ETF Portfolio Rebalance Report

Background

Suppose we have a portfolio of ETF which contains VOO, QQQ and DIA. we hope to determine the best way to rebalance the portfolio. To be specific, we hope to find out the optimal set of weighting scheme, rebalance frequency and the look back period. we will take Sharpe, Calmar and Maximum Drawdown into consideration.

Our Test Period : 2016/01/01 – 2020/12/31
Train set and Test set are in the same size

Parameter

1. Weighting Scheme

The possible Weighting Scheme would be Maximum Sharpe Ratio and Risk Parity
Maximum Sharpe Ratio : This scheme try to find out the weight of different ETF to attain the highest Sharpe Ratio
Risk Parity : This scheme try to find out the weight of different ETF to equalize the risk contribution from each ETF where Risk is quantified by Standard Deviation and risk contribution is measured by the delta change of the portfolio risk

2. Rebalance Frequency

We have set 3 rebalance frequency as test parameter : Daily (1 day), Weekly (5 days) and Monthly (20 days)

3. Look Back Period

The Look Back Period is defined for how many historical price we take to consider the standard deviation (risk)
Daily : [5, 10, 20, 40, 60]
Weekly : [5, 10, 15, 20]
Monthly : [20, 40, 60]

Performance

- Maximum Sharpe Ratio

Generally, The annualized return and Sharpe ratio are improving when we decrease the rebalance frequency. The reason should be based on the slippage. The higher frequency , the more the slippage would be charged.

By comparing the test performance, the highest annualized return would be 22.1% with Sharpe 0.92, Calmar 0.97 and look back period = 2 months (40 days). It outperforms the benchmark by around 8%

- Risk Parity

The general trend is same as above.

By comparing the test performance,, the highest annualized return would be 15.2% with Sharpe 0.69, Calmar 0.63 and look back period = 1 months (20 days). It outperforms the benchmark by around 2.5%

Summary

We can see from the performance and appendix, Maximum Sharpe Method performs slightly better than the Risk Parity Method in Monthly rebalance while their performance are close to each other in other frequency.

Due to Slippage, lower rebalance frequency would be rewarded because smaller slippage would be charged.

The suggested development would be listed as follow.

First, We may try another Smart Beta Method by searching the internet

Second, We may include some signal generations to avoid some downtrend like using Logistic regression or other Machine Learning Model and Technical Indicators.