

Beyond Risk Parity

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Risk parity is an approach to portfolio construction that focuses on the balance of risks within a portfolio. In this research paper, Vineer Bhansali, CIO and Founder of LongTail Alpha, explores the benefits and shortcomings of the traditional way risk parity is implemented and suggests extensions using a risk-factor based approach.

Summary

- Three important aspects of robust portfolio construction have gained traction as a result of the global financial crisis:
 - Broad allocation decisions can be more important to portfolio performance than security selection
 - Efficient implementation of asset allocation requires a forward looking risk policy that captures changes in the behavior of asset classes
 - Extreme portfolio risks need to be identified and managed by both direct and indirect means
- These concepts should be thought of as building blocks for robust portfolios in all seasons. Risk parity becomes a natural component of asset allocation, although not the only or dominant one.
- In risk parity, each portfolio “position” should be sized in order to match the “risk contribution” from all assets in the context of achieving a target return at the portfolio level. Put another way, risk equalization rather than the more usual “position” return forecasts is what drives portfolio construction.
- To practically implement a risk-based approach, one has to achieve 3 objectives:
 - Accurate estimates of the risks and correlations of various candidate assets on a forward looking basis.
 - The ability to lever up the less risky sources of return.
 - The ability to manage risk, especially tail risks.
- Returns become inputs that determine how much leverage to take to reach an overall portfolio return.
- While risk parity traditionally implemented attempts to equalize risk across assets, a more robust approach is to allocate instead to “risk factors” embedded in each asset.
- Ignoring the risk factor content in assets and fixating on assets themselves and their prospective returns results in opacity and perhaps tail risks.
- By using forward-looking risk factors, we reduce hindsight bias and the risk of concentration in assets that are not likely to repeat their past performance.
- For instance, a typical risk parity portfolio of stocks and bonds would appear to require a large allocation to bonds since bonds are less risky than stocks. But this would be a mistake since rates are so low relative to history. With the two-year yield at 2%, there is not much price appreciation potential given that two-year rates can’t fall that much. A

levered position in short-term government bonds to achieve risk parity could thus be exposed to significant fat tail risk if rates rise.

- It is well known that typical asset allocation portfolios (such as a 60/40 mix) have over 2/3 of their risk driven by the equity market. What is surprising is that even “diversified” portfolios show similar risk allocation. The dominance of equity factor risk rises sharply in crisis periods and has been an important motivator behind risk parity. The reason behind this is the larger volatility of the equity component as well as the dependence on the equity risk factor in other parts of the portfolio. For instance, most spread product contain a material amount of equity risk factor.
- The global financial crisis revealed that not only was diversification by looking at cosmetic asset allocation as opposed to risk factor allocation not successful in reducing risk by diversification, it also resulted in an increase in risk as “diversifying” assets became more correlated.
- The risk factor approach to asset allocation not only allows a clear look into the sources of risk, it simplifies the allocation problem significantly by setting the scale of various exposures in a clear way.
- Even though we do not think that much faith should be placed in backward-looking analyses, statistical exploration of the factor structure of asset returns shows that 4 or 5 risk factors saturate almost 70% of the movement of almost all liquid assets over the last 5 decades. These factors are:
 - Equity risk
 - Duration risk
 - Liquidity
 - Momentum
 - Currency risk
- It has also been documented by others that correlations between these key risk factors are low and stable in normal and crisis or turbulent periods. Over the same period, correlations between many major asset classes are much higher and variable.
- This is because many risk assets are dominated by exposure to equity and liquidity risk factors.
- We also show that the factor returns themselves have also been mean reverting, allowing one to increase exposures when the factor risk premia are high and decrease exposures when the factor risk premia are low.
- The long-term stability and mean-reversion characteristics of risk factors are related to the time variation of risk premia and allow the investor to tilt portfolios in directions where the compensation for the risk premia is appropriately priced.
- We computed the coefficients of regressions of the various asset classes in the factors themselves to identify the key risks. What we found is that the equity and duration risk factors are present almost everywhere. Most interesting is that the emerging markets bond index and the high yield bond index are dominated by equity risk factor. This illustrates the extra yield and extra risk for those asset classes and hence for appropriately accounting for that risk in an asset allocation. If one were to apportion the emerging market bond or high yield asset class to their bond allocation, they would materially understate risk in the portfolio.
- A risk parity solution that ignores the factor content of these indices would thus not be as balanced as one would think.

- One shortcoming of the risk factor based approach to asset allocation is that measurement of factor exposures requires sophisticated modeling as well as the ability to estimate the exposures by performing appropriate stress shocks.
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- Another shortcoming of the factor-based approach is that by construction it ignores idiosyncratic or security-specific contributors to risk and return.
- While this shortcoming matters significantly for long/short or arbitrage-type portfolios, it matters little to the investment decisions for longer-term investors who are harvesting risk premia from systematic risks.
- Implementation of risk parity relies on leverage to allow scaling up of risks. It is well known that investors who can lever have the possibility of constructing more efficient portfolios for delivering the same return than those who cannot lever and are forced into riskier assets to achieve the same returns.
- Risk parity lies between levering up a fully optimal portfolio (the one with the highest Sharpe ratio on the traditional mean-variance optimal frontier) and no leverage. Thus they behave somewhere in the middle zone between hedge funds and passive investments.
- The robust performance of risk parity in 2008 can be traced to the fact that many risk parity investors held government bonds (or the safe duration risk factor) in levered form. It could very well have been a coincidence that the securities that did well during that time were assets that could be easily leveraged. Access to leverage for the lower risk securities is critical to the performance of risk parity. We know that outside of liquidity events where leverage is hard to obtain, the cost of leverage goes up or the initial collateral (haircut) requirements become less favorable.
- This non-homogenous behavior of leverage can impact risk parity portfolios in significant ways.
- Implementing risk parity with market indices might embed structural mis-valuations if the indices themselves have been beneficiaries of risk-reduction driven outperformance.
- A risk-factor based approach mitigates the risk of holding expensive securities by quantifying the prospective risks under various economic outcomes in a forward-looking sense. When leverage is not easily available, a risk-parity portfolio has only two simple choices: live with the unbalanced risk or accept lower returns.
- In a world where the outcomes are more dispersed and the tails fatter, it is essential that portfolio risks are better understood and pro-active risk management is practiced.
- Risk parity attempts to manage risk solely by endogenous means. In other words, exposures and asset allocations are scaled up and down based on prospective volatilities. There are a few limitations to this approach:
 - Market distributions are typically non-normal, especially during periods of stress. So volatility is a very crude metric for risk and for dynamic asset allocation.
 - In periods of stress, transaction costs increase and it is usually not easy to de-risk or rebalance a portfolio easily.
 - Overweighting diversifying assets, such as Treasuries, may end up incurring a large insurance cost and may not end up to be insurance after all.
- In the risk factor approach, the exercise of risk mitigation is performed in a holistic manner by the evaluation of the “option costs” of such hedging. By reducing risk factor exposures, an investor is also prospectively giving up some upside. If this shadow price

of risk reduction is less than the price of explicit protection of the portfolio, then the latter is a more efficient solution to portfolio construction.

- In the presence of leverage, defensive and offensive tail hedging improves the performance of portfolios since it not only allows for more aggressively positioned portfolios but it also allows access to liquidity to increase exposure to risky assets when have the highest prospective returns. In this sense, tail hedging can be thought of as an offensive risk management tool.

IMPORTANT DISCLOSURES

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