese Market).
- Xiaomi: Mi 9 Pro, launched in February 2020, starting at around $535 (Chinese Market).
- OPPO: Find X2 Pro, launched in February 2020, starting at around $1,010 (Chinese Market).
- Vivo: X50 Pro Plus, launched in June 2020, starting at around $725 (Chinese Market).

5-Year Flagship Price



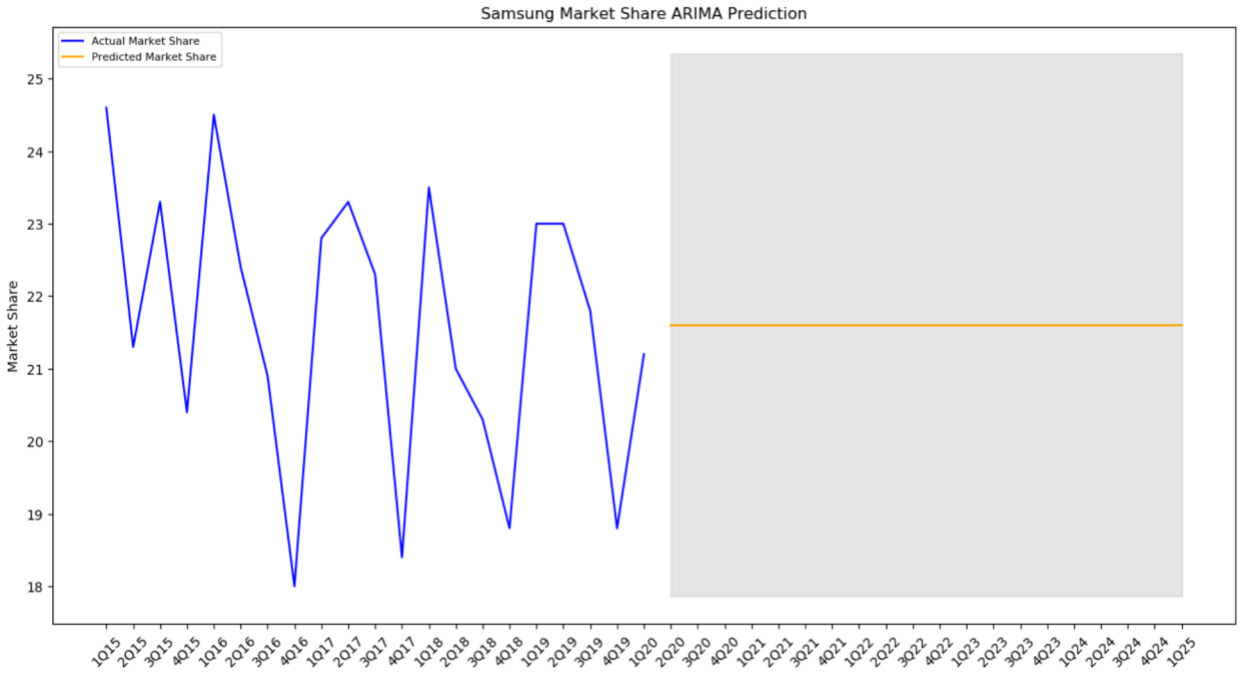
There has been an overall upward trend for all companies' flagship prices in the past 5 years (Apple has not delivered its 2020 flagship model yet). Generally speaking, Samsung, Apple and Huawei price their products at a higher level than the rest three manufacturers who target Chinese Gen Z as their main market.

Market Share Forecast

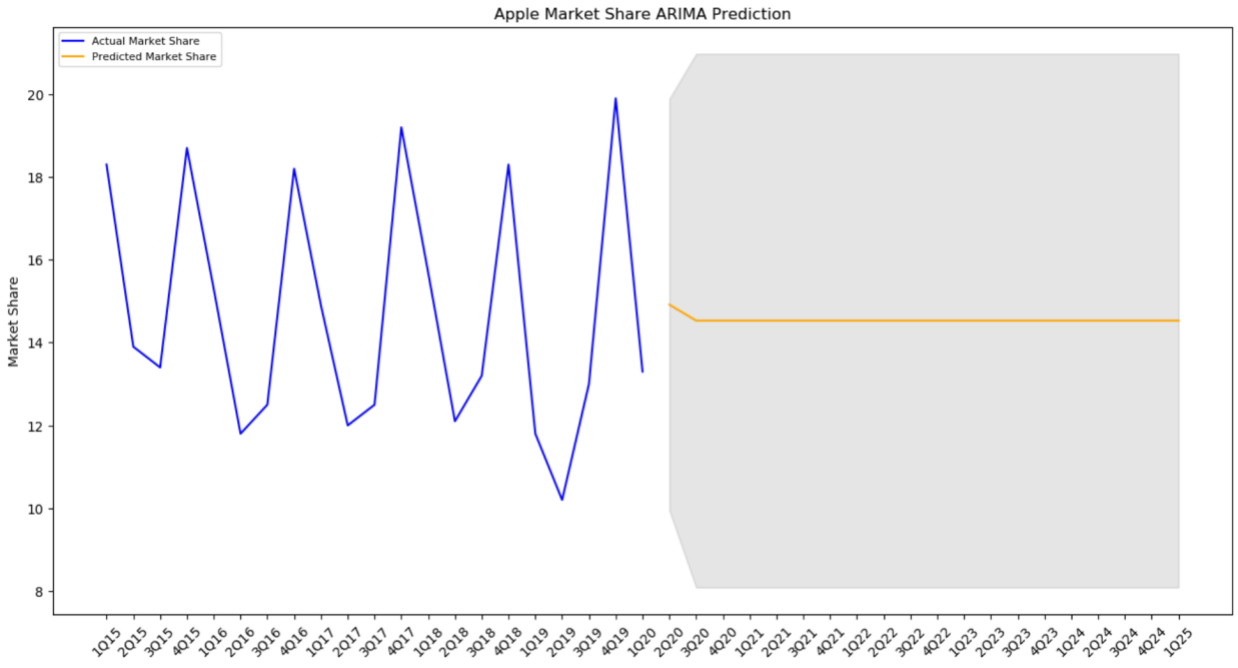
Auto-ARIMA Methodology –

Using Auto-ARIMA (python code shown in Appendix) on previous quarterly market shares I was able to find the best (p, q, d) combination with the lowest AIC score and to produce the following market share predictions for each company in the next five years:

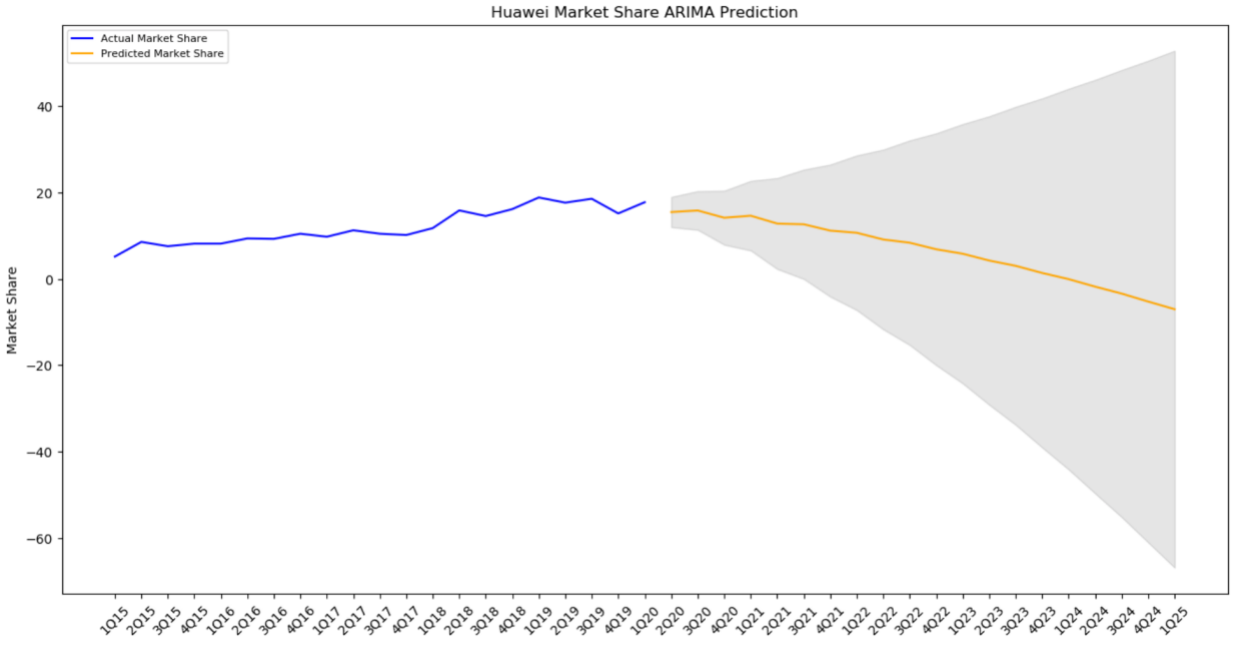
Samsung:



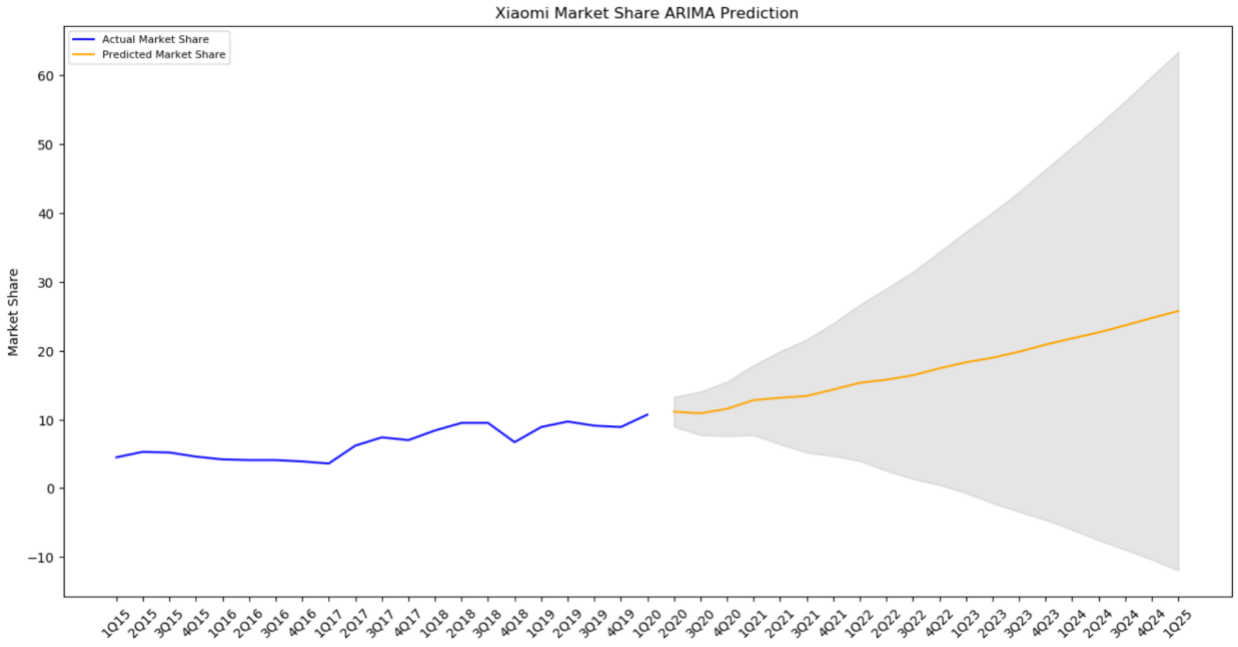
Apple:



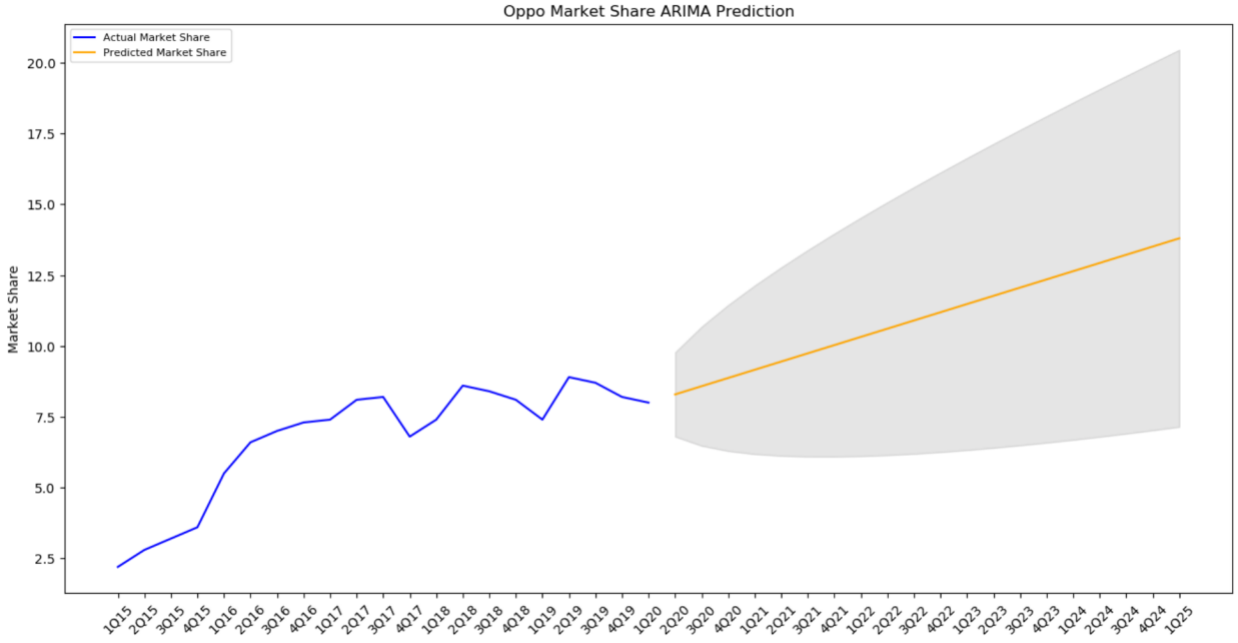
Huawei:



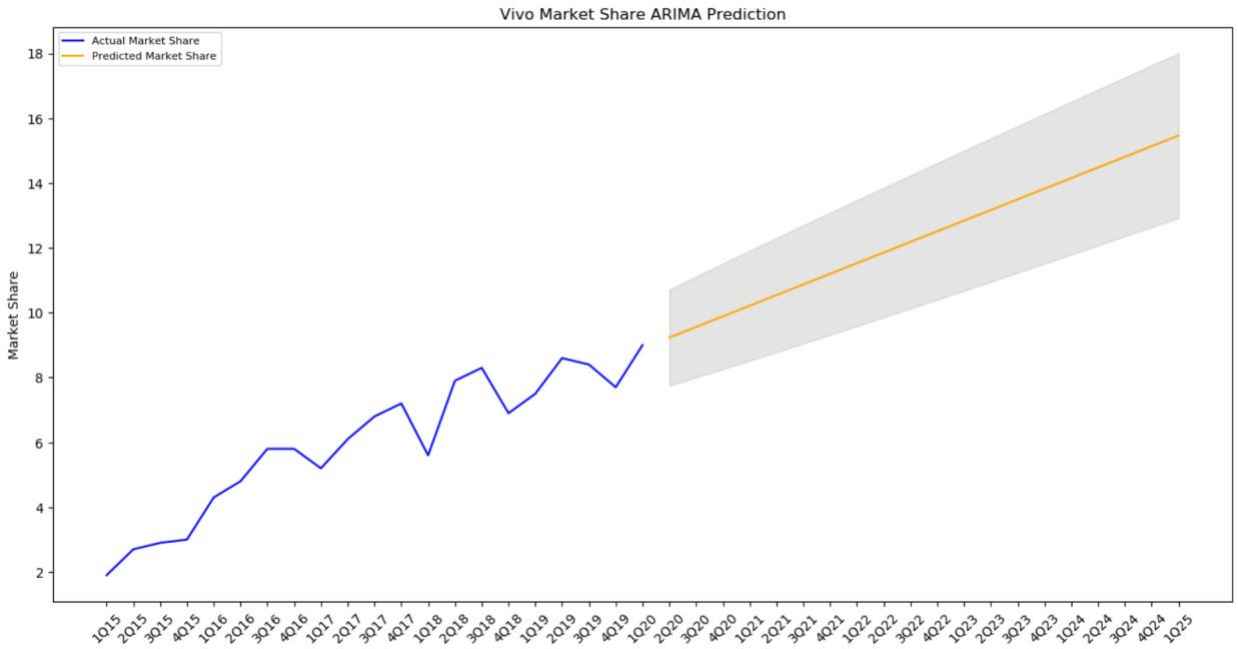
Xiaomi:


Xiaomi Market Share ARIMA Prediction
Actual Market Share
Predicted Market Share
Market Share

OPPO:


Oppo Market Share ARIMA Prediction
Actual Market Share
Predicted Market Share
Market Share

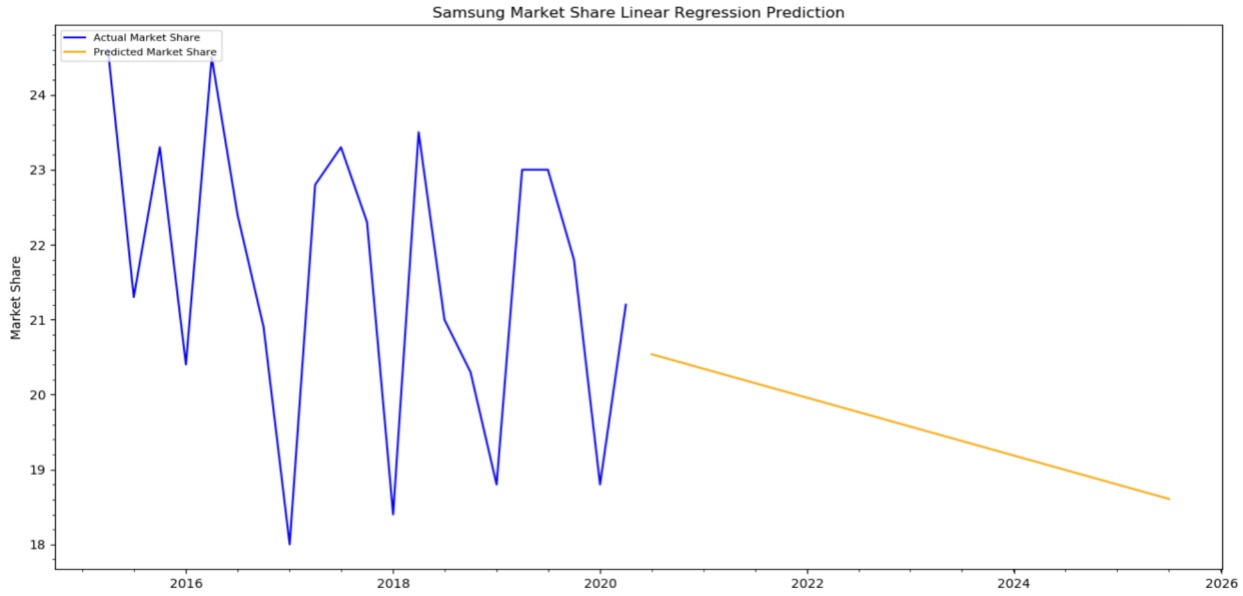
Vivo:



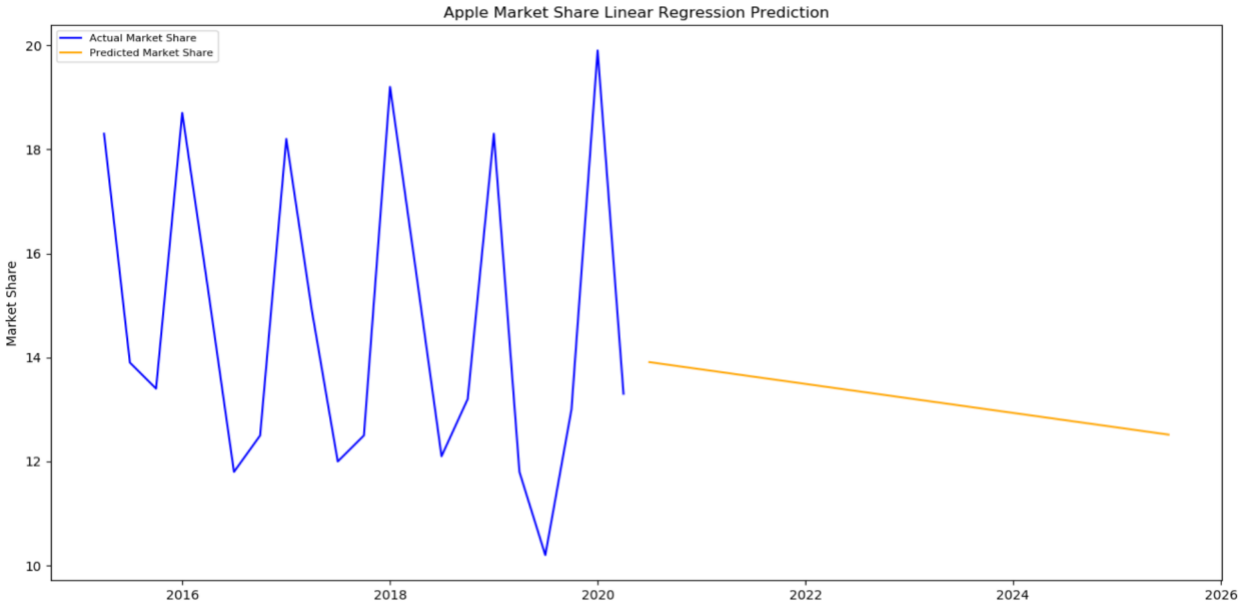
Linear Regression Methodology –

Fitting a Linear Regression model (python code shown in Appendix) with previous quarterly market share time-series data and predicting on future “datetime” I was able to produce the following predictions for each company in the next five years:

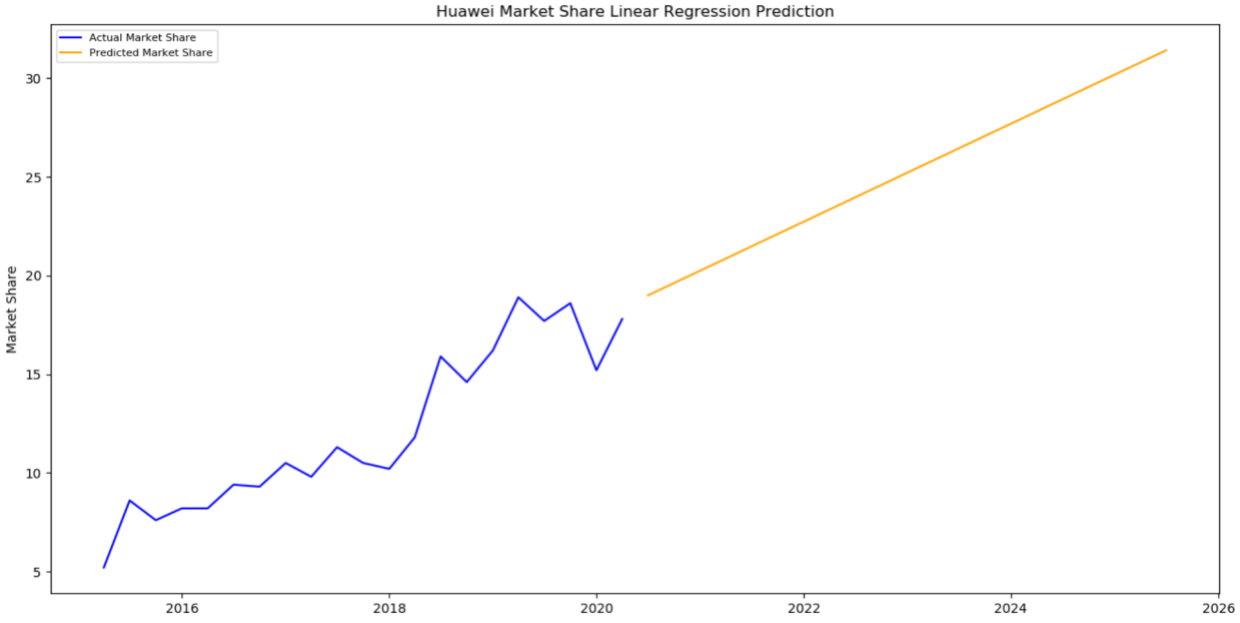
Samsung:



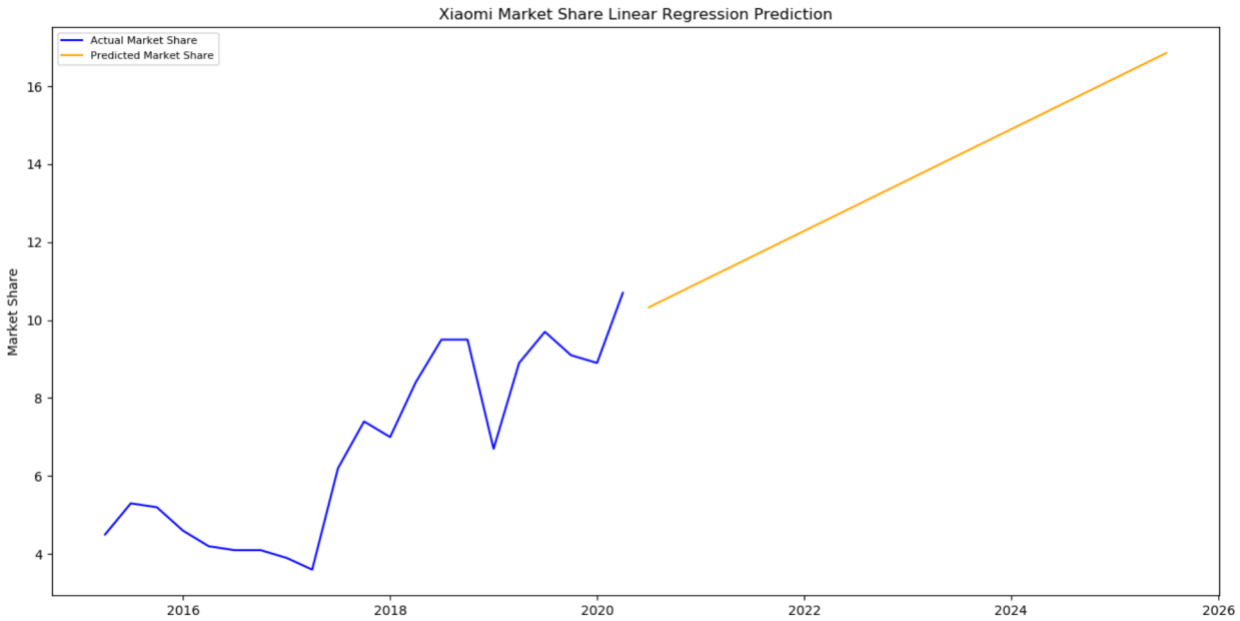
Apple:



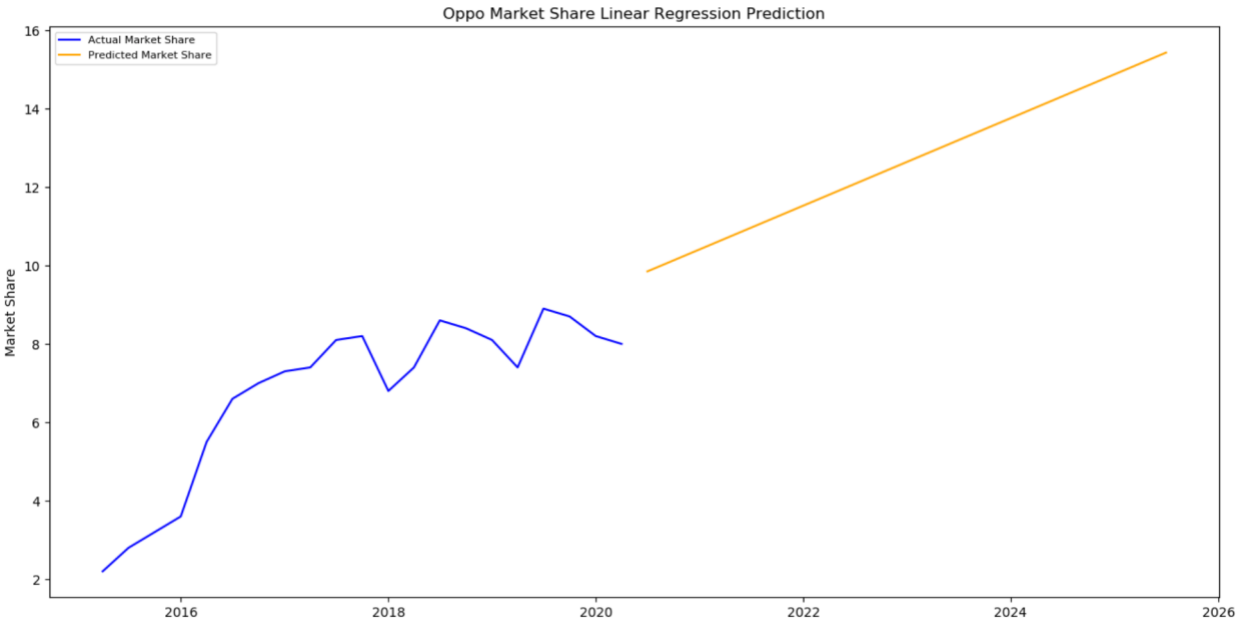
Huawei:



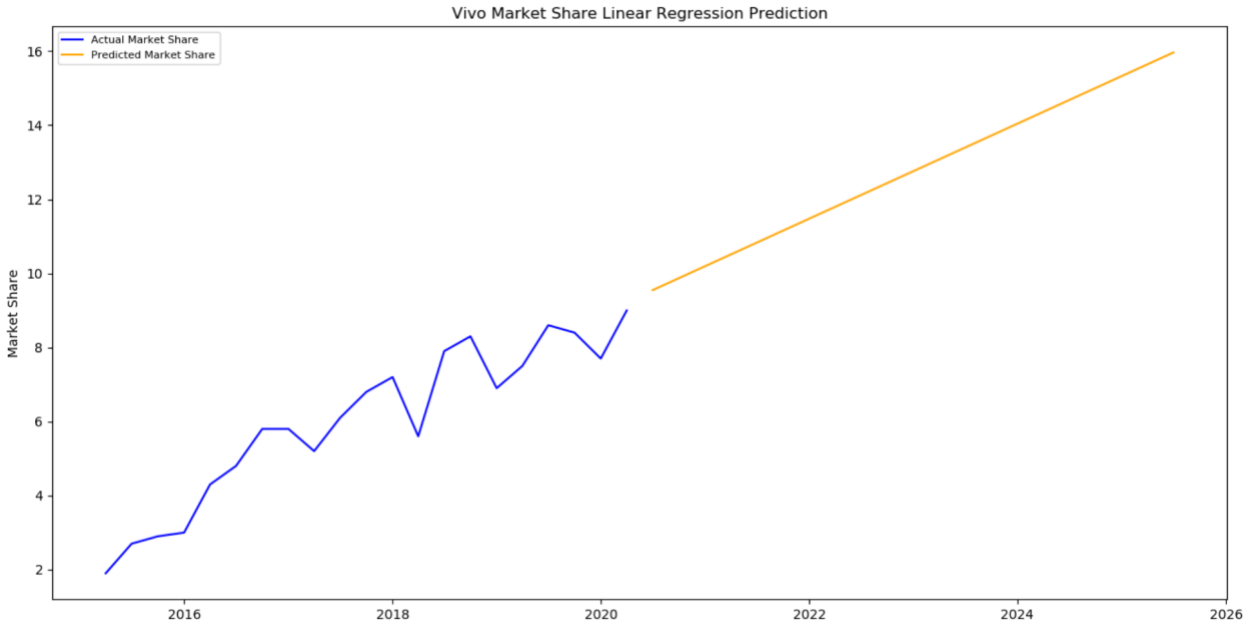
Xiaomi:


Xiaomi Market Share Linear Regression Prediction
Actual Market Share
Predicted Market Share
Market Share
16
14
12
10
8
6
4
2016
2018
2020
2022
2024
2026

OPPO:


Oppo Market Share Linear Regression Prediction
Actual Market Share
Predicted Market Share
Market Share
16
14
12
10
8
6
4
2
2016
2018
2020
2022
2024
2026

Vivo:



ARIMA –

It can be interpreted from the forecasts that Samsung and Apple's past patterns give them a rather flat future market share curve at around 22% and 14%, respectively. Huawei faces a potential downward trend while Xiaomi sees an upward trend. OPPO and Vivo are likely to grow their market share to around 15% in the next five years.

Linear Regression –

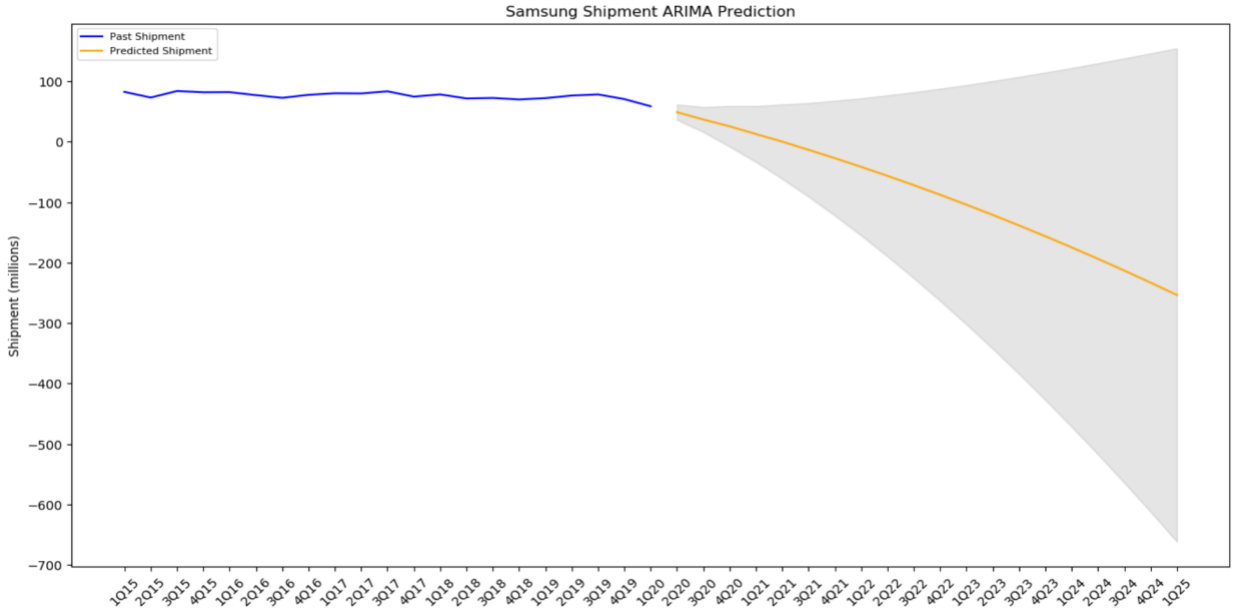
Samsung and Apple show signs of downtrend to around 18.5% and 12.5% in five years while the rest four hold very optimistic outlook. The difference of prediction on Huawei is possibly caused by ARIMA's ability to capture the slowdown of Huawei's growth in recent years.

Quarterly Shipment Forecast

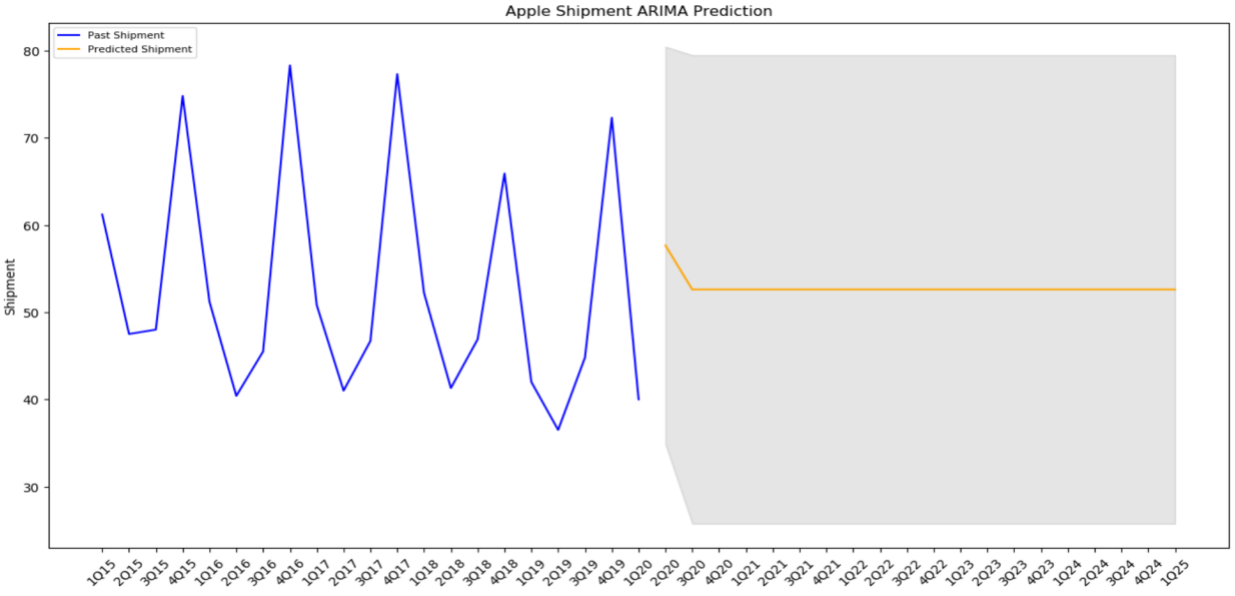
Auto-ARIMA Methodology –

Using Auto-ARIMA on previous quarterly shipment data I was able to find the best (p, q, d) combination with the lowest AIC score and to produce the following shipment predictions for each company in the next five years:

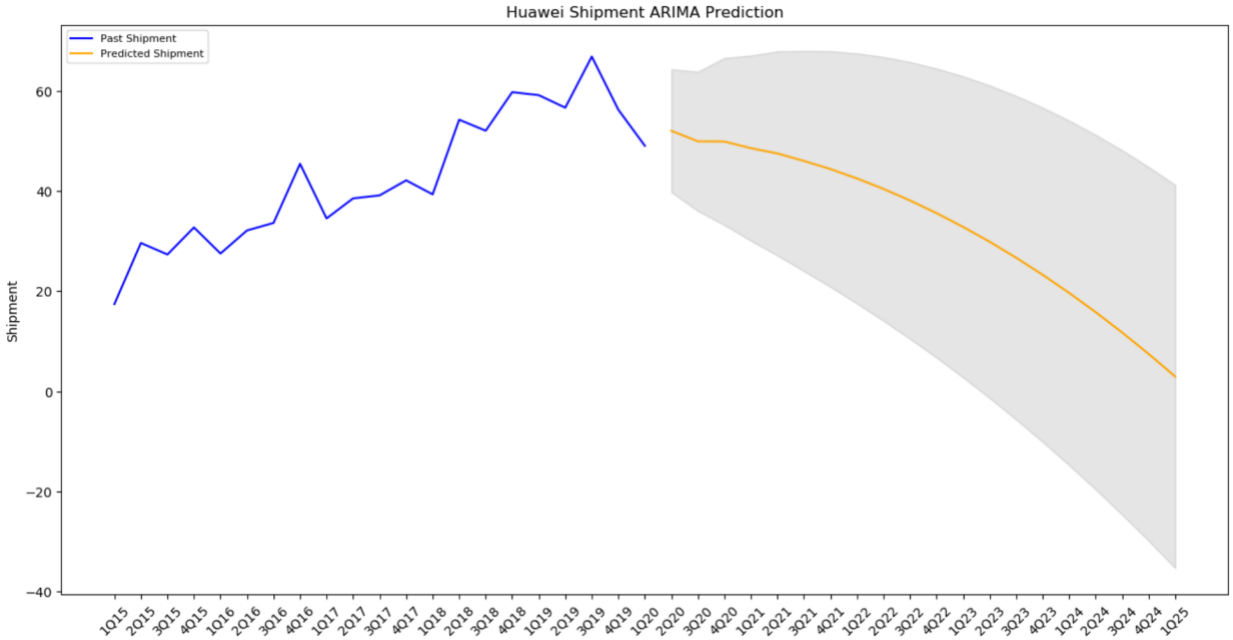
Samsung:



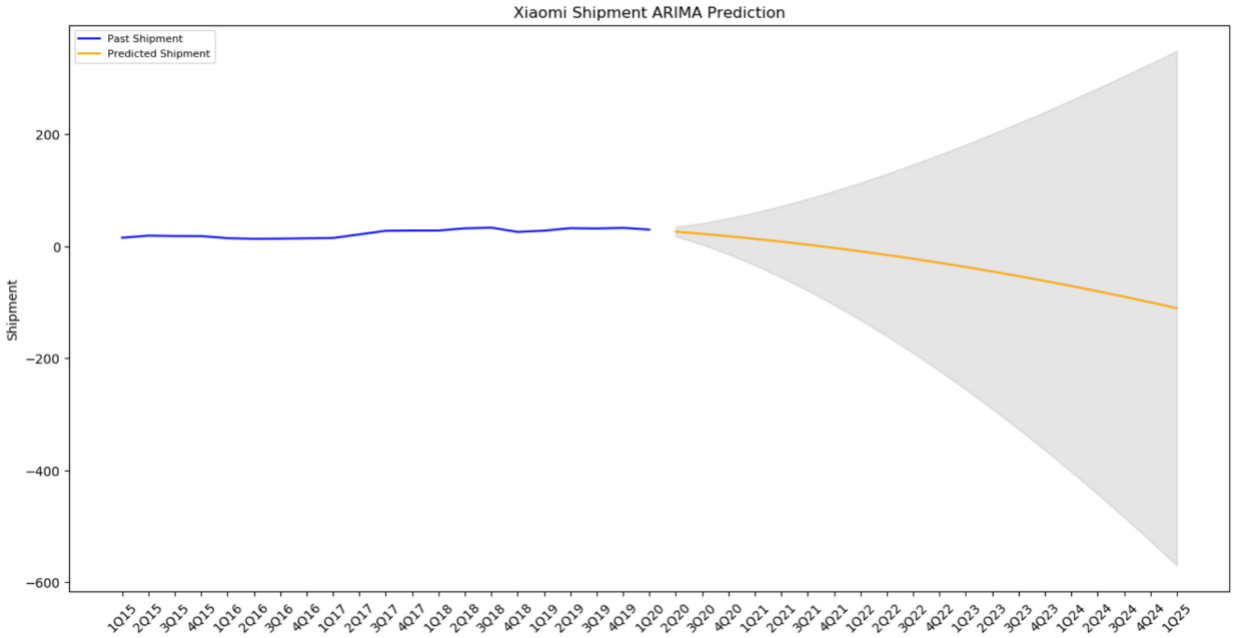
Apple:



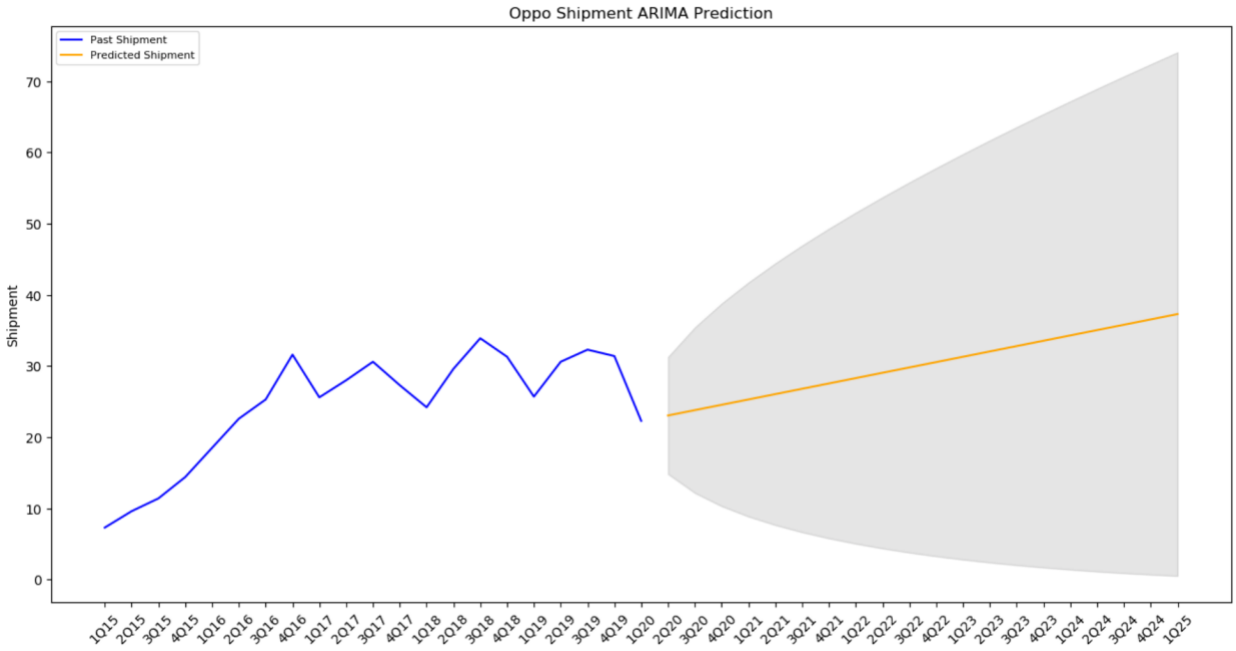
Huawei:



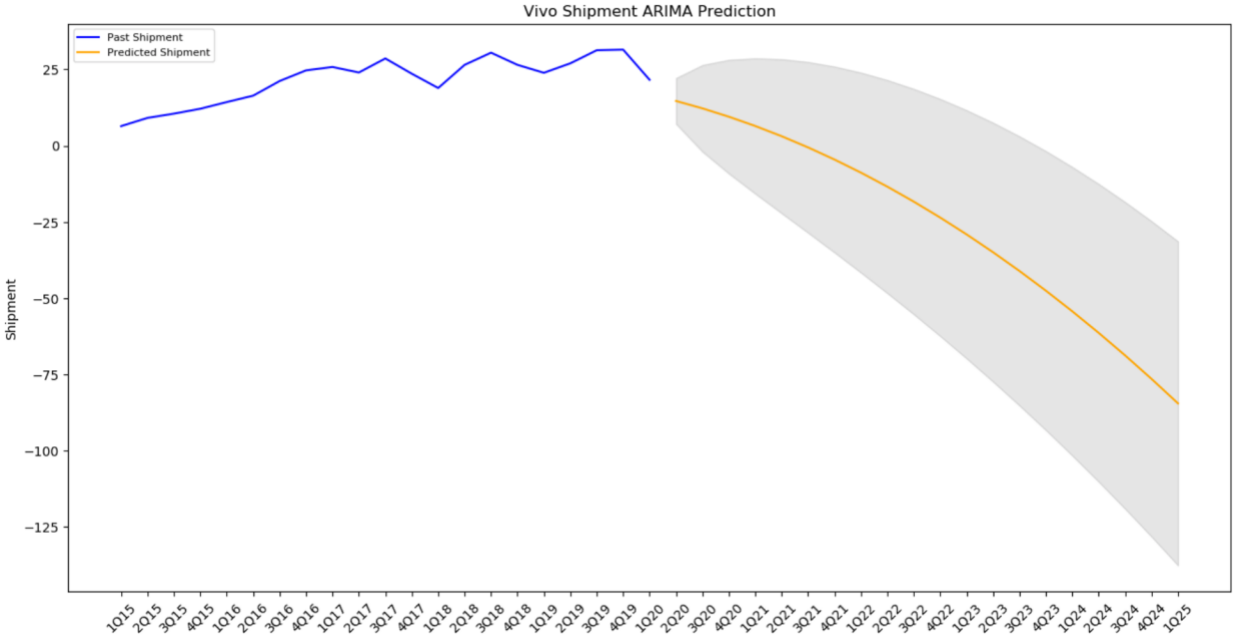
Xiaomi:



OPPO:



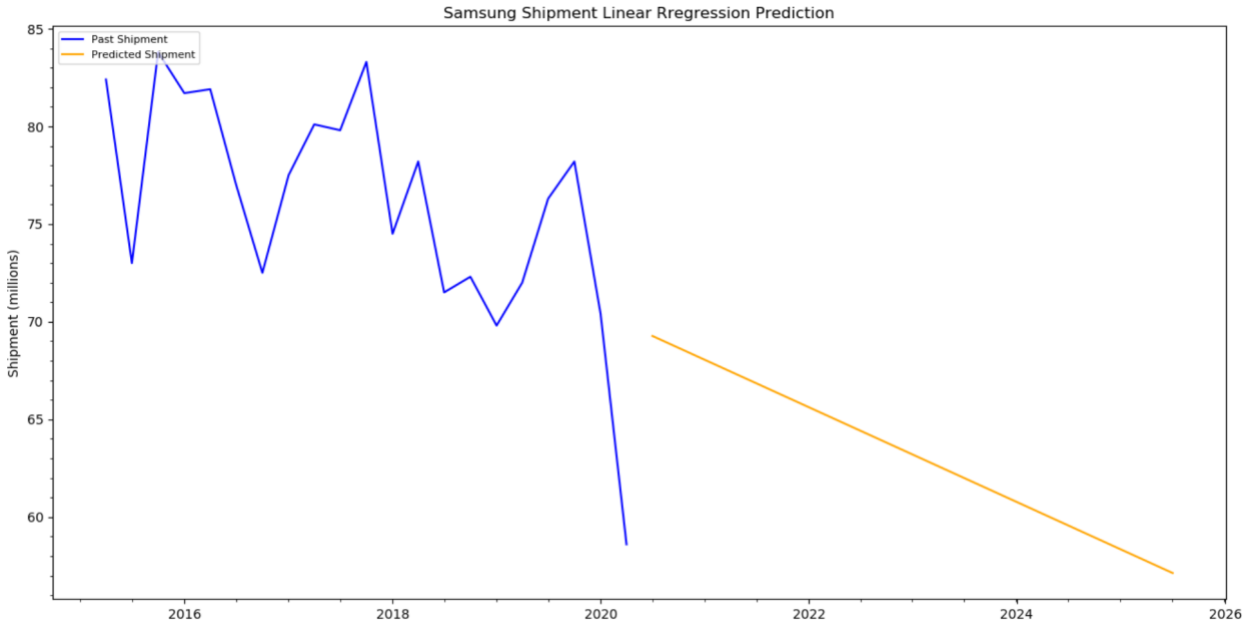
Vivo:



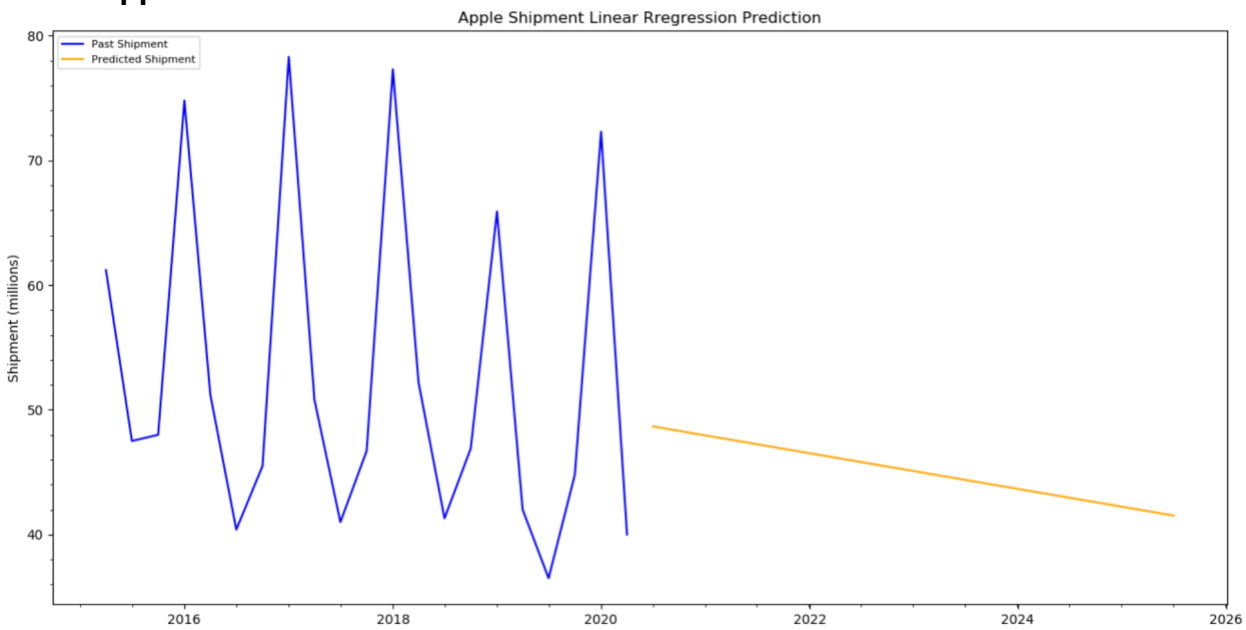
Linear Regression Methodology –

Fitting a Linear Regression model with previous quarterly shipment time-series data and predicting on future “datetime” I was able to produce the following shipment predictions for each company in the next five years:

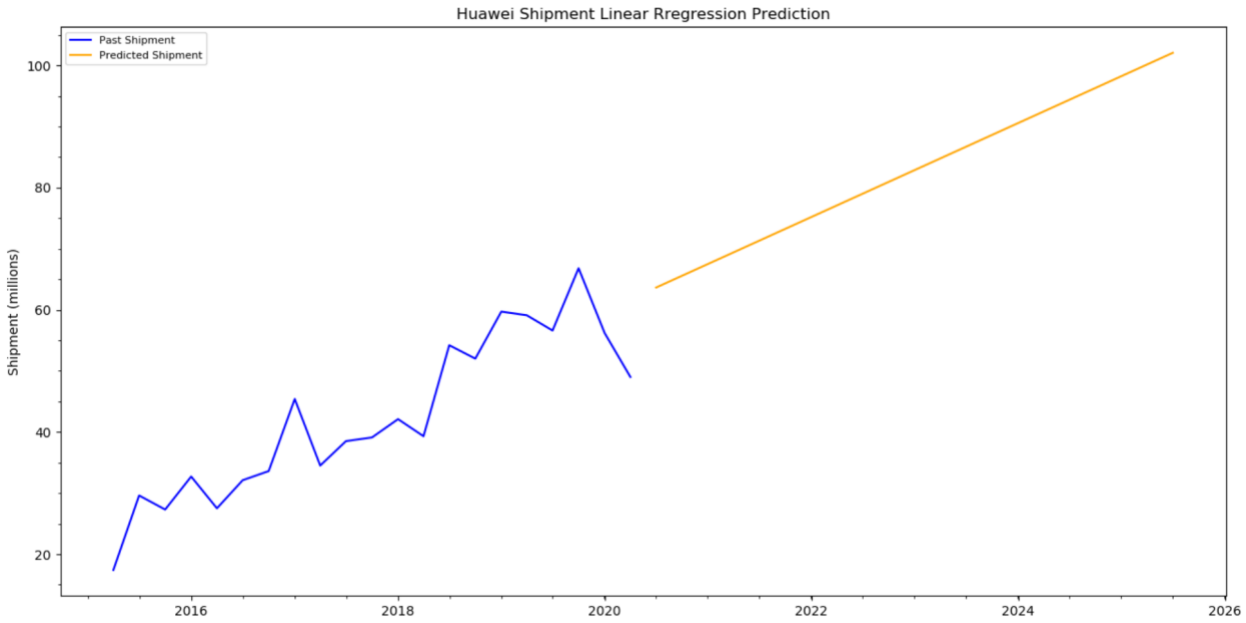
Samsung:



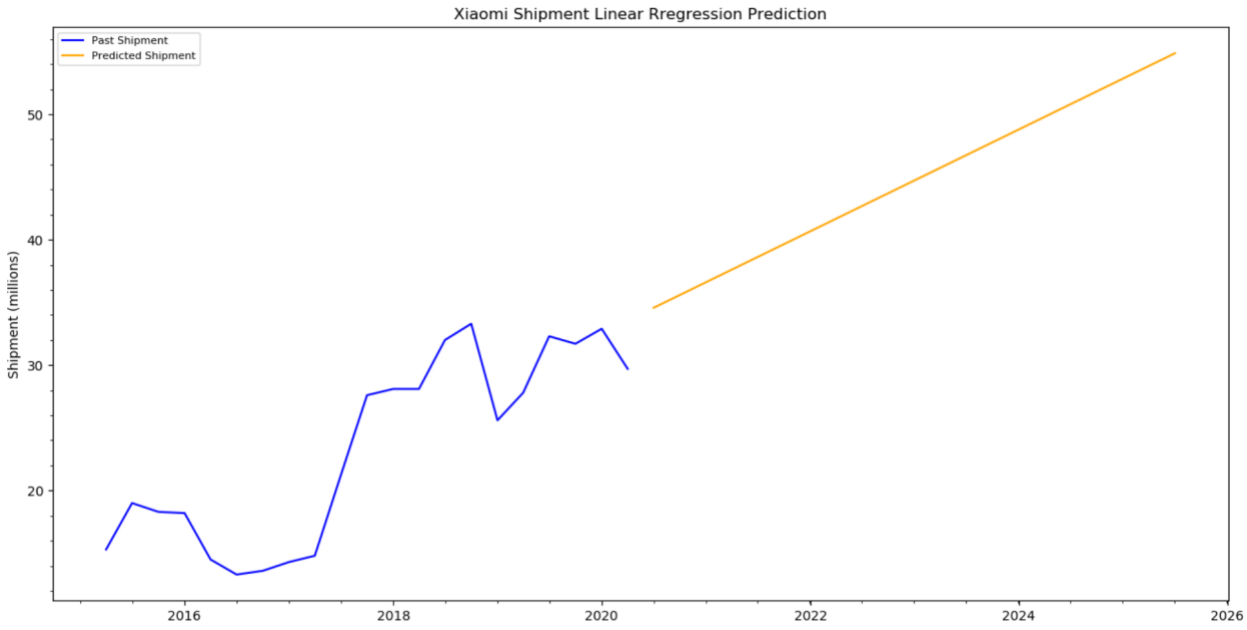
Apple:



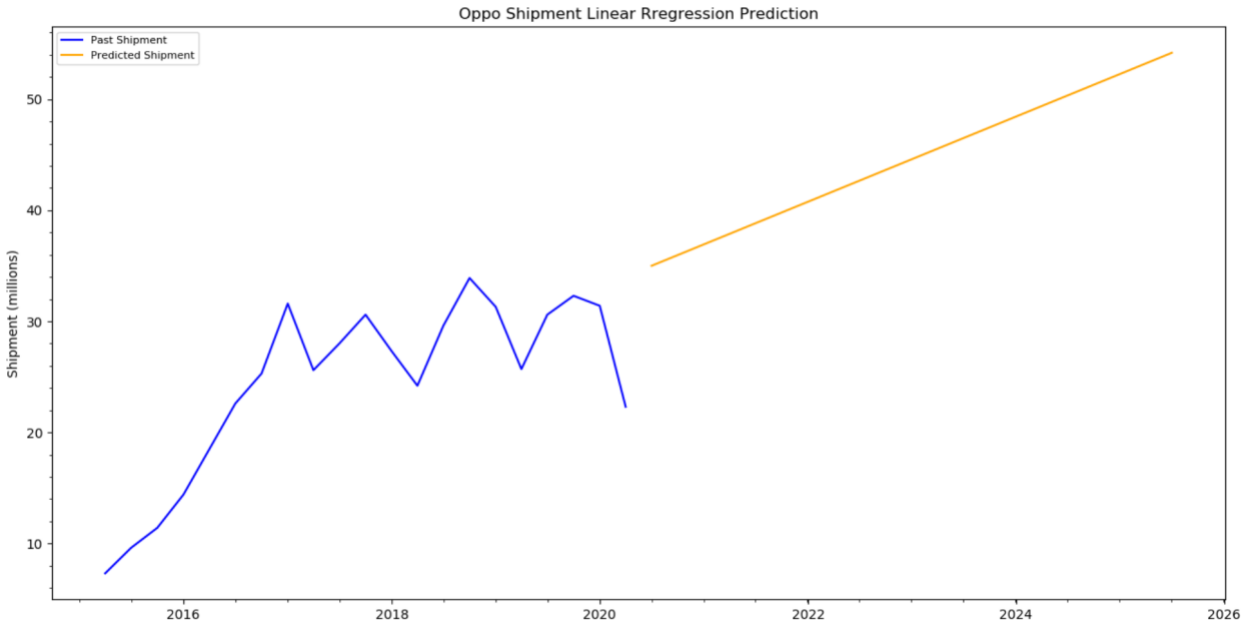
Huawei:


Huawei Shipment Linear Rregression Prediction
Past Shipment
Predicted Shipment
Shipment (millions)
100
80
60
40
20
2016
2018
2020
2022
2024
2026

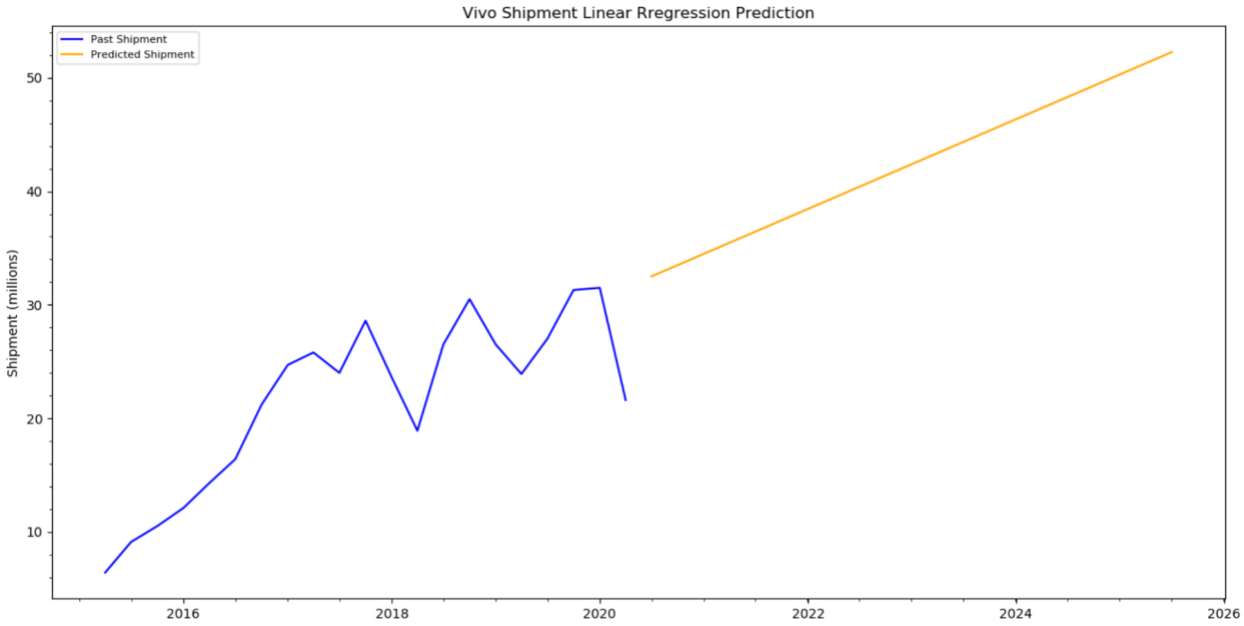
Xiaomi:


Xiaomi Shipment Linear Rregression Prediction
Past Shipment
Predicted Shipment
Shipment (millions)
50
40
30
20
2016
2018
2020
2022
2024
2026

OPPO:



Vivo:



ARIMA –

Apple is likely to maintain its quarterly shipment around the mean of 52 million units for the next five years. Samsung, Huawei, Xiaomi and Vivo faces a downslope

while Samsung and Xiaomi still seem to have some upward potential. OPPO's quarterly shipment is forecasted to grow to around 35 million units in five years.

Linear Regression –

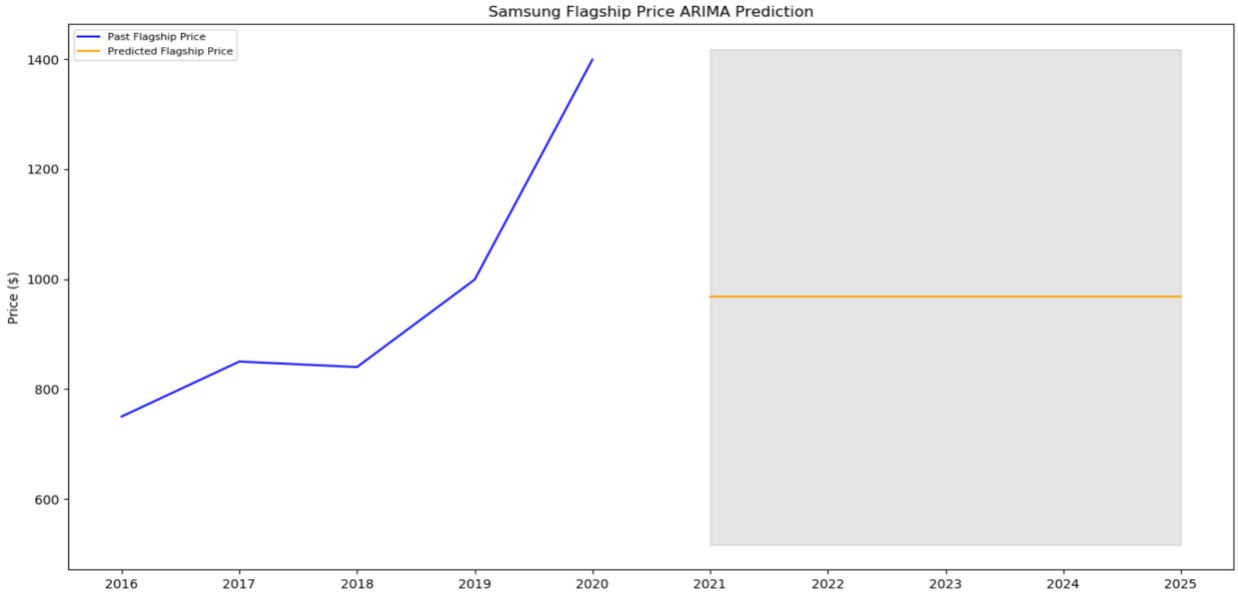
Samsung and Apple are likely to see a declining shipment while Huawei is forecasted to more than double its current shipment volume; the rest three are forecasted to hit 50 million units in five years. Compared to the ARIMA predictions, Linear Regression models provide a pessimistic prediction for Apple but relatively optimistic views on Huawei, Xiaomi and Vivo.

Future Flagship Price Forecast

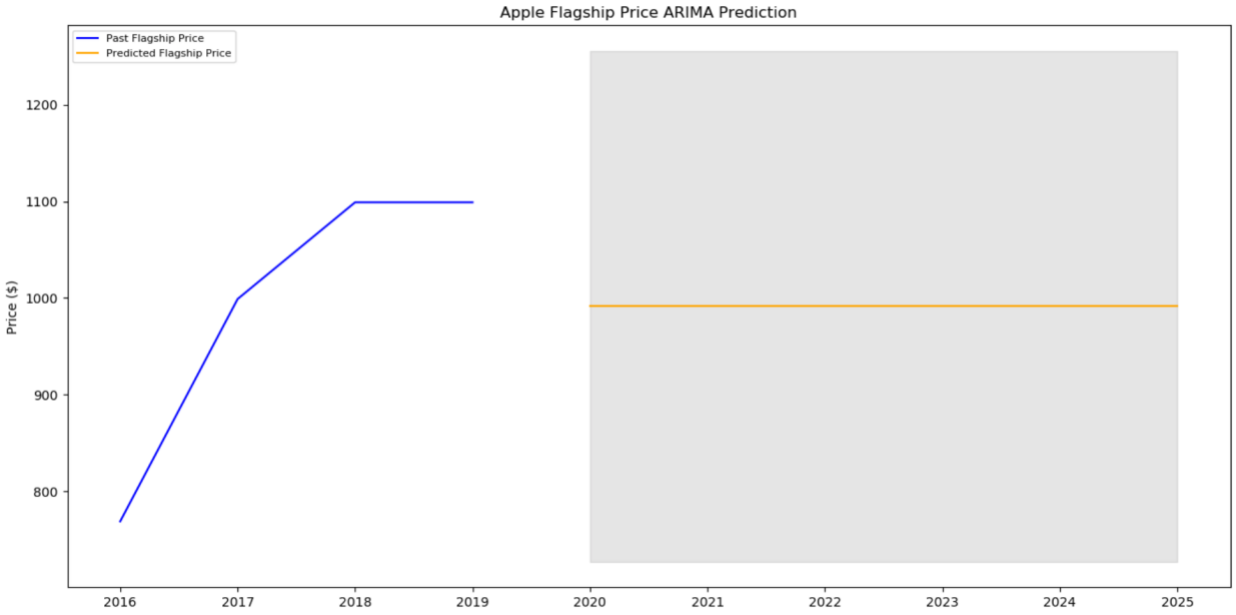
Auto-ARIMA Methodology –

Using Auto-ARIMA on previous flagship price data I was able to find the best (p, q, d) combination with the lowest AIC score and to produce the following flagship price predictions for each company in the next five years:

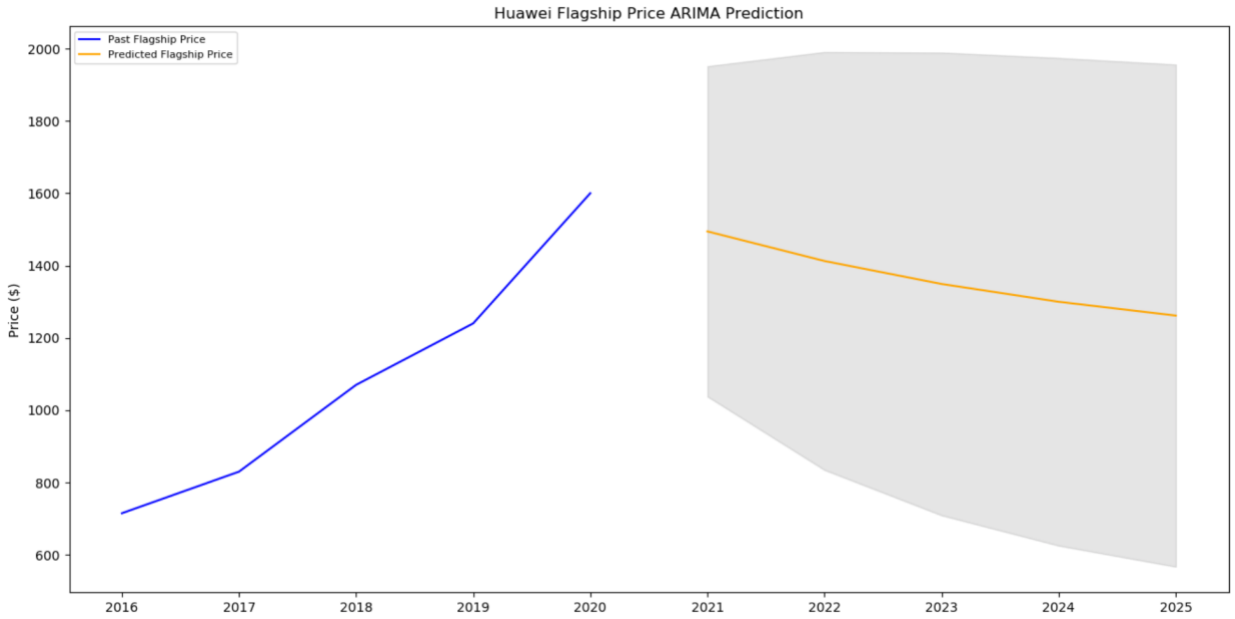
Samsung:



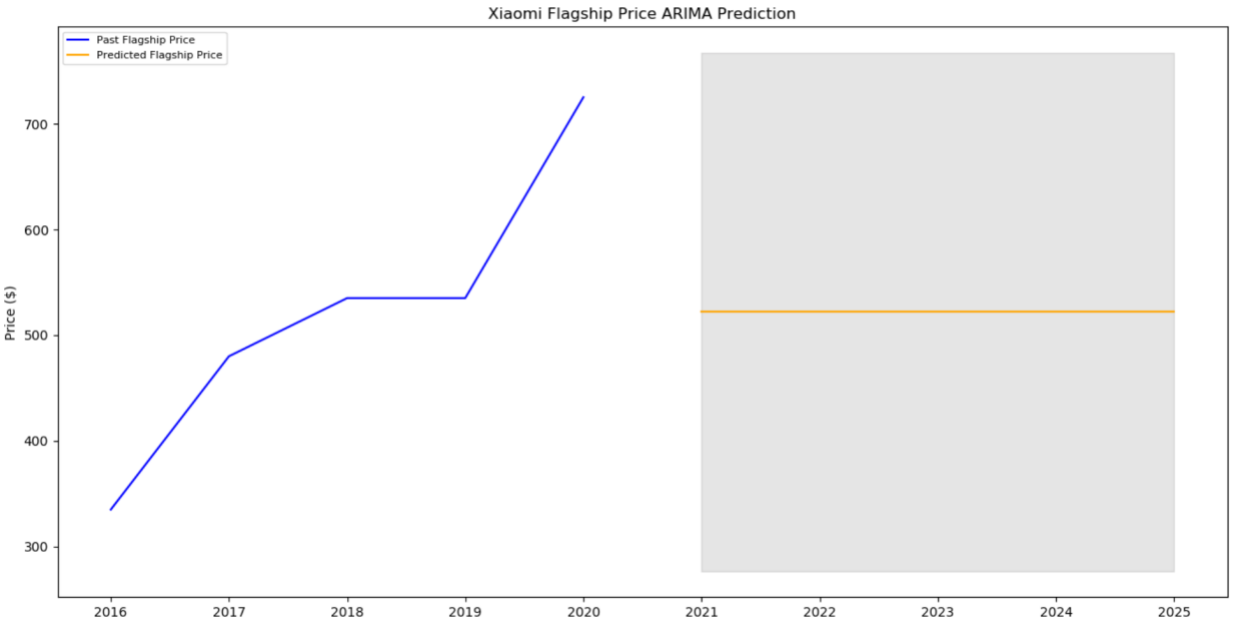
Apple:



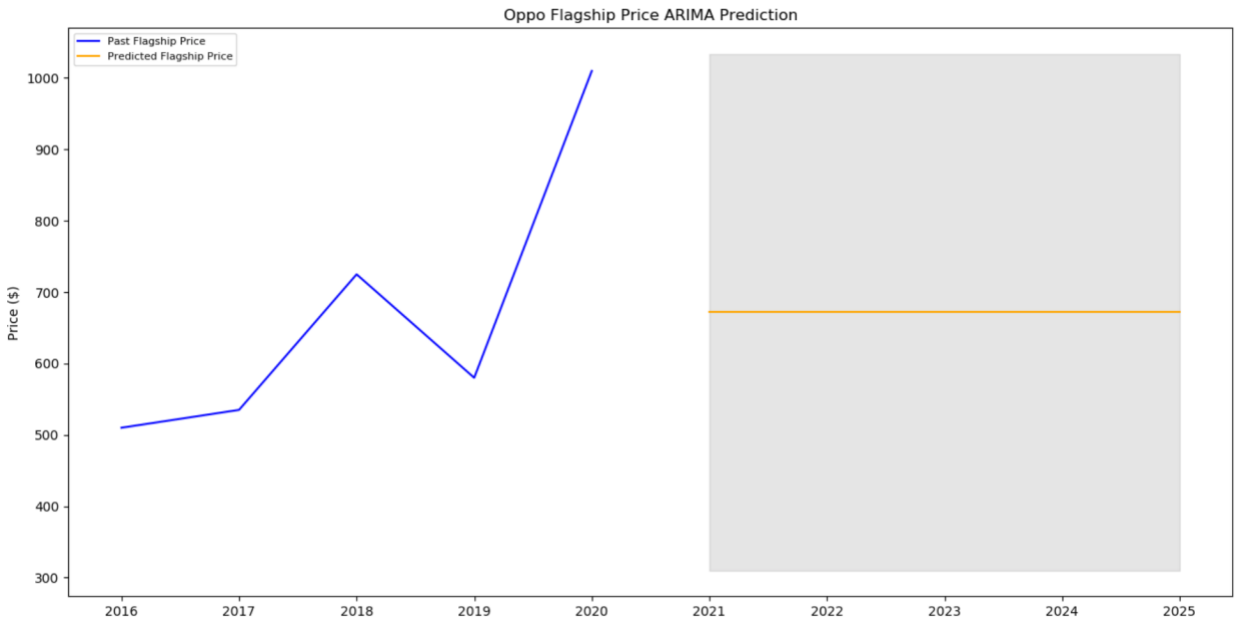
Huawei:



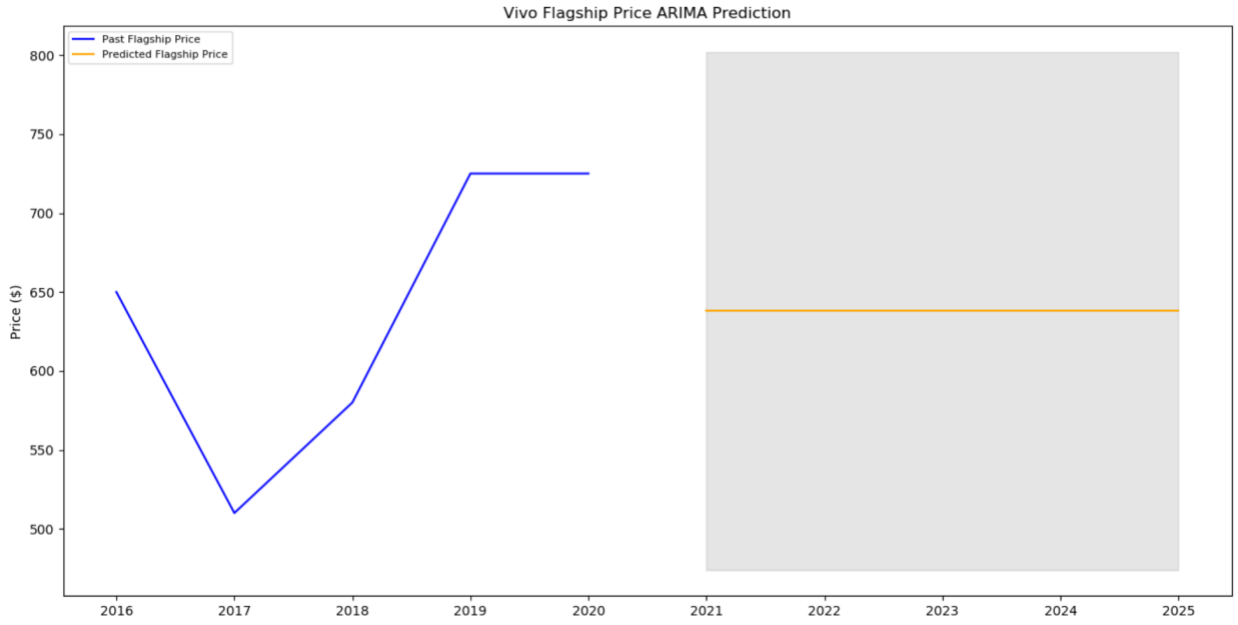
Xiaomi:



OPPO:



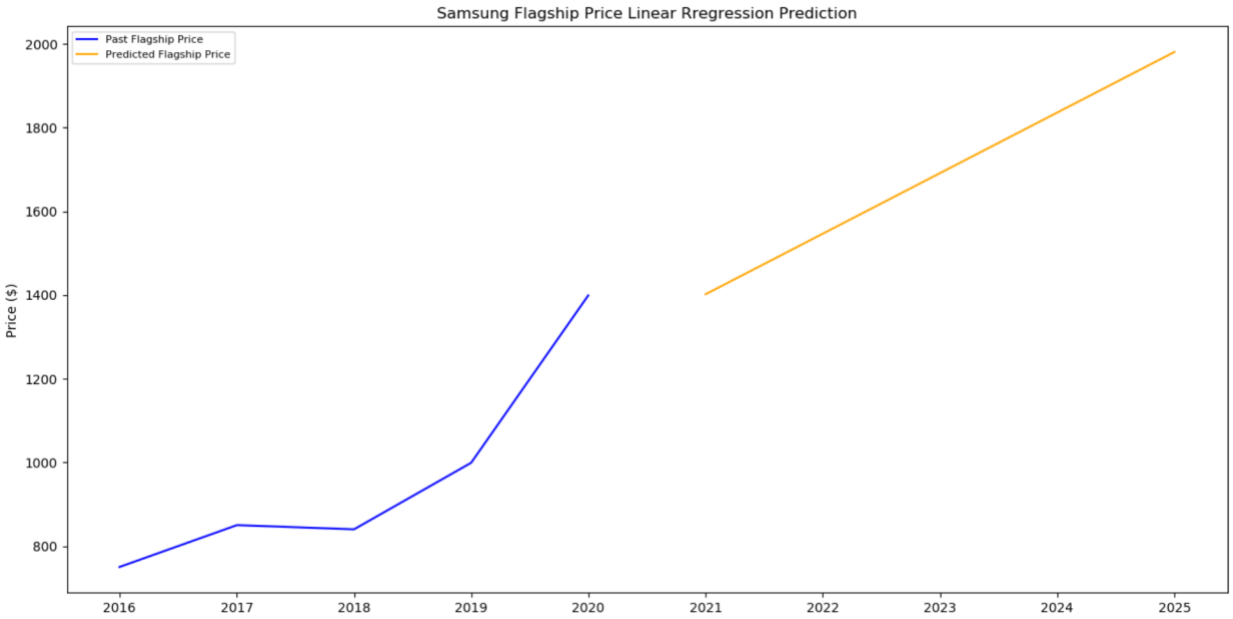
Vivo:



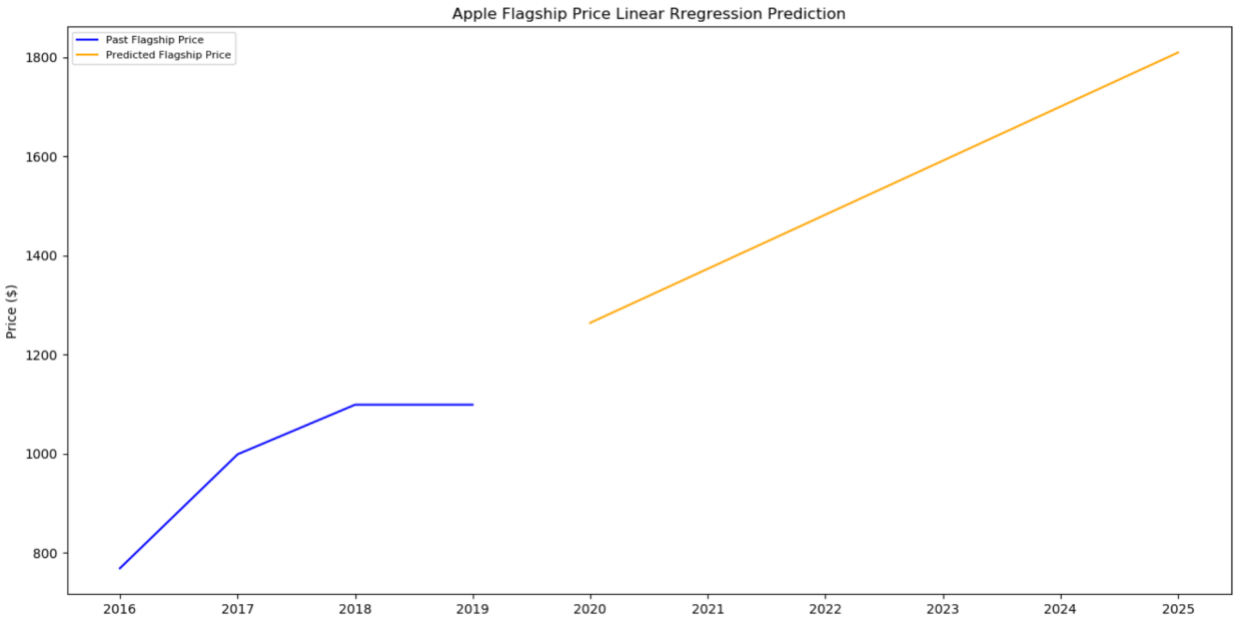
Linear Regression Methodology –

Fitting a Linear Regression model with past-year flagship price time-series data and predicting on future “datetime” I was able to produce the following flagship price predictions for each company in the next five years:

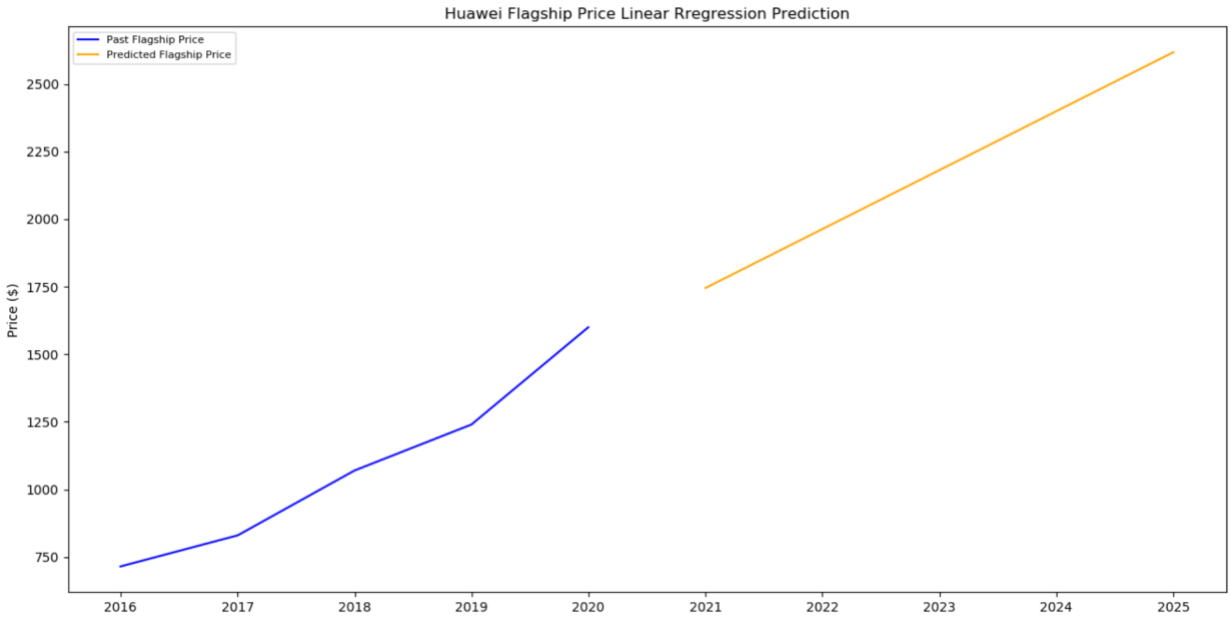
Samsung:



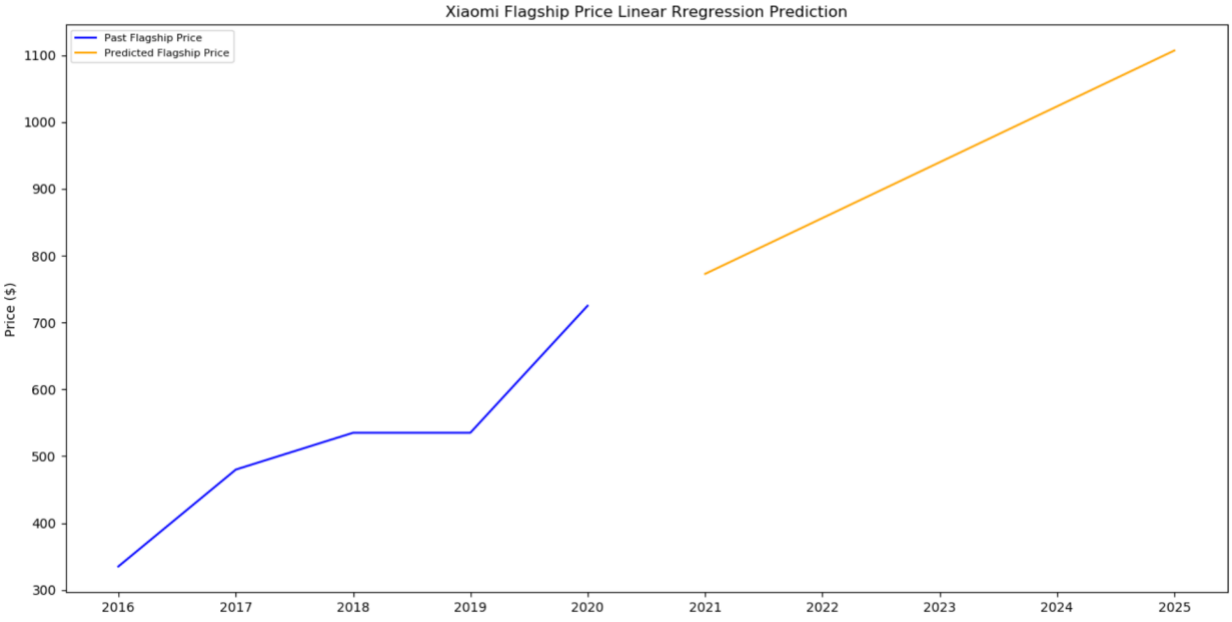
Apple:



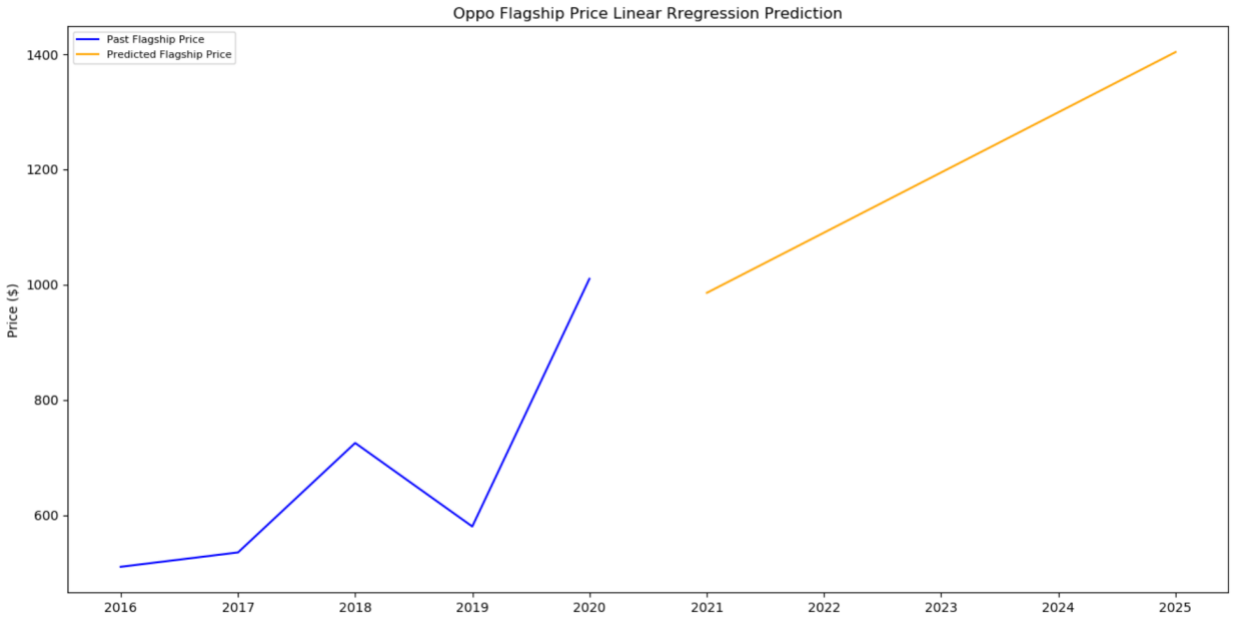
Huawei:


Huawei Flagship Price Linear Rregression Prediction
Past Flagship Price
Predicted Flagship Price
Price ($)
2500
2250
2000
1750
1500
1250
1000
750
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

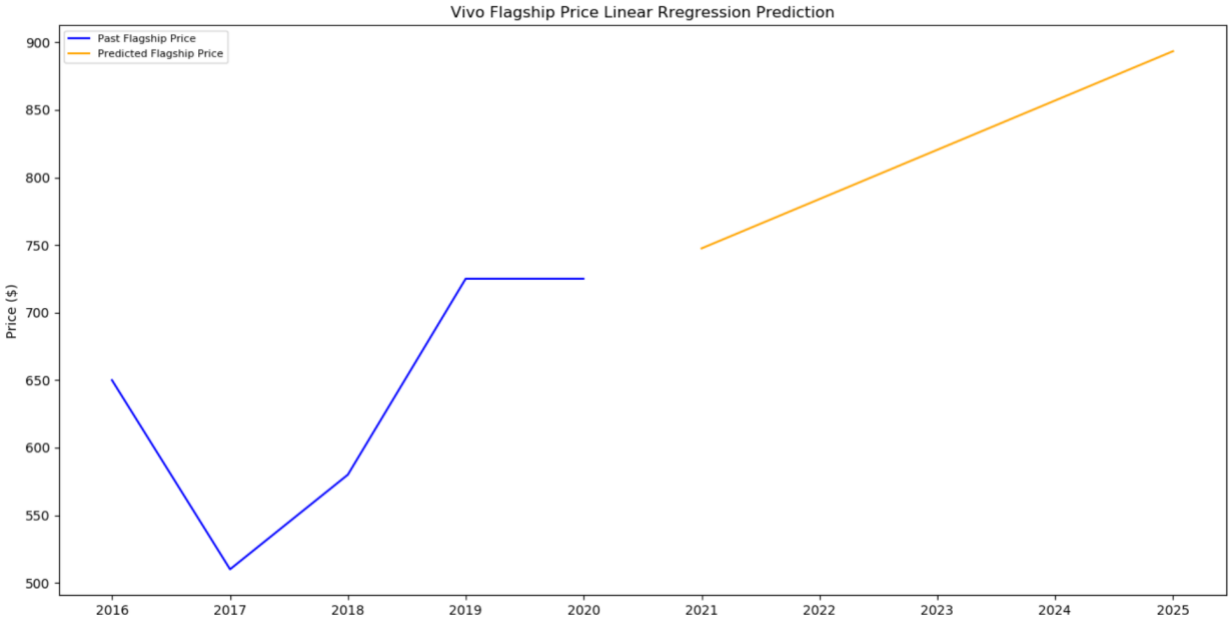
Xiaomi:


Xiaomi Flagship Price Linear Rregression Prediction
Past Flagship Price
Predicted Flagship Price
Price ($)
1100
1000
900
800
700
600
500
400
300
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

OPPO:



Vivo:



ARIMA –

According to the forecasts, all manufacturers tend to flat out their flagship price curve in the next five years, with Samsung and Apple fixing their prices at around

$1,000, Huawei at around $1,200, and the rest three in the $500~$700 range. The upward and downward potential for all companies, however, remains very huge.

Linear Regression –

According to the Linear Regression models, all companies face upward trends in flagship price, with Huawei reaching for the $2,500 price point and Samsung and Apple following its path. In comparison, the ARIMA forecasts are very conservative but open-ended. Given the current social economic status, the prices of future flagships are likely to following the upward trend, but the simultaneous economic development in the future might just be able to offset the effect of phone price increment for consumers.

Impact of COVID-19 on the Industry

There was a 20.4% overall decline in global smartphone sales in the second quarter of 2020.[1]

Samsung maintained its position at the top of the chart, but owning a very minimal market share in the recovering Chinese market, Samsung suffered huge sales loss due to the declined North America and European main market, which showed no signs of improvement anytime soon.

Coming into a virtual tie with Samsung for the Q2 2020 sales is Huawei, which has been seeing a recovery in sales with its home country of China pulling itself out of the pandemic situation. With nearly three-fourths of its sales taking place in the Chinese market in the second quarter, Huawei jumped to the top of the sales ranking, a phenomenon that is not expected to last long given the restricted status Huawei currently has among American technology providers. Apple's sales remained almost constant and ranked the third.

Xiaomi underwent a 1.2% decrease in revenue in its smartphone business but saw a 99.2% year-on-year growth in overseas sales. Focusing on Indian market, Xiaomi is expecting a sales recovery as India is gradually lifting its lockdown. Following Xiaomi, OPPO and Vivo are also putting much effort into India to relieve some pressure from the competition back in China. According to a Canalys analyst, the recent anti-China

[1] https://www.indulgexpress.com/gadgets/2020/aug/25/global-smartphone-sales-see-a-decline-of-204-per-cent-in-the-second-quarter-of-2020-27639.html

sentiment among Indian nationals is not very likely to have a huge hit for Chinese manufacturers such as Xiaomi, OPPO and Vivo.[2]

[2] https://gadgets.ndtv.com/mobiles/news/indian-smartphone-shipments-drop-48-percent-q2-2020-canalys-samsung-vivo-oppo-realme-xiaomi-apple-2265632

Best-performing Company Analysis

After an overall evaluation of the abovementioned analyses and forecasts, Xiaomi seems to be the best-performing companies among the six. Xiaomi shows a promising sign of market share growth as well as upward potential of production quantity in the next 5 years. Even though Xiaomi failed to keep up with its previous growth rate in Chinese Market in 2019, it has grown tremendously in the European market in recent quarters thanks to the trading restrictions against Huawei.

Samsung and Apple have shown signs of corporate maturity in their market share and global shipment, and their market share and shipment are influenced more by their respective seasonality and business cycle than a growing/declining trend. The growth opportunities and room for profit are not very big for either of the two compared to some other companies on the list. Coming into 2020, Huawei has been suffering a stagnation of growth due to multiple factors, and the chip ban from U.S. is forcing Huawei into a complete impasse – the future of Huawei is very unclear at this point as it currently has no source for chips.[3] OPPO and Vivo has a very good performance in market share growth; but according to the historical data and forecasts, Xiaomi just seems to hold a larger rise space, and the downward forecast for Vivo's shipment makes it less desirable than its Chinese cousin as well.

Apart from strong sales performance, Xiaomi is striving to build an ecosystem around its smartphone products, a path that Samsung, Apple and Huawei have proved to be conducive to the fundamentals and long-term development of a company.

[3] https://www.theverge.com/2020/8/9/21360598/huawei-chips-us-sanctions-trump-china-privacy-smartphone

According to IDC, approximately 11 billion devices had been connected to the Internet worldwide in 2016, and the number will hit 80 billion in 2025, an era when every electric-powered object can be reached via Internet.[4] Xiaomi was the first company to come up with the "AIoT (Artificial Intelligence + Internet of Things)" concept back in 2014 and is expected to invest more than 7.2 billion USD in its "5G + AIoT" layout between 2020 and 2025.[5] Integrating its ecosystem into the AIoT layout, Xiaomi is able to get an advantageous head start over other players in the market.

Risks certainly exist for Xiaomi – Xiaomi has been rising prices for its flagship phones every year, hoping to open up the high-end market. A company so deeply rooted in the budget smartphone market, Xiaomi is taking on a bold move to discard its long-established brand image and the outcome remains to be seen. On the other hand, Xiaomi has not been able to devote a lot of resources into R&D, at least not as much as other competitors such as Huawei and Apple. Its Chinese cousin, Huawei, spent over 20 billion USD (roughly 15% of its revenue) on R&D during 2019, while Xiaomi's R&D budget remained at 1.5 billion USD (3.5% of its revenue).[6] The majority of Xiaomi's R&D budget was invested into boosting "soft power" (apps, operation systems), but "hard power" development (chips, processors, etc.) was greatly neglected by Xiaomi compared to other industry giants.

In conclusion, Xiaomi is showing tremendous upward profitability potential over recent years thanks to its growing oversea market, the weakening Huawei and the its

[4] https://www.forbes.com/sites/michaelkanellos/2016/03/03/152000-smart-devices-every-minute-in-2025-idc-outlines-the-future-of-smart-things/#562268374b63
[5] https://www.zdnet.com/article/xiaomi-to-invest-us7-2-billion-on-5g-ai-and-iot-for-coming-five-years/
[6] https://www.gizmochina.com/2020/02/13/xiaomis-says-its-rd-investment-in-2019-was-around-7-billion-yuan-us1-bn/

constantly-tightening network of products, but its move into the unfamiliar high-end market and its lack of investment in hard power innovation bring about quite some risks at the same time as well.

Appendix

Auto-ARIMA Model Code Example

```
com = 'Samsung'
df = mkt_share[[com]]
model_autoARIMA = auto_arima(df, start_p=0, start_q=0,
                      test='adf',
                      max_p=3, max_q=3,
                      m=1,
                      d=None,
                      seasonal=True,
                      start_P=0,
                      D=0,
                      trace=True,
                      error_action='ignore',
                      suppress_warnings=True,
                      stepwise=True)
print(model_autoARIMA.summary())
```

```
model = ARIMA(df, order=(0, 0, 0))
fitted = model.fit(disp=-1)
arima_window = 20
fc, se, conf = fitted.forecast(arima_window, alpha=0.05)
fc_series = pd.Series(fc, index=range(0, arima_window))
fc_series = pd.DataFrame(fc_series, columns=['Prediction'])
df_pred = df.reset_index()
df_pred['Prediction'] = np.nan
df_pred = pd.concat([df_pred, fc_series])
df_pred = df_pred.reset_index()
lower_series = pd.Series(conf[:, 0], index=df_pred.iloc[-arima_window:].index)
upper_series = pd.Series(conf[:, 1], index=df_pred.iloc[-arima_window:].index)

indexq = []
for n in range(15, 25):
    for m in range(1, 5):
        indexq.append(str(m) + 'Q' + str(n))
indexq.append('1Q25')
df_pred.index=indexq

plt.figure(figsize=(16, 8), dpi=100)
plt.plot(df_pred[com], color = 'b', label='Actual Market Share')
plt.plot(df_pred['Prediction'], color = 'orange',label='Predicted Market Share')

plt.fill_between(lower_series.index, lower_series, upper_series,
                 color='k', alpha=.10)

plt.title(com + ' Market Share Prediction')
plt.ylabel('Market Share')
plt.xticks(rotation=45)
plt.legend(loc='upper left', fontsize=8)
```

Linear Regression Model Code Example

```
com = 'Samsung'
df = mkt_share[[com]]
df.index = train_index
y = np.array(df.values, dtype=float)

lm.fit(X, y)

X_test = np.reshape(X_test, (-1, 1))
pred = lm.predict(X_test)
pred = pd.DataFrame(pred, columns=['Prediction'])
pred.index = test_index

df_pred = df.copy()
df_pred['Prediction'] = np.nan
df_pred = pd.concat([df_pred, pred])

plt.figure(figsize=(16, 8), dpi=100)
ax = plt.plot(df_pred[com], color = 'b', label='Actual Market Share')
plt.plot(df_pred['Prediction'], color = 'orange',label='Predicted Market Share')

plt.title(com + ' Market Share Linear Regression Prediction')
plt.ylabel('Market Share')

plt.axes().minorticks_on()

plt.legend(loc='upper left', fontsize=8)
```

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