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Risk Parity: The Democratization of Risk in Asset Allocation

Francesco A. Fabozzi, Joseph Simonian, and Frank J. Fabozzi

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KEY FINDINGS

- Unlike mean–variance optimization, a risk parity strategy allocates across asset classes such that each asset class contributes equally to portfolio risk, regardless of its expected returns.
- In practice, there are variants of the risk parity strategy due to choices made by the portfolio manager, such as selection of the asset classes, risk measure, targeted volatility, degree of leverage, asset selection using active or passive approach, and tactical risk allocation strategy.
- The performance of the risk parity strategy has varied, with critics of the strategy identifying theoretical and practical implementation issues.

ABSTRACT

The risk parity investment model for asset allocation offers an alternative to the mean–variance framework. The fundamental idea is that the allocation to different asset classes should not be based on an optimization that targets a specific return with a minimal level of risk but, rather, should generate a portfolio in which the contribution to portfolio risk of each asset class is equal, regardless of its expected returns. In this article, the authors explain the fundamentals of the risk parity investment model and the variants in risk parity strategies due to the selection of the asset classes to be included in the portfolio, the choice of the risk metric, the portfolio risk target, how to obtain leverage, associated leverage, whether the selection of the specific investments within an asset class is made using an active or passive approach, and the tactical risk allocation strategy. In addition to describing the practical aspects of implementing risk parity strategies, the authors identify the various shortcomings of the model and some extensions of the basic risk parity model that attempt to address some of the issues identified by the model's critics.

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An alternative to the mean–variance framework is the risk parity strategy. With risk parity, the idea is not to allocate to different asset classes based on capital allocation using an optimization that targets a specific return with a minimal level of risk but, rather, to generate a portfolio in which the contribution to portfolio risk of each asset class is equal, regardless of their expected returns. The primary advantage of a risk parity strategy for asset allocation is that the need to forecast or posit expected returns is dispensed with a more egalitarian dispersion of risk among a portfolio's constituent asset classes. This is a significant potential advantage over the traditional 60/40 model in which, historically, as much as 90% of a portfolio's volatility is due to its equity exposure, and its performance is mostly determined by equity returns. According to Maillard, Roncalli, and Teiletche (2010), an unlevered risk parity portfolio creates a portfolio similar to that provided by the minimum variance portfolio, save for the fact that each asset class contributes equally to the portfolio's risk.

Risk parity strategies have become popular products over the years. Estimates by the firm Neuberger Berman suggest that there is about $120 billion of assets under management following risk parity strategies, or about $400 billion to $500 billion with leverage.[2] The popularity of this strategy has resulted in the creation of a risk parity index series by S&P as a benchmark for equal-weighted parity strategies (see Liu, Brzenk, and Cheng 2020).

In this article, we describe the basic workings of the risk parity portfolio allocation model. Practical aspects of implementing risk parity strategies are also discussed, as are various shortcomings of the model pertaining to empirical performance and theoretical and implementation challenges. We also mention extensions of the basic risk parity model that attempt to address some of the foregoing issues.

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The underlying economic thesis of the All Weather Fund is that different asset classes possess excess return over the risk-free rate, and they react differently to two macroeconomic risks of the business cycle: growth and inflation. The value of an asset is equal to the present value of its expected future cash flows, which are affected by changes in economic conditions. For example, expected economic growth and inflation affect corporate future cash flows. The level of interest rates affects the discount rate or the yield that is used to discount future cash flows. As these expectations about future economic conditions change, the value of assets and asset classes changes.

Given these fundamental asset pricing assumptions, Bob Prince, co-CIO of Bridgewater Associates, argued that the two main drivers of the valuation of asset classes are (1) the accrual of and changes in the risk premium and (2) unanticipated shifts in the economic environment (see Prince 2011). Given these two main drivers of

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The two major risks that Bridgewater uses in managing its All Weather Fund are growth and inflation. Accordingly, the four risk scenarios used to capture the economic scenarios are

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The aforementioned four risk scenarios can be viewed as subportfolios in which an investor can allocate funds. The investor is assumed to have no view that financial markets have any tendency to under- or overdiscount the two economic drivers (growth and inflation) in the future. Thus, portfolio construction in the risk parity strategy used by the All Weather Fund allows 25% of risk to be allocated to each of these categories.

How does this approach to portfolio construction generate a diversified portfolio in different economic environments? Consider the case in which bonds underperform in an economic environment due to higher than expected inflation. This would be offset by an asset class such as commodities that outperforms because its sensitivity to inflation is the opposite to that of bonds. The intent of this form of diversification is to produce a more stable portfolio return.

The Bridgewater All Weather approach is rather qualitative compared to most risk parity providers. Although it falls into the risk parity category, it is an exception because it was developed before the quantitative risk parity concept was formally proposed. Others select assets with equity risk, interest rate risk, and inflation-related risk; assign a balanced risk allocation to select assets; build a covariance matrix; solve for an unlevered risk parity portfolio; and then apply appropriate leverage based on targeted risk, as described later in this article.

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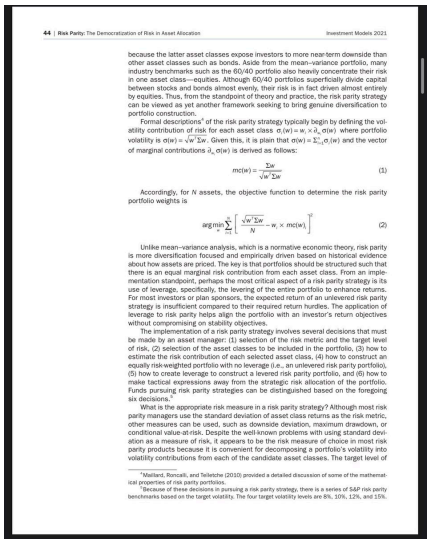

because the latter asset classes expose investors to more near-term downside than other asset classes such as bonds. Aside from the mean–variance portfolio, many industry benchmarks such as the 60/40 portfolio also heavily concentrate their risk in one asset class—equities. Although 60/40 portfolios superficially divide capital between stocks and bonds almost evenly, their risk is in fact driven almost entirely by equities. Thus, from the standpoint of theory and practice, the risk parity strategy can be viewed as yet another framework seeking to bring genuine diversification to portfolio construction.

Formal descriptions[4] of the risk parity strategy typically begin by defining the volatility contribution of risk for each asset class $\sigma_i(w) = w_i \times \partial_{w_i}\sigma(w)$ where portfolio volatility is $\sigma(w) = \sqrt{w'\Sigma w}$. Given this, it is plain that $\sigma(w) = \sum_{i=1}^{n}\sigma_i(w)$ and the vector of marginal contributions $\partial_{w_i}\sigma(w)$ is derived as follows:

$$mc(w) = \frac{\Sigma w}{\sqrt{w'\Sigma w}} \tag{1}$$

Accordingly, for N assets, the objective function to determine the risk parity portfolio weights is

$$\arg\min_{w}\sum_{i=1}^{N}\left[\frac{\sqrt{w'\Sigma w}}{N} - w_i \times mc(w)_i\right]^2 \tag{2}$$

Unlike mean–variance analysis, which is a normative economic theory, risk parity is more diversification focused and empirically driven based on historical evidence about how assets are priced. The key is that portfolios should be structured such that there is an equal marginal risk contribution from each asset class. From an implementation standpoint, perhaps the most critical aspect of a risk parity strategy is its use of leverage, specifically, the levering of the entire portfolio to enhance returns. For most investors or plan sponsors, the expected return of an unlevered risk parity strategy is insufficient compared to their required return hurdles. The application of leverage to risk parity helps align the portfolio with an investor's return objectives without compromising on stability objectives.

The implementation of a risk parity strategy involves several decisions that must be made by an asset manager: (1) selection of the risk metric and the target level of risk, (2) selection of the asset classes to be included in the portfolio, (3) how to estimate the risk contribution of each selected asset class, (4) how to construct an equally risk-weighted portfolio with no leverage (i.e., an unlevered risk parity portfolio), (5) how to create leverage to construct a levered risk parity portfolio, and (6) how to make tactical expressions away from the strategic risk allocation of the portfolio. Funds pursuing risk parity strategies can be distinguished based on the foregoing six decisions.[5]

What is the appropriate risk measure in a risk parity strategy? Although most risk parity managers use the standard deviation of asset class returns as the risk metric, other measures can be used, such as downside deviation, maximum drawdown, or conditional value-at-risk. Despite the well-known problems with using standard deviation as a measure of risk, it appears to be the risk measure of choice in most risk parity products because it is convenient for decomposing a portfolio's volatility into volatility contributions from each of the candidate asset classes. The target level of

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[5] Because of these decisions in pursuing a risk parity strategy, there is a series of S&P risk parity benchmarks based on the target volatility. The four target volatility levels are 8%, 10%, 12%, and 15%.