Part A:

Question1:

In part A, we have to find the optimal double moving average(MA) trading rules for all 30 DJ constituents stocks using monthly data. First, quantmod package is required to be installed. The data for the DJ constituents were downloaded from Yahoo finance. Between 1999-12-01 until 2018-12-31. Formulas are derived as below:

Using last year’s code for daily trading rule, we obtain strategy for monthly data moving average trading rule. After downloading data, we use function to obtain optimal monthly MA trading rules which means that these are such that maximizes the expected rule returns. Data is then summarized in a matrix with stock name and its m and r.

Question2:

In this question, we aim to construct the equally weighted and risk-parity weighted portfolios using the 30 DJ constituents and summarize the performance of such EW and RP portfolio (sharpe ratio). We use the 60 month window to obtain optimal trading rules. Using formula provided for calculating sharpe ratio,

We assume that the risk free rate or treasury bond is 0.02 and that is the monthly strategy returns. we get information for annualized expected return and annualized volatility.

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| OBSERVATION AND EXPLANATION: |
|  | #performance of equally weighted portfolio has a value of 0.4157, which is greater than delta= 0.02; |
|  | #furthermore, the risk parity portfolio has less volatility than the equally weighted portfolio. Due to |
|  | #the fact that risk parity portfolio is well-diversified and it has low idiosyncratic risk than equally weighted |
|  | #portfolio where market risk still exists. this is expected as risk parity seeks equal risk exposure from all assets |
|  | #in the portfolio, therefore, less weight is allocated to more risky asstes in comparison to equally weighted portfolio |
|  | #where equal weight of each asset is required. |

Part B:

Question1:

In this part, we will compute the volatility estimate for the DJ constituents. We make the assumption that = 0.2. The R code is implemented as follows to compute sigmat.

Furthermore, we have

Question2:

In this part, we have the goal of determining the optimal h for both predictive regressions for all 30 DJ constituents.

We have:

And we have

Where we have denoting the s-th stock in the DJ constituents. We want to determine the optimal h for all 30 stocks.

First, we obtain from rst\_sigmast. Then for each h, we construct model that maps sign() to . With the model we fitted, we predicted rh and find maximum rh to find the optimal h.

Question 3:

In this part, we will construct a time series momentum (TSMOM) portfolio from the 30 DJ stocks and will summarize the performance.

Some assumptions will be made: First, the performance will be based on a 60-month window rolling window and will be applied to the model.

We have the time series momentum trading strategy specified by:

and we have

is our position for the s-th constituent at time t and denotes the h month lagged returns observed at time t .we will take h= 12 for all 30 stocks.

Part C:

Question 1:

In this section, we will make it so that our position to the trading rule is determined by the magnitude of the signal. First of all, we have to compute the expected h-period holding period return. We have been provided the technical indicator Ft:

Furthermore, the h-period holding period return is:

The Formula is given as follows:

Question 2:

We will find optimal double MA for all 30 DJ constituents that maximize the 12-period holding period return.