

# QuantWeb Assignment 1

May 8, 2024

## Instructions

- Submission deadline is 11th EOD.
- Attempt both problems and try the BONUS too. For both the problems use the ticker symbol **'RELIANCE.NS'**. **Start date: '2018-01-01', end date: '2022-01-01'**
- The submission would be on GitHub classroom as stated in the meet. Submit separate .ipynb files for the problems you have attempted and most importantly **RUN ALL THE CELLS BEFORE SUBMITTING**
- Attach a document along with the submissions to explain how you tackled the questions.
- In case of any query please feel free to contact the mentors.

### Question 1:

Implement the following strategy using the same method we discussed in the meet. First let's have some definitions

- **E100:** Exponential Moving Average with a lookback period of 100 days.
- **E50:** Exponential Moving Average with a lookback period of 50 days.
- **S100:** Simple Moving Average with a lookback period of 100 days.
- **S50:** Simple Moving Average with a lookback period of 50 days.

The strategy goes as follows:

If the rate of change of E50 as compared to rate of change of E100

exceeds the rate of change of S50 as compared to rate of change of S100 the trend is strongly bullish indicating a buy signal. Similarly if the rate of change of S50 as compared to rate of change of S100 exceeds the rate of change of E50 as compared to rate of change of E100 the trend is strongly bearish indicating a sell signal. In simpler terms

- **Buy signal**

$$\frac{E50(t)-E50(t-1)}{E100(t)-E100(t-1)} \geq \frac{S50(t)-S50(t-1)}{S100(t)-S100(t-1)}$$

where E50(t) denotes 50 day EMA on 't' th day.

- **Sell signal**

$$\frac{E50(t)-E50(t-1)}{E100(t)-E100(t-1)} < \frac{S50(t)-S50(t-1)}{S100(t)-S100(t-1)}$$

Draft the strategy, append a signals column in the dataframe and modify it so that at a time you are holding a single position only. Refer to the attached collab notebook for reference. 1 for buy, -1 for sell and 0 for no position.

### Question 2:

Implement the Bollinger Band Technical Indicator.

- Follow a similar procedure of getting signals and change it so that you are holding a single position at a time.
- Fix the window size as 25 days over which the rolling mean would be calculated
- Vary the standard deviations between 1.5 and 5 at intervals of 0.1 and **find the value of standard deviation(s)** for which you get the largest number of closed trades.
- Example: Let's say the final signals column is: (1,0,0,-1,0,0,-1,0,1,-1,0,0). There are a total of 3 trades with 2 trades closed (one long and the other short) and an open short trade. For the question focus on number of closed trades.

### BONUS:

The code that modifies the signals column to allow only one position at a time oversees the possibility of an open trade. Could you modify the code to ensure that at the end of the entire iteration, there are no open trades and that all trades are closed, while also ensuring that the basic principle of staying in a single position holds