Problem Set 3

Due on 10/3/2022 before class

Carry out the following calculations in a single Jupyter notebook. Do your best to make sure that I will be able to run it. Read in the CSV files from the current directory.

Warning: This group problem set may be challenging!

Question 1

The russell_adjclose.csv file contains adjusted closing prices for these four ETFs:

IWF	large cap growth stocks
IWD	large cap value stocks
IWO	small cap growth stocks
IWN	small cap value stocks

Using ^IRX.csv, begin by computing excess returns on all four ETFs following the procedure used in Question 2 of Problem Set 2. (You may want to review my solutions.)

Now consider a strategy in which you allocate 25% of your portfolio to each ETF if it's lagged adjusted closing price is above its 200-day moving average. If below, that 25% gets allocated to cash. Note that cash earns an excess rate of return of zero.

What are the mean, standard deviation, and annualized Sharpe ratio of this portfolio? (Assume 264 days in a year to annualize the Sharpe ratio.) Compare these statistics to the strategy that always puts 25% in each of the four ETFs.

Question 2

Using the SPY.csv and ^IRX.csv files located in the problem sets folder, implement a managed volatility strategy similar to that described in the PIMCO research note.

Begin by computing excess returns on SPY, again following the procedure used in Question 2 of Problem Set 2.

Compute 22-day rolling standard deviations of the excess returns. The weight in SPY on day t should be equal to .01/SD(t-1), where SD(t-1) is the 22-day rolling standard deviation as of date t-1.

Compare the mean and standard deviation of this portfolio to a buy-and-hold position in SPY.

Similar in spirit to Exhibit 3 of the PIMCO note, plot 264-day rolling standard deviations of the portfolio and of SPY.

<u>Question 3</u>

Data for this question is from the Monthly tab of the PredictorData2021.xlsx file, which is in same folder as this file. It was downloaded from Amit Goyal's website and is an updated version of the data Goyal used in his 2011 paper with Ivo Welch on return predictability. You can read in this data using pd.read_excel. Throw out all data before 1950.

The worksheet contains data that can be used to construct a number of predictors. These include:

- The D/P ratio (column C divided by column B)
- The term spread (column I minus column F)
- The default spread (column H minus column G)
- Net stock issuance (column J)

The sheet also contains market returns in column Q and risk-free returns in column K. Use them to compute the excess return on the market.

Run an out-of-sample analysis of a regression that uses the four predictive variables described above. The dependent variable is the excess market return in the next month. All regressions should use exactly 10 years of data. (Since you must lag the independent variables, you will have 119 observations in your regression.) Your first prediction will therefore be made in December of 1959, when you will be predicting the January 1960 return. Move the sample forward one month and repeat.

If m(t) is your return excess forecast at time t, then set your portfolio weight equal to

$$w(t) = \min\{1.5, \max\{0.5, 100\times m(t)\}\}.$$

Note that the 100 is a lot different than the 8 used by Hull & Qiao. I am assuming that your market excess return forecasts will not be annualized. So if your expected return in the next month is .01 (a 1% return in the next month or 12% annualized), then you would put 100% of your money in the market index. Also note that the minimum weight is 0.5, rather than -0.5, as used by H&Q.

As with H&Q, assess both strategies using mean, standard deviation, and Sharpe. Report corresponding values for the strategy that simply puts 100% into the market.