The Hong Kong Polytechnic University

AMA3232 Programming for Data Science

(Mini-)Project

Due date: November 30th, 2022 by 23:59.

Instructions:

1.  This is an individual project.

2.  Please also submit your Turnitin report.

3.  Please print your R code in a Rscript file with comments explaining what you are trying to do at each step.

4.  What we are trying to do here is to have an automatic program which executes everyday to check whether a certain stock has shown a "buy" or a "sell" signal. This program should be able to read the stock prices, process an indicator, and alert the end-user to check out the stock.

Task:

There are more than 3000 stocks trading in NYSE. Select a company with a dividend history longer than 10 years, which you would like to invest in.

1.  Explain or present your idea about why you would like to invest in this particular company along with a suggested investment horizon using approximately 1000 words. Please do not copy and paste from the company's annual report or website.

2.  Install the package "Quantmod" in R and obtain the price history of your suggested stock.

3.  Write a R function to calculate the n-days moving average of the closing price.

4.  Write a R function to calculate the Bollinger bands. Normally, we use a 20 day moving average to create the Bollinger bands. For the sake of an individual project, please use a $ceiling\left(20 + \frac{last\ two\ digits\ of\ student\ ID}{10}\right)$ days moving average.

    For example, if your student ID is 20221234D, then please use the ceiling(20+3.4)=24 days moving average to create the Bollinger bands.

5.  Stanley believes that an investment strategy would be buy the stock when the stock price touches the bottom band and sell the stock when the stock price touches the upper band. Write a R function for this strategy. For the last 720 trading days, count how many times this strategy was executed and find the probability of making a profit and calculate the profit if one stock is being bought and sold whenever the strategy is executed.

6.  Adam believes that this strategy only works if the Bollinger bands are converging. This is something which we can do easily by reading the chart. Suggest a way to instruct R to identify that that Bollinger bands are converging.

7.  Imagine your father has bought 1 share of this company 10 years ago on your birthday, works out the Internal Rate of Return. Note: dividends are part of your returns as well. Please apply what you have learned in root finding to obtain the IRR. Would it be smarter to buy the US 10-years treasury bill ten years ago?

8.  Use taskscheduleR or any scheduling package in R to schedule your functions to run everyday by 18:00.


(Possible) Useful packages:

taskscheduleR


(Possible) Useful functions:

GetSymbols()

GetDividends()

julian()


Internal Rate of Return (IRR): The IRR is the discount rate that makes the net present value (NPV) of an investment zero. In other words, it is the expected compounded annual rate of return that will be earned on an investment. Hence,

$$0 = NPV = \sum_{n=0}^{N} \frac{CF_n}{(1+IRR)^n}$$

where, $CF_0$ is the initial investment and $CF_i$ are the cashflows at time $i$, $N$ is the holding period and $NPV$ is the net present value.

For example, if Frankie invests \$1000000 now and he will get his initial investment back in 1 year and he will receive \$4000 per month. The IRR can be calculated as

$$0 = -1000000 + \sum_{i=1}^{12} 4000\,(1+IRR)^{-\frac{i}{12}} + 1000000(1+IRR)^{-1}$$

Note that the $IRR$ here is the annual effective rate.