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COS30018 - Option B - Task 7: Extension

In this task, we undertake the process to extending the current stock prediction system

RELATIVE STRENGTH INDEX(RSI) AND ITS CONCEPT

Relative Strength Index (RSI) measures the magnitude of recent price changes to evaluate overbought or oversold conditions in the price of a stock. The RSI is displayed as a line graph that moves between two extremes reading from 0 to 100. An RSI of 70 or above indicate that security is becoming overbought or overvalued and a reading of 30 or below indicates an oversold or undervalued condition.

Image Source: https://www.investopedia.com/terms/r/rsi.asp

Apart from reading overbought and oversold conditions, there are special features in RSI which can be used extended and used with other indicators which are as follow:

1. Trendline Application

2. Pattern Breakout

3. Advance breakout and breakdown

4. Role of 50

5. Failure Swing

HOW TO IMPLEMENT THE RSI INDICATOR

We want to calculate the relative strength of the `Adjusted Close` values of the data. The data here refers to the stock prices that we are taking from the `Yahoo` database.

1. Load the data

2. Calculate the relative values of the adjusted close price of the stock.

For this, we calculate the difference between two rows except the `NaN` values.

```
delta = data['Adj Close'].diff(1)

delta.dropna(inplace=True)
```

3. We need the positive and negative values compared to the previous values of the stocks so that we can calculate the average loss and average gain.

```
positive = delta.copy()

negative = delta.copy()
```

4. Since, we need the relative values, and the existing calculations would produce values that are negative so we only need those values for the positive which are greater than zero and this logic applies to the negative values as well.

```
positive[positive < 0] = 0

negative[negative > 0] = 0
```

5. Now, we can calculate the `average loss` and `average gain` for a time period. The default value for this time period is 14 but we are calculating the RSI values in a function so we can change the value for this time period easily.

```
days = days  # default is 14

average_gain = positive.rolling(window=days).mean()

average_loss = abs(negative.rolling(window=days).mean())
```

6. Now, we calculate the actual RSI value for every row. The formula for RSI is given above.

```
relative_strength = average_gain / average_loss

RSI = 100.0 - (100.0 / (1.0 + relative_strength))
```

7. These values can then be combined in a data frame and later be used to plot the values.

```
combined = pd.DataFrame()

combined['Adj Close'] = data['Adj Close']

combined['RSI'] = RSI
```

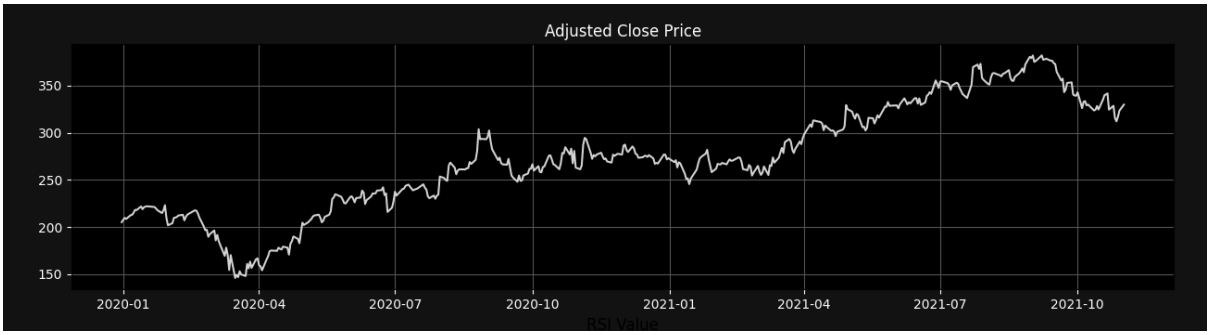
PLOTTING THE VALUES

We move to plotting values using the `matplot.lib`. We need to plot the `Adjusted Close` values for the stocks with their respective RSI indicator. Both the graphs share the `x` axis for dates. We also need the guiding horizontal lines to indicate overbought and oversold stocks.

1. We plot the combined data frame's index versus the adjusted close values.

```
# plotting the Adjusted Close value
plt.figure(figsize=(12, 8))
ax1 = plt.subplot(211)
ax1.plot(combined.index, combined['Adj Close'], color='lightgray')
ax1.set_title("Adjusted Close Price", color='white')


ax1.grid(True, color='#555555')
ax1.set_axisbelow(True)
ax1.set_facecolor('black')
ax1.figure.set_facecolor('#121212')
ax1.tick_params(axis='both', colors='white')
```



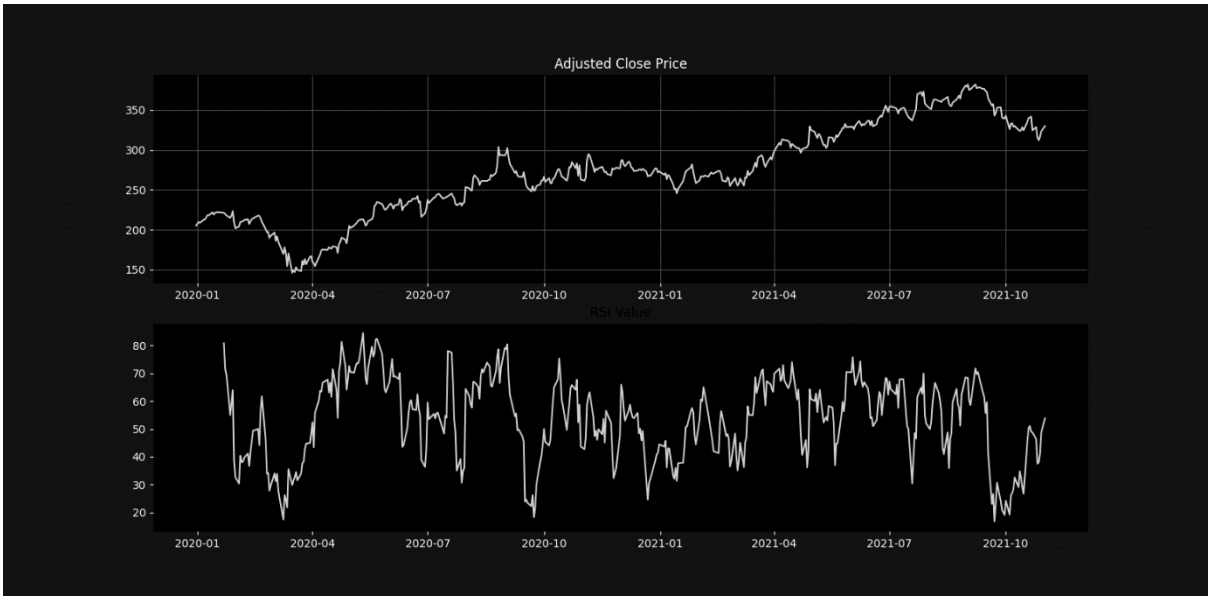
ADJUSTED CLOSE PRICE

2. Next we need to plot the RSI values with similar aesthetics with the stock price values.

```
# plotting the RSI indicator
ax2 = plt.subplot(212, sharex=ax1)
    # -------- plot the lines for RSI indicator ------
ax2.set_title("RSI Value")
ax2.grid(False)
ax2.set_axisbelow(True)
ax2.set_facecolor('black')
```

```
ax2.tick_params(axis='both', colors='white')

plt.show()
```



RSI VALUES WITHOUT HLINES

3. The horizontal line indicators can be plotted using the `axhline()` function.

```
ax2.axhline(0, linestyle='--', alpha=0.5, color='#ff0000')
ax2.axhline(10, linestyle='--', alpha=0.5, color='#ffaa00')
ax2.axhline(20, linestyle='--', alpha=0.5, color='#00ff00')
ax2.axhline(30, linestyle='--', alpha=0.5, color='#cccccc')
ax2.axhline(70, linestyle='--', alpha=0.5, color='#cccccc')
ax2.axhline(80, linestyle='--', alpha=0.5, color='#00ff00')
ax2.axhline(90, linestyle='--', alpha=0.5, color='#ffaa00')
ax2.axhline(100, linestyle='--', alpha=0.5, color='#ff0000')
```


Adjusted Close Price
350
300
250
200
150
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
RSI Value
100
80
60
40
20
0
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10

OUTPUT