Risk Parity
In the Spotlight after 50 Years

By Christopher A. Levell, ASA, CFA®, CAIA®

Risk parity is a simple idea: Maximize diversification by taking equal risk in each investment. This concept can be used to guide portfolio diversification by decreasing assets with large shares of the investment risk budget and increasing lower-risk assets. In practice, risk parity is used in an increasing number of investment strategies and even can be pursued at the total portfolio level. Most risk-parity approaches involve leverage, which has made recent headlines, with reporters questioning the logic behind gearing low-risk assets to increase return. This approach, however, is actually an insight that is more than 50 years old.

Markowitz (1952) introduced the concept of the efficient frontier. Using assumptions for expected return, standard deviation of return, and correlations between assets, the efficient frontier is a graphical depiction of the highest expected return possible for a given level of risk. Tobin (1958) pointed out that the frontier can be improved upon by adding risk-free investments to the total portfolio. To the left of the frontier, an allocation on the efficient frontier (the tangent portfolio) is combined with risk-free assets (generally cash or Treasuries) to create a line—dubbed the “capital market line”—that represents portfolios with higher returns for a set level of risk than those on the frontier.

The capital market line (CML) also extends to the right and above the frontier. Tobin (1958) showed that leveraging a well-diversified, low-risk portfolio produces a risk/return trade-off superior to that of an unlevered traditional portfolio concentrated in risky assets. Put differently, an investor can achieve expected returns above the efficient frontier by allowing the portfolio to be levered.

Despite the soundness of Tobin’s idea, the use of leverage by institutional investors has long been considered taboo. Many investors have a greater awareness of the potential dangers of leverage than an appreciation of its benefits when prudently used. They may dismiss the idea of leverage out of hand, without assessing its pros and cons. But attitudes are shifting. Investment professionals in particular are increasingly aware of the constraints on portfolio performance imposed by arbitrary restrictions on style, geography, shorting, and leverage.

More-open attitudes about moderate leverage have led managers to develop products that exploit Tobin’s insight. Many of these products come under the name “risk parity.”

Diversification
Diversification always has been key to successful long-term investing. To measure the benefits of diversification, metrics such as the Sharpe ratio, a measure of a portfolio’s excess return per unit of risk, were developed. What does a fully diversified portfolio look like? Using the tools mentioned above, we would look for the portfolio with the highest Sharpe ratio—specifically, the tangent portfolio in figure 1. This portfolio has relatively low risk; unfortunately, it is also one of the lowest returning portfolios on the frontier.

Broadly speaking, investors follow two main avenues to boosting returns: taking more beta (or market) risk along the frontier, and seeking alpha (or manager outperformance). The first technique, taking more beta risk, has led to portfolios with equity-heavy mixes that have concerned my firm, the independent investment consulting firm NEPC, for many years. The second technique, pursuing alpha, is employed in a huge array of products, many of them quite

![Figure 1: Efficient Frontier with Capital Market Line](image-url)
successful, but it is more expensive and fleeting than market beta exposure.

Yet there is a third way to increase expected risk and return, one that exploits the CML defined above. If investing and borrowing can be done at the risk-free rate, then this line can be drawn from the risk-free rate, tangent to the efficient frontier.

Portfolios on the CML are more efficient than portfolios on the efficient frontier; that is, they achieve more return at a given level of risk (see figure 1). But to position a portfolio along the CML and increase risk and return, leverage is needed in order to invest more than 100 percent in the tangent portfolio. The Sharpe ratio for all portfolios on the CML is constant; an investor simply chooses the level of risk to be taken.

**Risk Parity**

One simple way to diversify is to allocate equal capital to each asset class. Unfortunately, such an allocation is not efficient, and for that reason it has been called “naïve diversification.” The tangent portfolio, in contrast, tends to have allocations that are equally risk-weighted, leading to the term “risk parity.”

Risk budgeting can be used to calculate the risk allocations of a portfolio by asset class, based on the assumed volatility of each asset class and its correlations to other assets. We will examine a hypothetical asset allocation, first on the usual capital basis, and then on a risk basis. Figure 2 is an example of a typical risk budget, with a portfolio well-diversified across liquid asset classes.

Notice that many of the portfolio’s diversifying asset classes have 5-percent allocations, yet their shares of the risk budget range from 0 percent (rounded) for several to 9 percent for emerging market equities. Also, equity risk dominates the risk budget; in this case, the portfolio has a 55-percent allocation to equities, which accounts for 85 percent of risk.

With this typical risk-budget framework, we can construct a portfolio with risk parity—that is, one in which each asset class contributes an equal amount of risk. In essence, we “reverse-engineer” the process, starting with a portfolio of equal risks from each asset class and then deriving the underlying capital allocation. Figure 3 reveals the results of this exercise.

With 10 asset classes, each is 10 percent of the risk budget, as shown in the risk allocation section of figure 3. From this we derived capital asset allocations as shown in the asset allocation section of figure 3. Some asset classes, such as core bonds, gain a greater share of capital due to their relatively low volatility.

The allocations of other asset classes, such as commodities, expand because of their low correlation to other kinds of assets.

This risk-parity portfolio has an expected return of 5.9 percent, with a standard deviation of 6.9 percent, using NEPC’s 2010 assumptions. Regardless of the risk-free rate, this portfolio has a Sharpe ratio that exceeds that of most institutional funds. Unfortunately, its expected return is lower than required by many programs. This brings us back to the use of leverage along the CML.

If we lever this portfolio once, for 2.1 leverage, we increase the geometric return to 8.9 percent and the standard deviation to 13.9 percent. This is an attractive risk-return profile that would be acceptable to most investors, if they could become comfortable with the distinctive risks arising from leverage.

This 1x leverage example is presented in figure 4. Figure 4 reveals the 2010 return and risk assumptions of the 10 liquid asset classes used in the risk budgets, and the unconstrained efficient frontier of all combinations of these assets. Note that the efficient frontier is based on all long-only, unlevered combinations of assets. The basic risk-parity portfolio plots very close to the frontier, close to the tangent portfolio in figure 1. Importantly, a risk budget methodol-
ogy for creating the risk-parity portfolio does not guarantee that it will have the maximum Sharpe ratio.

However, we would expect either methodology to produce very similar results. As leverage increases along the line, the levered risk-parity portfolio can achieve returns significantly above those of portfolios along the efficient frontier.

**Economic Scenario Method**

Before discussing the risks and opportunities of leverage, let’s examine another framework for creating risk-parity portfolios. Instead of assessing prospective risks, returns, and correlations, this method aims to have investments that perform well across a variety of economic environments. The typical economic framework is based on projections of economic growth and inflation, very similar to those formulated by my firm (see figure 5).

Specific historical periods can be tied to each of these inflation/growth regimes. For any given period, the performance of individual asset classes has varied widely, in large part due to the divergent dynamics of inflation and growth. For example, the United States and much of the rest of the world experienced unprecedented disinflation and strong economic growth during the 1980s and 1990s. These forces helped drive extraordinary returns for traditional stock and bond investments.

In 2000–2002, a "perfect storm" of tumbling stock markets and lower interest rates was rough on equity markets and raised pension liabilities, but it was good for bonds. The overextension of the 1960s and the stagflation of the 1970s led to high inflation. Traditional stocks and bonds fare the worst in times of stagflation, now considered by many observers as a plausible threat for the first time in 30 years.

From a portfolio construction standpoint, all three approaches to achieving risk parity—a levered tangency portfolio, an equally apportioned risk budget, and the economic scenario method—lead to similar portfolio allocations. Compared to the asset allocations of most programs and the relic of a "60/40" equity/fixd portfolio, risk-parity portfolios have much less in equity, much more in inflation-sensitive TIPS and commodities, and greater international diversification. As we have discussed, such a portfolio carries much less risk, but (if unlevered) delivers lower returns than are generally required.

**Leverage**

So why have investors seeking higher returns not leveraged low-risk portfolios? The most likely reason is aversion
to the very idea of leveraging. Leverage has been part of the downfall of many investment strategies and firms, notably during the recent credit crisis. A leveraged portfolio can lose more than 100 percent of invested capital. Leverage using margin or prime brokerage is much more expensive than borrowing at the risk-free rate. Finally, because few institutional investors use leverage at the portfolio level, there is maverick risk from being different.

As addressed in Minahan (2009), leverage is a problem when combined with other factors:

- Distressed sales: forced deleveraging triggered by asset losses or changes in borrowing rates or terms
- Illiquidity: assets that are hard to sell, or that can be sold quickly only with a severe discount
- Kurtosis, or “fat tails”: return distributions that have a hidden risk of large losses
- High leverage: very high leverage can turn small underlying losses into catastrophes

These risks call for caution in deploying leverage in institutional portfolios. Yet leverage also presents an opportunity for institutional investors. Leverage remains a critical component of the market economy. Banks use fractional reserves to back commitments. Companies use operational leverage to trade off fixed and variable costs. Investors in a stock take on the risk of the issuer’s balance sheet leverage. More recently, my firm has recommended liability-driven investment (LDI) strategies to its corporate clients; many such strategies use derivatives to efficiently match liability duration with limited plan capital. The tremendous growth of derivative markets presents an opportunity to use leverage efficiently; derivatives priced off London Interbank Offered Rate (LIBOR) in effect allow institutional investors to borrow and lend at near a risk-free rate.

Plan sponsors can benefit by regarding leverage as a potential investment tool whose risks and opportunities are worthy of evaluation. For some institutional investors, this may mean employing leverage at the portfolio level. The ultimate constraint on any portfolio is its limited total capital. Leverage makes available much more capital efficiency than long-only investments, freeing up assets for alpha sourcing and necessary collateral management. This approach has been used very successfully by some endowments over the past several years.

For many other investors, acceptance of leverage may mean finding a place for risk parity in a diversified portfolio. Fortunately, several investment managers have introduced risk-parity products in recent years; indeed, many of our clients use such vehicles as alternatives to equity or within the global asset allocation sleeve of the portfolio. Risk-parity products have expected returns similar to equity, with lower volatility and attractive diversification benefits. Those characteristics make them useful to plan sponsors in reducing equity risk without sacrificing expected return.

**A Note on 2008**

How did risk-parity strategies fare during the massive financial market meltdown of late 2008? The worst market conditions since the Great Depression posed the most severe test of liquidity management for risk-parity programs since their creation—a test that they passed. By investing in generally liquid markets with low leverage, managers were able to avoid distressed sales and maintain exposure throughout the crisis. Counterparty management was also critical, and it strengthened as a result of the crisis. Leverage ratios were cut back for most strategies, which we believe was appropriate. The performance of leveraged risk-parity strategies in 2009 depended on the timing of increasing leverage back to long-term targets.

From a return perspective, although risk parity aims to protect in multiple economic environments, sudden and intense deleveraging across the financial system in late 2008 led to losses for all risky asset classes. Risk-parity strategies typically include an allocation to global nominal sovereign bonds, which performed exceptionally well during the flight to quality. However, all other asset classes fell, leading to total 2008 risk-parity returns of around –15 percent to –20 percent. This record is actually a compelling testament to the benefits of risk-parity investing: The typical risk-parity product, funded out of equity, experienced half of equity losses, while a total portfolio using risk parity lost less than two years of gains and did exceptionally well in 2009.
Summary
A 50-year-old insight is highly relevant and useful in today’s investment environment. Risk parity uses basic investment tools: the efficient frontier, risk budgeting, and scenario analysis. Leverage is a key component of successful risk-parity portfolios and products, and the understanding and acceptance of leverage is a critical factor in adopting and managing a risk-parity approach. Investors can use risk-parity products to diversify away from equities without sacrificing expected return. Risk parity also can be used at the total portfolio level, to seek an optimal unconstrained market exposure. Risk parity is a viable investment option for clients, helping them to deal with an uncertain future through the broadest possible diversification.

References

Conclusion
Technological changes continue to present new regulatory challenges. Those who stand to win or lose lobby about proposed rules. The latest rules require that automated traders send orders through software that has been approved to control against spurious orders that might adversely affect the stock market. As ever, the wisdom of favoring or opposing these new rules has been overshadowed by the participating parties’ financial incentives. Securities markets will continue to respond to technological change. The big change, however—the change from human beings making transactions face to face to computers that make decisions and transact with other computers—already has taken place. It took place, for the most part, within just one decade.

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Christopher R. Petruzzi, PhD, is a professor of accounting at the Mihaylo School of Business, California State University, Fullerton. He also is founder and chief executive officer of Smart Execution, LLC. He earned a BA in economics from Wabash College, an MBA from The University of Chicago, and a PhD in finance and business taxation from the University of Southern California. Contact him at cpetruzzi@usa.net.

Endnote