Technical Analysis

1. Strategy :-

My trading strategy is based on the hypothesis that the trade analysis on a short duration of sample would mimic the trade analysis on a longer duration. Here, I have used various exponentially moving averages as indicators.

For all these exponential moving averages, I have calculated their values for each of the stocks under consideration over three durations, short (20days) , middle (50 days) and long (300 days). These are calculated over the condition that a stock closed above it's opening price.

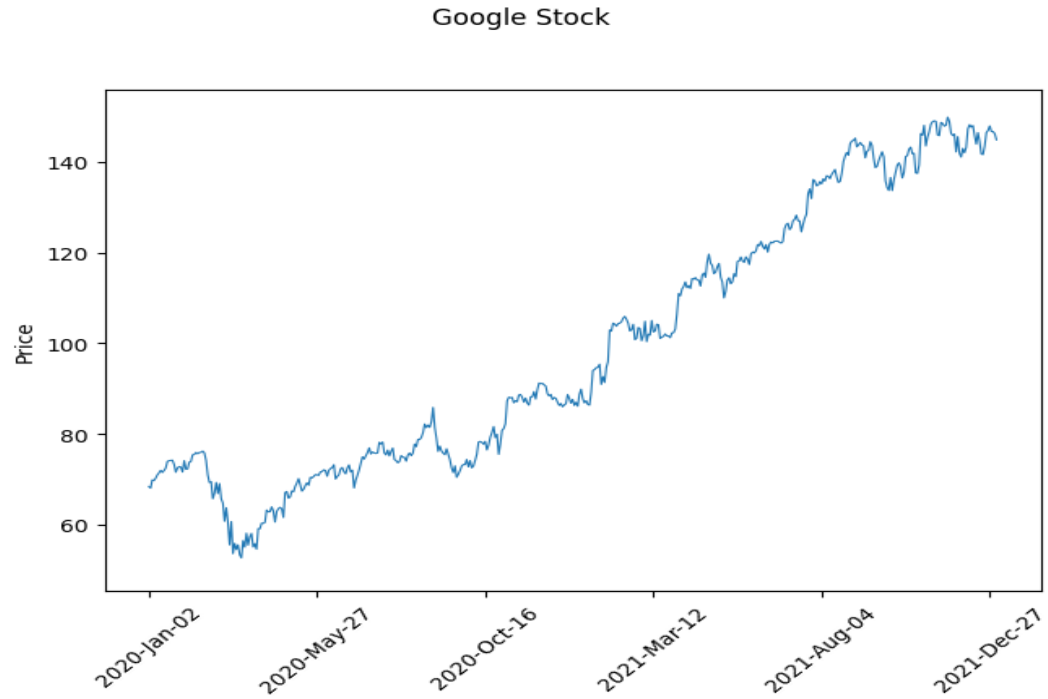
If the EMA of a stock on a short duration is lower than the EMA over the longer duration, it is expected that the ema would increase in future i.e. the stock would close above it's opening price. Thus , a buy signal would be sent. (Stock is longed).

By using multiple strategies for each stock, I am able to maximise returns by observing the historical performance of a stock under said category. This means that if a stock performs the best on DEMA(Double Exponential Moving Average), we perform the trade

operation on the basis of the trade signals arised due to DEMA.

2. **Initial Plotting of Stocks Under Consideration**:-

I am analysing five stocks, GOOGLE , APPLE, MICROSOFT, TESLA and ADANI.
I am analysing stocks starting from the beginning of 2020 to the beginning of 2022 (the pandemic years, where most tech companies saw a boom), alongside Adani stocks from the beginning of 2021 (as a stock which underperformed).
Even though it is generally advised to have the back testing period of around 5 years, I have chosen only 2 years because my strategy focuses on the fact that tech companies had an exponential rise during the pandemic years. Thus, I have chosen to analyse my strategy under a period of 2 years, rather than generally advisable 5 years.
Furthermore, I have invested 1,00,000 rupees for each stock.


Google Stock
Price
140
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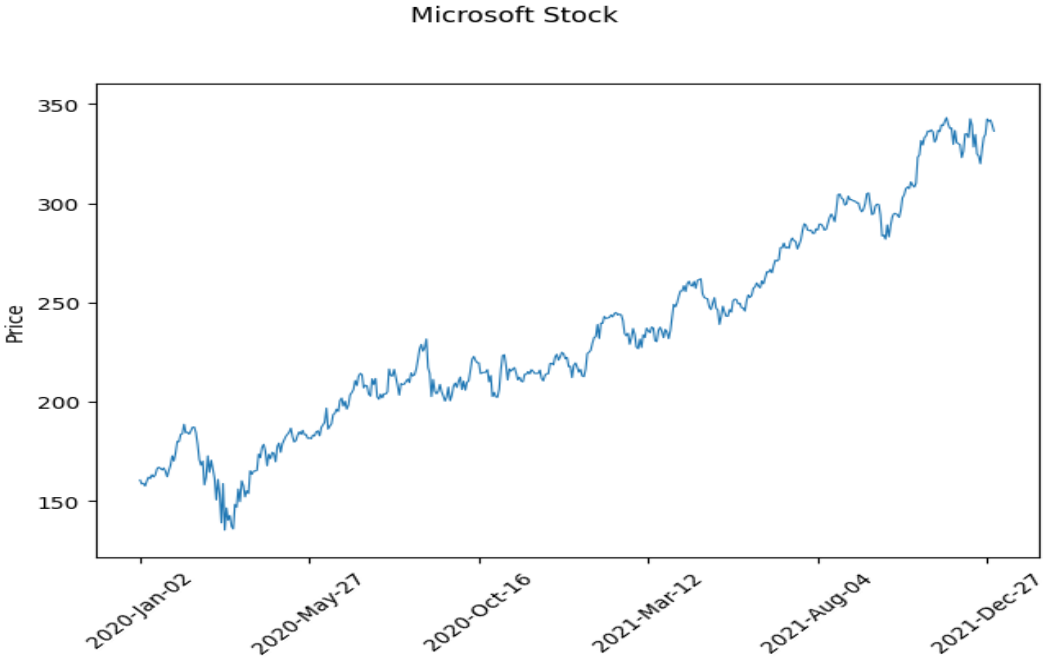
2020-Jan-02
2020-May-27
2020-Oct-16
2021-Mar-12
2021-Aug-04
2021-Dec-27


Microsoft Stock
Price
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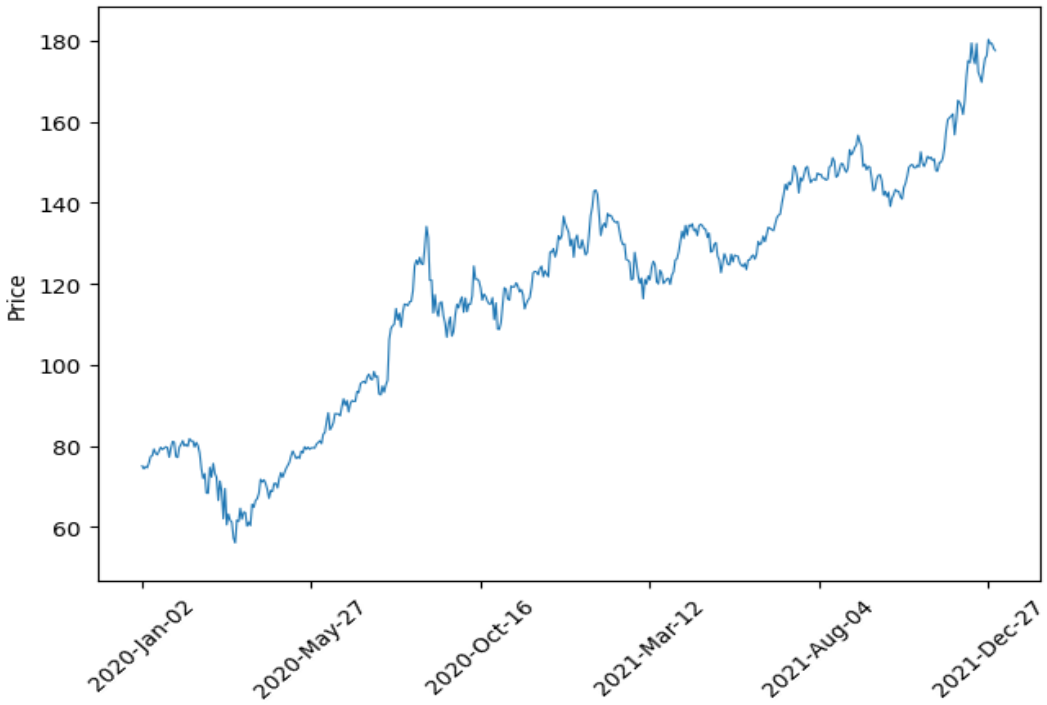
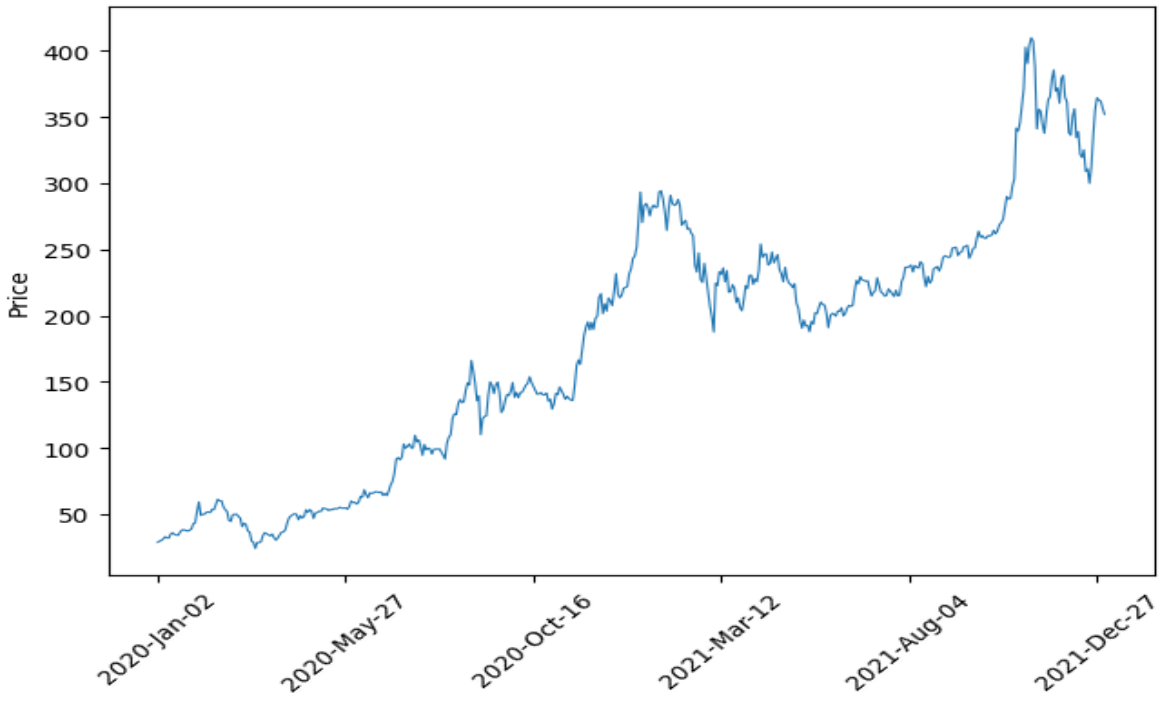
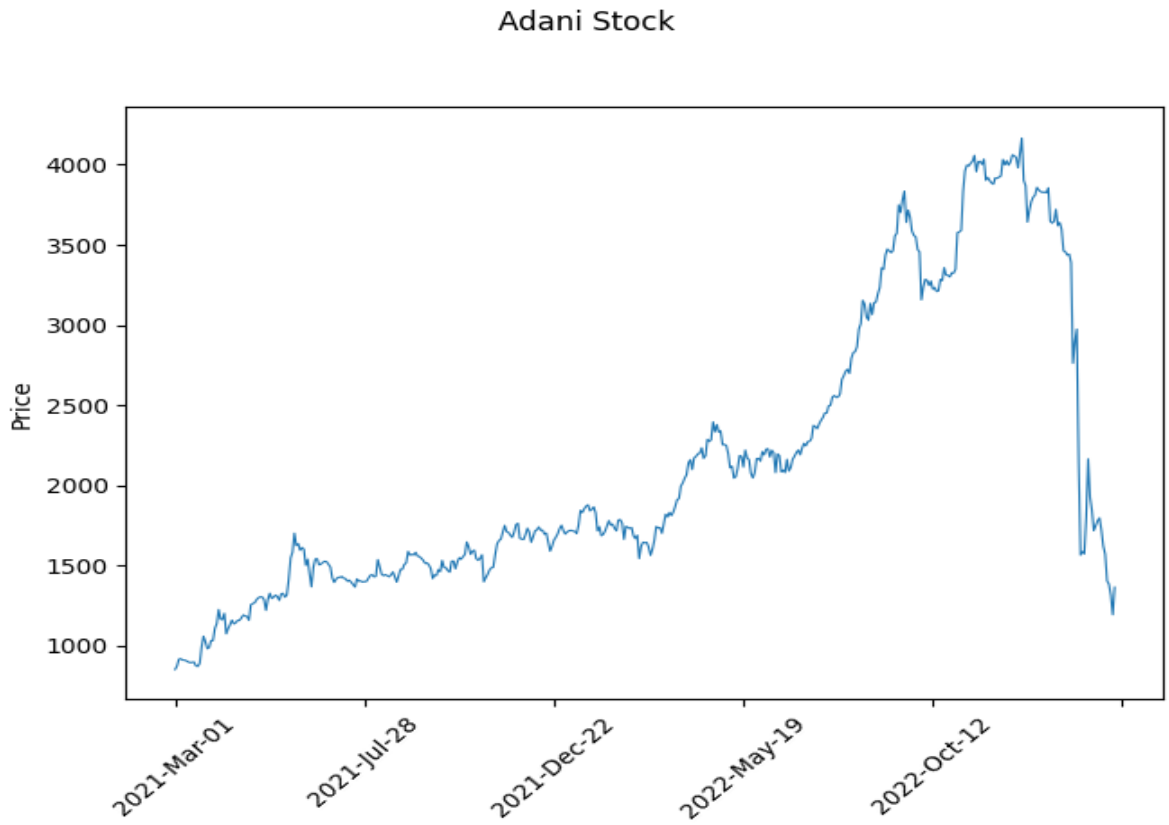
2021-Mar-12
2021-Aug-04
2021-Dec-27

Apple Stock



Tesla Stock





3. Indicators:-

I have used five indicators in my project:-

- Exponential Moving Average (EMA)
- Doubly Exponential Moving Average (DEMA)
- Triple Exponential Moving Average (TEMA)
- Quadruple Exponential Moving Average (QEMA)
- Pentagon Exponential Moving Average (PEMA)

I have formulated these indicator functions with the masking that closing price of the stock is greater than its opening

price. The strategy implementation takes use of these varied averages to maximise the returns calculated.

- EMA :- Exponetially moving average is a popular technical analysis indicator which assigns more weight to recent data points, making it much more responsive to price movements and market fluctuations.

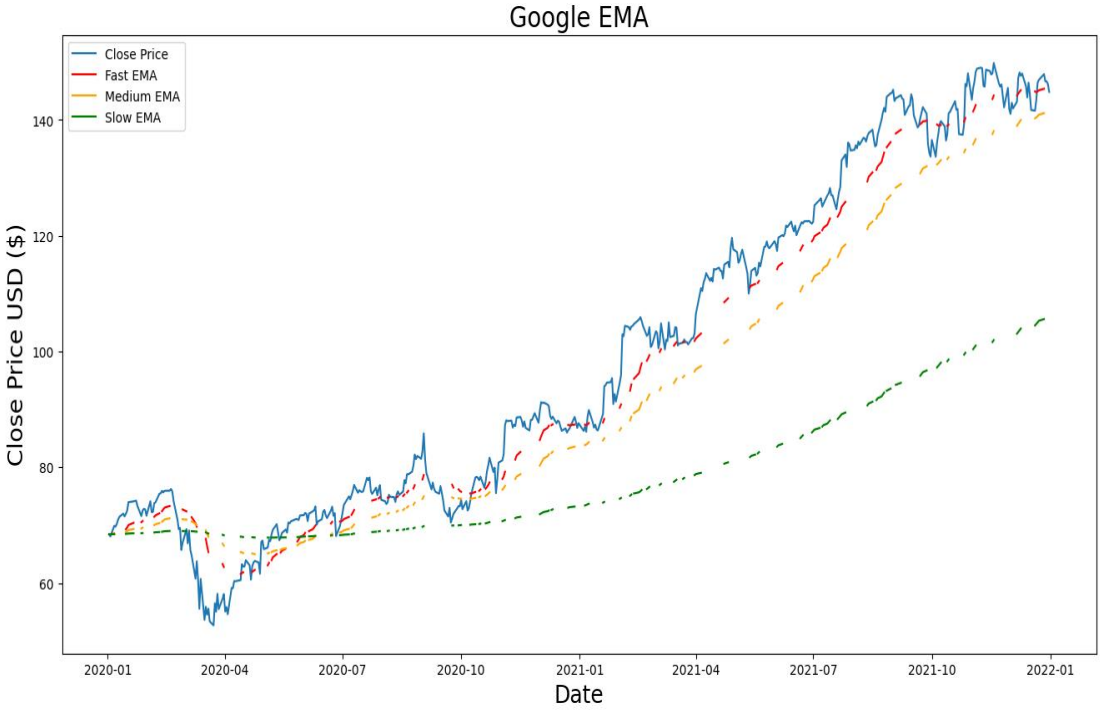
  EMA=(Closing Price- Previous EMA)*Multiplier +Previous EMA.

  Here Previous EMA keeps on getting updated. Multiplier is a constant which assigns more weight to recent data.

- DEMA:- This is a two step process which results in a more smoother and responsive trading strategy.
  DEMA= 2*EMA – EMA1
  EMA1 is the EMA of the EMA.
- TEMA:- TEMA= 3*EMA – 3*EMA1 + EMA2
- QEMA:- QEMA=4*EMA – 6*EMA1 + 4*EMA2 – EMA3
- PEMA:- PEMA=5*EMA – 10*EMA1 + 5*EMA2 – 10*EMA3 + EMA4

Following are the graphs of EMA, DEMA, TEMA, QEMA, PEMA for all the five stocks.

a) GOOGLE :-


Google EMA
Close Price
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Medium EMA
Slow EMA
Close Price USD ($)
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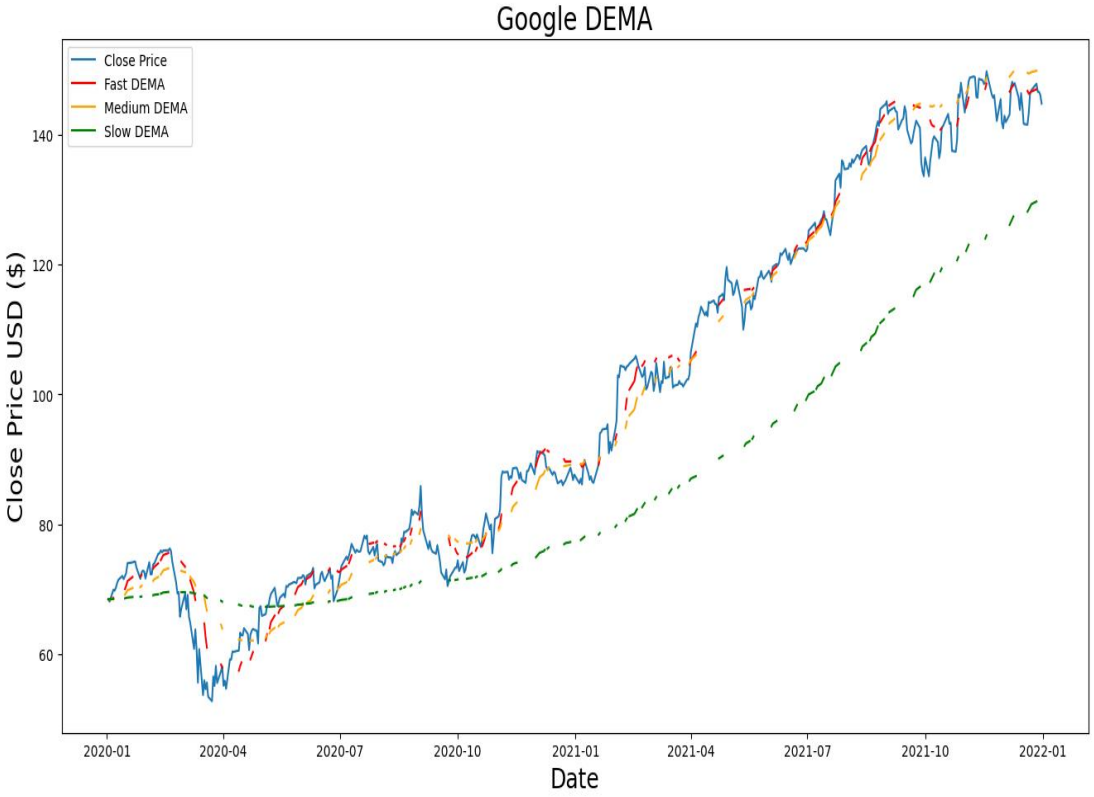
Google DEMA
Close Price
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Close Price USD ($)
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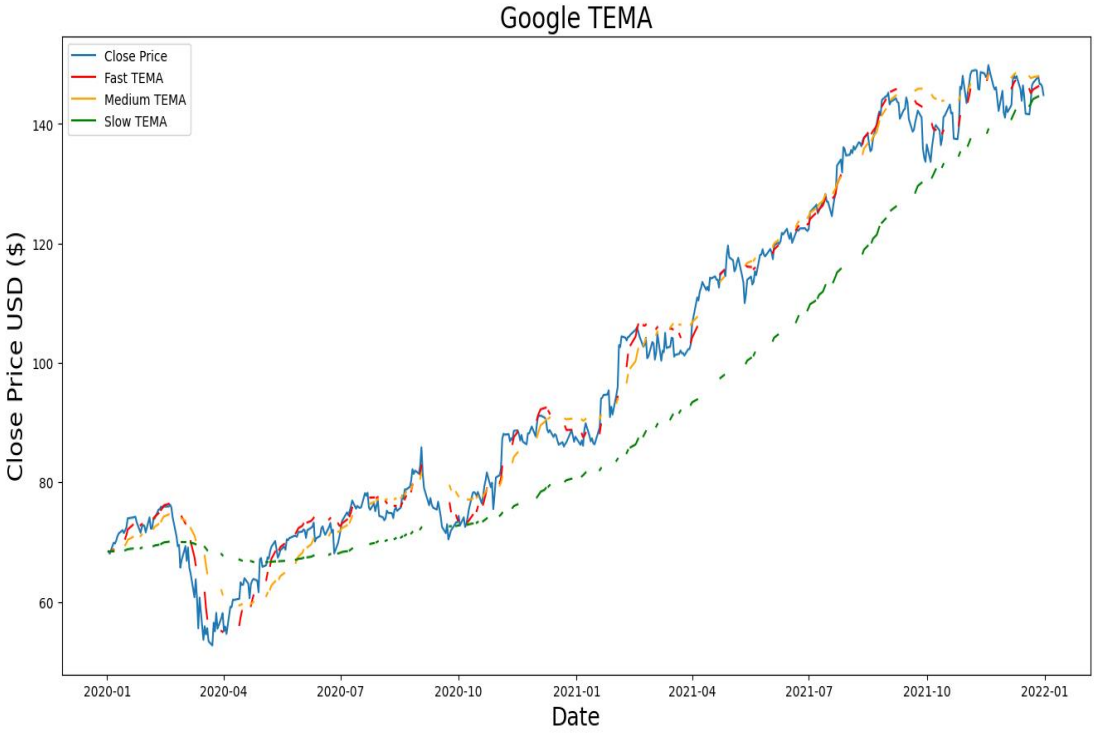
Google TEMA
Close Price
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Medium TEMA
Slow TEMA
Close Price USD ($)
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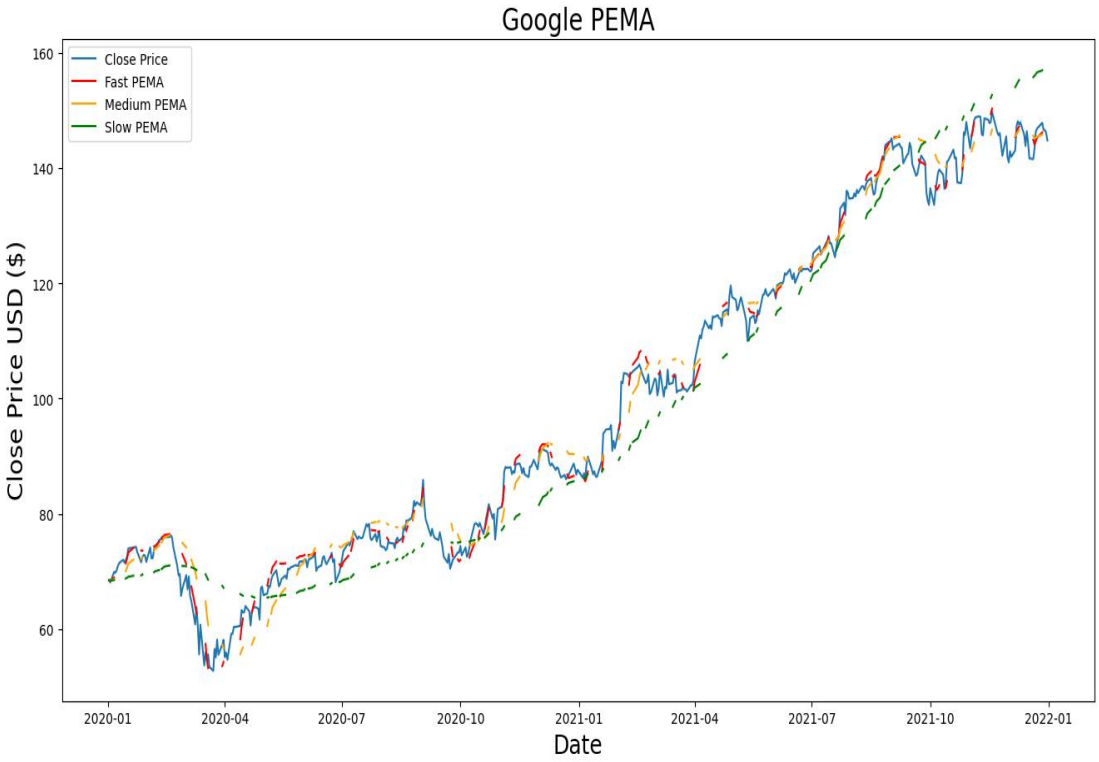
Google PEMA
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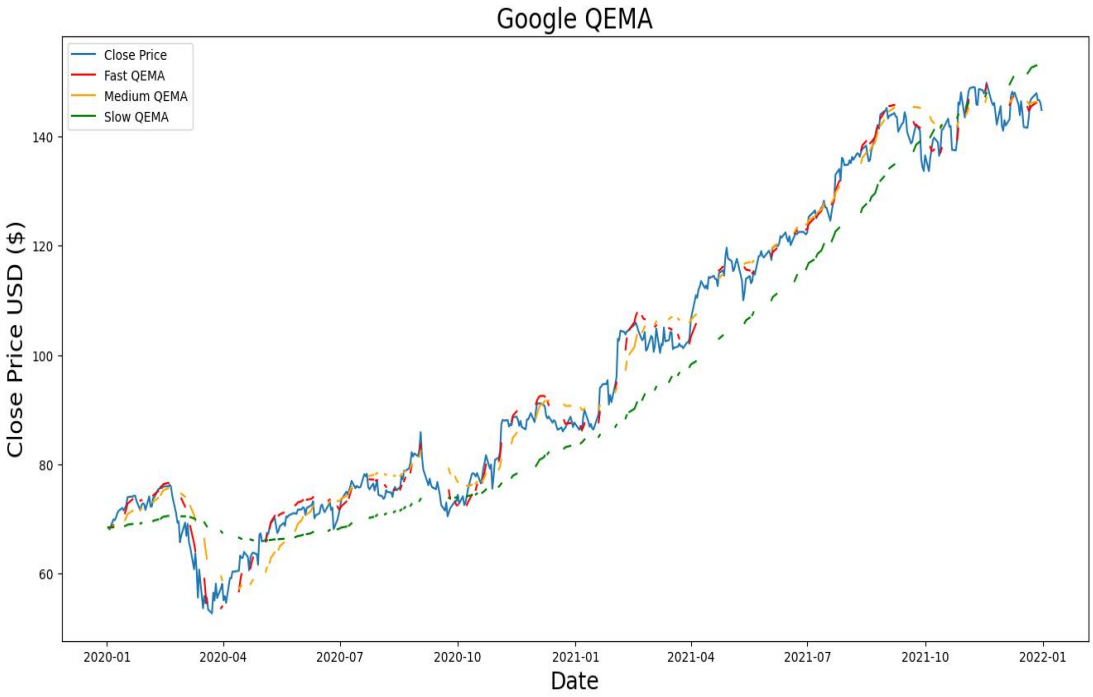
Google QEMA
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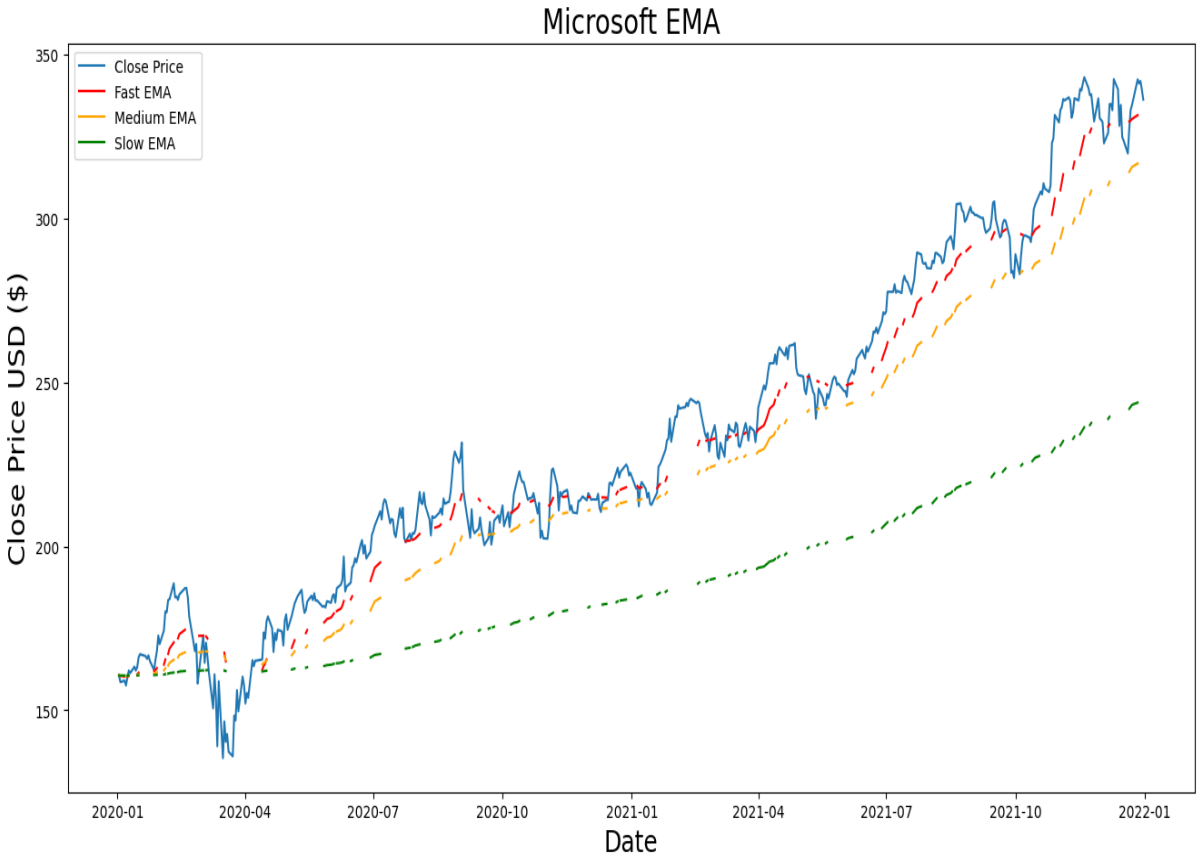
b) MICROSOFT :-


Microsoft EMA
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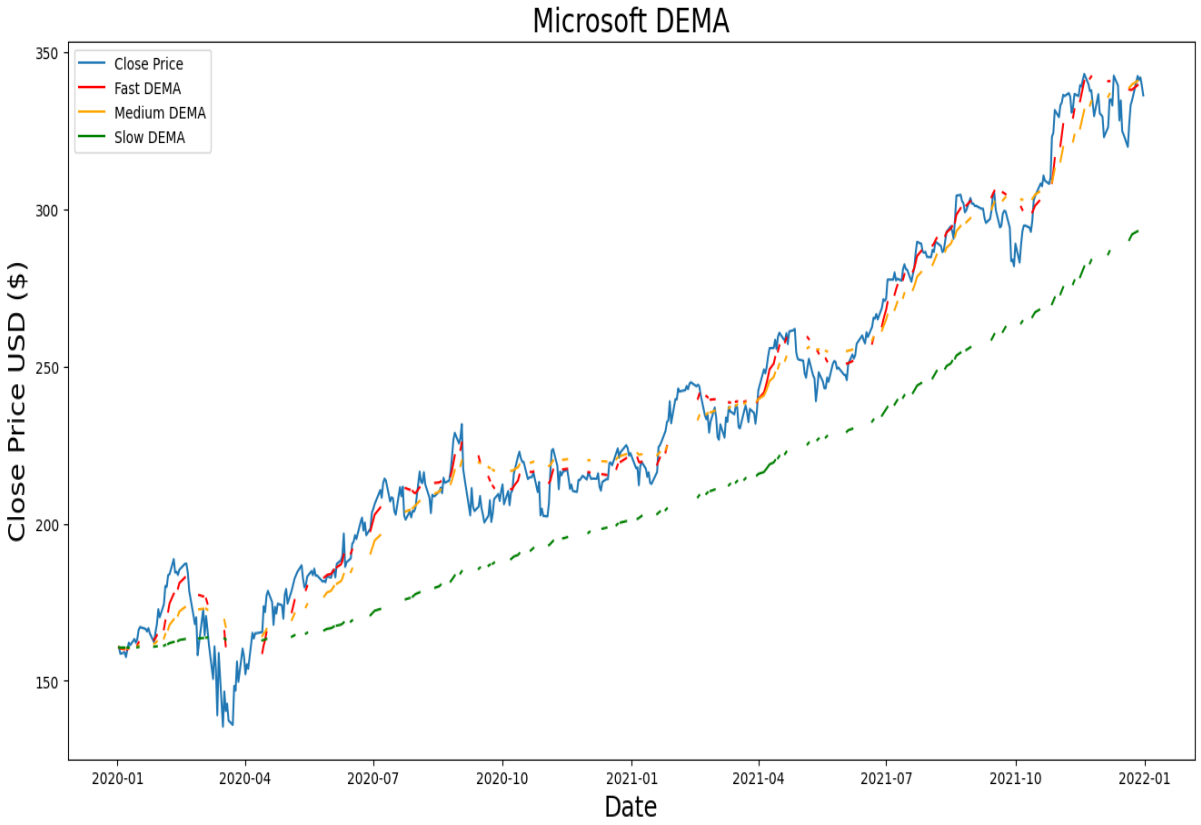
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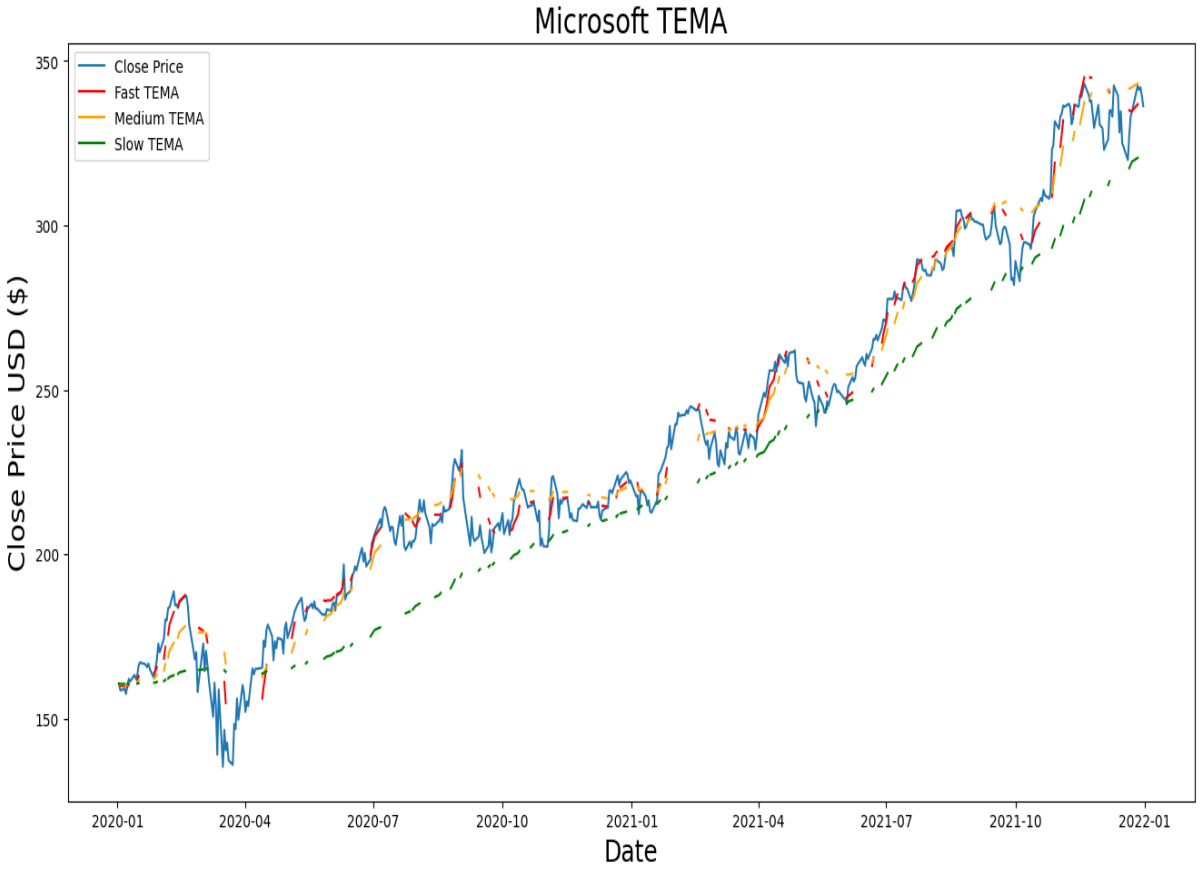
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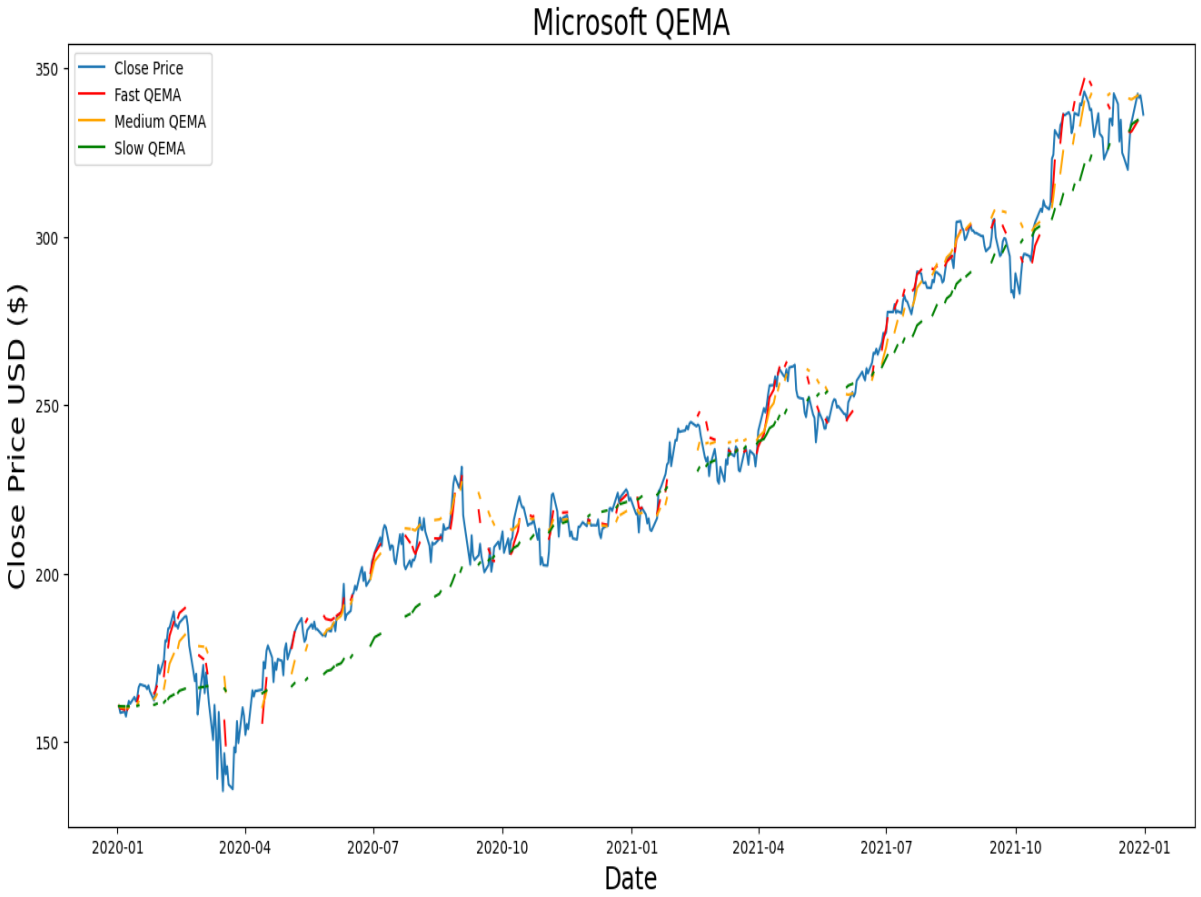
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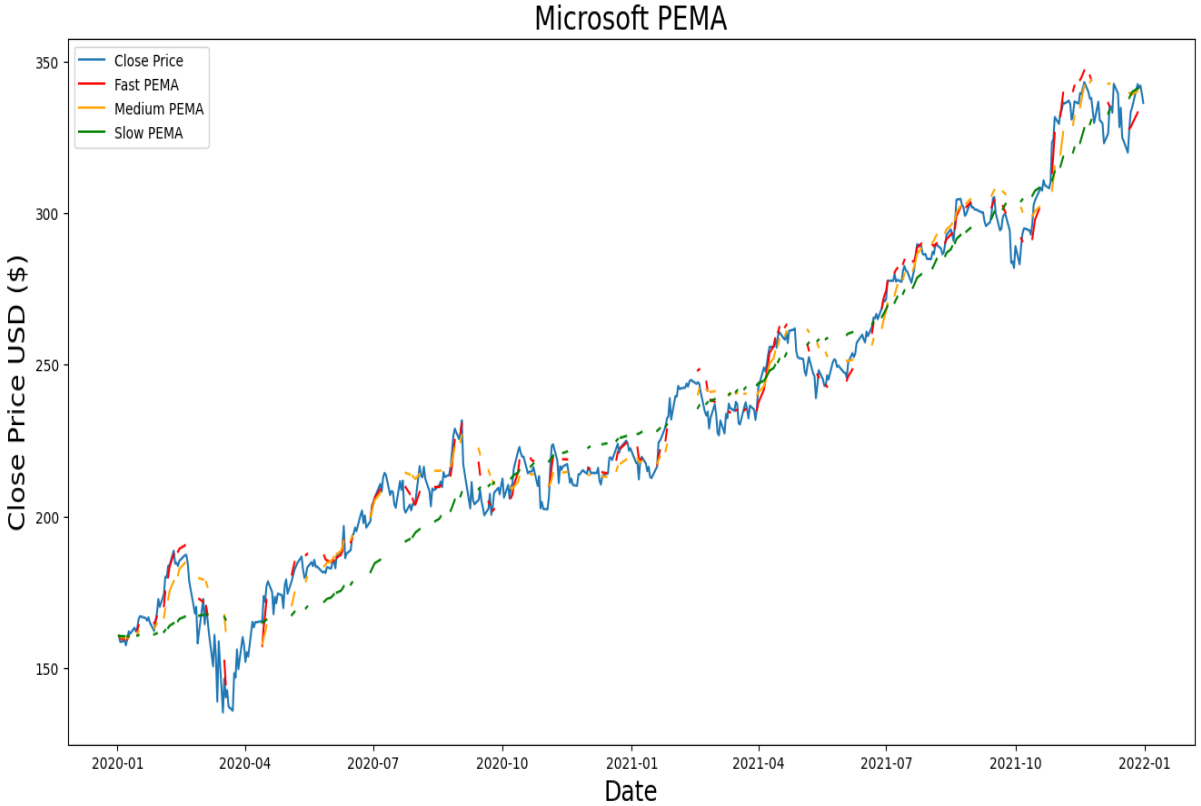
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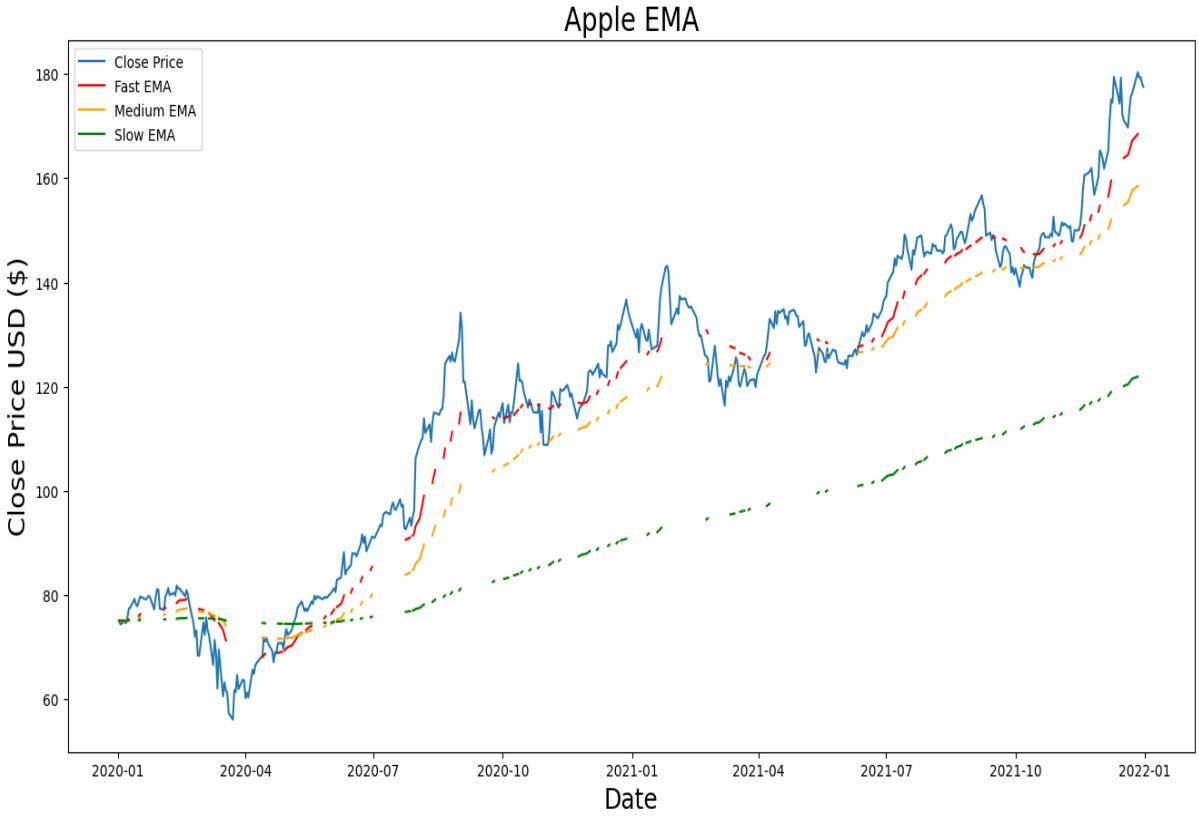
c) APPLE:-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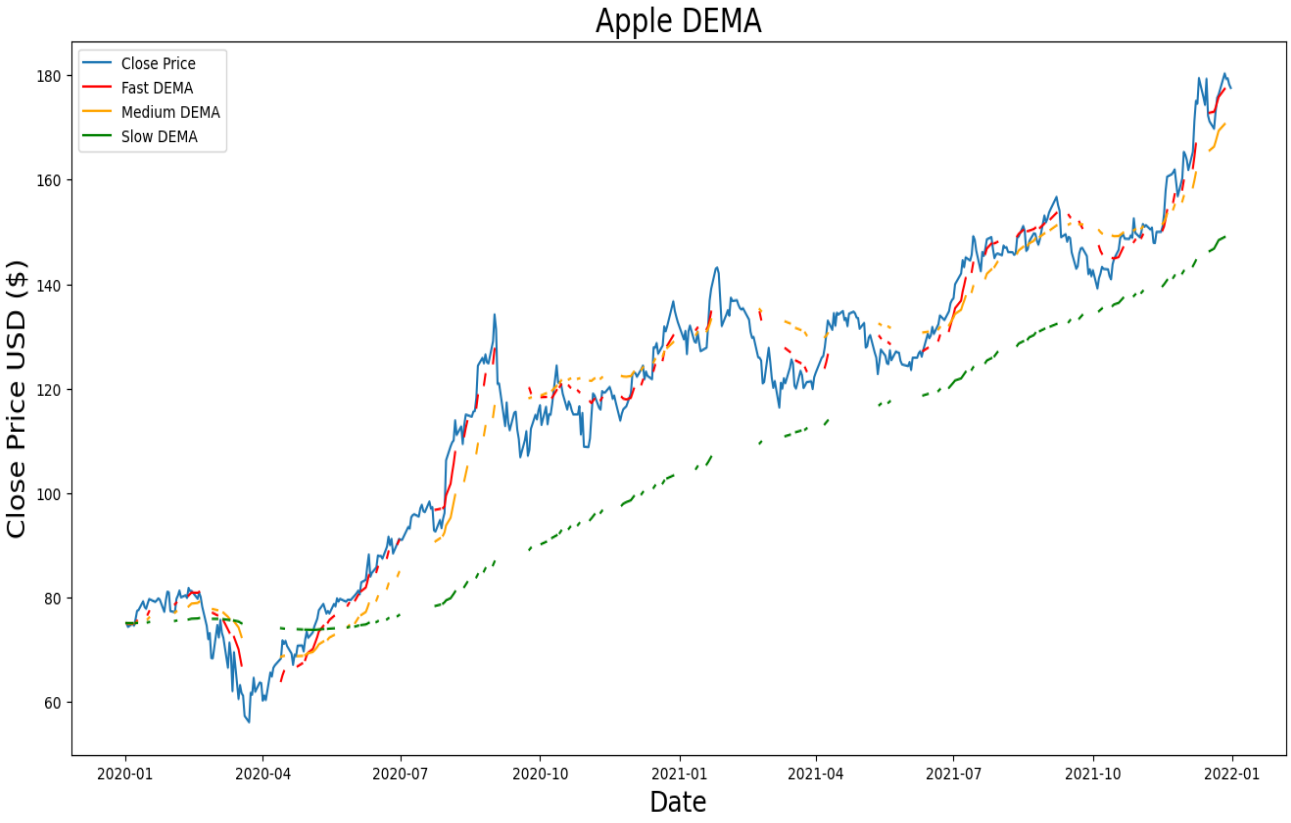
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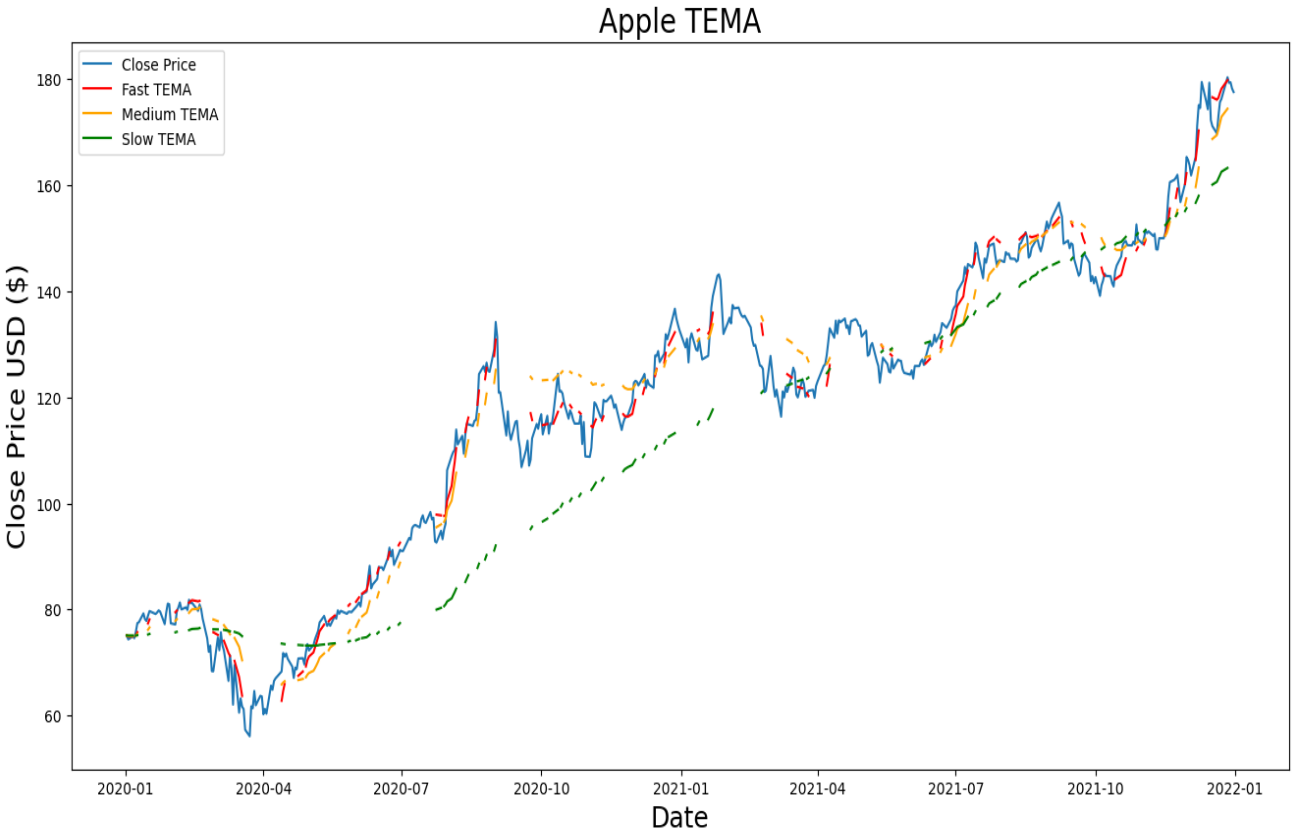
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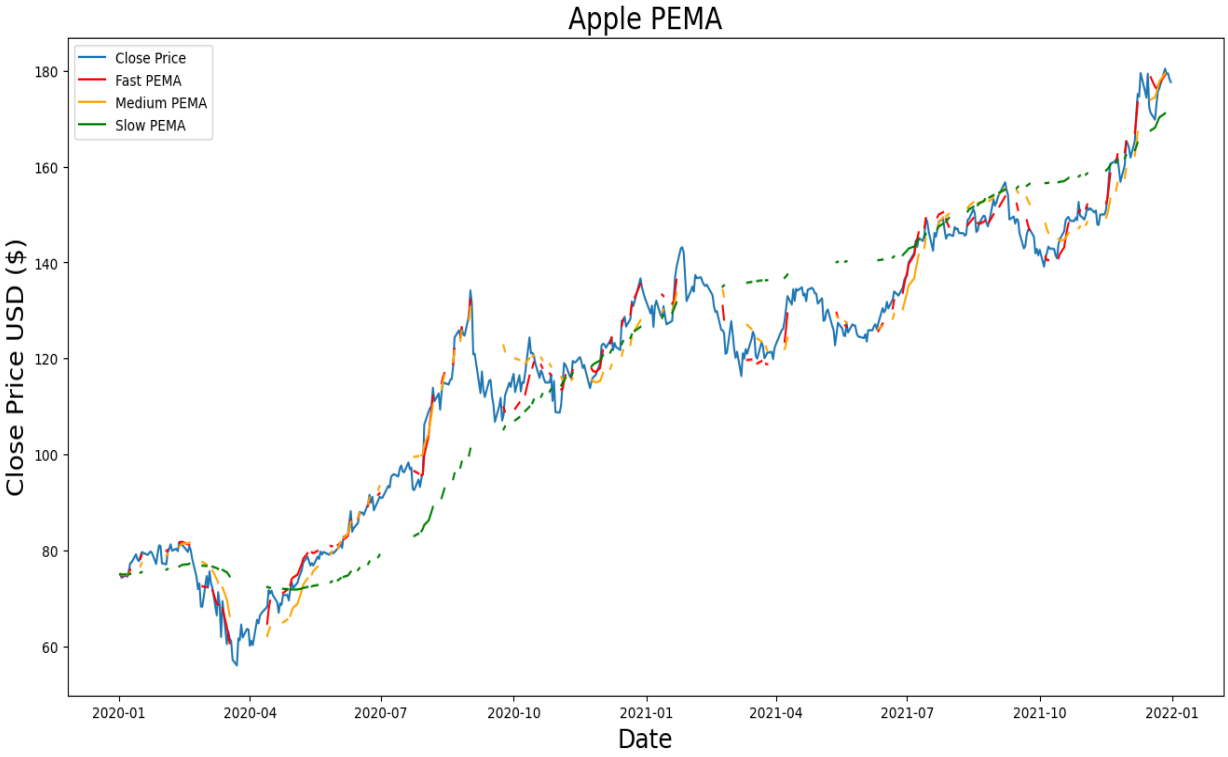
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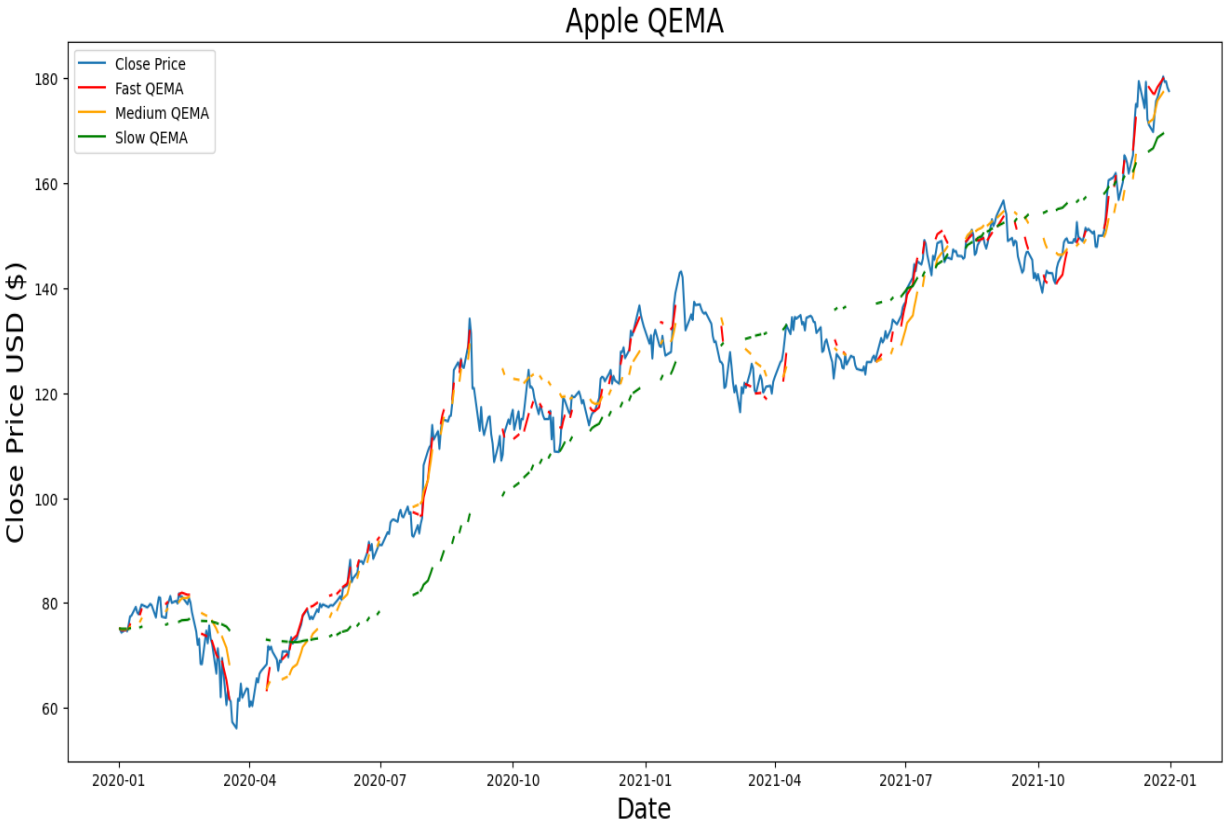
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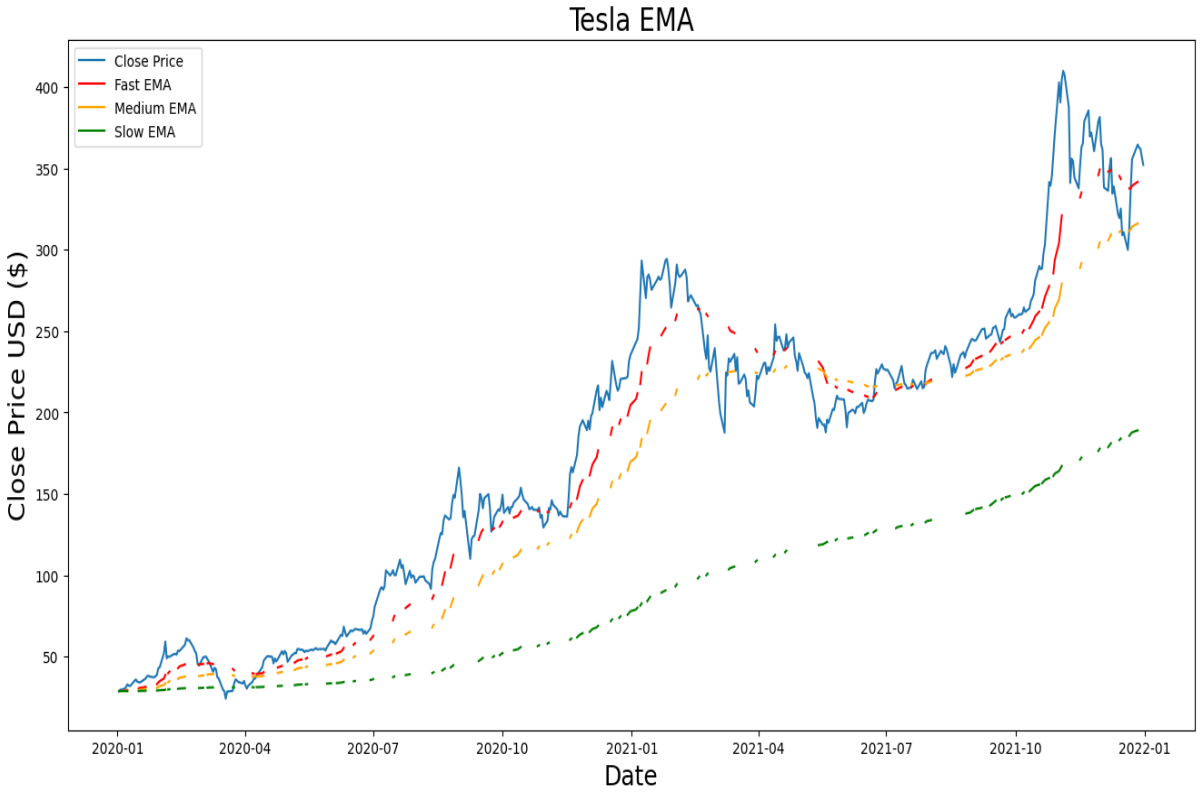
d) TESLA:-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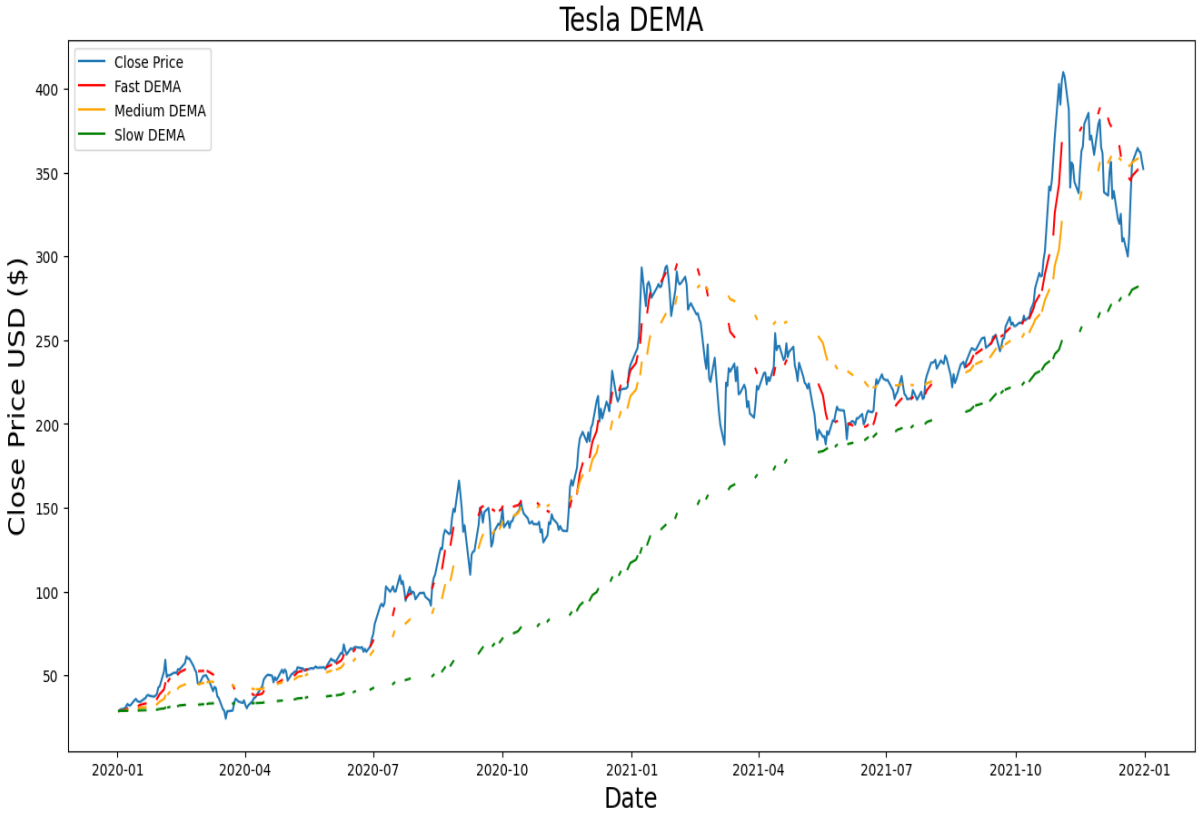
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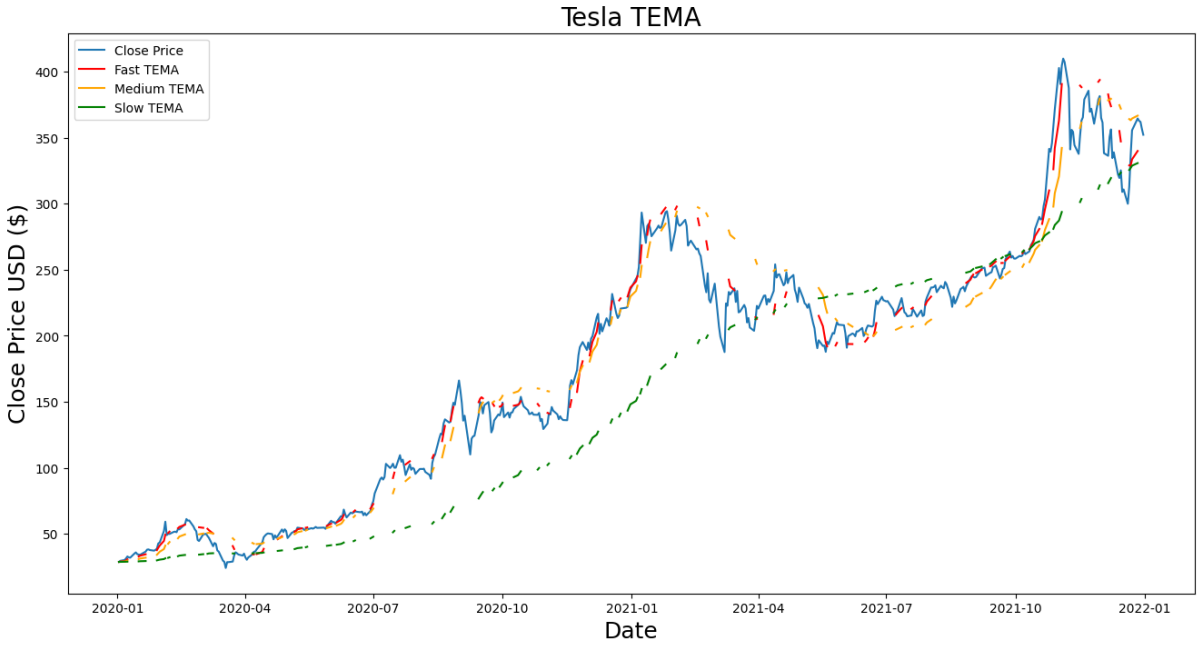
Tesla TEMA
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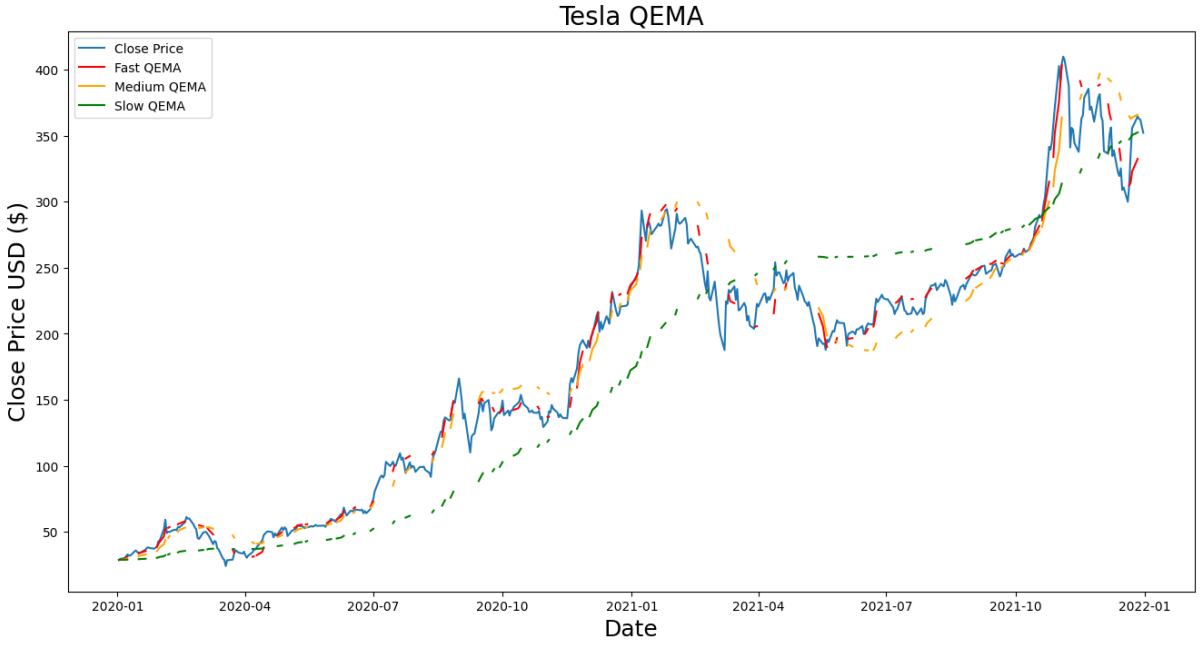
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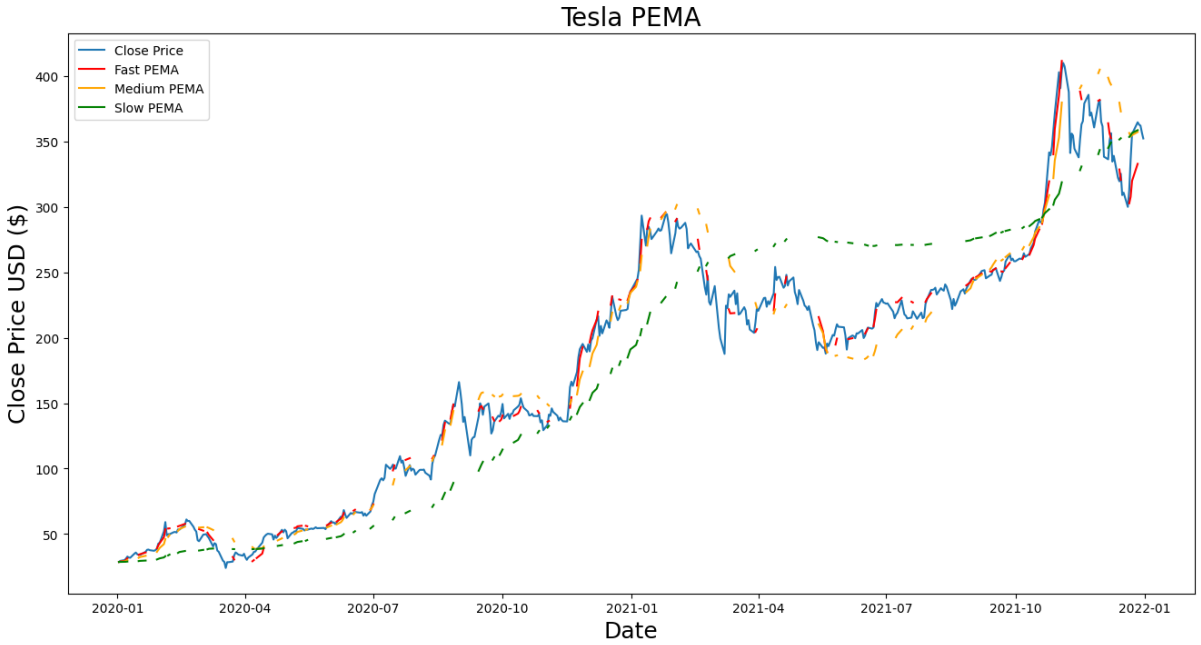
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e) ADANI:-


Adani EMA
Close Price
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Medium EMA
Slow EMA
Close Price USD ($)
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Adani DEMA
Close Price
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Adani TEMA
Close Price
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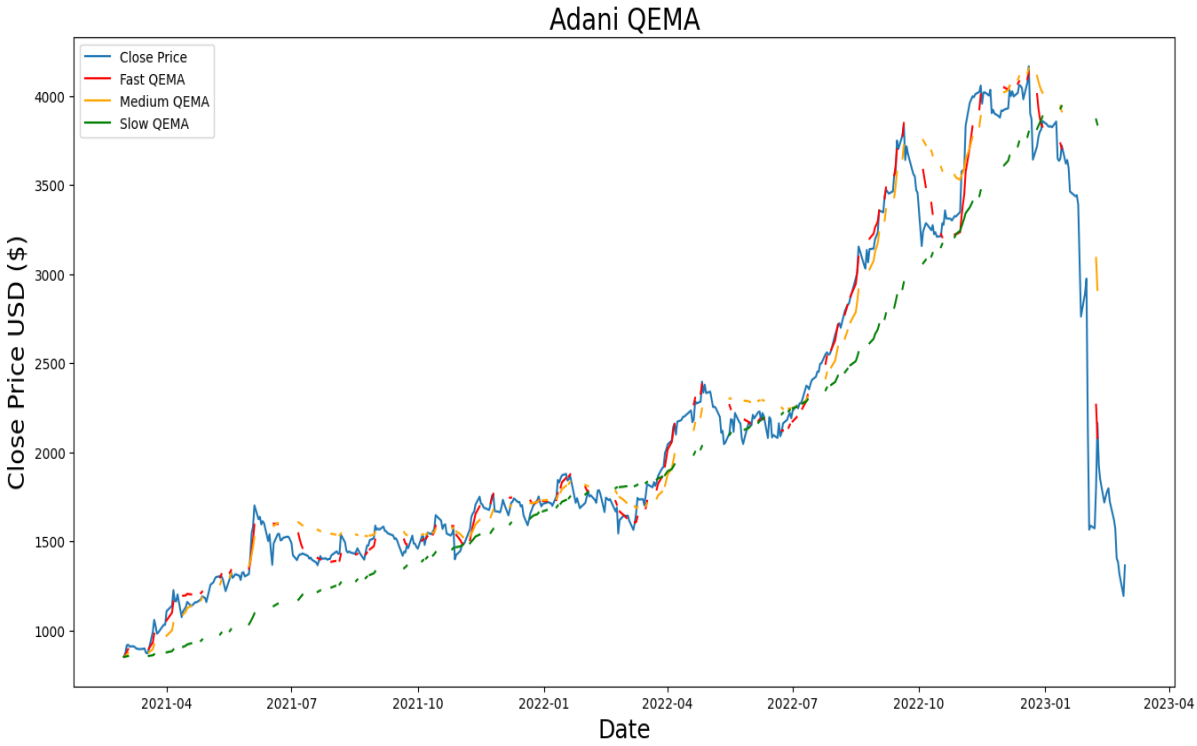
Adani QEMA
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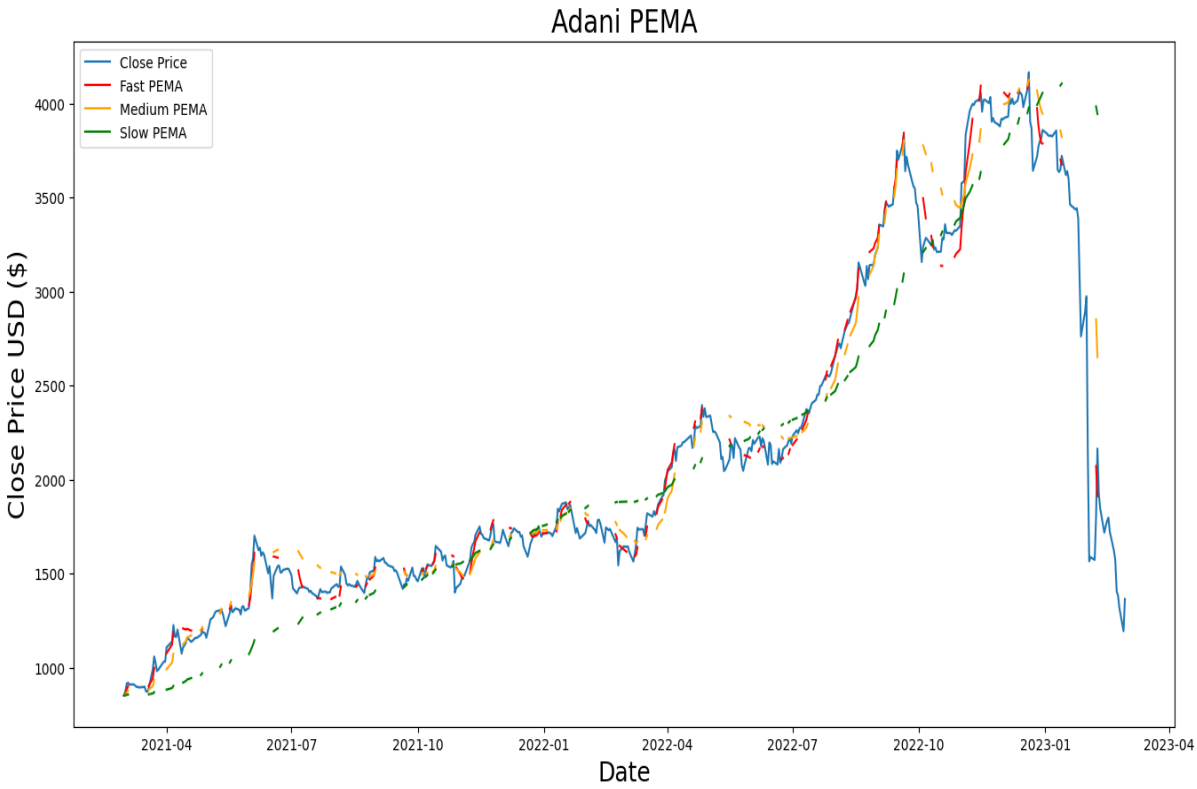
Adani PEMA
Close Price
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Close Price USD ($)
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4. BUY AND SELL SIGNALS:-

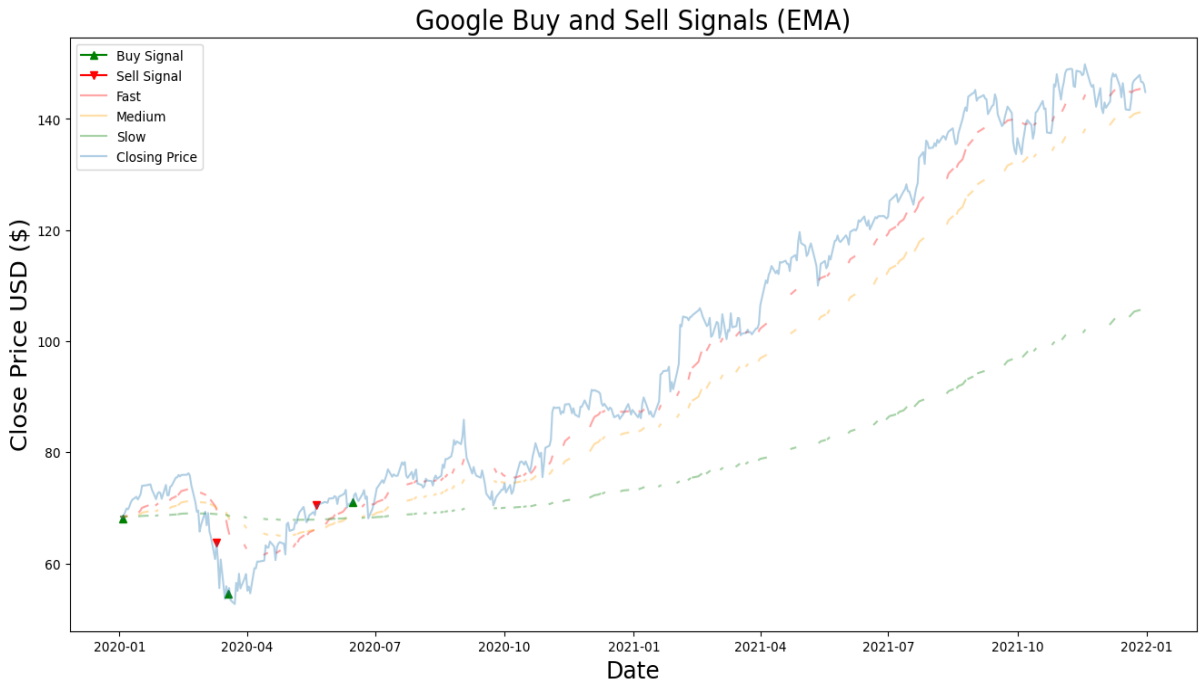
Here I have depicted points where a buy/sell signal should be sent.

I have also calculated Maximum Trade, Minimum Trade, number of times a trade signal(buy) is executed., Win Ratio and number of loss making trades.

a) GOOGLE

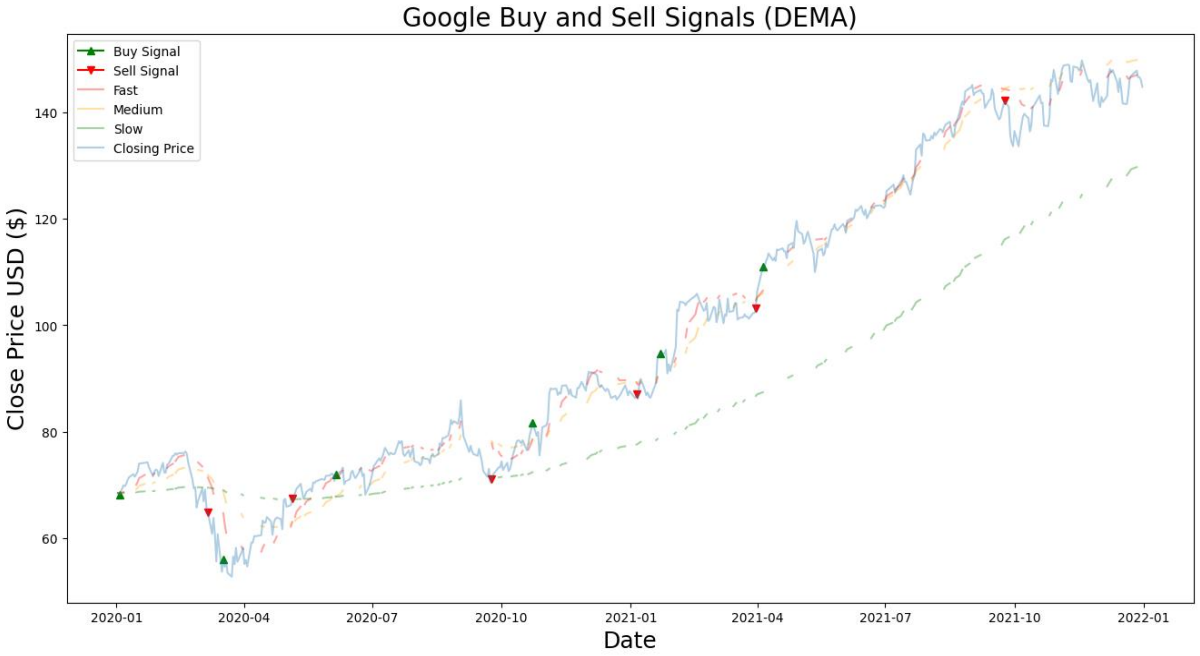
1. GOOGLE_EMA:-

- Maximum Profit = 29126.05
- Minimum Profit = -6338.09
- Number of trades (buy) = 3
- Win Ratio= 0.5
- Number of loss making trades = 1



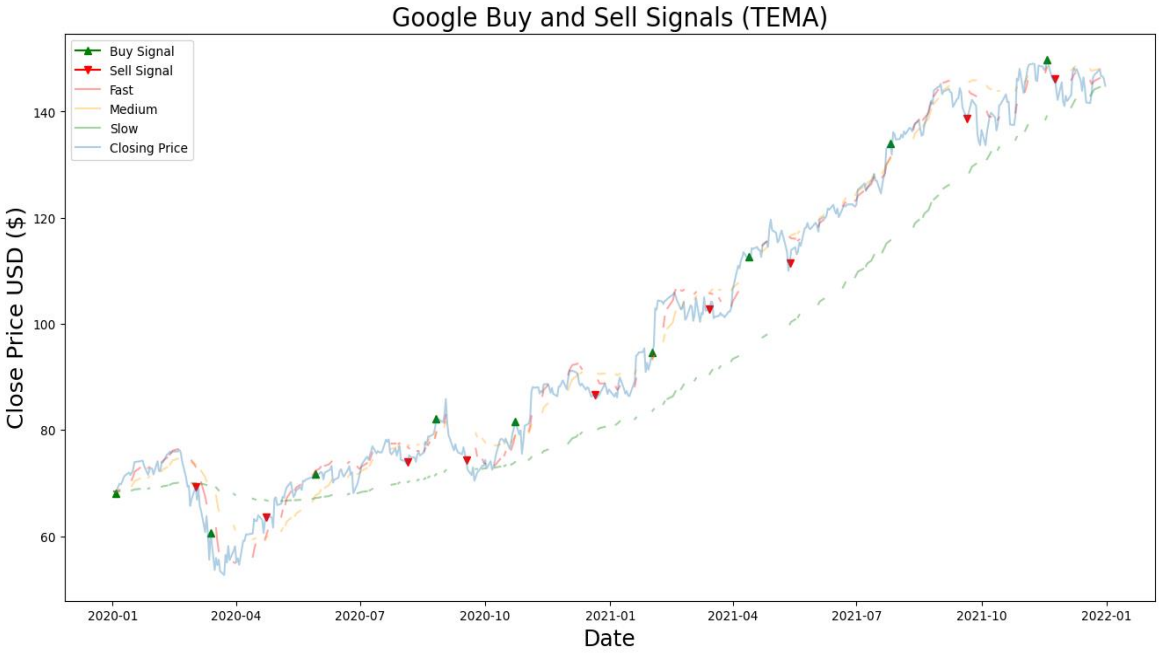
2. GOOGLE_DEMA:-

- Maximum Profit = 28171.56
- Minimum Profit = -4828.243
- Number of trades (buy) = 6
- Win ratio =0.66
- Number of loss making trades = 2



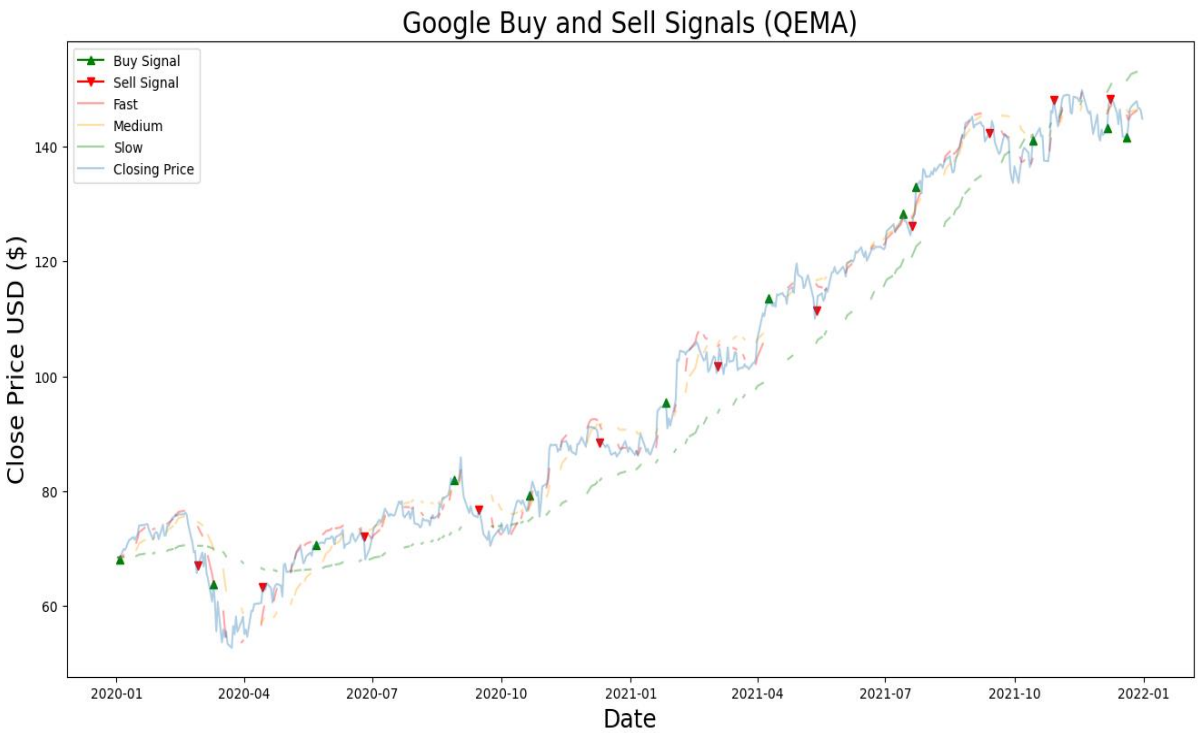
3. GOOGLE_TEMA:-

- Maximum Profit = 8520.33
- Minimum Profit = -9551.07
- Number of trades (buy) = 9
- Win ratio=0.5555
- Number of loss making trades = 4



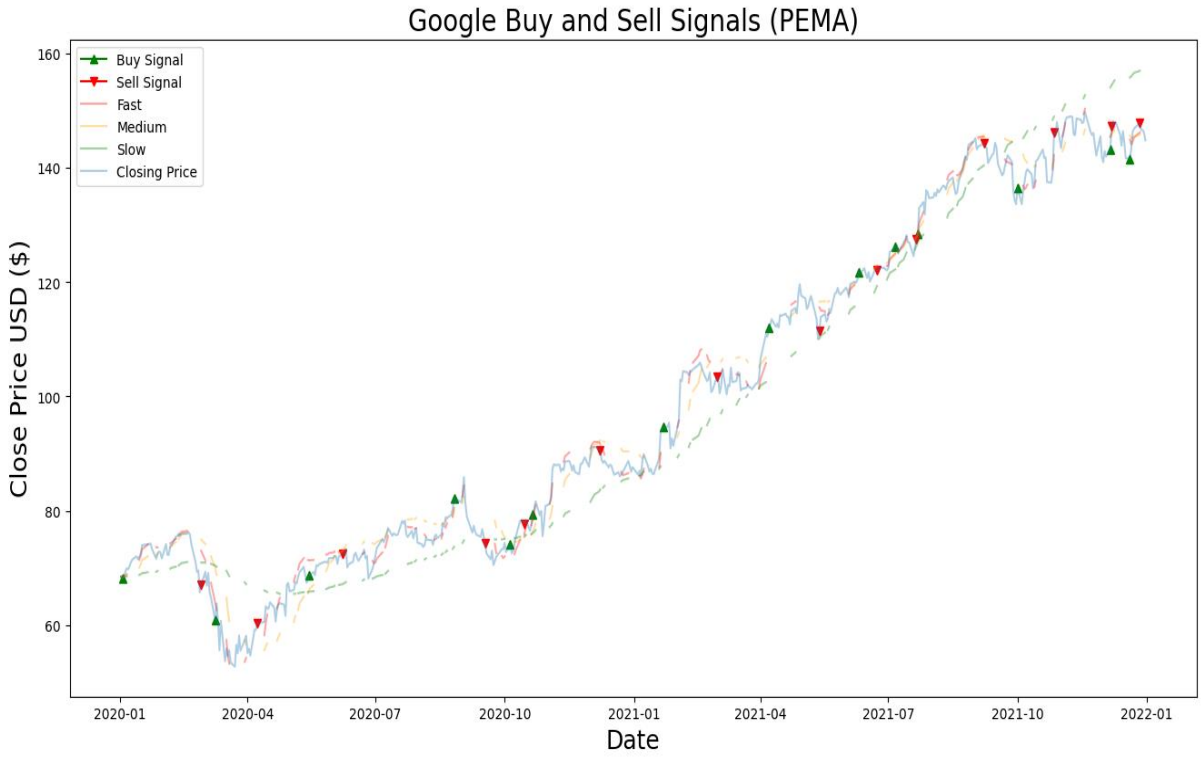
4. GOOGLE_QEMA:-

- Maximum Profit = 11453.66
- Minimum Profit = -6357.7
- Number of trades (buy) = 12
- Win Ratio =0.5454
- Number of loss making trades = 5



5. GOOGLE_PEMA:-

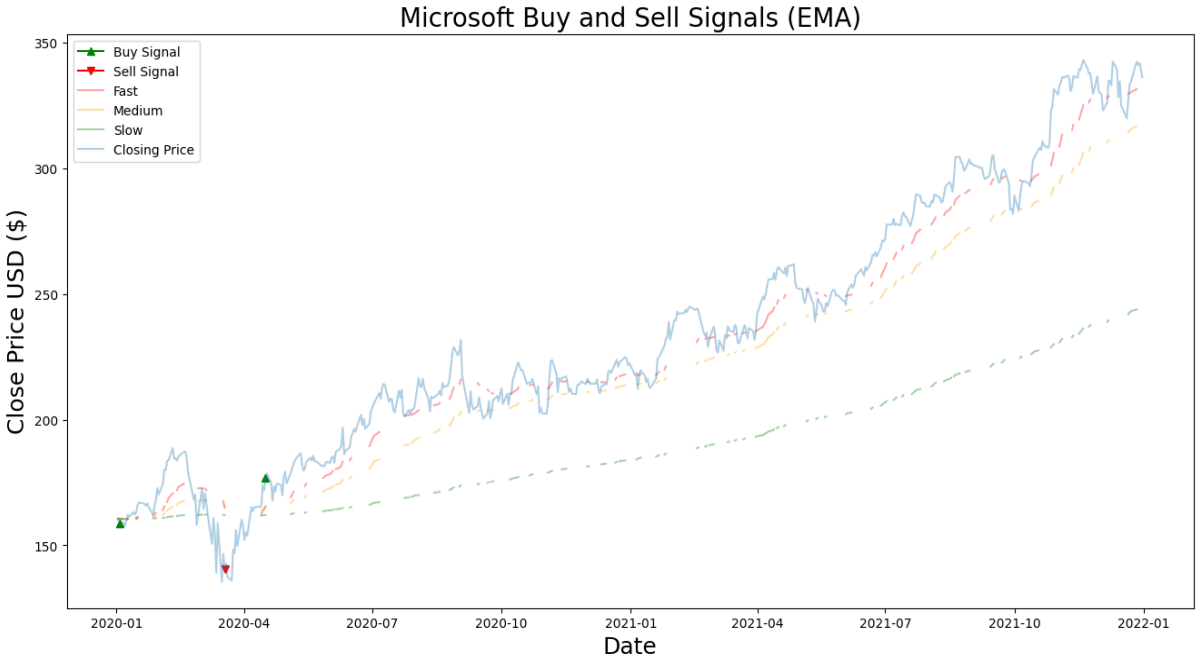
- Maximum Profit = 14207.68
- Minimum Profit = -9551.07
- Number of trades (buy) = 14
- Win ratio=0.714
- Number of loss making trades = 1



b) <u>MICROSOFT</u>

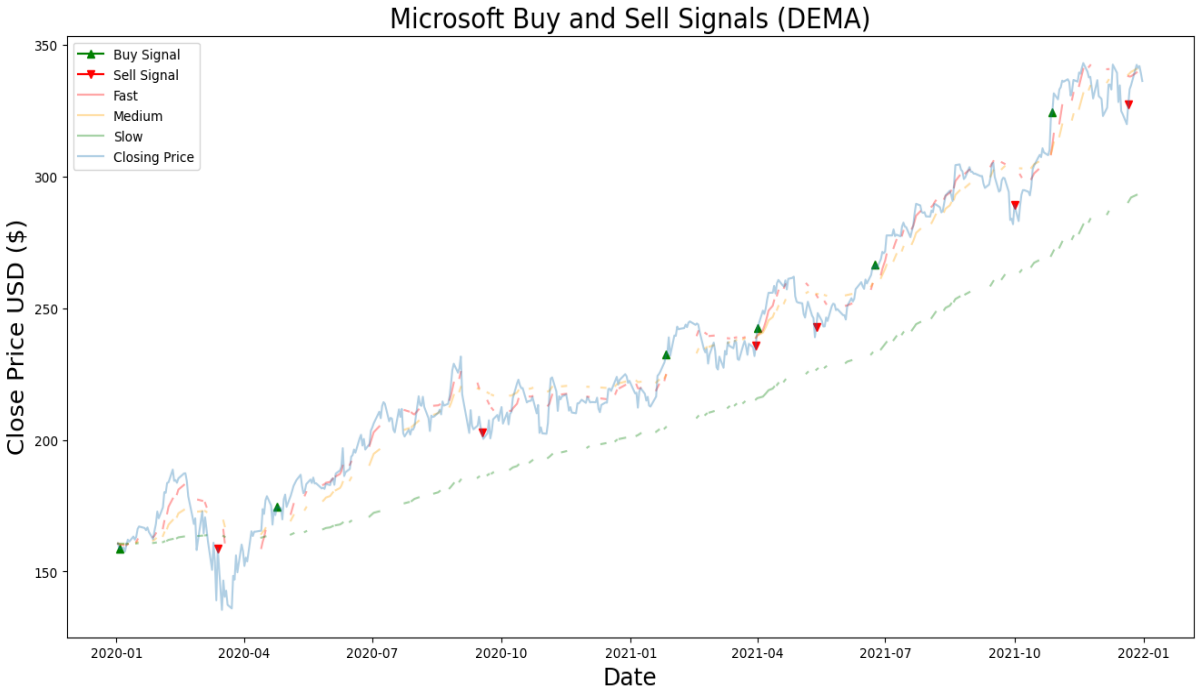
1. MICROSOFT_EMA:-

- Maximum Profit = -11478
- Minimum Profit = -11478
- Number of trades (buy) = 2
- Win Ratio = 0
- Number of loss making trades = 1



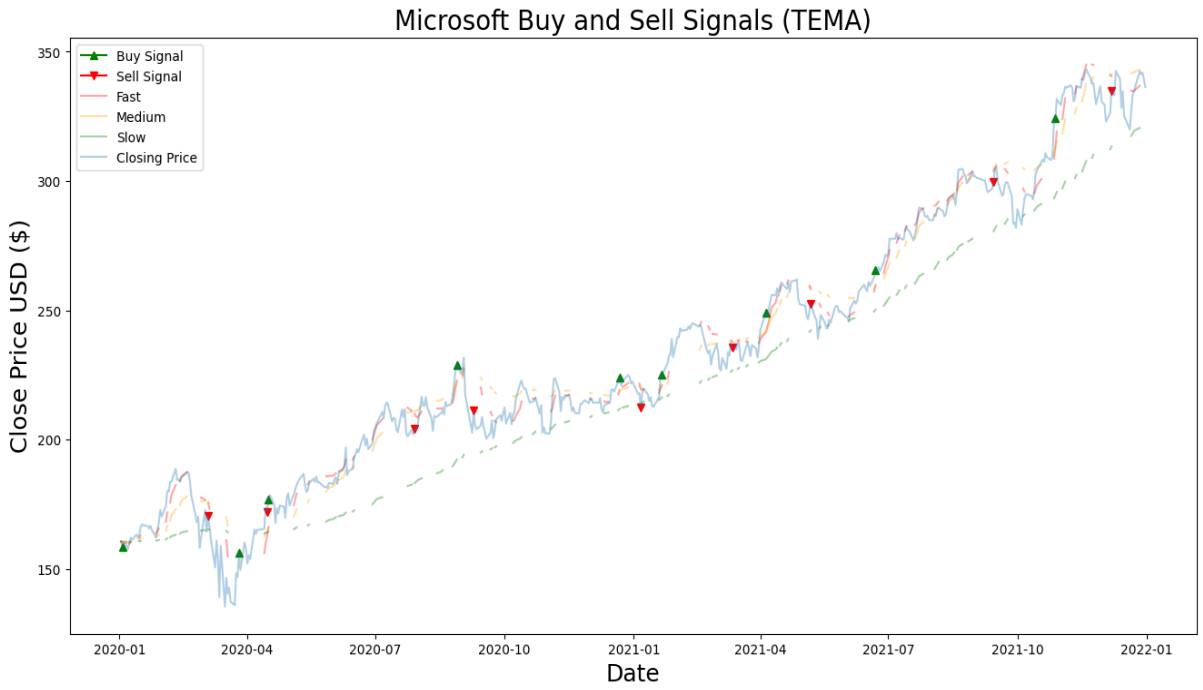
2. MICROSOFT_DEMA:-

- Maximum Profit = 16221.92
- Minimum Profit = 132.30
- Number of trades (buy) = 6
- Win ratio = 0.833
- Number of loss making trades = 1



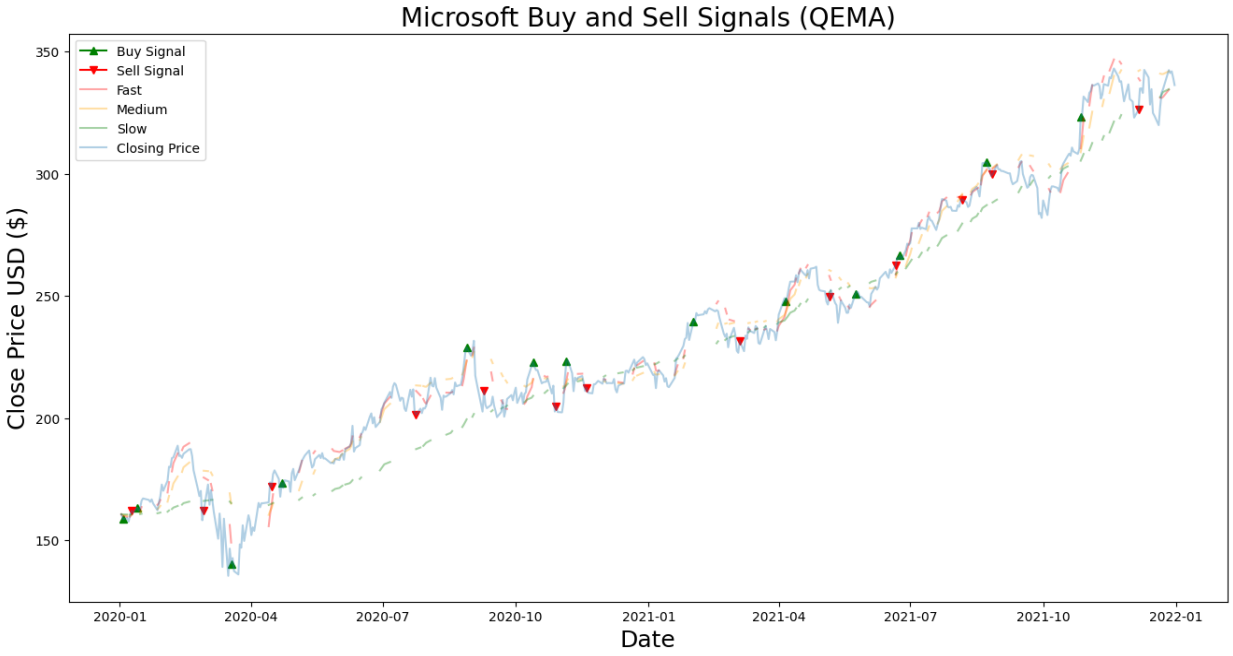
3. MICROSOFT_TEMA:-

- Maximum Profit = 15239
- Minimum Profit = -7682
- Number of trades (buy) = 9
- Win Ratio =0.66
- Number of loss making trades = 1



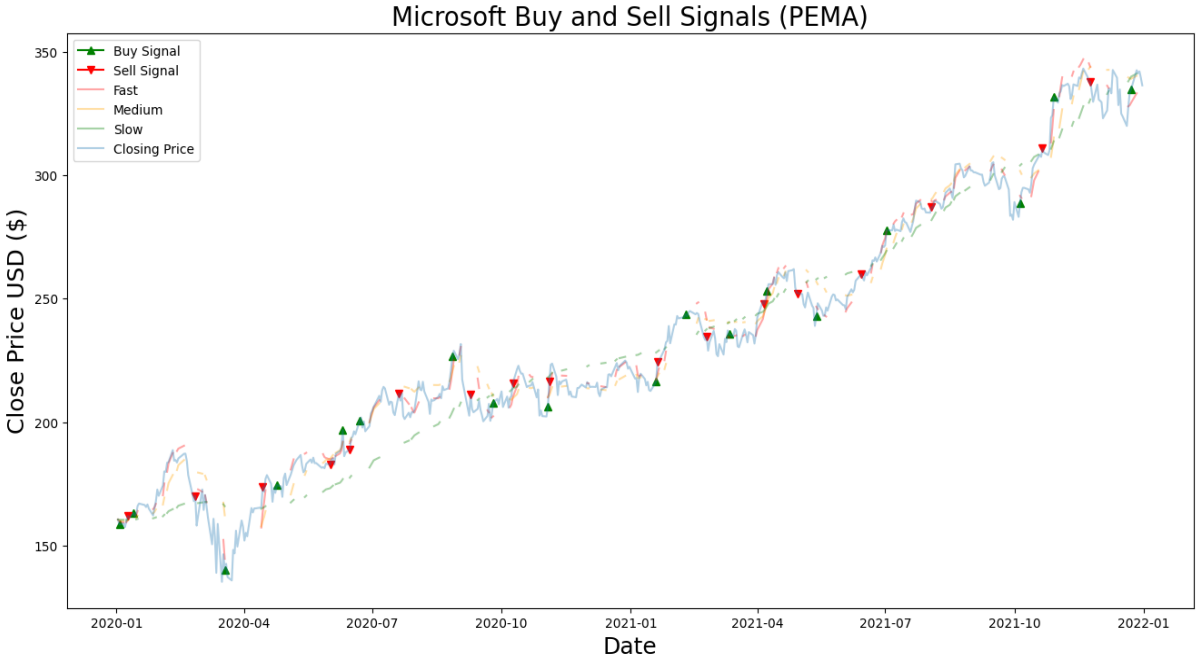
4. MICROSOFT_QEMA:-

- Maximum Profit = 22413
- Minimum Profit = -8126.7
- Number of trades (buy) = 13
- Win Ratio =0.46
- Number of loss making trades = 1



5. MICROSOFT_PEMA:-

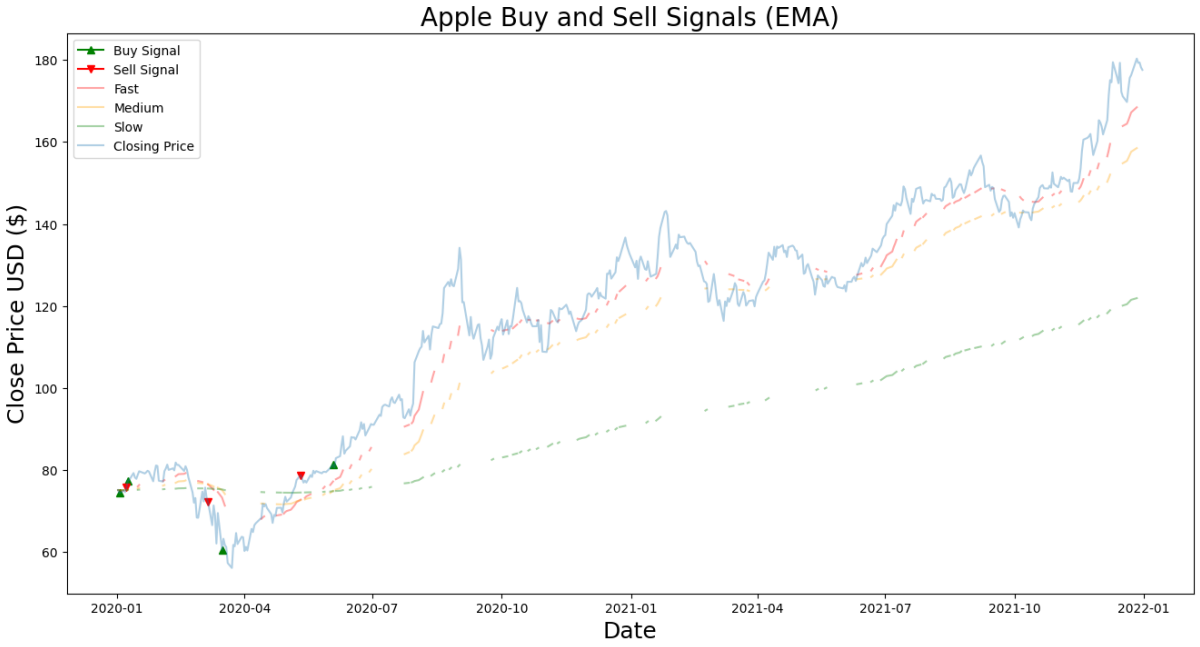
- Maximum Profit = 29126.05
- Minimum Profit = -6338.09
- Number of trades (buy) = 3
- Win Ratio = 0.705
- Number of loss making trades = 1



c) **APPLE**

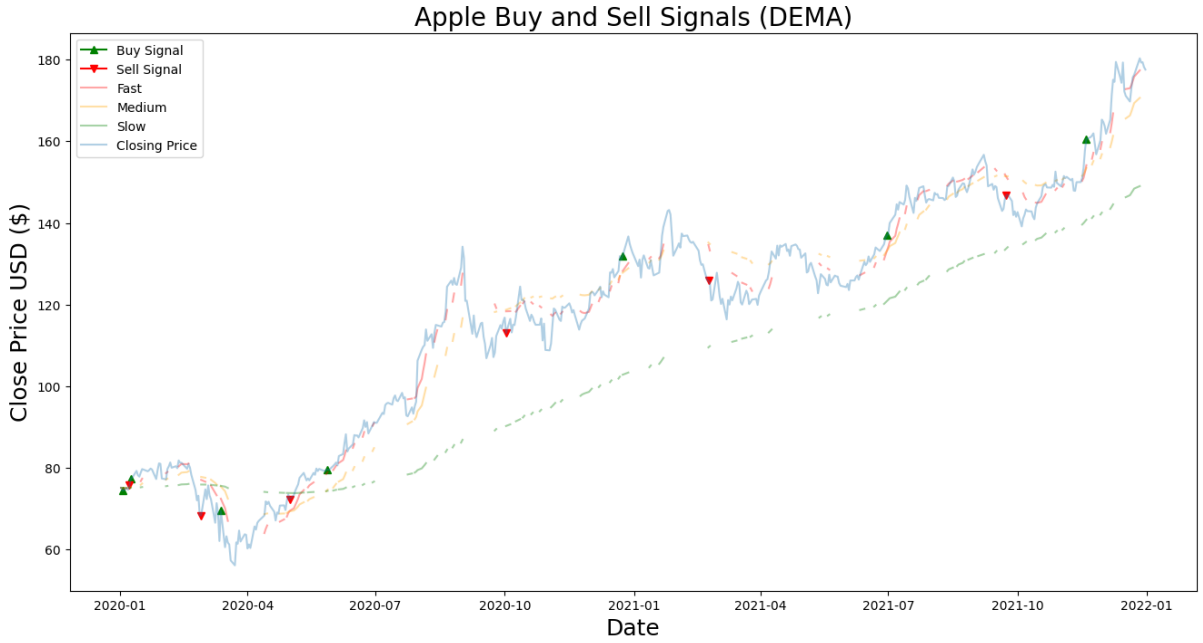
1. APPLE_EMA:-

- Maximum Profit = 30048.2
- Minimum Profit = -6648.65
- Number of trades (buy) = 4
- Win Ratio = 0.33
- Number of loss making trades = 1



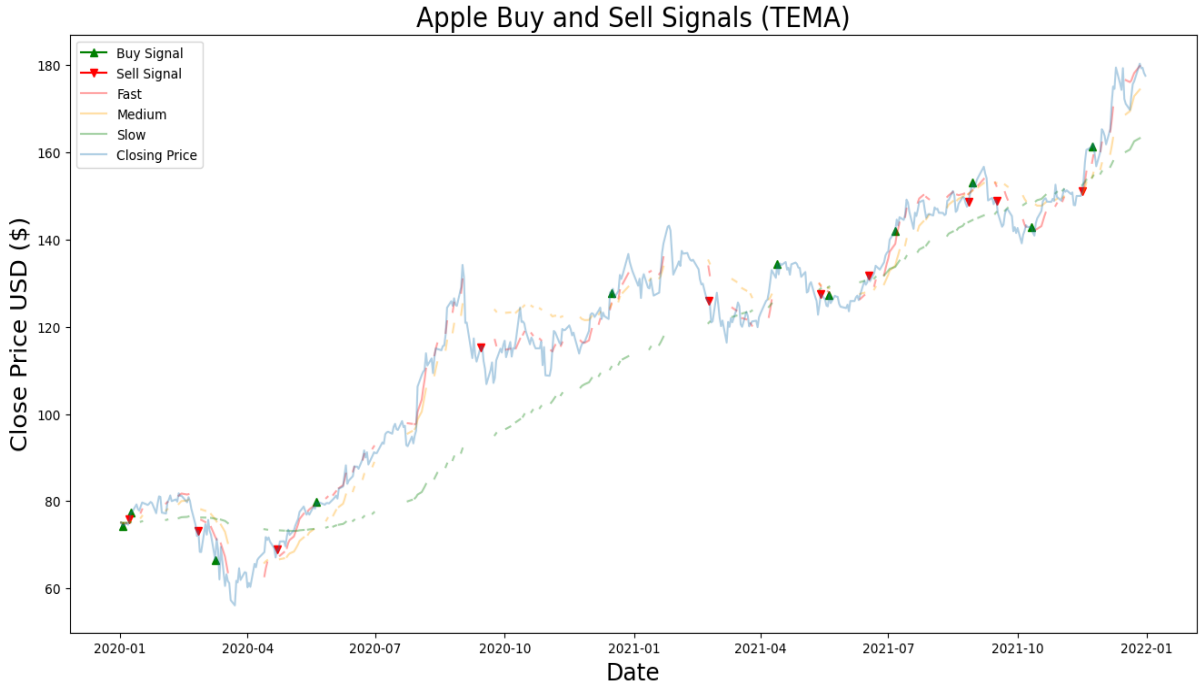
2. APPLE_DEMA

- Maximum Profit = 42022.61
- Minimum Profit = -11706.15
- Number of trades (buy) = 7
- Win Ratio = 0.5
- Number of loss making trades = 1



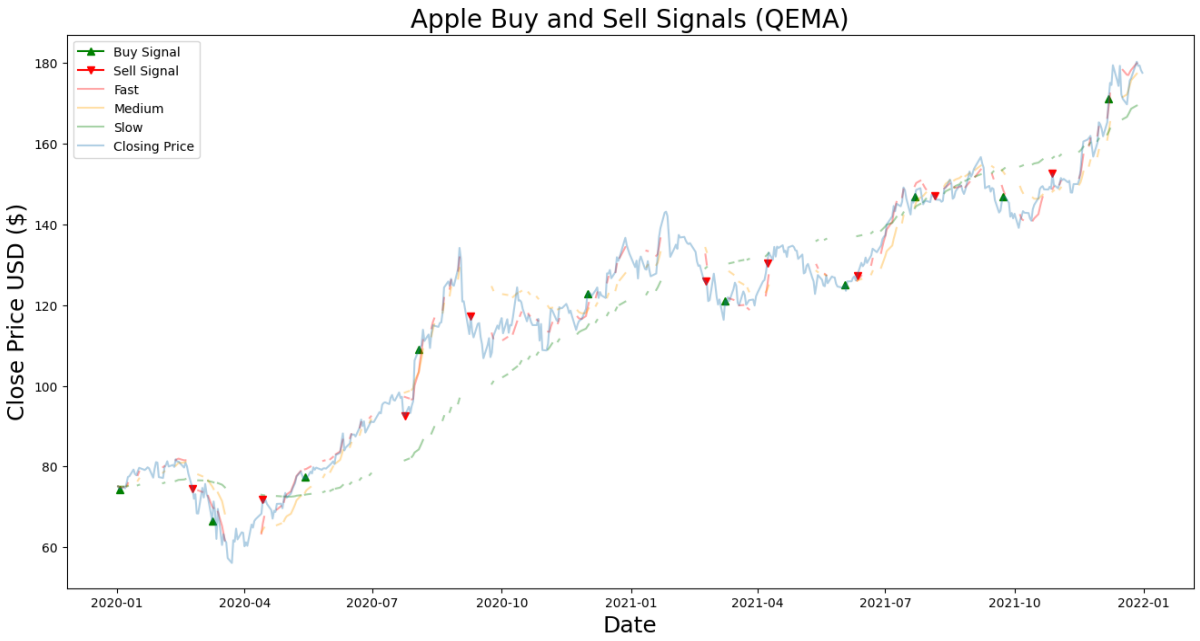
3. APPLE_TEMA

- Maximum Profit = 44547.28
- Minimum Profit = -11706.15
- Number of trades (buy) = 11
- Win Ratio = 0.5
- Number of loss making trades = 1



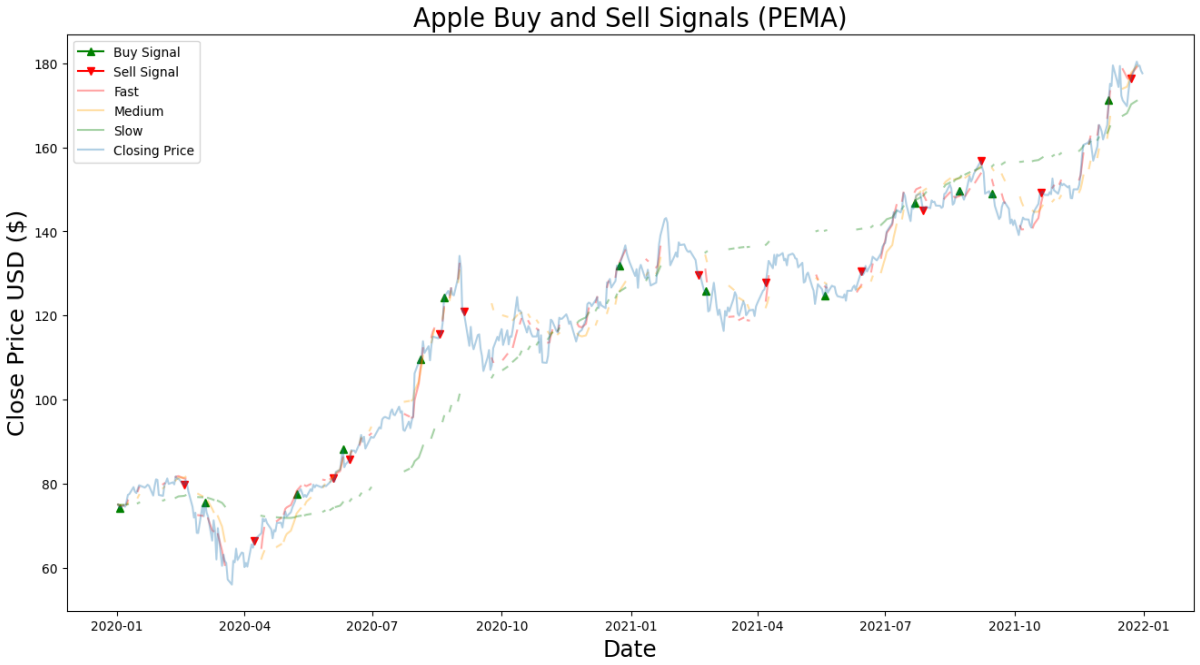
4. APPLE_QEMA

- Maximum Profit = 19677.15
- Minimum Profit = 177.05
- Number of trades (buy) = 10
- Win Ratio =0.88
- Number of loss making trades = 1



5. APPLE_PEMA

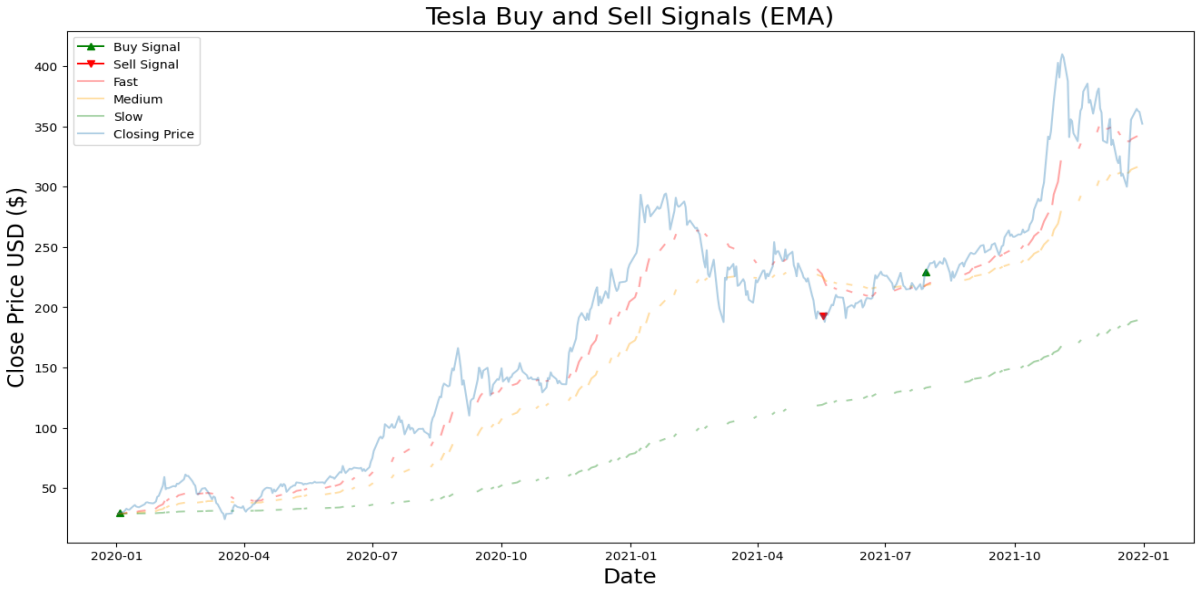
- Maximum Profit = 7247.52
- Minimum Profit = -12110.26
- Number of trades (buy) = 13
- Win Ratio =0.538
- Number of loss making trades = 1



d) TESLA

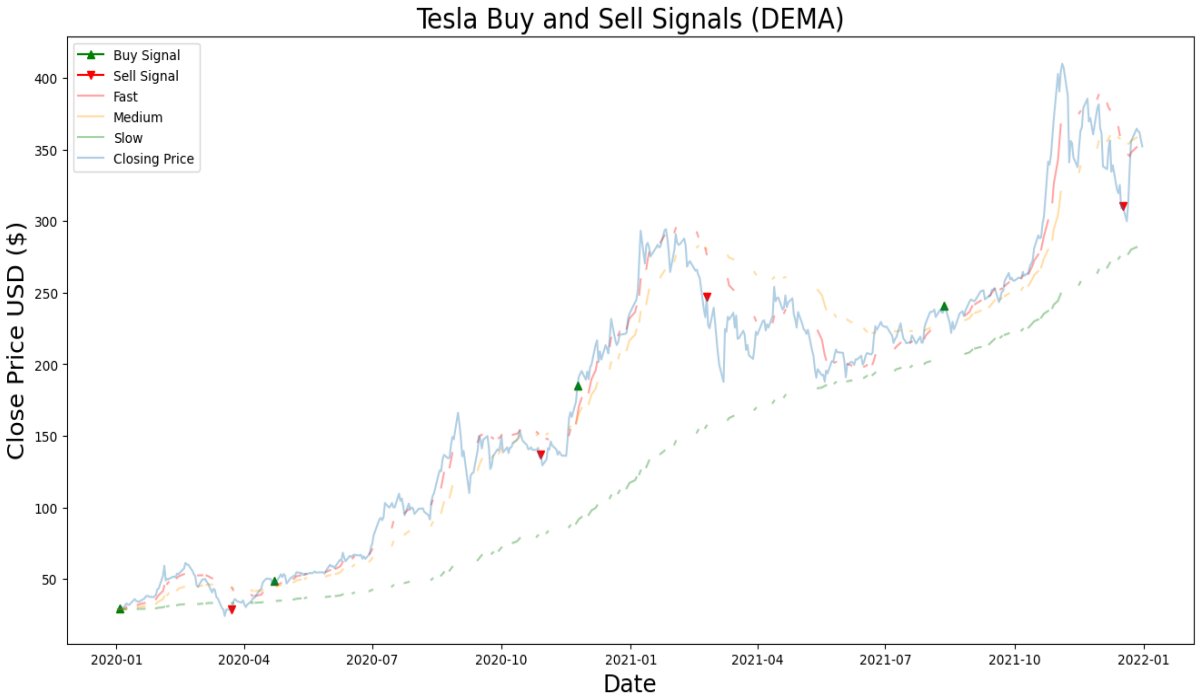
1. TESLA_EMA

- Maximum Profit = 552057.4
- Minimum Profit = 55207.4
- Number of trades (buy) = 2
- Win Ratio =0
- Number of loss making trades = 1



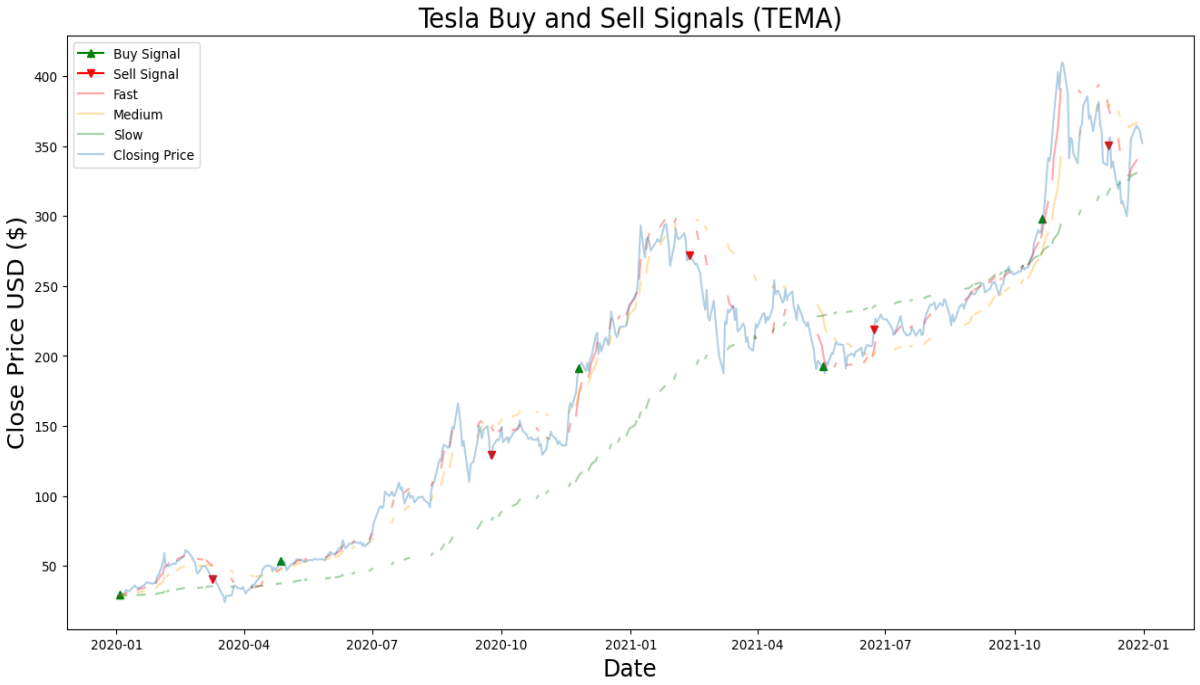
2. TESLA_DEMA

- Maximum Profit = 180502.515
- Minimum Profit = -1967.81
- Number of trades (buy) = 4
- Win Ratio =0.75
- Number of loss making trades = 1



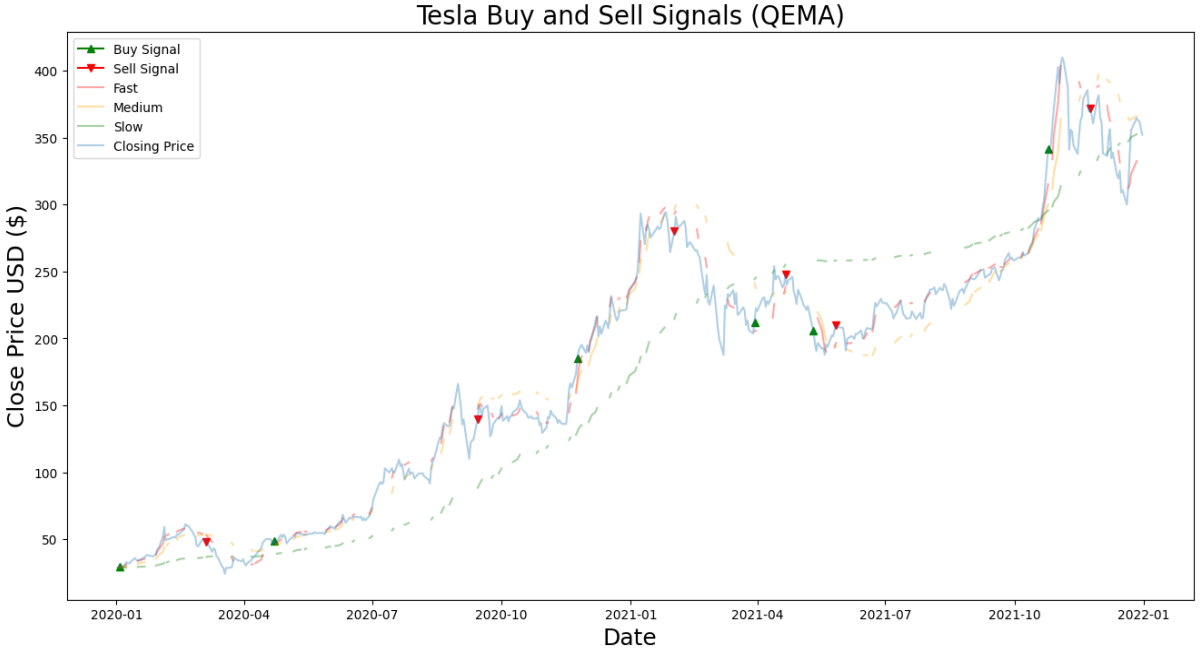
3. TESLA_TEMA

- Maximum Profit = 142667.032
- Minimum Profit = -13615.10
- Number of trades (buy) = 5
- Win Ratio =0.8
- Number of loss making trades = 1



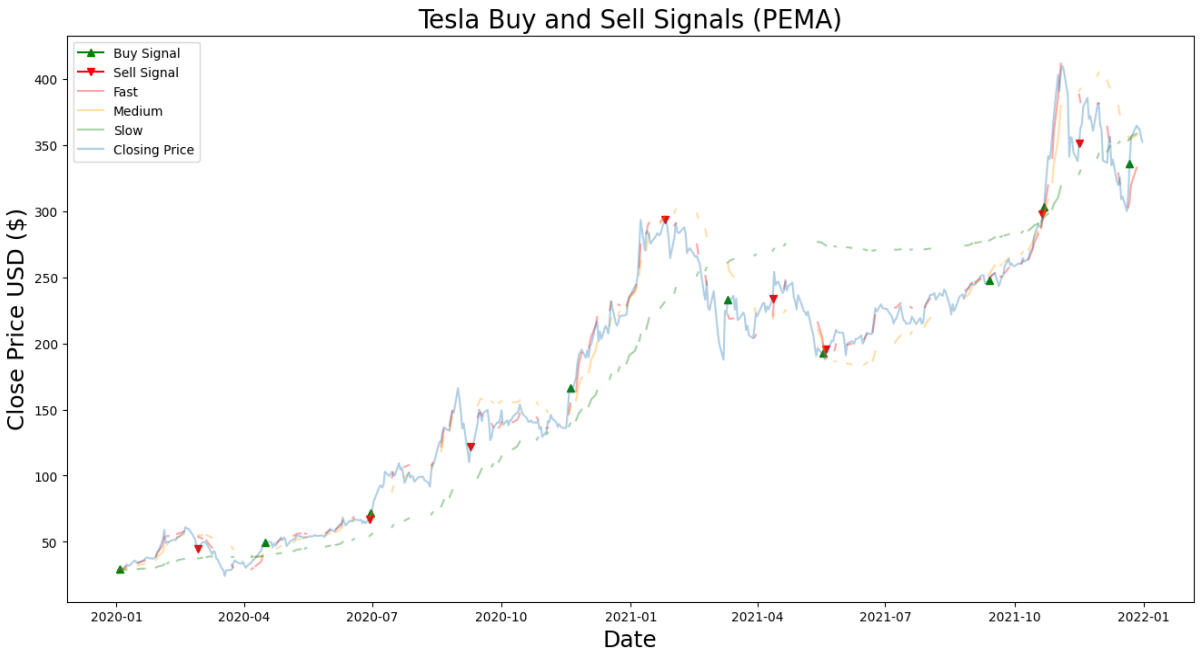
4. TESLA_QEMA

- Maximum Profit = 186503.1718
- Minimum Profit = 2211.30
- Number of trades (buy) = 6
- Win Ratio = 0.833
- Number of loss making trades = 1



5. TESLA_PEMA

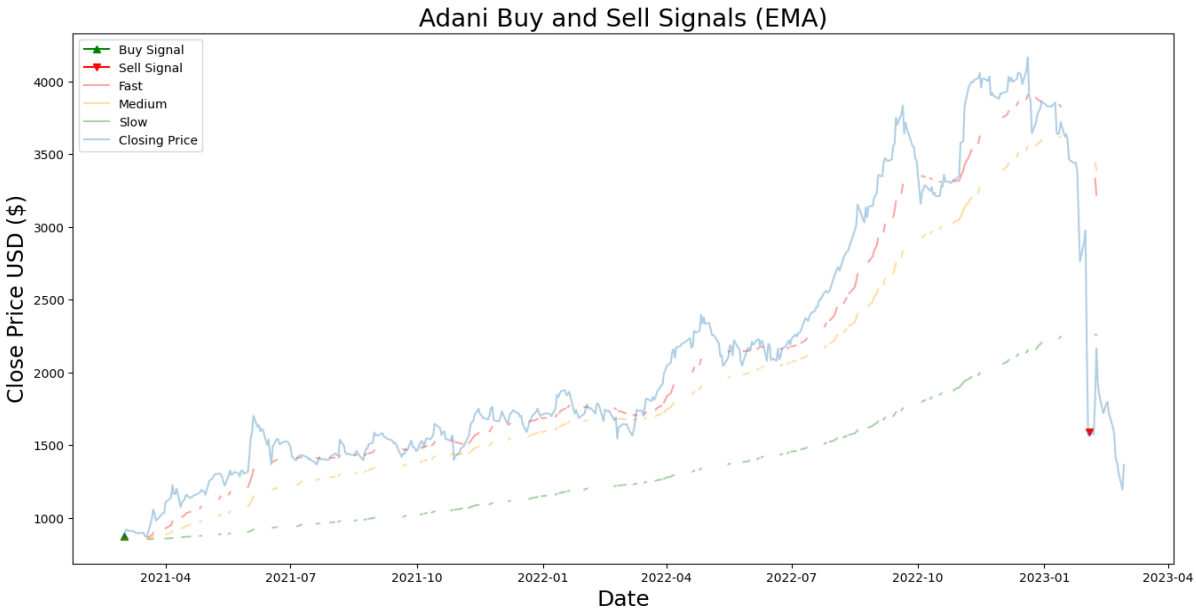
- Maximum Profit = 76306
- Minimum Profit = 339.54
- Number of trades (buy) = 9
- Win Ratio = 0.875
- Number of loss making trades = 1



e) ADANI

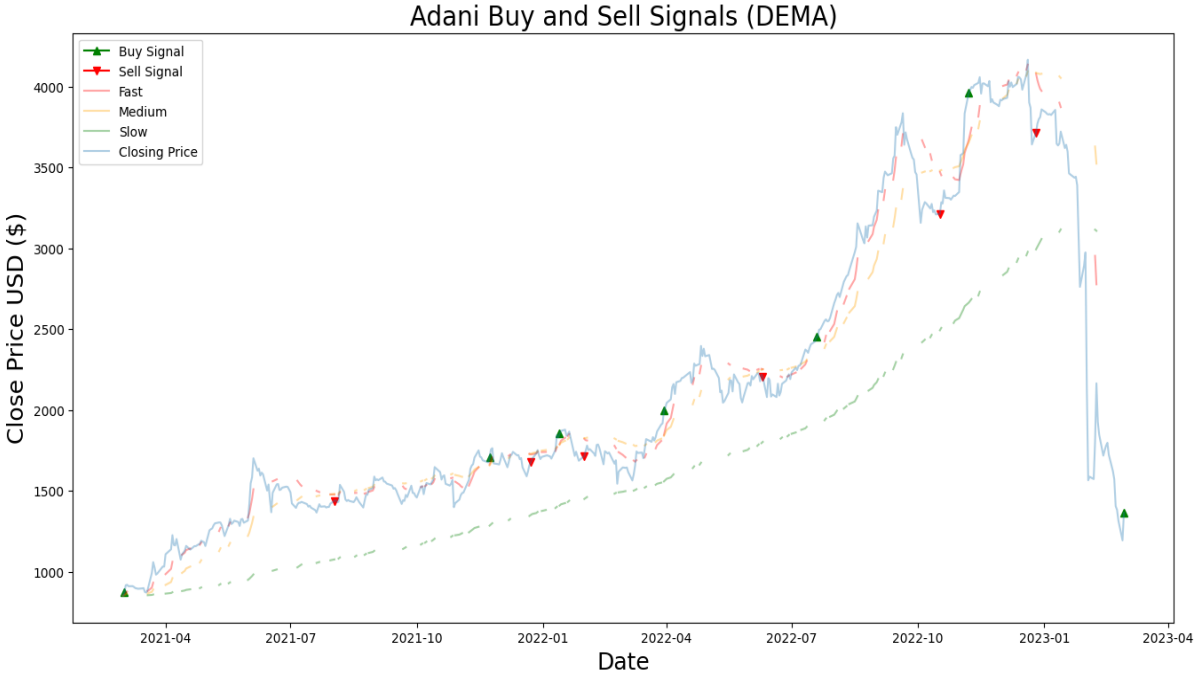
1. ADANI_EMA

- Maximum Profit = 81428.5
- Minimum Profit = 81428.5
- Number of trades (buy) = 1
- Win Ratio =0
- Number of loss making trades = 1



2. ADANI_DEMA

- Maximum Profit = 64484.095
- Minimum Profit = -7335.20
- Number of trades (buy) = 7
- Win Ratio = 0.33
- Number of loss making trades = 1

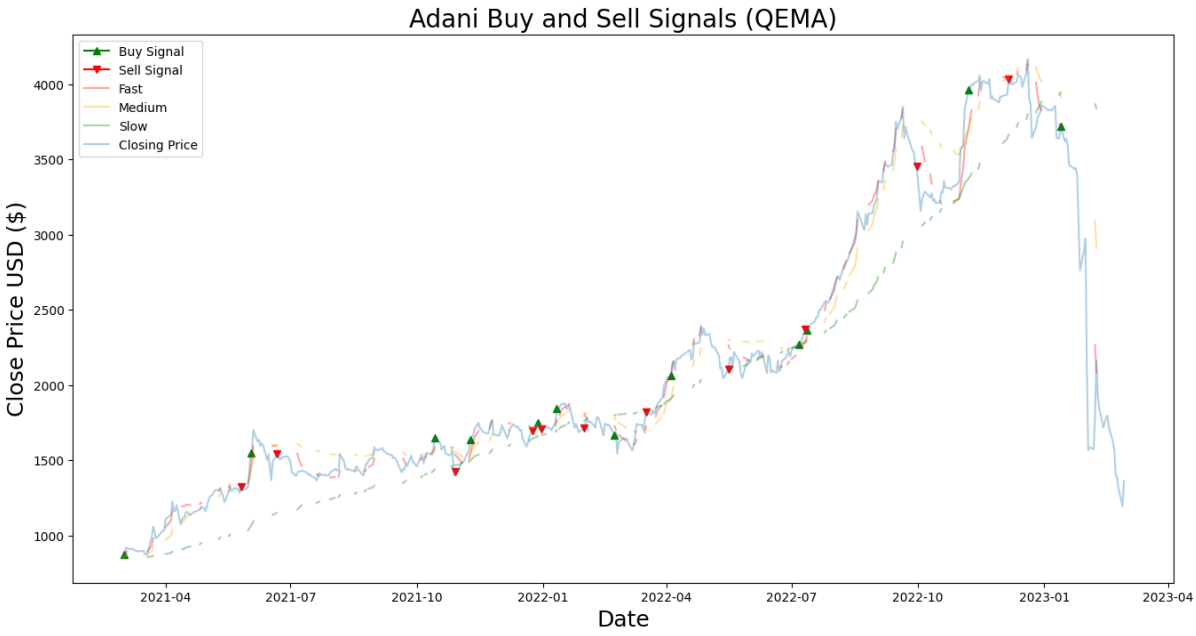


3. ADANI_TEMA

- Maximum Profit = 63053.404
- Minimum Profit = -7335.20
- Number of trades (buy) = 7
- Win Ratio = 0.33
- Number of loss making trades = 1

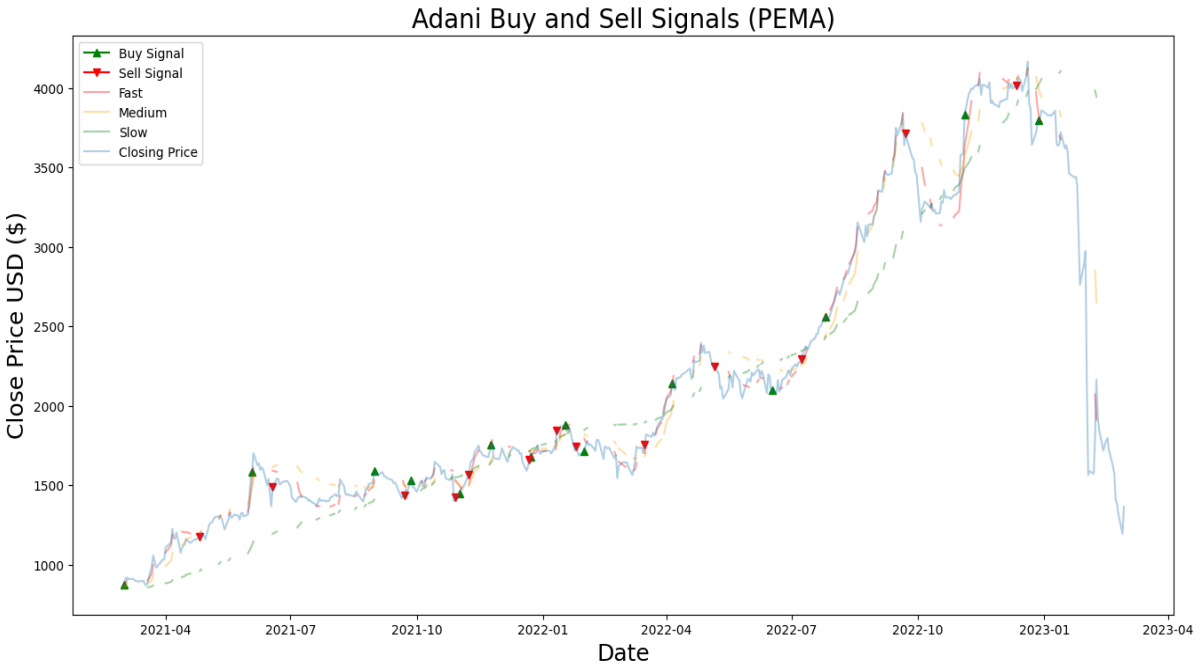
4. ADANI_QEMA

- Maximum Profit = 51328.5
- Minimum Profit = -13365
- Number of trades (buy) = 12
- Win Ratio = 0.54
- Number of loss making trades = 1



5. ADANI_PEMA

- Maximum Profit = 45107.4
- Minimum Profit = -9290.7
- Number of trades (buy) = 14
- Win Ratio =0.54
- Number of loss making trades = 1



5) Returns, ROI, AROI, Sharpe , Drawdown

The csv file stores the returns, drawdown, sharpe , return of Investment and annualised return of Investment for all the different indicators, along with the maximum of all these properties. The reason behind storing the maximum is so as to analyse the final returns. In my strategy, I have used five different indicators in order to execute those trade signals which provide the maximum returns. (Investement=1,00,000.)

a) GOOGLE:-

The returns are maximised from using the EMA indicator. So we execute the trade signals arising from that.

- Returns = 126645.7
- ROI = 126%
- AROI = 50%
- Sharpe = 1.657974
- Drawdown = 0.265615
- Benchmark Returns=111666.7285
- Final Portfolio Value=226645.7

b) MICROSOFT:-

The returns are maximised from using the EMA indicator. So we execute the trade signals arising from that.

- Returns = 78355.33
- ROI = 78.35%
- AROI = 33.54%
- Sharpe = 1.0374767

- Drawdown = 0.297258
- Benchmark Returns=109388.63
- Final Portfolio Value=178355.33

c) APPLE:-

The returns are maximised from using the EMA indicator. So we execute the trade signals arising from that.

- Returns = 143771.6
- ROI = 143.77%
- AROI = 56.131%
- Sharpe = 1.552
- Drawdown = 0.35824
- Benchmark Returns=136484.106
- Final Portfolio Value= 243771.6

d)TESLA:-

The returns are maximised from using the EMA indicator. So we execute the trade signals arising from that.

- Returns = 605769.7
- ROI = 605.77%
- AROI = 165.6633%
- Sharpe = 0.988
- Drawdown = 0.474
- Benchmark Returns=1128071.43
- Final Portfolio Value =705769.7

e) ADANI:-

The returns are maximised from using the DEMA indicator. So we execute the trade signals arising from that.

- Returns = 90055.65
- ROI = 90.05565
- AROI = 37.86067%
- Sharpe = 1.06
- Drawdown = 0.64
- Benchmark Returns=60170.28
- Final Portfolio Value=190055.65

6) Further Development of My strategy

a) Risk Management :-

- By using an indicator like Relative Strength Index (RSI) , buy and sell signals can be confirmed as it gives an idea about those stocks which are overbought/oversold.
- For example- When a buy signal would be generated, I would check whether the RSI is above 30 (indicating potential bullish momentum) to confirm the trade.

b) Diversification:-

- Currently my strategy is only over stocks of giant tech companies, as they saw a huge boom from the beginning of 2020 to beginning of 2022. (the

pandemic years). I would further diversify my portfolio by incorporating other stocks, and analyse my strategy's performance.

- I would also inculcate bonds or commodities for diversification, so as to reduce risk.

c) Market Condition:-

- Testing my stocks over bullish / bearish period would ensure that the strategy has a uniform performance throughout.

7) Insights Gained:-

- I have used exponentially moving averages(EMA) as my trade indicators. The process of writing the python functions for all the EMAs has helped to understand the logic and reasoning behind calculating it.
- The EMA crossover strategy, where short term EMA and long term EMA have been compared provide insights into stock performance over short and long durations.
- I have stressed upon selecting the right EMA, in order to have the best results. Different EMAs provide different results, allowing me to bring adaptability to my strategy.
- By analysing the historical performance of different stocks , we have emphasised upon tailoring the approach on individual assets.

- Furthermore, this project also gave me deep understanding about technical criteria like sharpe , drawdown, ROI ,etc ; the way they are calculated and the way they represent the strength of a particular strategy.

8) Summary:-

- To summarise my strategy, I would bring light upon the hypothesis that short duration trends mimic longer duration trends. I have used this theory in my project, to predict whether a buy or sell signal would be sent.
- My trading strategy uses various technical indicators with the aim to analyse market dynamics. I have focussed on bringing adaptability and flexibility , by making sure that the strategy is dynamic, as in using the indicator which provides the best results.
- The returns that my strategy has provided, is a clear indicator of it's strength. I had used ADANI stock so as to show that even a stock which underperformed during the chosen duration, provided positive results through my strategy.