Quant Assignment

Harsh Kumar, 20112047

Project Objective

The goal of this assignment was to write a code to backtest a long-only trading system based on certain technical indicators. Furthermore, we were required to create our 'Profit Booking Logic' that will decide our entry and exit criteria and encapsulate it with a 'Position Management Logic' that maximizes the strategy's gross profit

Methods Used

The technical indicator I used to get my buy and sell signal was RSI (Relative Strength Index).

The relative strength index (RSI) is a momentum indicator that measures the magnitude of recent price changes to evaluate overbought or oversold conditions in the price of a stock or other asset. The RSI is displayed as an oscillator (a line graph that moves between two extremes) and can have a reading from 0 to 100.

Generally, when the RSI surpasses the horizontal 30 reference level, it is a bullish sign, and when it slides below the horizontal 70 reference level, it is a bearish sign. Put another way, one can interpret that RSI values of 70 or above indicate a security is becoming overbought or overvalued and may be primed for a trend reversal or corrective price pullback. An RSI reading of 30 or below indicates an oversold or undervalued condition.

$$RSI = 100 - [\frac{100}{1 + RS}]$$

where,

$$RS = \frac{mean\ of\ upward\ moves\ in\ past\ window}{mean\ of\ downward\ moves\ in\ past\ window}$$

Project Description

- Motivation:

- In general, when the RSI crosses 30, it is indicative of a bullish sign and calls for a buy and when it slides below 70, it is indicative of a bearish sign and points towards a sell sign.

- Data and Scope:

  - I have used past 5 year stock data of RELIANCE.NS from yahoo financials

  - The data was divided into two parts

    - First three years i.e. [2016-01-01 to 2018-12-31] is used as training data

    - Last two years i.e. [2019-01-01 to 2021-06-01] is used as testing data

    - I have used the standard OHLC (Open High Low Close) format of data

- Methodology Approach:

  - In the beginning, I import necessary libraries and download csv data from yahoo financials

  - After that, I load it into a pandas dataframe and calculate 100 days simple moving average (to show trend in the stock data) and 19 days RSI using Exponential moving average. I add these as columns in my original dataframe and plot them

  - Then I implement my trading strategy :

    - I go long when the RSI crosses horizontal 30 reference level from above

    - And sell when the RSI crosses horizontal 70 reference level from below

  - Based on this trading strategy (profit booking logic), buy and sell signals were generated. From these signals only those sell signals which were preceded by a buy signal and similarly for buy signals were chosen to represent the actual trading entry and exit points.

  - Furthermore, at each buy signal, the entire capital available was used in buying stocks. This is because, at the end of each trade, percentage profit will remain the same irrespective of the initial capital. Hence maximum profit will be extracted for maximum initial capital. So, all the capital available was used in buying stocks.

  - A transaction cost of 1% of the total amount traded is paid during each trade

  - Detailed trading plot and dataframe show all the trades done and portfolio price at that time.

- Finally, I compare the results between applying my trading strategy and just holding the stock.

Code

- All the code is written in python. Google colab notebook is available at : https://colab.research.google.com/drive/1kghAMC8vYV7Gr32r8Aymb5XD6yO3PvQI?usp=sharing
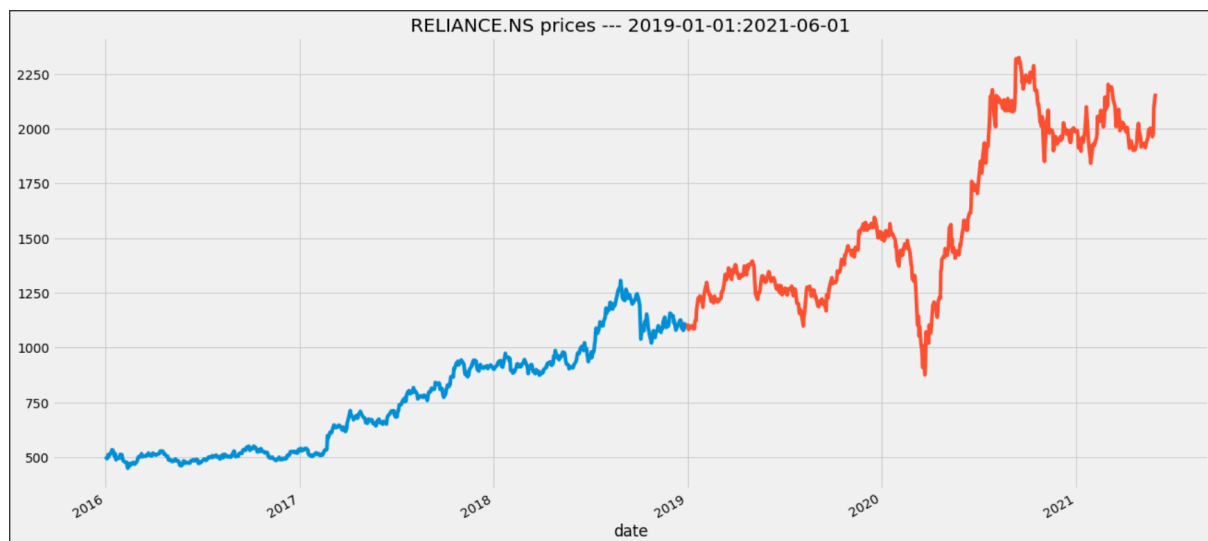
Google Colaboratory

G https://colab.research.google.com/drive/1kghAMC8vYV7Gr32r8Aymb5XD6yO3PvQI?usp=sharing

Summary

- The trades generated by the code are summarized below



Overall closing prices of RELIANCE.NS

Training Period

Closing prices during training period

| date	open	high	low	close	sma100	rsi_14
2016-05-30	483.61581	486.14188	477.96933	479.80197	495.11555	47.36689
2016-05-31	479.95056	481.93176	473.75925	474.42789	494.83075	43.72990
2016-06-01	474.47742	478.51416	471.43130	472.32285	494.62421	42.35793
2016-06-02	472.76862	474.08118	468.11276	473.63541	494.38201	43.54724
2016-06-03	475.49280	476.92920	473.43729	475.31946	494.02266	45.11201
...	...	...	...	...	...	...
2018-12-21	1,114.43628	1,120.62756	1,085.70862	1,089.86914	1,150.00906	43.85528
2018-12-24	1,090.56250	1,092.84094	1,076.34729	1,078.92285	1,149.75150	41.32436
2018-12-26	1,075.60437	1,089.67102	1,055.64355	1,088.03650	1,149.62966	44.21115
2018-12-27	1,096.80334	1,116.41748	1,093.63342	1,109.68127	1,149.53407	50.44670
2018-12-28	1,114.93152	1,124.58997	1,110.67200	1,114.98108	1,149.27799	51.86536

Indicators during training period
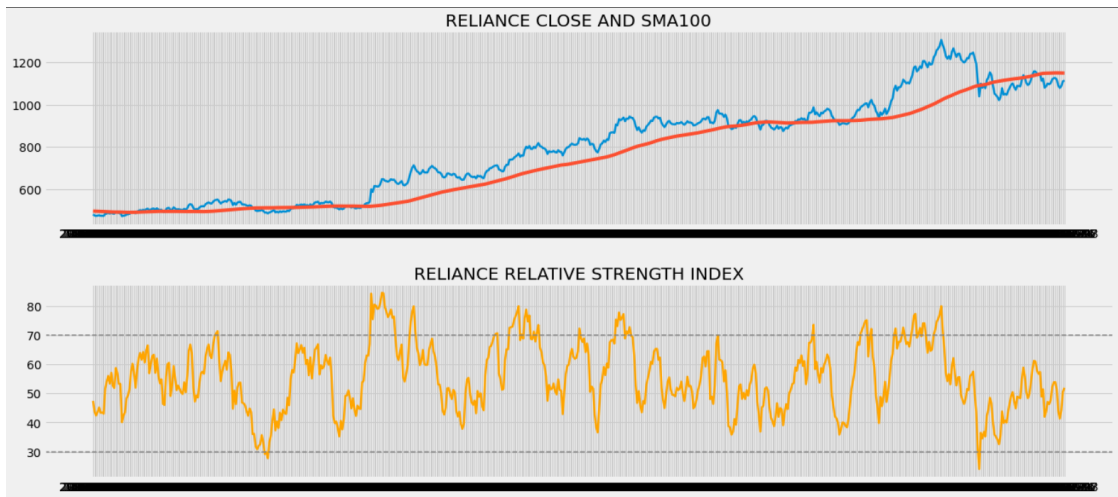
Closing price SMA and RSI
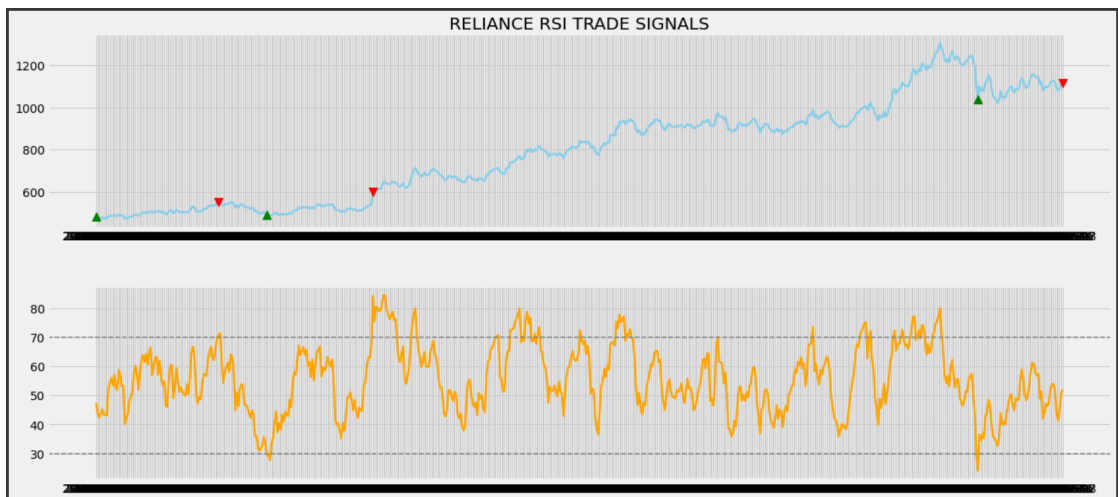
Trading Signals
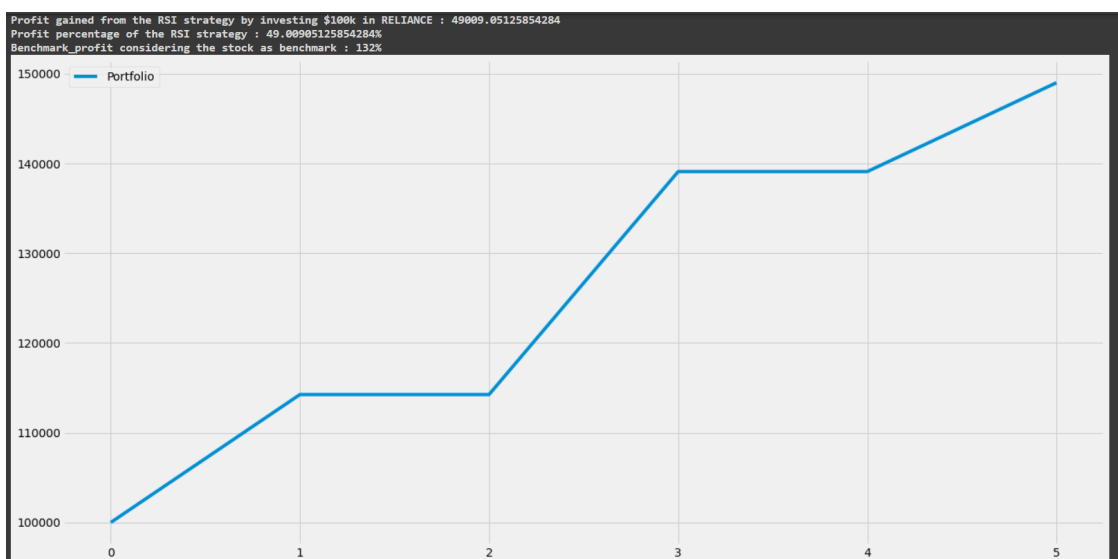
Profit gained by RSI strategy, benchmark profit and portfolio values

	Trading Days	Action	Profit	Portfolio
0	2016-05-30	BUY	–	100000
1	2016-09-27	SELL	0.14256	114,255.83313
2	2016-11-16	BUY	–	114,255.83313
3	2017-02-23	SELL	0.21750	139,106.65024
4	2018-10-08	BUY	–	139,106.65024
5	2018-12-28	SELL	0.07119	149,009.05126

Trades executed

```
Calculations invloved
Buy Signals generated : 3
Sell Signals generated : 3
Total trades executed : 6
Maximum Drawdown : 21.849888268516548%
```

Other calculation involved

Testing Period


Closing prices during testing period

	open	high	low	close	sma100	rsi_14
date						
2019-05-30	1,303.89038	1,329.39868	1,303.89038	1,317.26367	1,264.46018	51.56683
2019-05-31	1,325.33716	1,329.29956	1,307.80334	1,317.65991	1,266.53204	51.62740
2019-06-03	1,322.46436	1,354.41150	1,308.79395	1,347.42773	1,269.04621	55.98034
2019-06-04	1,344.70361	1,361.34583	1,335.44141	1,338.95801	1,271.61090	54.51118
2019-06-06	1,349.11182	1,349.11182	1,308.69482	1,314.88623	1,273.87642	50.54286
...	...	...	...	...	...	...
2021-05-25	1,996.40002	1,997.00000	1,960.00000	1,963.15002	1,999.04851	48.49436
2021-05-26	1,975.00000	1,979.50000	1,965.30005	1,970.05005	1,998.71601	49.38086
2021-05-27	1,970.30005	1,993.00000	1,962.25000	1,976.09998	1,998.57651	50.17240
2021-05-28	1,990.00000	2,105.00000	1,990.00000	2,094.80005	1,999.56951	62.33593
2021-05-31	2,102.00000	2,191.69995	2,085.05005	2,160.30005	2,001.31951	67.01324

493 rows × 6 columns

Indicators during testing period
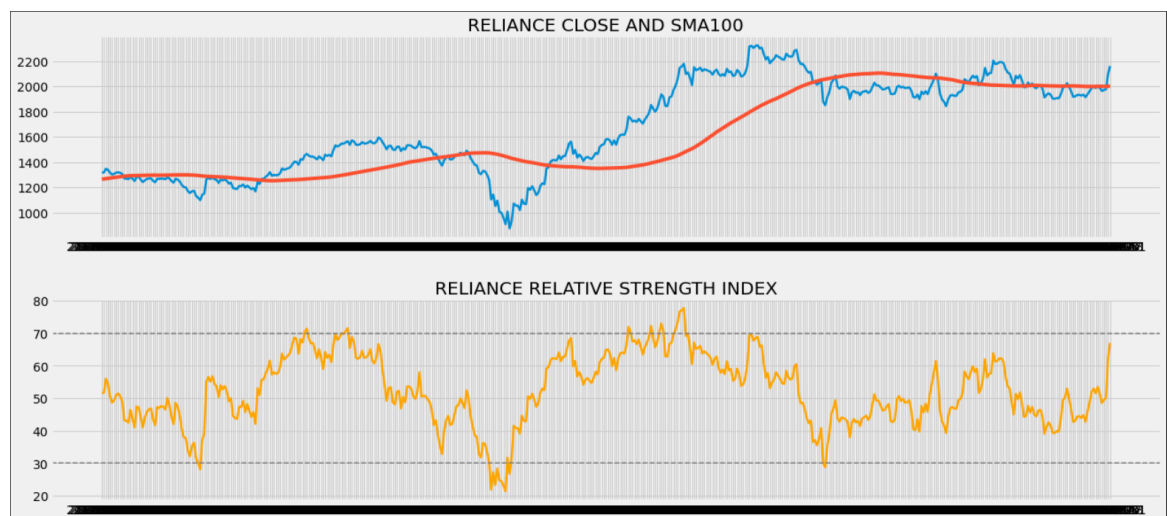
Closing price SMA and RSI
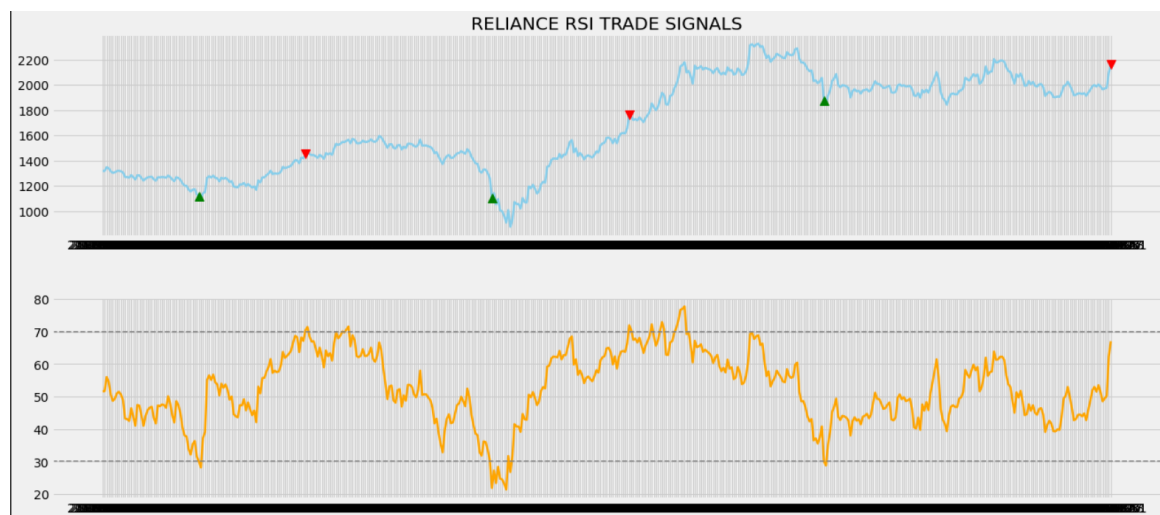
Trading Signals

	Trading Days	Action	Profit	Portfolio
0	2019-08-07	BUY	-	100000
1	2019-10-30	SELL	0.31067	131,066.58175
2	2020-03-11	BUY	-	131,066.58175
3	2020-06-22	SELL	0.60956	210,958.98409
4	2020-11-03	BUY	-	210,958.98409
5	2021-05-31	SELL	0.11105	234,385.47699

Trades executed

```
Calculations invloved
Buy Signals generated : 3
Sell Signals generated : 3
Total trades executed : 6
Maximum Drawdown : 45.08835871220752%
```

Various calculations involved

Completed On : 15-08-2021