A Performance Analysis of **Risk Parity**

Do Risk Parity Asset Allocations Outperform and What Are the Return Sources of Risk Parity Portfolios?

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A risk parity model is used to construct portfolios that seek to equalize the contributing risk of each asset class under consideration. Risk parity portfolios typically have lower volatilities and higher Sharpe ratios as a result of effective risk-based diversification. As a result, they have become a popular tool for investors seeking to minimize downturns and preserve capital.

In this paper, we examine whether or not risk parity can outperform a buy and hold, asset-based, equal-weighted allocation and seek to identify the key factors that drive the performance of risk parity. We show that risk parity has had better risk-adjusted results when compared to an equal-weighted allocation. Furthermore, we find that rebalancing based on short-term changes in asset class correlation and volatility only minimally influences the risk parity model's asset allocation decisions and results. Instead, long-term (i.e., structural) risk characteristics of the underlying asset classes are the primary determinants of risk parity-derived allocations.

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Introduction

Asset allocation is a critical element of successful investment management. As such, a key goal of many portfolio managers has been to develop asset allocation models that can add value for sustained periods of time. Broadly speaking, asset allocation models fall into two categories: strategic asset allocation and tactical asset allocation (TAA). In strategic asset allocation, an investor's return objectives, risk tolerance, and investment constraints are integrated with long-run capital market expectations in order to determine the portfolio weights, which are typically rebalanced periodically back to the strategic weights. The underlying assumption is that the risk and return expectations for various asset classes will remain constant in the long run, allowing portfolio managers to provide long-term investors with the desired level of systematic risk. But in practice the risk-return relationships across asset classes are not constant.

By contrast, TAA involves making short-term adjustments to the asset mix based on quantitative and qualitative forecasting of relative asset class performance—through studying several market and economic variables. TAA is an active investment strategy with the potential to add value for investors if the portfolio manager is successful in consistently over-allocating to high-performing asset classes and under-allocating to low-performing asset classes.

Skeptics of active management have long criticized TAA, arguing that in reality very few managers can consistently forecast asset class performance. They contend that in the long run strategic asset allocation will outperform an active investment strategy like TAA. Further, TAA has been criticized for having higher trading costs due to frequent rebalancing and higher fees when compared with a passive allocation strategy. However, some managers do outperform strategic asset allocations using TAA. Importantly, strategic asset allocations offer little downside protection during times of market stress. Since correlations between asset classes typically will increase during market downturns (Exhibit 1) portfolio volatility will also increase, as such TAA can benefit a portfolio by taking advantage of these short-term changes in asset class correlation.

Since most strategic asset allocations are diversified by asset class rather than risk, these can lead to higher volatility because there is an unintended concentration in risky assets (Exhibit 2). Risk concentration may lead to sharp drawdowns and losses during periods of market stress. This point is highlighted by examining the annual returns of a 60/40 portfolio of global equities and global bonds. Although the portfolio generally generates a positive return, during market downturns it fails to preserve investor capital; for example, in 2008 a 60/40 portfolio lost nearly 27%.[2]

As a result of these drawbacks, strategic asset allocation has fallen under scrutiny and investors have shown increased interest in TAA strategies. With that context in mind, in this paper we will 1) examine the benefits of risk parity (defined in more detail in the next section), relative to a buy and hold, equal-weighted allocation; and 2) determine the key factors that drive the performance of risk parity asset allocation.

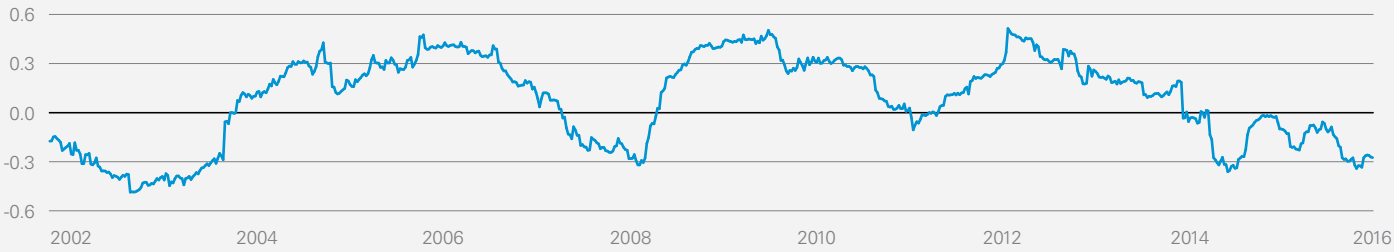
Methodology and Data

Theoretical Overview of Risk Parity

Risk parity seeks to equalize the risk contribution from each underlying asset class within a portfolio. The potential to generate alpha with this approach is derived from two sources. First, risk-based allocations allow managers to avoid over-allocating their risk budget to a specific, risky asset class thus subjecting their portfolio to asset class–specific tail risk. Second, to achieve risk parity between asset classes over time, it is necessary to tactically rebalance the portfolio to account for short-term changes in asset class correlation and volatility. Risk parity will increase its allocation to asset classes that have declining volatility or correlation as their marginal risk contribution to the portfolio volatility is lower. As such, risk parity should theoretically lead to superior risk-adjusted returns as a result of more efficient diversification.

Exhibit 1
Correlations Can Increase in Periods of Stress

12-Month Rolling Correlation: Global Equities and Global Bonds (2002–2016)

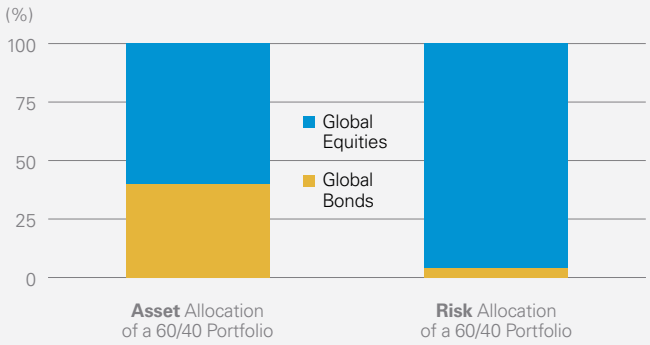


As of 13 July 2016

Global Equities = MSCI World Index; Global Bonds = Barclays Capital Global Aggregate Bond Index. The performance quoted represents past performance. Past performance is not a guarantee of future results. This is not intended to represent any product or strategy managed by Lazard. It is not possible to invest directly in an index.

Source: Bloomberg

Exhibit 2
Asset-Based Allocation Can Lead to Concentrated Risk Sources

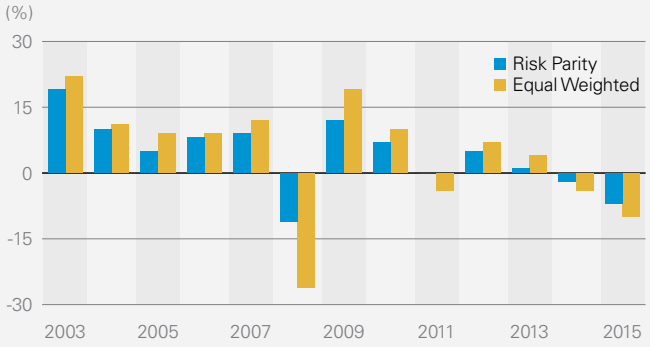


For illustrative purposes only
Source: Bloomberg, Lazard

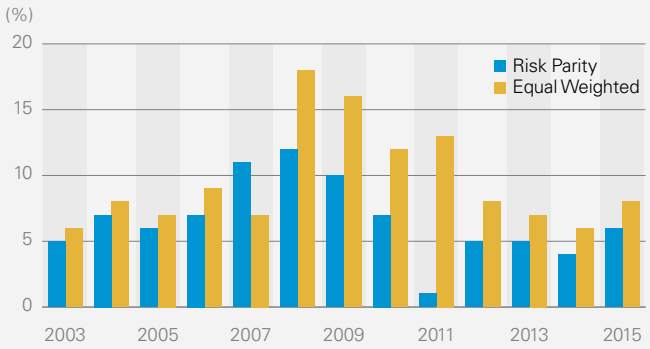
Exhibit 3
Risk Parity Has Shown Superior Risk-Adjusted Returns

	Average Annualized, May 2002–July 2016		
	Volatility (%)	Return (%)	Sharpe Ratio
Risk Parity	7.47	4.91	0.66
Equal Weighted	11.17	4.08	0.37

Annual Returns (2003–2015)



Annual Volatilities (2003–2015)



For the period 8 May 2002 to 13 July 2016
The performance quoted represents past performance. Past performance is not a reliable indicator of future results. This information is for illustrative purposes only and does not to represent any product or strategy managed by Lazard. It is not possible to invest directly in an index.
Source: Bloomberg

Methodology

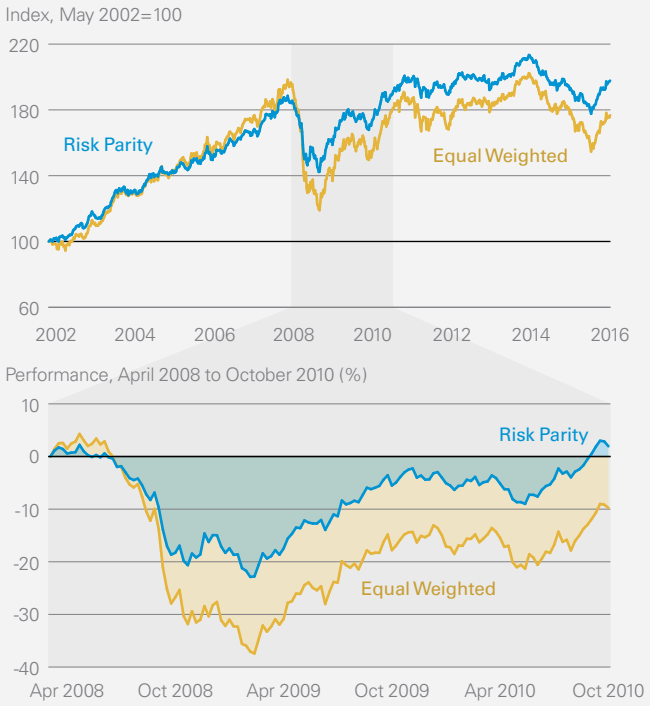
To analyze the benefits of risk parity, we backtested the performance of a risk parity portfolio and compared it to a buy and hold, equal-weighted portfolio, both portfolios used the same asset classes. We believe that an equal-weighted allocation is the best benchmark as it is the average of all possible static allocations in a portfolio and therefore is not biased to a particular allocation (such as the popular 60/40). The backtest covers the period between May 2002 and July 2016 using weekly returns for the asset class and assumes weekly rebalancing for risk parity. We believe this period is appropriate as it covers a variety of market conditions. We chose to include three different asset classes which we represented through indices:

- Global equities represented by the MSCI World Index
- Global bonds represented by the Barclays Capital Global Aggregate Bond Index
- Commodities represented by the Bloomberg Commodity Index

We used 12-month rolling volatility and rolling correlation through *period t* as inputs to calculate the risk parity allocation which is backtested in *period t+1*. In addition we examined and quantified the underlying performance drivers of risk parity. We compared the performance of a dynamically rebalanced risk parity portfolio to a buy and hold, risk-weighted portfolio (we label this in our results, in the next section, as "buy and hold risk parity"). This baseline portfolio is constructed by using the historical volatility and correlation of the underlying asset classes as inputs into the risk parity model to calculate a fixed allocation. Based on our analysis, if the performance of the buy and hold, risk-weighted portfolio is similar to a rebalanced risk parity allocation, then we can conclude that long-term asset class volatility and correlation is the primary performance driver.

To strengthen the analysis, we measured the Sharpe ratio improvement resulting from dynamic allocation based on changing correlation and changing volatility, one variable at a time: one portfolio was constructed with a fixed historical volatility and rolling correlation and another portfolio was constructed with a rolling volatility and fixed historical correlation (we label these portfolios as "dynamic correlation risk parity" and "dynamic volatility risk parity," respectively). Effectively, this methodology allows us to deconstruct dynamic allocation in risk parity and ascertain an approximate performance attribution from changes in allocation due to short-term movements in asset class correlation and volatility. By parsing the performance drivers of risk parity, we believe we can determine the value-add of the strategy's dynamics and rebalancing relative to its unique risk-based approach to asset allocation.

Exhibit 4
Downside Protection from Risk Parity Helps Long-Term Performance



For the period 8 May 2002 to 13 July 2016

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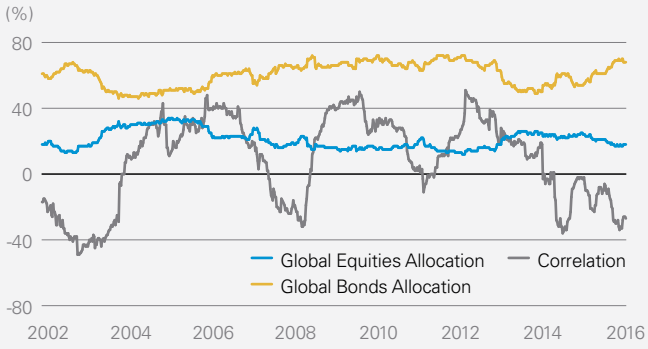
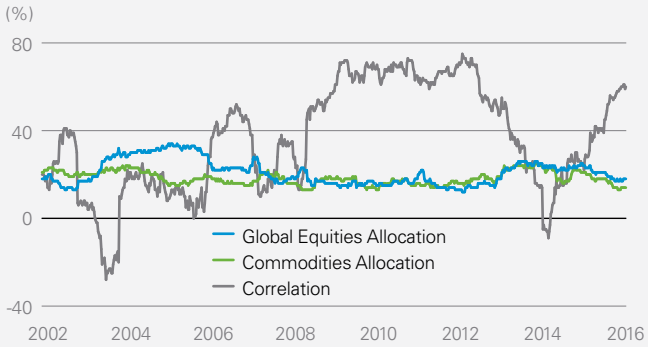
Source: Bloomberg

Exhibit 5
Allocation Changes and 12-Month Rolling Correlation

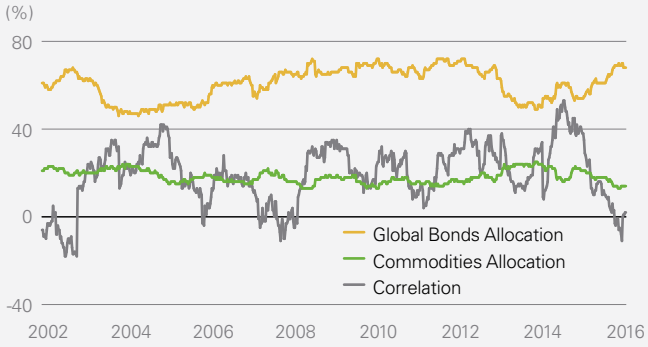
Global Equities and Global Bonds



Global Equities and Commodities



Global Bonds and Commodities



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Source: Bloomberg

Results and Analysis

Performance of Risk Parity versus Equal Weighted

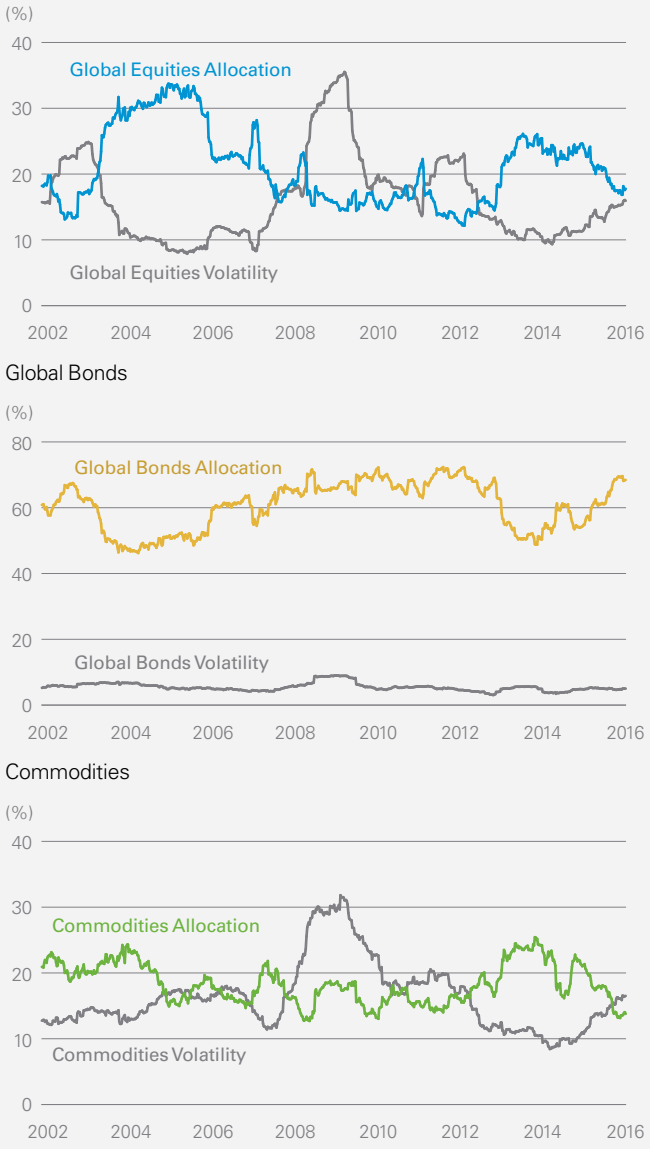
Our results show that risk parity outperforms equal-weighted allocations as it produces superior risk-adjusted returns, measured by the Sharpe ratio (Exhibit 3, page 3, table). We also examined the returns and volatilities of risk parity versus equal-weighted over time.

These statistics suggest to us that risk parity's superior Sharpe ratio is largely due to its lower volatility rather than higher returns (Exhibit 3, page 3, charts). Furthermore, risk parity has a stable distribution of annual returns and volatilities, highlighting the strategy's consistency. Risk parity also was effective in protecting investor capital during bear markets leading to better cumulative performance—for example throughout the global financial crisis, risk parity had a shallower drawdown than the asset-based allocation (Exhibit 4).

Performance Attribution of Risk Parity

Given these favorable results, we sought to explain risk parity's outperformance. We hypothesized that the outperformance could be a function of two factors: 1) risk-based allocations prevent an overconcentration of risk in a single asset class, mitigating portfolio drawdowns during bear markets; and 2) risk parity maintains effective diversification through rebalancing based on short-term changes in asset class correlation and volatility. We tested if dynamic asset allocation holds in practice by comparing the allocation of asset class pairs against their 12-month rolling correlation (Exhibit 5) and the allocation of a single asset class against its 12-month rolling volatility (Exhibit 6, page 5).

Exhibit 6
Allocation Changes and 12-Month Rolling Volatility



For the period 8 May 2002 to 13 July 2016

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Source: Bloomberg

Exhibit 7
Testing the Drivers of Risk Parity Performance

	Average Annualized		
	Volatility (%)	Return (%)	Sharpe Ratio
Risk Parity	7.47	4.91	0.66
Dynamic Volatility Risk Parity	7.42	4.80	0.65
Dynamic Correlation Risk Parity	7.56	4.83	0.64
Buy and Hold Risk Parity	7.50	4.71	0.63

For the period 8 May 2002 to 13 July 2016

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Source: Bloomberg

Though the relationship is not perfect, it seems that as correlation between asset classes increases, the allocation differential between each asset class shrinks. By contrast, when correlation decreases, the allocation to each asset class differs by a greater magnitude. This relationship indicates to us that risk parity, to some degree, dynamically allocates based on short-term changes in asset class correlation.

Likewise, there is a similar relationship between asset class volatility and allocation. The data show that as the volatility of an asset class increases, the allocation to it decreases and vice versa. This suggests that risk parity, to some degree, dynamically allocates based on short term-changes in asset class volatility.

Given that risk parity allocates based on short-term changes in asset class correlation and volatility, we attempt to discern how significantly such rebalancing contributes to the strategy's performance (Exhibit 7).

The results suggest to us that risk-based allocation is the primary determinant of the risk parity-derived allocation. Risk parity with dynamically rebalanced allocations generated a Sharpe ratio of 0.66 while a buy and hold, risk-weighted allocation generated a Sharpe ratio of 0.63, only 3 points basis points (bps) lower. Out of the 3 bps improvement due to dynamic allocation, 2 bps came from risk parity's ability to dynamically allocate from short-term changes in volatility and 1 bps from the strategy's ability to dynamically allocate from short-term changes in correlation. Notably all risk-based variants have much better Sharpe ratios than the asset-based allocation shown earlier (see the equal-weighted results in Exhibit 3).

Although the results show that risk parity benefits from dynamic allocation, the benefit appears to be minimal, with portfolio Sharpe ratios being largely driven by structural risk-based allocation rather than dynamic rebalancing. This is consistent with the principal criticism of risk parity—its performance could be replicated with a buy and hold, risk-based allocation.

Conclusion

We summarize the key insights of our analysis in the concluding points below:

- Risk parity portfolios outperform equal-weighted asset allocation portfolios across market environments; the strategy's superior risk-adjusted returns are largely a function of its lower volatility and downside protection rather than superior returns.
- Risk parity determines the asset mix from two primary sources: 1) the decision to allocate based on asset class risk and 2) the ability to dynamically allocate based on short-term changes in correlation and volatility.
- Although our results show that risk parity benefits from dynamic allocation, the benefit is minimal, with portfolio Sharpe ratios being largely driven by structural risk-based allocation rather than dynamic rebalancing.
- As is typical in empirical studies, our conclusions are subject to our data and methodology decisions. That is, our results could differ if asset classes are changed or added, or if different time frames are studied.

We believe that the results of this research will help highlight some of the key advantages of risk parity over traditional asset-based allocations. However, within the context of risk parity we found that there was not significant value added from dynamic rebalancing versus a buy and hold, risk-weighted allocation. In other words, long-term volatility and correlation are appropriate assumptions for modeling risk parity. But overall, we believe risk-based considerations for asset allocation are a superior approach versus those based on asset weights. Importantly, both approaches are not mutually exclusive. Once implementation costs are taken into account, a potential solution can involve combining these approaches.

This content represents the views of the author(s), and its conclusions may vary from those held elsewhere within Lazard Asset Management. Lazard is committed to giving our investment professionals the autonomy to develop their own investment views, which are informed by a robust exchange of ideas throughout the firm.

Notes

1 This paper is also the work of Christian Fernando, summer intern on Lazard's Multi Asset team.

2 This result is based on the 60/40 mix of the MSCI World Index and the Barclays Capital Global Aggregate Bond Index.

Important Information

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