

CFM 101 Group Assignment - Robo-advising

Teams of 3 will choose one of two goals: you can either target the market beat, or the market meet portfolio. There will be 2 prize winning championship teams, and 2 prize-winning runner-up teams.

For teams targeting the market beat portfolio: we will use the average return over the period of a) the TSX 60 and b) the S&P 500. To be more specific, we will look at the return of each index over the period, and then take a simple arithmetic average between the two. To evaluate your portfolio, we will take the value of the portfolio on December 02, 2024 (i.e., using close prices from the previous trading day) and calculate your \$1,000,000 starting cash. The team with a highest return above the index average will win. Winning teams must beat the market index.

For teams targeting the closest to market: We will use the same market index calculation as in the market beat portfolio. To evaluate your portfolio, we will take the value of the portfolio on December 02, 2024 (i.e., using close prices from the previous trading day) and calculate your return given the \$1,000,000 investment. The team with a return closest to the index average will win. The winning team can have a return above or below the market average. We will have a runner-up prize in each of the two categories.

Task 1: Due date November 23, 2024 at 9:00am. Code to be submitted on Dropbox (no need for pdf)

- Please use the provided jupyter notebook file, and name it according to your group number as indicated. The libraries you may use are in there. You may use other libraries however you must email me first for permission. If you wish to use python programming that we did not explicitly deal with in the course (e.g., threading), please make sure everyone in your group understands the code. Please also understand that a group can receive top marks with just the libraries outlined in the main file. You must provide the strategy that your team has selected in the space provided. Your choices are: 1) Risky, 2) Safe.
- You will be dynamically creating a portfolio, where you will not know which stocks you are choosing from beforehand
- Your code will read in a .csv file containing a finite number of stock tickers (example to be provided). The title of the file will be "Tickers.csv" and will reside in the same directory as the code. Our TAs will run your code with our top-secret file, which we will only let you see after the portfolios are finalized.
- You are to ignore any tickers that do not reference a valid stock denominated in either USD or CAD, i.e., your portfolio must contain only US and Canadian listed stocks.
- You may only include stocks in your portfolio that have an average monthly volume of at least 100,000 shares, as calculated based on the time interval of October 01, 2023 to September 30, 2024. A month is defined as a calendar month. Drop any month that does not have at least 18 trading days.
- You must pick a minimum of 12, maximum of 24 stocks for your portfolio. If you choose n stocks for your portfolio, each stock must make up a minimum of $(100/(2n))\%$ of the portfolio when weighted by value (i.e., the overall value of the shares purchased in that particular stock) as of closing prices on November 22, 2024. In addition, no individual stock may make up more than 15% of the portfolio when weighted by value (i.e., the overall value of the shares purchased in that particular stock) as of closing prices on November 22, 2024. All values should be calculated in CAD.
- Teams have \$1,000,000 CAD to spend on their portfolio, you MUST SPEND IT ALL (or as close to it all as is possible). To do so, you can purchase fractional shares.

- There is a flat fee of \$3.95 CAD, or \$.001 CAD per share, whichever is smaller, for each stock that you purchase. Note that this fee applies to purchases made in any currency (clearly this is a simplification since trades on the US side would be in USD, but I'm making your lives slightly easier here!). This fee must be paid from your 1,000,000 CAD that you start with, and you must take it into account when figuring out how much shares you can purchase.
- Once the portfolio is set, it cannot be changed.
- Any dividends paid out during the contest period will not be considered in your portfolio return.
- Teams will purchase their stocks at the closing prices on November 22, 2024
- When your code is run with our .csv file, it must create a DataFrame called "Portfolio_Final" where the index starts at 1 and ends at the number of stocks that your code chooses. The headings must be as follows: Ticker, Price, Currency, Shares, Value, Weight. Ticker will be the ticker your code selected, Price is the price on November 22, 2024, Currency is either USD or CAD, Shares is the number of shares you purchased of that stock, Value is the total value of those shares, and Weight is the weight that the value of shares represents relative to the value of your portfolio (which again, must be \$1,000,000 CAD). You should show that your total adds to \$1,000,000 CAD and that the weights add to 100%. This DataFrame must be printed to the screen as the second to last output to the screen. The final output to the screen will be a declaration to be detailed below.
- After the creation of the above DataFrame, you must create one final DataFrame called "Stocks_Final" which has the same index as "Portfolio_Final" but only has the Tickers and Shares from "Portfolio_Final". Your code must output this DataFrame to a CSV file titled "Stocks_Group_XX.csv", where XX is your group number.
- At the conclusion of your assignment, you will provide a declaration of contribution from each team member. A template is provided in the jupyter notebook "The following team members made a meaningful contribution to this assignment" – each applicable team member will then put their name below. If your name does not appear, you are assumed to have not contributed. You are to contact me directly for discussion.
- If your portfolio violates one or more of our rules, we may allow it for the competition (provided your code successfully outputs a portfolio to a csv file), however as you will read below, your mark is not based off the competition, so your grade will be affected.

Notes on Code and markdown:

- Your code should be well commented, with descriptive variable names
- You should write and call your own functions when appropriate
- You should use loops when appropriate.
- Hardcoding should be avoided
- You need to tell a convincing story of why you are picking the stocks you are picking. This can involve calculating and discussing statistics, outputting and discussing graphs. Using markdown text will be particularly helpful in explaining your group's thinking. I am leaving this part open ended on purpose, the groups that receive the best marks will put a good amount of thought in on this.
- When choosing stocks, you should bring in concepts from the course. You can go further if you like and use more advanced concepts, but a word of warning, make sure you understand what you're doing.
- If your code fails, the TAs will do their best to correct it (note that this means you may end up with a portfolio different than you imagined). In the case in which the TA cannot fix your code, they will generate a random portfolio for you. Thus, you will still have a chance of winning a prize. The TAs will inform your group of the result. **The result is final.**

Notes on Marking:

- The mark received will be entirely driven by your code, and not on whether you win a prize. Since we are only running this game for 5 trading days, there is going to be an extreme amount of randomness, so this is why we will not award any part of your grade based on what happens to your portfolio in those 5 days. For example, by pure luck, a poorly designed portfolio may perform extremely well in 5 days – but it doesn't matter. Your mark will reflect the fact that your portfolio was poorly designed.

Task 2 (optional): Due date December 02, 2024 at 11:59pm. Report to be submitted on dropbox and can be in pdf or MS Word format.

- For those teams with code that did not work, or did not work as expected, you can update your code and provide an explanation. Please provide this explanation at the bottom of your code in a new markdown box, where text is entirely in red. Any new code you insert should have a comment above that starts with "NEW CODE".
- Please note that your original code will still be graded, the updated code may help your final grade on the assignment, however we make no promises.

Prize Awards

- Winners will be announced, and prizes awarded during our final class on December 02, 2024.