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# Risk Parity™: The Original

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## The popularity of 60/40 portfolios

Many plan sponsors allocate their pension assets to a portfolio of 60/40 global stocks and bonds. More sophisticated plans use variations of a 60/40 portfolio, as they substitute private equity, real estate and other hard assets, or hedge funds in place of public equity or fixed income exposure.

Why do these plan sponsors and their advisors design a policy portfolio with that target in mind? Asset allocation is by far the most important investment decision for many investors. Each year, plan sponsors devote a significant amount of consideration and resources to traditional asset allocation studies, starting from asset return forecasts and risk estimation, followed by portfolio construction with a combination of quantitative methods and qualitative tilts. Yet, irrespective of investment environment changes over time, it seems that the popularity of 60/40 portfolios continues to persist. Why?

We offer a potentially simple explanation. In order to achieve a targeted nominal return, based on a reasonable set of capital market assumptions and *budget constraints*, one only has to have sufficient investments in stocks and other risky assets. Hypothetically, if the return target is 8%, and if the expected return for stocks is 10% (higher than 8%) and the expected return for bonds is 5% (lower than 8%), a 60/40 portfolio would meet the target with an annualized standard deviation of 10%, and anything else with less exposure to stocks would not yield 8%.

Is there anything wrong with a 60/40 portfolio then? Why is the ubiquitous 60/40 widely known as a *balanced* portfolio? Millions of investors clamor for

balanced funds. If it is labeled “balanced”, it must be diversified, and based on its 60/40 *capital allocation* it is just that. But what’s in a name?

## The unbalanced portfolio

The truth is 60/40 portfolios are not balanced at all. A lot has gone wrong for 60/40 portfolios. As global financial markets were roiled by the technology bubble burst in 2000 and the latest credit crisis in 2007, 60/40 portfolios and their more sophisticated cousins suffered tremendous losses due to their exposure to risky assets. The bond portion of the portfolios proved to be inadequate in providing any meaningful diversification and downside protection. The balanced portfolio has stumbled, repeatedly. What’s the underlying cause of the failure of 60/40 portfolios?

To anyone who has researched the *risk allocation* of 60/40 portfolios and its return implications, what happened should not be all that surprising. The fact is a 60/40 portfolio does not offer true diversification because 95% of its risk profile is from equity or equity-like risky assets while the remaining assets contribute only 5% to the risk profile. In a 2005 research paper, we used a simple example of “eggs” to illustrate the concept of risk allocation.<sup>1</sup> In essence stocks are considerably more risky than bonds, so a 60% allocation to stocks leads to a highly concentrated risk allocation. The balanced fund is truly *unbalanced*.

1. Assume stock and bond returns have an annual standard deviation of 15% and 5%, respectively. Then, in terms of variance, stocks are nine times riskier than bonds. Now, imagine we have six stock units of size 9 and four bond units of size 1 in two separate baskets. In total, we have an equivalent of 58 units (i.e.,  $(6 \times 9) + (4 \times 1)$ ), of which 54 are from stocks. Fifty-four out of 58 is about 93%.

The unbalanced risk allocation has many consequences. For example, the return correlation between a 60/40 portfolio and stocks is close to 0.98. But by far, the strongest financial implication of risk contribution is *loss contribution*.

### From risk contribution to loss contribution

Why should we care about risk contribution? We should, and must, because it is a measure of true diversification and it has a direct and measurable connection to portfolio return stability. Not long ago, many investors and even some prominent researchers doubted the usefulness of risk contribution because the concept seemed to be of a mathematical nature, with no apparent financial interpretation. In a separate academic paper<sup>2</sup>, we provided such an interpretation, which firmly established the connection between the concept of risk contribution and portfolio returns. We found that risk contribution is a very accurate indicator of loss contribution. This is especially true during times of financial stress. In other words, when a 60/40 portfolio suffers a large loss, we can blame almost all of it (on average 95% and often much more) on stocks.

A simple empirical example sufficiently illustrates this linkage. Take a “traditional” 60/40 portfolio consisting of the S&P 500 Index and the Barclays Capital Aggregate Bond Index. Using the monthly returns from 1976 to 2009 and a loss of 3% as threshold, there are thirty-two months when returns of the 60/40 portfolio suffer a loss greater than 3%. From the thirty-two data points, the average contribution to the portfolio loss is 97% for stocks and 3% for bonds. Just as our research proved, the risk contribution accurately predicted the loss contribution. When this approach is applied to a global equity and global bond benchmark (such as the MSCI World Equity Index and the Barclays World Global Bond Index), a similar relationship exists.

Stocks also have fat tail risk and negative skewness. Using Value at Risk as a risk measure, we have shown that the risk contribution from stocks is even higher than it would be if standard deviation was used as the risk measure. This is why a 60/40 portfolio is not a well-diversified portfolio. To put it differently, the diversification effect of bonds is

insignificant in a 60/40 portfolio. As a result, any large loss generated by stock allocation will result in a loss of similar size for the whole portfolio. This is hardly diversification.

The recent market events have provided further validation of the downside risk present in a 60/40 portfolio. Since July 2007, the 60/40 portfolio has returned -21.6%, with the stock portion contributing -23.6%, a contribution of 110%!

### Risk Parity solution

Can we use these insights to design a portfolio that limits the impact of large losses from individual components? Years ago, it occurred to me that one should combine the concept of risk contribution and the principle of diversification in constructing asset allocation portfolios. The idea was introduced in Qian<sup>3</sup> (2005) and it led to the creation of *Risk Parity Portfolios*, where we allocate an equal amount of risk to stocks and bonds in order to capture long-term risk premium embedded within various assets. In subsequent years, other practitioners have followed our logic, and indeed some commonly use our original terminology (*Risk Parity*) as everyday language.

Risk Parity portfolios are truly balanced in terms of risk allocation. There are many benefits to the Risk Parity approach. First is risk management. Due to the fact that risk contribution, and therefore, loss contribution, is the same for specific asset classes, the overall asset allocation portfolios are better protected should one of the underlying assets incur a large loss. Second is diversification. Risk Parity portfolios are truly diversified. Assets with a positive risk allocation will have a positive weight. They are less susceptible to the sensitivity problem that has plagued the optimization approach, in which a minute change in expected returns can cause a large swing in portfolio allocations. Third is efficiency. Risk Parity portfolios are more efficient than the traditional 60/40 portfolios. In fact, Risk Parity portfolios are mean-variance optimal with the assumption that risk-adjusted returns

2. Qian, Edward, E., “On the Financial Interpretation of Risk Contribution: Risk Budgets Do Add Up.” *The Journal of Investment Management*, Fourth Quarter, 2006.

3. Qian, Edward, E., “Risk Parity Portfolios.” PanAgora Asset Management, 2005.

(or Sharpe ratio) of various assets are the same and are not correlated. These assumptions are supported by empirical data in observing long-term historical returns of stocks and bonds. For example, when we look at the Sharpe ratios of U.S. Treasury bonds and U.S. stocks since 1900, we see that over reasonably long periods they are roughly the same, at between 0.25 and 0.3. It should also be noted that their correlation, while positive, is quite low.

It is obvious that allocating similar amounts of risk to bonds requires us to raise the capital allocation to bonds while decreasing the capital allocation to equities. Therefore, a Risk Parity portfolio with a *budget constraint* would be an efficient portfolio, but with a level of total risk that is substantially lower than that of 60/40. While this “conservative” Risk Parity portfolio may be suitable for some investors, its expected return would be lower than that which many pension plans require. We can all agree that an efficient portfolio with a high Sharpe ratio is a good thing; however, investors don’t live on Sharpe ratio. They depend on returns. So how do we loosen the grip of a budget constraint? The answer lies in the beneficial innovations of modern financial markets. To achieve required expected returns, Risk Parity uses exchanged-traded futures to target total risk at a portfolio level *and* to deliver required expected returns.

## Historical perspectives

Before we provide some historical perspectives of Risk Parity portfolios, it is worth noting one potential misconception of Risk Parity, when compared to 60/40 portfolios. The misconception is that if stocks outperform bonds then, by extension, Risk Parity will underperform. This

notion of relative returns is wrong because it ignores the fact that when we construct portfolios based on risk allocation, it is precisely the *risk-adjusted return* that matters, provided that both portfolios have a similar level of total risk. A behavioral view of 60/40 managers may be that investors have painted themselves into a narrow corner. The corner of the risk/return space delivers extreme risk concentration and requires equally extreme outperformance by stocks over bonds in order to survive.

Again, we construct our examples based on the S&P 500 Index and Barclays Capital Aggregate Bond Index. Table 1 below provides summary statistics on the excess return over 3-month Treasury bills from 1976 to 2009. Over this period, stocks had an annualized excess return close to 4% while bonds outperformed cash by 2.3%. However, on a risk-adjusted basis, bonds outperformed stocks with a Sharpe ratio of 0.40 compared to that of stocks at 0.26. The 60/40 portfolio’s excess return is 3.6% with roughly 10% volatility, and a Sharpe ratio of 0.36. We present two versions of Risk Parity portfolios with the same Sharpe ratio at 0.45, one with a budget constraint [Risk Parity (C)] and the other (Risk Parity) with the same risk as 60/40. The excess return of the latter is 4.5%, outperforming 60/40 by 90 basis points per year.

TABLE 1

	Stocks	Bonds	60/40	Risk Parity (C)	Risk Parity
Excess Return	3.97%	2.32%	3.59%	3.01%	4.49%
Volatility	15.20%	5.84%	9.97%	6.67%	9.97%
Sharpe Ratio	0.26	0.40	0.36	0.45	0.45

Source: PanAgora

**TABLE 2**

<b>1980s</b>	<b>Stocks</b>	<b>Bonds</b>	<b>60/40</b>	<b>Risk Parity (C)</b>	<b>Risk Parity</b>
Excess Return	7.74%	3.03%	6.18%	4.60%	6.01%
Volatility	16.53%	8.60%	11.40%	8.73%	11.40%
Sharpe Ratio	0.47	0.35	0.54	0.53	0.53
<b>1990s</b>	<b>Stocks</b>	<b>Bonds</b>	<b>60/40</b>	<b>Risk Parity (C)</b>	<b>Risk Parity</b>
Excess Return	12.68%	2.62%	8.75%	5.49%	8.77%
Volatility	13.44%	3.89%	8.82%	5.52%	8.82%
Sharpe Ratio	0.94	0.67	0.99	0.99	0.99
<b>2000s</b>	<b>Stocks</b>	<b>Bonds</b>	<b>60/40</b>	<b>Risk Parity (C)</b>	<b>Risk Parity</b>
Excess Return	-6.54%	3.15%	-2.43%	0.66%	1.24%
Volatility	16.17%	3.86%	9.77%	5.19%	9.77%
Sharpe Ratio	-0.40	0.82	-0.25	0.13	0.13

Source: PanAgora

Table 2 shows that the risk-adjusted returns of stocks and bonds over the most recent three decades are not very different. They do, however, exhibit great disparity over particular sub-periods. Now, the same statistics are listed above for the 1980s, the 1990s, and the most recent period from 2000 to April 2009.

Markets underwent the steady decline of interest rates and strong global economic growth during the past three decades, punctuated by generally milder recessions (excluding the current one) and a series of financial crises and asset bubbles. Indeed, the 1980s and 1990s were very generous to stocks, with high excess returns. Since 2000, stocks have delivered significant negative excess return under the weights of the tech bubble bursting and credit crisis. On the other hand, the excess returns of bonds have been more stable. Comparing 60/40 with the Risk Parity portfolio, we note that their Sharpe ratios were virtually identical during the 1980s and 1990s, about 0.5 and 1.0, respectively. At first glance, this is puzzling since stocks outperformed bonds on both an absolute return and a risk-adjusted return basis. Again, the answer to this puzzle lies in diversification. The 60/40 portfolio is heavily invested in stocks; hence there is little diversification gain and its Sharpe ratio mirrors that of stocks, if only slightly higher. On the other hand, the Risk Parity portfolio provides maximum diversification, and as a result, its

Sharpe ratio is higher than that of both stocks and bonds, matching that of 60/40.

In the last sub-period, 60/40 had a negative Sharpe ratio due to poor stock market performance while Risk Parity delivered a positive excess return of 1.24%. This reflects a pattern we identified in our research. Not only has Risk Parity delivered a higher Sharpe ratio than 60/40 over the long run, it has also shown more consistency over sub-periods. This consistency leads to higher probability of attaining positive Sharpe ratios, and, most importantly, creating long-term wealth.

### **Future expectations – Why Risk Parity now?**

One of the major issues that all investors face after the market turmoil of 2008/2009 is repositioning asset allocation policies. As equity markets have collapsed, the question of whether their future risk-adjusted returns are more favorable than that of other asset classes needs to be answered. In the context of Risk Parity, there is an additional question of whether equity allocations can, or should, be “sacrificed” from their historical 60% level if the expected equity risk premium is above long-term averages. Institutions face significant funding shortfalls as a result of the recent bear market. In this environment, can a portfolio such as Risk Parity, which has significant fixed-income exposure, continue to provide the required rate of return for most plan sponsors?

To address these questions, we analyze expected returns based on scenarios of risk and return assumptions. Table 3 lists a base case scenario, in which both Sharpe ratios are 0.30, with volatility of 15% and 5% for stocks and bonds, respectively. These assumptions imply expected excess returns of 4.5% for stocks and 1.5% for bonds. We also assume a correlation of 0.1 between stocks and bonds. It then follows that 60/40 would have an expected Sharpe ratio of 0.35 while Risk Parity's Sharpe ratio is 0.40.

**TABLE 3**

Base case	Stocks	Bonds	60/40	Risk Parity
Excess Return	4.50%	1.50%	3.30%	3.80%
Volatility	15.00%	5.00%	9.40%	9.40%
Sharpe Ratio	0.30	0.30	0.35	0.40

Source: PanAgora

If we alter the base case scenario by changing the Sharpe ratios of stocks and bonds, the resulting 60/40 and Risk Parity portfolios would have different expected returns and different Sharpe ratios, while the expected risk would remain the same. In the first case, we change the Sharpe ratio of stocks from 0.0 to 0.6, while keeping that of bonds at 0.3. The Sharpe ratios of 60/40 portfolios change dramatically, while that of Risk Parity is more stable. 60/40 would underperform unless the Sharpe ratio of stocks is near 0.6, which implies an excess return of 9%.

**TABLE 4**

Stocks	Bonds	60/40	Risk Parity
0.60	0.30	0.64	0.61
0.45	0.30	0.49	0.51
0.30	0.30	0.35	0.40
0.15	0.30	0.21	0.30
0.00	0.30	0.06	0.20

Source: PanAgora

In the second case, we change the Sharpe ratio of bonds from 0.0 to 0.6, while keeping that of stocks at 0.3. In this case, 60/40 would outperform, should the Sharpe ratio of bonds falls below 0.15.

**TABLE 5**

Stocks	Bonds	60/40	Risk Parity
0.30	0.60	0.41	0.61
0.30	0.45	0.38	0.51
0.30	0.30	0.35	0.40
0.30	0.15	0.32	0.30
0.30	0.00	0.29	0.20

Source: PanAgora

Several observations are worth pointing out from this scenario analysis. First, Risk Parity is always a better choice when the expected Sharpe ratios are the same for both stocks and bonds. This is true regardless of whether the overall level of the Sharpe ratio is 0.3 or 0.5. Second, due to maximum diversification, Risk Parity is expected to outperform 60/40 even when stocks offer higher risk-adjusted return than bonds. Third, only when stocks have a much higher risk-adjusted return than bonds, does 60/40 makes sense. Plan sponsors need to carefully assess the probability of different scenarios in deciding whether a 60/40 portfolio is still appropriate.

## Concluding thoughts

There is a "well-documented" phenomenon in the scientific community when it is faced with a new innovative idea. It evolves in four stages. The response in the initial stage is "Rubbish!" The second stage is "It is wrong but interesting nevertheless." During the third stage, "It might have some minor relevance." And the last stage is "I told you so!" Something similar seems to have happened to the Risk Parity concept. It is gaining acceptance in the investment community. Someone jokingly remarked to me that it seems that almost everyone with whom I have ever worked is now involved in some type of Risk Parity work.

I view this as a very good thing. As we pursue further research and broader application of Risk Parity, we'd like to correct a few more misconceptions on Risk Parity.

**Fallacy 1: Risk Parity is a strategy that leverages the bond portion of the portfolio to extend duration.** This is a convenient operational argument; however, it gives the wrong notion that one can attribute overall portfolio leverage to some specific components. The correct way to view Risk Parity portfolios with targeted risk is that we build the most efficient mix of assets with Risk Parity and then scale portfolio risk up or down by changing portfolio leverage.

**Fallacy 2: Without limit, the more asset classes the merrier.** Herein, is a misconception about diversification, in general. For example, one might be tempted to add other asset classes, such as high yield debt, emerging markets debt, or real estate. These asset classes are already highly correlated with equities, especially so during market crises. The fundamental reason behind this is that they all have significant exposure to downside risk of global economic growth. They tend to suffer large losses together with the equity market, offering no downside protection, while giving a false sense of diversification.

We believe that the Risk Parity portfolios are well suited to meet the needs of institutional investors. Investors must seek better alpha sources as well as extract higher returns from their existing market exposures in order to make up for significant portfolio shortfalls. For many investors, the beta risk actually represents the majority of their total risk budget. This element of portfolio construction is unlikely to change as plans rebalance into risky asset classes to recover asset values. The Risk Parity portfolios provide a more efficient alternative to traditional asset allocation in that they: 1) limit the risk of overexposure to any individual asset class; 2) simultaneously provide ample exposure to all of them; and 3) eliminate extraneous allocations that do not provide additional risk diversification. With Risk Parity portfolios, investors know that the diversification, along with a required rate of return that they seek, is embedded in the risk allocation of their efficient market portfolio.

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The unmanaged indices described below do not reflect fees and expenses and are not available for direct investment.

**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. Aggregate Bond Index** is an unmanaged, market-value weighted index used as a general measure of U.S. fixed income securities. The index comprises approximately 6,000 publicly traded bonds including U.S. government, mortgage-backed, corporate, and Yankee bonds with an approximate average maturity of 10 years.

**The Barclays Capital Global Aggregate Bond Index** is an unmanaged index used as a broad measure of the global investment-grade bond index. The index contains three major components: the U.S. Aggregate Index, the Pan-European Aggregate Index, and the Asian-Pacific Aggregate Index. In addition, the index includes Global Treasury, Eurodollar, Euro-Yen, Canadian, and Investment-Grade 144A index-eligible securities.

**The Morgan Stanley Capital International (MSCI) World Index** is an unmanaged list of securities from developed and emerging markets, with all values expressed in U.S. dollars.



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