

# Risk parity

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By equalizing risk contributions, the risk parity manager seeks to enhance the diversification of the portfolio. The collection of risk parity products we have reviewed makes use of leverage to counterbalance the return losses associated with low-risk assets. To date, the embedded leverage has not materially added to the risk of the risk parity funds.

In the pages to follow, we evaluate both the universe of risk parity products available and a naïve construct of a risk parity portfolio using Russell's Strategic Planning Assumptions. We offer a few distinct conclusions based on our evaluation:

1. Our review and analysis suggest that there is, indeed, merit to the idea of managing the risk contributions in a portfolio and employing implicit leverage to increase expected returns.
2. There are many different approaches to risk parity. Therefore, fund selection requires a great deal of due diligence. For the investor, having confidence in the risk parity provider is essential.
3. Russell's Strategic Planning Assumptions bode well for risk parity strategies on a forward looking basis. Therefore, we encourage investors to consider risk parity as a reasonable strategy worthy of consideration.

## Introduction

The concept of risk parity was pioneered in 1996 by Ray Dalio, of Bridgewater Associates, as a scheme for managing his wealth. His idea was to realize equity-like growth with lower volatility by equalizing the risk contribution of each asset class in his portfolio. His approach focused around avoiding any reach for alpha and relying solely on beta. Out of that effort the All Weather portfolio, now a household name, was developed. However, neither Ray nor Bridgewater ever called their investment

philosophy "risk parity." The term was coined a decade later by Eddie Qian, of PanAgora, who launched his own risk parity product in 2006.

Not all risk parity products label themselves as such, and in this note we are using "risk parity" as a bit of a catchall to describe a collection of funds that focuses on risk as the primary factor in the weighting of a portfolio's asset classes.<sup>1</sup> Since the early days of All Weather, aided by some very painful drawdowns in equity markets, the lure of capturing "equity-like" returns without taking on "equity-like"

risk has consistently increased. As well, several risk parity products have entered the market and gained considerable assets. The seven largest risk parity products represent approximately \$100B in assets as of October, 2012. The largest risk parity fund (Bridgewater's) has been building assets for more than a decade, but only a handful of other funds have track records longer than three years, and very few longer than five.

We begin with a discussion of risk parity and some typical assumptions made by risk parity fund managers. With an understanding of risk parity established, we evaluate the merits of the investment strategy. Our evaluation comes from two angles: an examination of the historical performance of risk parity funds in the Russell funds universe, and a calculation of forward-looking expectations based on Russell's strategic forecasts. Finally, we pass judgment on risk parity as an investment strategy and determine that it is a worth considering for many investors.

## What is risk parity?

In this note we use the term "risk parity" to describe a collection of strategies focused on equalizing or carefully targeting the risk contribution of each asset class in a portfolio. We will use the phrase "equalizing risk contribution(s)" for either circumstance.

By equalizing risk contributions, the risk parity manager seeks to enhance the diversification of the portfolio. Given that equity risk generally dominates more traditional portfolios, the idea of making risk contributions equal necessarily reduces the dollar weight of equities and other risk assets that are often sought for their attractive expected return levels. The collection of risk parity products we have reviewed makes use of leverage to counterbalance the return losses associated with low-risk assets. By leveraging up an equal-risk-weighted portfolio, the risk parity manager typically targets a particular volatility – generally around 10%. This level is selected because it positions the fund to offer returns similar to those expected of a 60% equity/40% aggregate fixed income portfolio, but with lower overall volatility.<sup>2</sup> We do not suggest that the 60/40 is a benchmark for risk parity portfolios, given that these funds do not seek the same pattern of returns, but we acknowledge this as the likely alternative for investors. As well, most risk parity managers acknowledge the 60/40 as a target they wish to outperform. Because of this 60/40-relative goal, we regularly compare the universe of risk parity managers to the 60/40 below.

Due to their use of leverage and to the need for regular rebalancing, managers implementing risk parity often use futures, swaps and ETFs instead of trading physical shares.<sup>3</sup> Most risk parity managers will target a risk level that is either below or comparable to that of a portfolio with 60% equities and 40% aggregate fixed income. In risk parity products, allocations to risk assets, factors and/or economic scenarios vary with volatility forecasts, and they require regular adjustment.

Assumptions underlying the risk parity story typically include the following:<sup>4</sup>

1. Risk (i.e., covariance) forecasts are more reliable than return forecasts.
2. Sharpe ratios are either roughly equal or not robust enough to be forecasted with high confidence.
3. Risk has a direct relationship to return over the long term.
4. Leverage, especially implicit leverage of futures, does not materially increase the liquidity risk of a portfolio.
5. Using leverage, a risk parity manager intends to achieve a higher return per unit of risk than characterizes a 60/40 portfolio.
6. Broad asset classes have low correlations to each other. The lower the correlations, the greater the benefits of risk parity.

A very common theme in the construction of risk parity portfolios is managers' use of leverage with the intention of enhancing returns. Because leverage has caused difficulty in many illiquid or semi-liquid strategies,<sup>5</sup> its prominent role in this strategy is worth discussion.<sup>6</sup> While individual risk parity managers' practices vary, our assumptions largely describe what induces the managers to allocate assets in this way.

The use of leverage in risk parity is largely (or in some cases completely) implicit. By using futures, risk parity managers do not explicitly borrow. The major difference between risk parity and funds that have experienced problems with leverage in the past is the use of highly liquid instruments. While we cannot know what the future will hold, leverage has not, in the past, caused the same issues for risk parity managers as it has for those following illiquid or semi-liquid strategies.

Another benefit of using highly liquid futures is that risk parity can be offered at a relatively low cost compared to traditional active management. In addition risk parity may have a rules-based implementation, thus avoiding some of the costs associated with active management.<sup>7</sup> This lower cost may come with an absolute return target and a transparent methodology. Therefore, fee-conscious investors may find risk parity attractive relative to hedge funds for the absolute return space in a portfolio.

With an understanding of the assumptions underlying risk parity, the instruments the strategy uses, and some typical risk/return targets, we can now move on to evaluating the strategy on its record and to looking at its potential going forward.

## Considering the history and future of risk parity as an investment strategy

With \$100B in assets and new funds opening and gathering assets, risk parity is clearly gaining momentum among investors. But a number of important questions should be addressed: Have fund returns achieved their targets? What are the expectations for risk parity going forward? Does the strategy merit the attention it has received? And ultimately, for investors, what are the conditions for considering risk parity an attractive option? We explore these questions in the pages that follow.

### Have fund returns achieved their targets?

In our review of risk parity managers, we have had the opportunity to evaluate past performance, both live and simulated. Recall that these managers target returns comparable to 60/40 but with lower total volatility. Therefore, using 60/40 as a yardstick to measure risk parity manager success is consistent with manager goals.

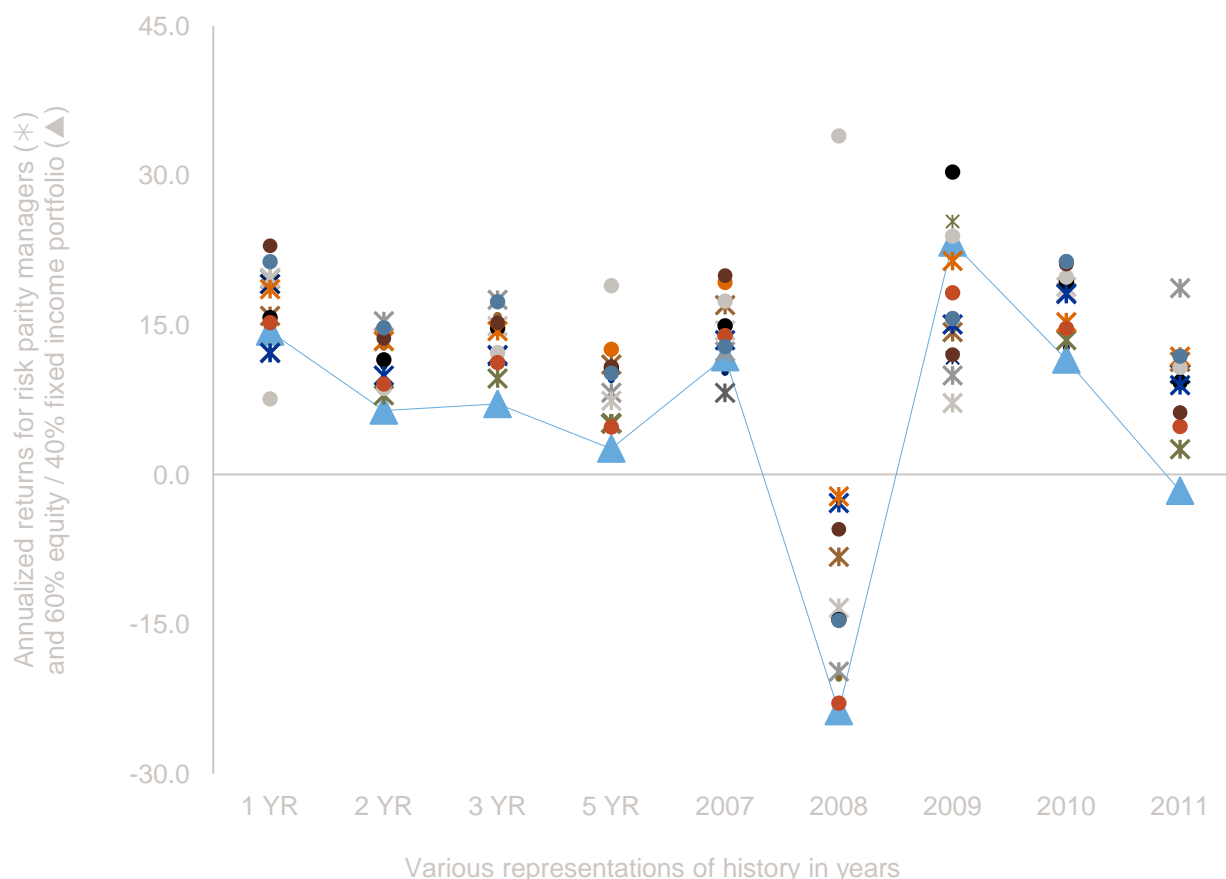
In Exhibit 1, we observe that the universe of risk parity funds has produced attractive returns relative to the 60/40 portfolio over the last five years. What is more interesting is that there are two calendar years (2010 and 2011) where the entire distribution of risk parity portfolios outperforms the 60/40 portfolio, and two calendar years (2007 and 2008) where only one or two funds underperform the 60/40. Finally, we see that, except for the one-year returns, the entire distribution of risk parity outperforms the 60/40. It appears that historically, risk parity has done what it set out to do.

The reader should keep a few things in mind:

1. Many of the risk parity returns are simulated – they represent what the funds *would have achieved* had they existed at that time – but the 60/40 returns are not simulated. Therefore, one might suspect that a live history of each of these 12 funds might not look as pretty as the simulated version.
2. While risk parity returns as a group seem quite attractive relative to those of 60/40, they are by no means homogeneous. The distribution of returns in

### Exhibit 1: Comparison of risk parity universe with 60% equity and 40% bond portfolio

Distribution of risk parity returns compared with 60% equities and 40% fixed income



Stars indicate live fund returns. Dots indicate simulated returns. Simulated returns were provided by individual managers. The methodology used by each manager may vary so that returns may not be directly comparable. The returns are shown gross of fees. Please see the disclosure section for limitation of simulated returns. The triangles with a connecting line indicate the 60/40 portfolio. Equities are represented by the Russell Global Index. Fixed income is represented by the BarCap US Aggregate Bond Index.

Source: Russell, Barclays Capital, various risk parity managers.

2008 and 2009 is particularly broad.

3. Investors should note that risk parity managers may experience drawdowns. For example, risk parity may have outperformed the 60/40 in 2008, but the returns were often quite negative.
4. Risk parity's relatively high allocation to fixed income (as compared with the 60/40) has been a strong tailwind in a falling-rates environment. When equity performed well in 2009, the 60/40 outperformed 75% of the risk parity funds.

The importance of the first point is obvious. We see from the return distributions that risk parity managers *expect* that they would have outperformed the 60/40, but we do not know for certain that they would have.

This second point is material because it goes to the heart of why benchmark-oriented 60/40 is attractive. In the case of a 60/40 portfolio, the investor is relying on fixed allocations to well-known markets. Moreover, active management in these markets has the expected advantage of providing a well-known market's passive return along with the potential for additional alpha. The second point also highlights a relative strength of risk parity over 60/40 portfolios. When a 60/40 portfolio does poorly, virtually all portfolios benchmarked to 60/40 do poorly. Therefore, the investor cannot easily diversify the event risk associated with 60/40 (which mostly comes from the 60). By contrast, risk parity managers may provide some diversity to each other, as they are not tied to particular benchmarks or allocations. The differences among risk parity managers carry with them a caveat as well: the user of risk parity must have a high level of confidence in the asset-allocation skills of the manager, since allocation is neither specified in advance nor fixed.

The third point is important, because risk parity is not necessarily immune from drawdowns, nor is it a "guarantee" of low-volatility returns, nor is it uncorrelated to a 60/40 experience. Investors must understand that risk parity is still risky. To get an idea of the diversification of a risk parity portfolio to the 60/40, we calculated five-year monthly correlations. We found one fund with a 0.09 correlation to the 60/40 and another with 0.54; the remaining 10 had correlations above 0.70. Indeed, one fund exhibits a surprisingly high correlation, at 0.93 to the 60/40 over the last five years. Ultimately, risk parity may indeed suffer from equity downside volatility.

Finally, the fourth point is a favorite of the risk parity critics. We can approximate how much of the return for risk parity strategies may be due to declining interest rates by observing the change in bond yields. The capital gain due to declining interest rates is approximately the duration of a bond times the change in yield. The table below provides an estimate of the return due to capital appreciation for the Barclays Aggregate Bond Index over recent five- and 10-year horizons. This calculation does not capture the return due to the spread between the borrowing rate and fixed income investments, only the capital appreciation portion.

We should note that bond exposure for risk parity strategies may exceed 100% of the portfolio value, depending on the level of leverage applied, and that risk parity managers are not simply leveraging up the Barclays Aggregate Bond Index within their strategies. But this calculation supports the critics' assessment that recent market patterns have provided a significant tailwind for risk parity, a trend that may not be sustained going forward.

Note that Russell's strategic planning assumptions, which we use in our calculation below, take into account the current forward expectations for bond markets; therefore, to undo the return expectations for risk parity, conditions would need to be worse than what is priced in for the reliance on fixed income and credit. As well, regardless of what one expects in the fixed income market going forward, the risk parity portfolio has other exposures, such as (depending on the product chosen) equities, commodities, currencies, credit, momentum and interest rates. Risk parity managers generally expect low correlations to prevail, such that if one of the asset classes does not provide return, other asset classes will.

To a large extent, risk parity portfolios have achieved their targets, at least in back-tests. The three-year Sharpe ratios from the sample of funds range from 1.6 to 3.3, compared with 0.6 for a 60/40 mix. As well, the sample median three- and five-year returns (annualized) – nearly 14% and 10%, respectively – are far more attractive than those of the 60/40, which were 7.1% and 2.6%, respectively. That said, the next three to five years may be unlike the last three to five years.

What, then, is next? In the following section, we look at what Russell's strategic planning assumptions bode for 60/40, risk parity and some other asset allocation schemes.

**Exhibit 2: Estimate of benefits from declining interest rates on recent risk parity performance**

	DECLINE IN YIELD TO MATURITY	AVERAGE DURATION	CAPITAL APPRECIATION	ANNUALIZED IMPACT
5-year horizon, Dec. 31, 2007 – Dec. 31, 2012	3.2%	4.7	15.1%	+3.0%
10-year horizon, Dec. 31, 2002 – Dec. 31, 2012	2.4%	4.4	10.6%	+1.1%

## What are Russell's expectations for risk parity going forward?

As a basis for comparison, we use Russell's strategic planning assumptions to construct a forecast of risk parity. In Exhibit 3 we compare five portfolios – 60/40, frontier tangent, minimum risk, equal-weighted and risk parity. We have constructed a plain-vanilla version of risk parity that considers only the volatility of each asset class, and not its covariance structure vis à vis other asset classes. The range of long-only portfolios – those subject to a “no shorting” constraint – is highlighted with grey dots, and the “no leverage” frontier is illustrated with an orange dashed line. In this analysis, we employ Russell's 10-year forecast as of March 31, 2013, and include global equities, U.S. aggregate bonds, collateralized commodities futures, U.S. TIPS, global high yield, emerging market debt and a “risk-free rate.”<sup>8</sup>

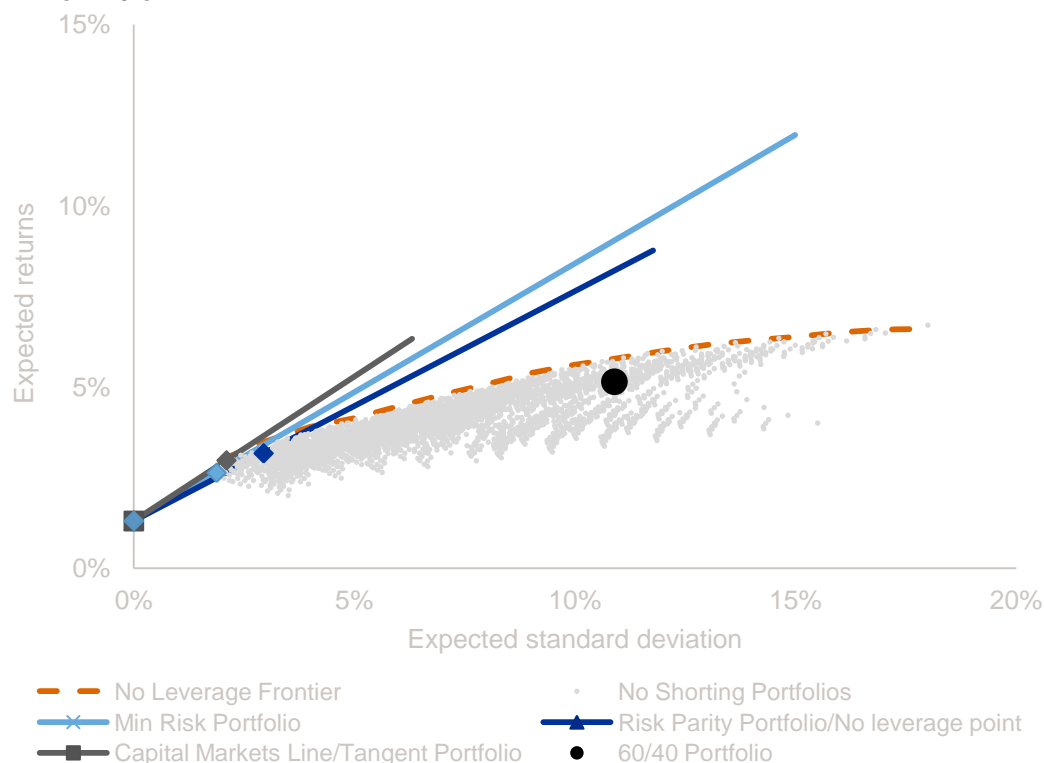
It is important to note that the calculations we label below as being risk parity do not reflect the sophisticated strategies of actual risk parity managers, nor are they calculated from the historical performance of actual risk parity product(s). They do provide an estimate of the return prospects for a very simply implemented risk parity strategy.

To assist the reader with specific numbers, we include statistics in Exhibit 4. The 60/40 is used simply as a point of comparison; it is not in any sense meant to suggest optimality. Note that all data in this analysis is indicative of passive investment instruments and excludes the use of active management.

Any of these strategies could be implemented via active management, with, potentially, an added benefit for doing so. In practice, to increase managers' flexibility in trading positions and to avoid the use of costly explicit leverage, risk parity generally eschews active management. Instead, risk parity more often relies on implicit leverage through the use of futures markets. The use of active management is a fundamental difference between levered and unlevered portfolios.

The use of leverage in risk parity portfolios is common, and there is a cost to leverage, which may vary by asset class. For our analysis, below, we are ignoring potential leverage costs and any leverage-induced changes in volatility. Therefore, compared to the unlevered, the levered portfolios have a bit of a tailwind. Our implicit assumption is that the differences we observe are robust to a haircut in consideration of these costs.

**Exhibit 3: Portfolio views – 60/40, the tangent portfolio, the minimum risk portfolio, equal-weighted and the risk parity portfolios**



Source: Russell



**Exhibit 4: Risk parity compared with other options, unlevered and levered, that seek to meet either equal risk or equal return expectations**

	ALLOCATIONS							SUMMARY STATISTICS		
	EQUITY	FIXED	CCF	TIPS	G HY	EMD	RFR	ER <sup>†</sup>	STDEV	SHARPE
<b>UNLEVERED</b>										
RP	5%	45%	6%	26%	8%	11%	-	1.87%	2.94%	0.63
Tangent	3%	91%	1%	2%	2%	1%	-	1.68%	2.10%	0.80
Min Var	0%	84%	1%	18%	-1%	-1%	-	1.33%	1.87%	0.71
1/N	17%	17%	17%	17%	17%	17%	-	2.80%	6.00%	0.47
60/40	60%	40%	0%	0%	0%	0%	-	3.84%	10.89%	0.35
<b>LEVERED TO EQUALIZE 60/40 STANDARD DEVIATION EXPECTATIONS</b>										
RP	18%	166%	21%	95%	29%	39%	-270%	6.91%	10.89%	0.63
Tangent	14%	471%	6%	8%	12%	6%	-418%	8.68%	10.89%	0.80
Min Var	2%	485%	5%	104%	-9%	-6%	-481%	7.74%	10.89%	0.71
1/N	30%	30%	30%	30%	30%	30%	-81%	6.38%	10.89%	0.47
<b>LEVERED TO EQUALIZE 60/40 EXCESS RETURN EXPECTATIONS</b>										
RP	10%	92%	12%	53%	16%	22%	-106%	3.84%	6.04%	0.63
Tangent	6%	208%	3%	4%	5%	3%	-129%	3.84%	4.81%	0.80
Min Var	1%	241%	2%	51%	-4%	-3%	-188%	3.84%	5.40%	0.71
1/N	23%	23%	23%	23%	23%	23%	-37%	3.84%	8.24%	0.47

Source: Russell; <sup>†</sup>Excess return over risk-free rate, CCF=Collateralized Commodities Futures, TIPS=Treasury Inflation-Protected Securities, GHY=Global High Yield Bonds, EMD=Emerging Markets Debt, RFR= Risk Free Rate.

Exhibit 4 allows for a variety of interesting observations. Before delving into them, let us remind ourselves one more time that these calculations are based on Russell forecasts for returns, volatilities and correlations.<sup>9</sup> The forecasts incorporate our expectations about changes in interest-rate levels – specifically, our assumption that rates are likely to be higher in the future than they are as of the forecast date. This point will be important later. Now, on to the observations:

**Observation #1:** While it is not possible for all investors to use leverage, the practice may allow those who can to move away from singular reliance on highly volatile equity for generating asset growth. The equity allocation of risk parity is noticeably lower than that of 60/40.

**Observation #2:** By definition, the tangent portfolio has the highest Sharpe ratio. Risk parity is behind both the tangent and the minimum variance portfolio in regard to Sharpe ratio. However, risk parity requires less use of leverage to achieve potentially equity-like returns.

**Observation #3:** The 60/40 portfolio does offer the lowest Sharpe ratio.

**Observation #4:** Introducing leverage allows for either higher expected returns at an equal level of risk or equal expected returns at a lower level of risk.

### Does risk parity merit the attention it has received?

Again we note that, at least in our universe of largely simulated returns, risk parity has offered some very attractive return patterns in recent years. As the strategy

has caught the attention of many investors, critics have highlighted the falling interest rate environment, coupled with highly volatile equity returns. As well, in recent years liquidity provided by central banks has been a global strategy to promote market growth. Remember, however, that Russell's forecasts take forward expectations for interest rates fully into account. Combining our consideration of forward rates with the four observations above, we conclude that risk parity does indeed merit attention and further investigation. For investors who are not averse to implicit leverage, risk parity is a reasonable strategy to consider. But who are those investors, and what assumptions and conditions are necessary for them to take the plunge?

### Under what conditions does risk parity make sense?

First, let's review what we've said above, as we offered a basic understanding of risk parity and reviewed typical assumptions for managers:

1. Risk forecasts are more reliable than return forecasts.
2. Sharpe ratios are either roughly equal or not robust enough to be forecasted with high confidence.
3. Risk has a direct relationship to return over the long term.
4. Leverage, especially implicit leverage of futures, does not materially increase the liquidity risk of one's portfolio.

5. Using leverage, the risk parity manager intends to achieve a higher return per unit of risk than is available in a 60/40 portfolio.
6. Broad asset classes have low correlations to each other. The lower the correlations, the greater the benefits of risk parity.

Therefore, for an investor to consider risk parity a viable investment strategy, the above assumptions must be palatable. Moreover, the investor must have the ability to take up leverage in the portfolio (generally this is a function of regulation, formal guidelines or investment preferences). As well, risk parity may result in shorting particular asset classes, so the investor must also be able to accept short positions. Finally, the investor must be comfortable that future conditions do not necessarily preclude success for this investment strategy.

### What will undo the positive potential for risk parity?

There are some conditions under which the risk parity strategy will come undone. Recall that a common criticism of risk parity is its heavy reliance on fixed income. For example, if interest rates rise faster than what is currently priced into the yield curve, risk parity may experience a headwind. As well, risk parity is highly reliant upon implicit leverage. If the cost of such leverage rises, or if margin calls require explicit leverage, risk parity may also experience problems. In addition, risk parity relies on diversification among major asset classes. If correlations among these asset classes increase while asset class performance declines, then risk parity will also experience problems. Finally, risk parity requires more frequent trading than does 60/40. Therefore, dramatic increases in the bid/ask spreads or trading costs of futures, swaps or ETFs will present issues for the risk parity fund. The risk parity investor must either accept that adverse conditions may arise and cause lower expected returns, or be confident in considering these conditions unlikely.<sup>10</sup>

### How to use risk parity?

Risk parity should be viewed as complementary to other asset allocation methodologies and may be best employed as a form of sensitivity analysis around base forecast assumptions. Recall that the risk parity outlook (the plain-vanilla version, at least) is akin to a multivariate normal forecast with zero correlations and equal Sharpe ratios. Because expected return assumptions have the strongest influence on selected allocations,<sup>11</sup> and because many researchers feel that covariance values are more stable than return levels, it is informative to compare the recommendations of a risk parity view, which emphasizes the covariance structure, to a mean-variance solution using base forecast values for expected returns.

As well, risk parity can be applied at a multi-asset level or within the implementation of individual asset classes. A number of risk parity funds will have multiple layers of parity – at the asset level, within an asset level, across regimes. If the risk parity paradigm is agreeable to an investor, selecting risk parity for any of these levels is appropriate. For example, one might believe risk parity to be a useful way of selecting from among individual stocks, equity sectors, or currencies.

### Summary

Risk parity had attracted much attention in recent years. The dominant features of risk parity are (1) its attempt to allocate risk across a wide range of return sources in a more elegant fashion than the current norm offers and (2) to use implicit leverage to achieve a higher level of return.

There are many different approaches to risk parity. Therefore, fund selection requires a great deal of due diligence. For the investor, having confidence in the risk parity provider is essential.

The assumptions underlying risk parity may be robust to deviations, but only time and individual applications will reveal such robustness. Ultimately, selecting risk parity requires accepting some assumptions about risk, leverage and the ability of the provider to forecast covariances.

Our review and analysis suggest that there is, indeed, merit to the idea of managing the risk contributions in a portfolio and employing implicit leverage to increase expected returns. To date, the embedded leverage has not materially added to the risk of the risk parity funds. Thus, history has been favorable, albeit simulated in some cases. But what about the future?

In our analysis, forecasted conditions bode well for risk parity in comparison to the more traditional 60/40 portfolio. For risk parity to be deemed a poor choice in regard to the risk/return outcome, conditions would need to be markedly worse than forecasted for fixed income strategies. Shocks to the futures market that are separate from the outcomes of the market itself could also cause issues for risk parity investors; however, we note that such shocks have not been experienced in recent years, even in the turbulent financial markets.

In conclusion, we encourage investors to consider risk parity as a reasonable strategy that uses leverage to offer an alternative asset allocation methodology by use of liquid instruments.

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## RELATED READING

Chopra, Vijay K., and William T. Ziemba (Winter 1993), "The effect of errors in means, variances and covariances on optimal portfolio choice," *Journal of Portfolio Management*.

Lowenstein, Roger (2000), "When Genius Failed: The Rise and Fall of Long-Term Capital Management," Random House Publishing Group, New York.

Madden, William (December 2012), "Estimating the conditions for return equality between risk parity and a traditional 60/40 portfolio," Russell Practice Note.

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The simulated returns were derived by the various calculations of the individual managers. The results do not reflect actual trading or the impact of factors that might have affected the manager's decision-making. No market risk was taken during the periods that were simulated. The results may benefit from hindsight and, as a result, almost invariably will show attractive returns. Hypothetical or back-tested performance is no guarantee of future results.

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<sup>1</sup> A multitude of funds focus on risk weights within an asset class – we are not considering that collection of funds in this paper.

<sup>2</sup> For our analysis, we use 60% Russell Global Index (RGI) and 40% Barclays US Aggregate. We refer to this portfolio as "60/40" for the remainder of this note.

<sup>3</sup> There are some instances in the universe of using physicals. Some risk parity managers avoid swaps due to counterparty considerations.

<sup>4</sup> This list of assumptions is based on our discussions with managers of risk parity products.

<sup>5</sup> See Lowenstein (2000).

<sup>6</sup> Risk parity managers exhibited gross notional exposures ranging from 102% to 284%, with a median gross exposure of 173%, as of September 30, 2012. This is from the universe of managers. The leverage levels may have been live or simulated.

<sup>7</sup> While the implementation of these strategies may be rules-based, most risk parity providers have qualitative oversight given extreme market conditions.

<sup>8</sup> We actually use Russell's 10-year cash forecast and ignore the volatility of that forecast. Essentially, we are explicitly assuming that we can borrow with a determinate rate. This is not a strong assumption, since the rate of borrowed funds will not change over time; but the reader should note that the determinate rate at which one borrows will vary with the point of borrowing. That is, while I can borrow today at 2.1% for a 10-year obligation, if I borrow again next week, the rate will be slightly different.

<sup>9</sup> As noted above, correlation is not considered in determining the risk parity allocations, but it is used in the calculation of the portfolio performance metrics of Table 2.

<sup>10</sup> For more details, see Madden (2012).

<sup>11</sup> See Chopra and Ziemba (1993).