Editor's Letter

Risk Parity and Volatility Targeting Strategies: Recent Performance

Alternative methods of asset allocations have gained wide acceptance in recent years. Fundamental indexing, risk parity, volatility targeting, smart betas, and alternative betas are just some examples of this new breed of asset allocation strategies. While these are not active strategies in the sense of taking positions based on active views of the expected performance of various asset classes or securities, they are not passive either. Rather they represent some form of deviation from the more common approach of using market cap weighted indices or allocations. In this brief note, I will discuss the main features of two strategies have been in the news during the last few months: risk parity and volatility targeting. By some estimates around $1 trillion are managed using these two asset allocation approaches. After briefly discussing each approach, I will examine some hypothetical and actual performance figures for these two strategies using S&P Risk Parity Index - 10% Target Volatility, J.P. Morgan Cross Asset Risk Parity Index, and AQR Risk Parity Fund-I.

Risk Parity Approach

The risk parity approach defines a well-diversified portfolio as one where all asset classes make the same contribution to the overall risk of the portfolio. That is, the goal is to create an equally weighted portfolio, where the weights refer to risk rather than dollar amounts invested in each asset.

Four important issues must be addressed in using the risk parity approach. First, we need a quantifiable measure of risk. The standard deviation of returns is typically used for this purpose. Second, we must be able to measure the contribution of each asset class to the risk of the portfolio. When standard deviation or volatility of return is used as a measure of risk, then measuring the contribution of each class to the total risk has a well-known formulation. Third, one does not need to forecast expected returns on asset classes to apply this method. Proponents of the risk parity approach consider this as one of its main advantages as models based on forecasted returns have poor track records. Finally, risk parity portfolios typically have low volatility and low returns. Therefore, unless investors are seeking to create a low vol/return strategy, the allocation must be levered up to generate returns in line with a 60/40 equity/bond portfolio. Critics of the risk parity approach consider leverage risk as one of its main shortcomings.

A simple but effective method of creating a risk parity like portfolio is to relate the weight of each asset class to the inverse of its volatility. That is,

$$\text{Weight of Asset } i = K \times \frac{1}{\text{Volatility of Asset } i}$$

The value of the constant is selected such that the weights would add up to one. In this approach, one assumes that various asset classes are equally correlated to each other.

As an illustration, consider the following estimates of volatility for equities, fixed income securities and commodities and their corresponding weights in a diversified portfolio

1/2017-10/2018	MSCI World Equity	Global Corporate Bonds	Medium Term Treasuries	Commodities
Annual Volatility	8.7%	4.1%	2.8%	14.4%
Weights	14.6%	31.1%	45.5%	8.8%

Source: Bloomberg

There has been some speculation in the press that recent spike in volatility and subsequent declines in equity prices have resulted from reallocation strategies of risk parity portfolios. To examine this issue, consider the above table, but let's use an estimate of volatility based on the last 30 trading days rather than the last 180 trading days, which is used in the above table.

9/14/18-10/25/18	MSCI World Equity	Global Corporate Bonds	Medium Term Treasuries	Commodities
Annual Volatility	14.1%	3.9%	2.9%	16.0%
Weights	9.7%	34.9%	46.9%	8.5%

We can see that the most recent increase in volatility would have required the above risk parity portfolio to reduce its allocation to equity by almost 5%. For each $100 billion managed using this strategy, the portfolio manager would have had to sell $5 billion in equities. The total amount of equity that had to be sold was not perhaps large enough to make a significant contribution to the market decline, but it certainly did not help either.

Volatility Targeting Approach

Volatility targeting is rather different from risk parity as it does not prescribe a specific approach to diversification. Instead, once a diversified portfolio is created, a volatility targeting approach suggests a method for increasing or decreasing the portfolio's exposure to market risk such that the return volatility is close to a prespecified target. Therefore, one could in principle combine a risk-parity portfolio with a volatility targeting strategy to create a risk-diversified portfolio whose return volatility is managed systematically.

To apply a volatility targeting approach, one must consider the following issues. First, we need a method for creating the diversified portfolio. This could be a diversified all-equity portfolio (e.g., MSCI World), a multi-asset portfolio (e.g.,50/30/20 equity/bond/alternative portfolio) or a multi-asset risk parity portfolio. Note that since the portfolio needs to be rebalanced frequently (e.g., weekly or monthly), the portfolio must consist of rather liquid assets. For instance, the allocation to alternative assets could consist of commodities and liquid alternatives. Second, we need to identify a volatility target (e.g., 10% annualized volatility). Third, we need to specify a method for estimating the volatility of the portfolio and the time horizon over which the volatility is estimated. Finally, we need to specify the maximum amount of leverage we are willing to employ. The market exposure (i.e., allocation to the risky diversified portfolio) is given below

$$E = \min\left(1+\text{Maximum Leverage}, \frac{\text{Target Volatility}}{\text{Realized Volatility of the Portfolio}}\right)$$

As an illustration, suppose the realized volatility of a 60/40 equity/bond portfolio is 5.5%, and the volatility target is 6%. If the maximum leverage allowed for this program is 10%, then market exposure would be:

$$E = \min\left(1 + 10\%+, \frac{6\%}{5.5\%}\right) = 1.091$$

This means we need 109.1% exposure to the market (the 60/40 portfolio) and therefore must use 9.1% leverage.

The impact of a spike in market volatility could be far more significant for a volatility targeting portfolio than a risk parity portfolio. For example, the volatility of the 60/40 portfolio increased to 8.4% during the past 30 days (9/14/2018-10/25/2018). As a result, the market exposure of the above example had to change to

$$E = \min\left(1 + 10\% + \frac{6\%}{8.4\%}\right) = 0.714$$

As a result, the allocation to equities had to be reduced by 22.6% while the allocation to bonds had to be reduced by 15%. Therefore, for each $100 billion managed under this strategy, the portfolio manager had to sell $22.6 billion in equities and $15 billion in bonds. These are not insignificant amounts. Of course, if a longer window is used to estimate these volatilities, the reaction could be smaller. On the other hand, the combined effects of risk parity and volatility targeting strategies could provide significant downward pressure on equity prices as both strategies will be selling equities as equity volatility spiked.

Hypothetical Performance

Here, I present hypothetical performance figures for the risk parity portfolio discussed earlier with 80% leverage and a 60/40 portfolio with a volatility target of 5.5%. The performance figures are presented below

	Annualized		
2017-2018	**Mean**	**Volatility**	**Info Ratio**
Risk Parity: No Leverage	3.20%	2.98%	1.076
Risk Parity: 50% Leverage	3.82%	4.47%	0.854
60/40 Portfolio: No Vol Target	6.95%	5.53%	1.257
60/40 Portfolioi: 4.5% Vol Target	6.03%	4.50%	1.340

Source: Bloomberg and Author's Calculations

The above figures highlight one particular problem with risk parity portfolios: if returns on the un-levered portfolio are low, then the use of leverage does not add much to the performance of the portfolio while the volatility increases. For example, in a flat yield curve environment, the cost of leverage, which is assumed to be 50bp above the yield on short-term Treasuries, will not be significantly different than the rate of return on the fixed income assets in the portfolio. Therefore, it will be up to the equity allocation to generate high enough return to justify the use of leverage. However, in a risk parity portfolio the allocation to equity is typically rather small.

On the other hand, the potential problem with volatility targeting strategy is that unless the permissible degree of leverage is high enough, the portfolio may end with a volatility that is below its target during a low volatility market environment. As a result, the portfolio may not take advantage of rising markets fully and suffer losses equal to the market during periods of declining prices.

Recent Performance

The following table presents performance figures for two indices and one fund covering January 2017 through October 25, 2018. These figures are calculated using the daily total return indices.

		Annualized	
2017-2018	**Mean**	**Volatility**	**Info Ratio**
S&P Risk Parity Index - 10%% Target Volatility	3.29%	4.79%	0..687
J.P. Morgan Cross Asset Risk Parity Index (Series A)	0.93%	4.38%	0.212
AQR Risk Parity Fund-I	5.25%	7.43%	0.706

Source: Bloomberg

The first index presented above is a combination of risk-parity and volatility targeting strategies. We can see that the realized volatility of this index is far below its target -- 10%. The reason is that during this period, markets were generally not very volatile, and the maximum leverage allowed by this index was not large enough to lever up the portfolio to generate 10% volatility. As a result, the portfolio's performance is rather low. The second index is a pure risk parity index with no volatility target. While the J.P. Morgan product has the same volatility as the S&P risk parity product, it has a substantially lower rate of return, which means not all risk-parity portfolios are created equal. It does matter what asset classes are selected to create the portfolio or how the risk allocations are implemented. The last example is the risk parity fund managed by AQR. It has a higher mean return than the other two but has also been more volatile. If we compare the information ratio of these three products, we can see that the AQR Fund has provided a higher mean return per unit of volatility over this period. However, all three of them have underperformed our hypothetical allocations, which do not include fees and transaction costs.

It is interesting to see how these three products have performed during October.

October 1- October 25	**Return**
S&P Risk Parity Index - 10%% Target Volatility	-2.5%
J.P. Morgan Cross Asset Risk Parity Index (Series A)	-4.2%
AQR Risk Parity Fund-I	-4.9%

Source: Bloomberg

We can see that all three have declined between 2.5% and 4.9%. By contrast, our 60/40 portfolio was down 5.1%, our no leverage risk parity portfolio was down 1.8%, and the MSCI World Index was down 8.1% during the same period. Risk parity and volatility targeting strategies have provided some downside protection compared to an all-equity portfolio, but the benefits have been negligible compared to the 60/40 portfolio.

There have been many academic and industry research papers around the relationship between risk and return. Risk parity strategies are based on the general finding that low volatility asset classes have provided a higher risk-adjusted return in the past. Therefore, a levered portfolio that has a relatively large allocation to low-risk assets should outperform an equally risky portfolio that uses market caps or similar weights. This argument rests on the assumption that not enough investors are able or willing to take advantage of this opportunity -- an assumption that may no longer be valid given the popularity of these strategies.

Volatility targeting strategies are meant to provide downside protection to a diversified multi-asset portfolio. Since volatility tends to spike when markets are performing poorly, this strategy could provide some downside protection as it de-levers as volatility increases. However, if the fund's market exposure (i.e., volatility) is adjusted too quickly, the fund may overreact to short-term spikes in volatility, and if the exposure is adjusted too slowly, the portfolio may not be protected against sharp declines (e.g., of the type we have seen during the month of October). Also, if the portfolio does not adjust quickly enough to a decline in market volatility, the portfolio may not participate in a market recovery that follows a spike in volatility. In short, there are no free lunches in financial markets, and no strategy will continue to match its back-tested performance if it is widely adopted by large investors.

Finally, as we saw in our hypothetical examples, during periods of increased volatility in equity markets, these two strategies could contribute to further declines in prices. The actual impact will be a function of the market size for these strategies as well as the methodology they use to estimate volatility of various asset classes.

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