

Investment Insight

Are Risk Parity Managers Risk Parity?

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In recent years, Risk Parity managers are popping up, as the Chinese saying goes, like bamboo shoots after a spring rain. In the case of Risk Parity though, “the spring rain” was the “tsunami” of the global financial crisis, which delivered devastating losses to traditional capital-based asset allocation portfolios and prompted a significant increase in investors’ interest in risk-based portfolios, such as Risk Parity.

The flood of new entrants into the marketplace has raised the question: are these new offerings truly Risk Parity as we know it? This is an important question to answer as an “in-name-only” Risk Parity portfolio may fail to provide the diversification and stable investment returns that investors expect from a risk-balanced approach like Risk Parity.

While its importance is apparent, this is certainly not an easy question to answer. In order to do so, there are at least two issues we have to address. First, there is no clear consensus as to the definition and interpretation of the Risk Parity principle. Second, there is no simple way for the investing public to tell if a given manager adheres to this principle. These difficulties, however, shall not deter us from the search for answers. In this research note, I aim to define the principles of Risk Parity investing and then examine several Risk Parity managers quantitatively using return-based style analysis. The results are revealing, as well as surprising.

What is Risk Parity?

As someone who initiated the research on Risk Parity, and in 2005 coined the term “Risk Parity¹”, I’d like to share with readers my perspectives about Risk Parity as an investment approach. The best way in which to do this would be to first define that which is not Risk Parity.

First, we can all agree that a 60/40 stock/bond portfolio is not Risk Parity, because the so-called balanced (in capital) portfolio is terribly unbalanced with regard to risk allocation, having between 90 to 95% of the portfolio’s risk in stocks. Second, portfolios constructed with risk budgeting are not necessarily reflective of Risk Parity. A common example is **a portfolio with an equal risk allocation to all select asset classes**. Imagine, for example, that a manager has chosen four equity asset classes and one fixed income asset class in an asset allocation portfolio. Such an equal risk contribution portfolio would have 80% of its risk in stocks and 20% of its risk in bonds. While this could likely be considered an improvement over the 60/40 portfolio, it is definitely not Risk Parity². Conversely, if the portfolio budgets risk equally between four fixed income asset classes and one equity asset class, we are still left with a portfolio that is not utilizing Risk Parity.

¹ Edward Qian, 2005, “Risk Parity Portfolios – the Original”, PanAgora Asset Management

² The paper by Chaves et al - “Risk Parity Portfolio vs. Other Asset Allocation Heuristic Portfolios” (Journal of Investing, Vol. 20, No. 1, Spring 2011), makes such a mistake in defining Risk Parity.

This example thus highlights the importance of Parity along the right dimension. It begs the question: what are the most important dimensions? Obviously, it is not based upon the number of assets, or the asset class dimension. This brings me to the third point: **a portfolio with equal risk allocation to select asset categories is not necessarily Risk Parity.** Suppose the manager above has realized his mistake and decides to include four fixed income asset classes to balance out the number of equity asset classes. The manager chooses High Yield Debt, Emerging Markets Debt, Inflation-linked Bonds, and Investment-grade Bonds. Is an equal risk contribution portfolio from the eight asset classes Risk Parity? It certainly is not, because these four fixed income asset classes all contain varying degrees of equity risk or inflation risk exposure. In the case of High Yield, it is almost all equity³.

So what is Risk Parity? The key word in Risk Parity is Risk. **A Risk Parity portfolio, at a minimum, must have balanced risk allocation along the economic risk dimensions that have a major impact on the portfolio's returns.** For Risk Parity asset allocation portfolios, the key risk dimensions are growth risk and inflation risk.

Associated with these risks are risk premiums provided by the different asset classes. Along the growth risk dimension, there is equity risk premium and interest rate risk premium, and along the inflation risk dimension, there is real return premium and nominal return premium. When we risk budget these premiums together to achieve balanced exposure to growth and inflation risk, then it is evident that a **Risk Parity portfolio should have a balanced risk contribution from three sources: (1) equity risk; (2) interest rate risk; (3) inflation risk.**

Some asset classes fit into these three risks directly. Stocks represent equity risk, government bonds represent mostly interest rate risk, and commodities represent inflation risk. Other "hybrid" asset classes, such as the four fixed-income assets mentioned above, can be decomposed into the three risks by either qualitative or quantitative analyses.

³ Edward Qian, "High Yield as an Asset Class: Equity in Bond's Clothing", PanAgora Investment Insight, January, 2012

A Style Analysis of Risk Parity

I define Risk Parity as a portfolio that targets balanced contribution from equity risk, interest rate risk, and inflation risk. I now examine seven Risk Parity managers listed in the eVestment database by performing a return-based style analysis and then mapping their effective asset allocation mixes to risk allocations.

Return-based style analysis was introduced by William Sharpe⁴ to analyze asset allocation and equity managers. The original technique is designed for long-only, unlevered portfolios; I have extended it to analyze long-only leveraged portfolios.

Our sample period covers the trailing three years from 10/2009 to 9/2012, during which monthly returns for all seven managers are available⁵. While it is possible to begin the sample period as of an earlier date, many Risk Parity managers evolved their strategies in one way or another after the global financial crisis of 2008. Therefore, the data from the last three years would likely be a better representation of their current style.

The choice of return indices also warrants some consideration. On the one hand, a choice of too few might not provide sufficient coverage of all managers' investment choices. On the other hand, too many indices might lead to multicollinearity and over-fitting. I have found that while the effective asset mix from the style analysis may change with the choice of the asset indices, the final risk allocation to the three risk sources is rather robust. This is because changes in the effective asset mix tend to occur between asset classes that are highly correlated and therefore represent similar type of risks from a macroeconomic perspective. I thus opt to use a sufficient but not exhaustive number of return indices to produce a good fit for the style analysis.

Exhibit 1 shows the effective asset mixes for the seven Risk Parity managers labeled from A to G. There are

⁴Bill Sharpe, "Determining a Fund's Effective Asset Mix," Investment Management Review, December 1988, pp. 59-69 and Bill Sharpe, "Asset allocation: Management style and performance measurement," The Journal of Portfolio Management, Winter 1992, pp. 7-19.

⁵ One of the managers stopped reporting in 6/2012.

twelve asset classes included in the analysis. For commodities or inflation risk, I use the DJ-UBS commodity index. Among the fixed income asset classes, US Treasury, MBS, and WGBI x US are almost all interest rate risk; Credit and EM Debt represent a combination of interest rate risk and equity risk; TIPS represent a combination of interest rate risk and inflation risk; and High Yield can be categorized as equity risk. Finally, there are four equity asset classes representing equity risk.

Exhibit 1 Effective asset mixes of seven Risk Parity Managers, and total leverages and R-squared of the fit

	A	B	C	D	E	F	G
DJUBS	18%	7%	15%	25%	21%	13%	17%
BarCap US Tsy	0%	43%	66%	38%	65%	17%	0%
WGBI x US	87%	93%	57%	93%	52%	9%	74%
BarCap MBS	0%	0%	0%	0%	0%	18%	7%
Citi US TIP	57%	79%	46%	29%	55%	50%	37%
BarCap Credit	30%	18%	7%	0%	0%	15%	0%
Citi EM Debt	0%	7%	0%	1%	0%	0%	14%
BarCap US HY	1%	0%	4%	0%	0%	8%	32%
S&P 500	0%	0%	8%	15%	4%	37%	2%
MSCI x US	22%	11%	3%	0%	28%	19%	19%
R2000	13%	9%	15%	5%	8%	0%	15%
MSCI EM	0%	2%	5%	0%	0%	1%	9%
Leverage	228%	269%	226%	205%	232%	188%	225%
R-squared	92%	94%	95%	82%	89%	96%	96%

For illustrative purposes only. Source: PanAgora

There are several observations to be made regarding the results in Exhibit 1. First, the style fit is quite good. With the exception of manager D, the R-squared is either close to or above 90%. Second, the leverage ratios are between 200% and 300% except for manager F whose leverage is 188%. Manager B has the highest leverage at 269%. But I caution that this leverage comparison is not indicative of the total level of portfolio risk, since 93% of manager B's portfolio is in the WGBI x US index whose return volatility is very low, whereas manager F, with the lowest leverage, has an exposure of 65% in four equity asset classes and High Yield combined.

Furthermore, as we shall see later, the fact that a portfolio, such as the one run by manager F, is levered and has substantial notional exposure to fixed income

assets does not necessarily prove the portfolio is Risk Parity. The use of leverage to balance the risk allocation of Risk Parity portfolios is often a hotly debated issue, which in my view is misguided. Regardless, it is crucial to point out that while portfolio leverage is necessary in order for Risk Parity to achieve a risk level that delivers high expected returns, **leverage is not a sufficient condition for an asset allocation portfolio to be Risk Parity.**

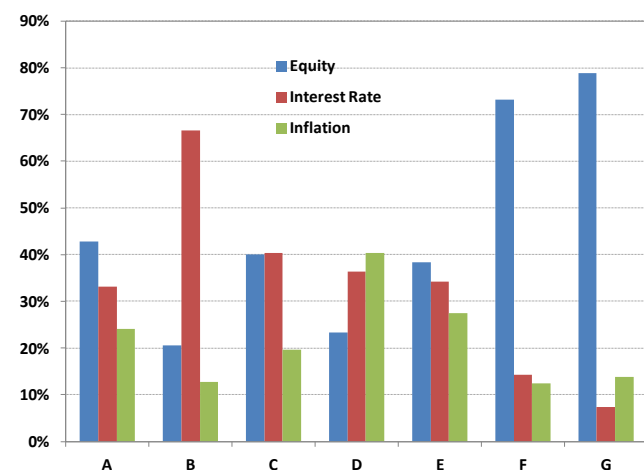
Third, among all asset classes, managers have common exposure to some but not to others. The common exposures seem to include commodities, global sovereign bonds, inflation linked bonds, and global developed equities, within both large and small capitalization.

Risk Allocations of Risk Parity Managers

Given the effective asset mixes in Exhibit 1, we can now derive the risk allocations to the individual asset classes, providing a covariance matrix of asset returns. Most Risk Parity managers use various quantitative methods and long term historical returns to compute their covariance matrices. Furthermore, a covariance matrix based on the last three years of returns, which is used in the style analysis, is too short-term and is susceptible to distortion introduced by the particular macroeconomic environment in which we've been of late. I thus use monthly returns covering a much longer period to calculate the covariance matrix used in order to determine the managers' risk allocation.

Once I have the risk allocation to asset classes, I combine them into risk allocation to the three risk sources: equity, interest rate and inflation, the results of which are shown in Exhibit 2.

Exhibit 2 Risk allocations to three risk types



For illustrative purposes only. Source: PanAgora

The question now is whether these risk allocations are balanced. It is obvious that managers F and G do not pass the test since both maintain a very low risk allocation to interest rate risk. Manager G, in particular, has a risk profile that is very similar to that of a 60/40 portfolio, with the exception that some of the equity risk is now diverted to the inflation risk bucket. In Exhibit 3, I aggregate equity and inflation risk into “risk-on” risk and re-label interest risk as “risk-off” in order to reflect the recent risk-on/risk-off market phenomenon, whereby many risky assets including equities and commodities move in tandem. From this perspective, the 93/7 split between risk-on and risk-off makes manager G no different than a 60/40 manager.

Exhibit 3 Risk-on combines risks in equity and inflation and risk-off is the interest rate risk.

	A	B	C	D	E	F	G
Risk on	67%	33%	60%	64%	66%	86%	93%
Risk off	33%	67%	40%	36%	34%	14%	7%

For illustrative purposes only. Source: PanAgora

The risk profile of manager F is similar, with only 14% in interest rate risk and 86% in equity and inflation risk combined. It is apparent that both managers F and G are heavily exposed to equity or growth risk, with no meaningful difference to the traditional 60/40 portfolio. Yet, both managers have significant notional exposure to fixed income asset and portfolio leverage. How can this be? There are three reasons. First, the interest rate exposure is in low-risk asset classes. Second, many fixed income exposures have embedded equity risk. Third,

they have high notional weights in equity assets. Due to these reasons, managers F and G are not Risk Parity.

Manager B is different from Risk Parity in the opposite way – its interest rate exposure accounts for 67%, or two-thirds, of the risk budget, while equity risk and inflation risk only account for 21% and 13%, respectively. This is due to the fact that its effective asset allocation mix has low weight in equity assets (22%) and commodities (7%) and very high weights in both nominal and inflation-linked bonds. The aggregate risk-on risk is only 33%. It thus appears that manager B is invested in not Risk Parity, but a significantly more conservative, fixed-income tilted portfolio with some exposure to equity and real assets in commodities and inflation-linked bonds.

Exhibit 2 shows that the rest of four managers - A, C, D, and E - have rather balanced risk allocations to three types of risks. These allocations fall in the range of 20% to 40% within each of these risks. While this group shares more similarities in regard to their risk profiles, according to Exhibit 3, manager A appears to be the most growth oriented with 67% of risk in risk-on assets and manager C appears to be the least, with 60% of its risk attributed to risk-on assets.

Return “tests”

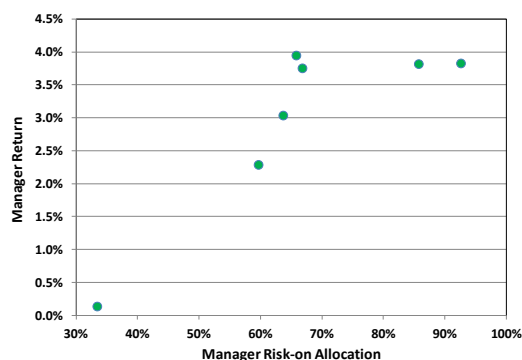
The style analysis and breakdown of risk allocation to equity, interest rate, and inflation risks may appear to be abstract, but its practical implication is clear. Managers that target higher allocations to equity and inflation risks would perform well in risk-on markets, but would do poorly in risk-off markets. In contrast, managers that target a higher allocation to interest rate risk would perform well in risk-off markets but would likely lag in risk-on markets. These scenarios would especially hold true when the markets are volatile, whether they are up or down.

The past three years provide many test cases for our prediction. We choose December 2010 as the risk-on case, where risky assets rallied strongly and government bond yields rose significantly. For the risk-off case, we choose August and September of 2011, where risky

assets suffered severe losses and US Treasury yields reached new lows.

Based on our analysis, there should be a strong correlation between managers' allocation to risk-on and their returns in December 2010.

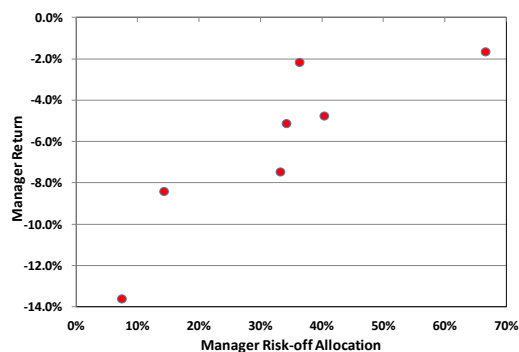
Exhibit 4 Managers' risk allocation to risk-on assets and their performance in December 2010



For illustrative purposes only. Source: PanAgora

Exhibit 4 plots the risk allocation to equities and inflation protected assets versus their returns in December 2010. Indeed there is a strong correlation between them. Managers with the least amount of exposure to risky assets have the lowest return, while managers with the highest exposure to risky assets attain the highest returns.

Exhibit 5 Managers' risk allocation to risk-off (interest rate risk) and their performance in August and September 2011



For illustrative purposes only. Source: PanAgora

For the case of risk-off markets in August and September of 2011, Exhibit 5 plots the risk-off allocations versus managers' returns. Indeed, managers with very low risk allocations to defensive assets suffered the most losses, while the manager with the

highest risk allocation to defensive assets only had minimal losses. These "event" studies provide strong validation to our return-based style analysis and risk allocation decomposition to three risk sources.

Summary

Risk Parity as an alternative asset allocation approach differs from traditional capital-based approaches by balancing the risk allocation from various sources. Because its implementation has considerable freedom and the concept of Risk Parity is open to different interpretations, it is hard for investors to tell the difference between various approaches.

In this research note, I argue that a true Risk Parity portfolio should have balanced risk exposure to the economic risks of growth and inflation and, as a consequence, balanced, but not necessarily equal, risk contribution from three sources of risks: equity, interest rate, and inflation.

Measured against this criterion, we examine seven "Risk Parity" managers in the eVestment database with return-based style analysis and find that at least three managers have investment styles that are significantly different from what we believe to be Risk Parity. Two of these managers have dominant equity, or growth risk, exposures that are reminiscent of the traditional 60/40 portfolios while another manager has concentrated interest rate exposures that are much more conservative than that which Risk Parity would imply.

Given these results, it is interesting to ponder why some "Risk Parity" managers are not Risk Parity. One possible reason is some trivial misunderstanding of the Risk Parity principle, as discussed previously – either parity in the number of assets or parity in the category of assets leading to an unintended risk concentration in risk dimensions that are based on economic fundamentals.

Another possibility is that some managers are intentionally making a strategic decision to significantly overweight one type of risk over others. For example, a common, but thus far mistaken, prediction over the last three years was the rise of interest rates. Perhaps some "Risk Parity" managers have made this view a

dominant theme of their strategic allocation. But even if this were the case, the magnitude of their active decisions, inferred from their risk concentration in both equity and inflation risks, seems extraordinary. On the contrary, the manager with concentration in interest rate risk could be expressing a strategic preference over quality fixed income assets relative to growth-oriented assets.

The lesson is that a product's name, use of leverage and even use of risk budgeting does not necessarily mean that a portfolio adheres to our principles of Risk Parity. Consequently, it is important for investors to closely assess both the strategic and tactical allocations made in a Risk Parity portfolio. The style analysis shared in this note suggests that not all managers offer the risk balance that investors likely expect to receive from their Risk Parity portfolios. Whether the lack of balance is a result of some misconception of the Risk Parity principle, a persistent bias in a manager's strategic allocation or the expression of a large tactical bet is not particularly relevant. The more important point is that this lack of balance, while not obvious on the surface, has important implications on the portfolio's ability to promote stable wealth creation across various macroeconomic and market conditions.

Index Descriptions

The Citigroup World Government Bond Index (formerly Salomon Smith Barney World Government Bond Index (WGBI)) is a market-capitalization-weighted benchmark that tracks the performance of 23 government bond markets including Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Poland, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

The Morgan Stanley Capital International (MSCI) Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure equity performance in the global emerging markets.

The Morgan Stanley Capital International (MSCI) World Index is a free float-adjusted market capitalization index that is designed to measure equity performance of globally developed countries.

The Dow Jones-UBS Commodity Index is a broadly diversified index that allows investors to track commodity futures through a single, simple measure. The DJ-UBS is composed of futures contracts on physical commodities. The index is designed to minimize concentration in any one commodity or sector. It currently has 19 commodity futures in seven sectors. No one commodity can compose less than 2% or more than 15% of the index, and no sector can represent more than 33% of the index [as of the annual weightings of the components].

The Russell 2000 index measures the performance of the 2,000 smallest companies in the Russell 3000 index, which represents approximately 10% of the total market capitalization of the Russell 3000 Index.

The S&P 500 Index is an unmanaged list of common stocks that is frequently used as a general measure of U.S. stock market performance.

The Barclays Capital U.S. Treasury Index includes public obligations of the U.S. Treasury.

The Barclays Capital U.S. Credit Bond Index covers the U.S. dollar-denominated fixed-rate taxable bond market, including corporates, local authorities, sovereigns, supranationals, taxable municipals, and non-native currency agencies.

The Barclays U.S. Corporate High-Yield Bond Index is comprised of U.S. corporate bonds that meet the entry requirements as defined by Barclays for High Yield Bond Indices.

The Barclays U.S. Mortgage Backed Securities (MBS) Index covers agency mortgage-backed pass-through securities (both fixed-rate and hybrid ARM) issued by Ginnie Mae (GNMA), Fannie Mae (FNMA), and Freddie Mac (FHLMC).

Citigroup US Treasury Inflation Protected Securities (TIPS) measures the performance of the TIPS market with a remaining maturity of one year or more.

Global Emerging Markets Sovereign Bond Index (ESBI) measures the performance of U.S. dollar-denominated, emerging market sovereign debt.

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