

Systematic Investing
Professor Dhar
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Assignment on Risk Parity using ETFs
(Data available on class website)

You are provided daily data for three ETFs: XLF, XOP, XLK between January 2014 and January 2024. Your exercise is to combine their daily returns in two ways. In the first, you average their returns, which means that your bets are “equal sized” in terms of dollars. In the second method, you will combine the three so that you take “equal risk” which is expressed in terms of volatility. What this means is that you’ll invest fewer dollars if a series of more volatile and vice versa. This is commonly referred to as “risk parity.”

Calculate the combination of returns by combining the ETFs in the two ways described above. For the former, give the returns equal weights. For the latter, you will weight the returns in inverse proportion to their 20-day trailing volatility. So, calculate the 20-day trailing window of daily returns for each instrument, and size (or weight) each instrument in inverse proportion to its 20 day volatility. The three weights should add up to one.

Note that the returns are based on close to close prices and you are calculating the weights at the *end* of each day (sizing the position at the end of the day), so that the weights are applied the *next* day to the return. That is how you calculate your “volatility-weighted average returns” for each day. The intuition is that the higher the volatility, the lower the dollars allocated and vice versa.

Requirements:

- Plot the two Equity Graphs for the equal and vol-weighted returns (start them at 100). Which is better? Why?
- Plot the weights of the three ETFs over time. Do they look relatively smooth to you? When would you expect sudden changes, like we see between 12/08/2014 and 1/27/2015?

If you feel like the challenge, calculate the worst *drawdowns* of the two strategies. A drawdown is essentially a “peak to trough” return. Which of the two exhibits better drawdown behavior?