Risk parity and the limits of leverage
February 2012

Key points
• The primary investment policy decision is the appropriate level of risk to take, and how that risk should be allocated;
• Any investor with a mix of return-driven (equity-like) and risk-reducing (fixed income) investments will have overall asset returns highly correlated to those of the return-driven component;
• Equity dominates portfolio risk for a good reason — its role is to deliver returns on risk, and it has done so over the long term;
• We believe the primary role of investment-grade fixed income in an institutional total fund is risk reduction; leverage distorts that property;
• Leveraged strategies provide limited risk and return benefits relative to traditional portfolios, except at levels of risk associated with an all-equity portfolio;
• We believe the current environment offers a relatively strong outlook for equities, and modest returns for bonds;
• Investors can navigate difficult times for equities with a market-sensitive investment strategy
• Risk-parity strategies are appropriate for consideration as a component of an opportunistic or alternatives allocation, particularly at higher levels of targeted volatility; and
• The benefits of a risk-parity strategy as a total fund asset allocation approach are limited relative to the new portfolio risks introduced.

Introduction
The term “risk parity” refers to an investment strategy advertised as balancing risk exposures more evenly than in a typical institutional portfolio; in particular, reducing a portfolio’s reliance on equity and increasing effective exposure to other asset types, such as fixed income. Risk-parity strategies typically involve leverage, both to increase effective exposure to lower-volatility asset classes and to achieve a desired overall expected portfolio return. These strategies sometimes also involve engineering of a set of exposures to economic factors (such as growth and inflation) different than those of traditional portfolios. This paper examines risk parity in the context of a total fund asset allocation strategy, and also as a component of an opportunistic or alternatives allocation.

Risk and reward
A central tenet of investment policy decision-making is that there is a relationship between the amount of risk an investor takes and his or her expected return over the long term. Risk manifests itself both in the volatility of short-term (year to year) outcomes, which truly long-term investors expect to be able to withstand, and in the possibility that even a well-designed investment policy will fail to deliver the desired outcome, even over the long run (10 years or more). The central decisions in investment policy-setting are the overall level of risk to take on, and how that risk should be allocated among the various possible sources.

Numerous publications have discussed the Risk Parity context. Readers wishing an introduction to the concept might start with one from a well-known provider of Risk Parity strategies, Dalio [2004].
The appropriate overall level of risk is guided first by the investor’s risk tolerance. Most individuals and organizations find it difficult to quantify their tolerance for risk, so the investment policy-setting process typically involves an examination of trade-offs of reward, in the expected case, and downside risk, in unfavorable scenarios, tailored to the definition of those two measures in the context of the investor’s circumstances and objectives.

The rewards associated with risk change over time as investors’ appetite for risk ebbs and flows. An investor with an unchanging risk tolerance might nevertheless find his optimal level of risk also changing; potentially high in times of expected future optimism among market participants, and reduced in time of heightened uncertainty.

Likewise, the allocation of risk among its various sources varies by the relative reward (adjusted for level of risk) offered by each; these, too, change over time so that an optimal investment structure today might be different from yesterday’s or tomorrow’s.

A convenient way to classify assets for the purposes of investment policy-setting is between those that are “risky” — return-seeking assets meant to deliver a premium for providing capital to risky ventures and accepting uncertainty — and risk-reducing assets that are expected to deliver a lower return, while providing protection from risk in its various definitions. In the events of 2008 and early 2009, the value of this simple distinction was reinforced as risky assets joined together in global decline with little regard to diversification.

Even an investor who wished to avoid making judgments about the relative attractiveness of assets over the long term, by allocating risk equally among them, is implicitly taking a position (that they are equally attractive).
Risk concentration

For most investors, “risky assets” mostly means publicly traded equities (home country, foreign and global-oriented) as the largest or even sole component. Many observers have commented in recent years on the concentration of the typical investor’s portfolio risk in equities. But this should come as no surprise, because this is the asset class with the purpose of delivering expected gains in return for risk in the long run. Any investor with a portfolio divided among assets meant to capitalize on tolerance for risk, and those meant to preserve capital, will find the volatility of asset results from year to year driven by the risky investments, almost regardless of the level of allocation.

Exhibit 1 illustrates the correlation of the returns of a portfolio of public equities and bonds with those of equities alone, at various equity allocations. Even modest equity allocations result in total portfolios that are equity driven, in terms of asset return movements. The dominant role of equity risk in portfolios is a characteristic of any portfolio expected to deliver excess returns (through equities and other risky assets) while also limiting risk (through fixed income) — not just of the “typical 60/40” allocation strategy.

Exhibit 1

![Exhibit 1](image)

Is concentration of risk a bad thing? The answer depends on the extra returns offered by the markets for taking that risk. A concentration of risk is rational when the investor is sufficiently compensated. Conversely, not all forms of risk are good — some are fairly reliably compensated (for example, equity and credit), while others offer little extra return in the long run, or none at all (for example, arguably, currency).

---

3 Equity is defined as a globally oriented portfolio of 45% Dow Jones U.S. Total Stock Market index and 55% MSCI EAFE; fixed income is the Barclays Aggregate Bond index. Similar results are obtained with different definitions of risky assets (for example, the inclusion of allocations to alternative assets) and fixed income.

4 This discussion is similar to that of Asness et al. [2011], but reaches a different conclusion (that equity investors have been adequately compensated for risk in the long run).
Have investors been compensated for equity risk in the long run? Exhibit 2 provides an analysis of the growth in wealth provided by stocks and bonds, relative to a “risk-free” cash investment, since 1926. Over the past 85 years, stocks generated more than 25 times the excess return over cash as compared to bonds.

Exhibit 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Stocks</th>
<th>Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>$100</td>
<td>$0</td>
</tr>
<tr>
<td>1931</td>
<td>$160</td>
<td>$30</td>
</tr>
<tr>
<td>1936</td>
<td>$250</td>
<td>$100</td>
</tr>
<tr>
<td>1941</td>
<td>$360</td>
<td>$200</td>
</tr>
<tr>
<td>1946</td>
<td>$500</td>
<td>$300</td>
</tr>
<tr>
<td>1951</td>
<td>$720</td>
<td>$450</td>
</tr>
<tr>
<td>1956</td>
<td>$1,000</td>
<td>$600</td>
</tr>
<tr>
<td>1961</td>
<td>$1,300</td>
<td>$800</td>
</tr>
<tr>
<td>1966</td>
<td>$1,700</td>
<td>$1,000</td>
</tr>
<tr>
<td>1971</td>
<td>$2,200</td>
<td>$1,200</td>
</tr>
<tr>
<td>1976</td>
<td>$2,800</td>
<td>$1,400</td>
</tr>
<tr>
<td>1981</td>
<td>$3,500</td>
<td>$1,600</td>
</tr>
<tr>
<td>1986</td>
<td>$4,400</td>
<td>$1,800</td>
</tr>
<tr>
<td>1991</td>
<td>$5,500</td>
<td>$2,000</td>
</tr>
<tr>
<td>1996</td>
<td>$6,800</td>
<td>$2,200</td>
</tr>
<tr>
<td>2001</td>
<td>$8,300</td>
<td>$2,400</td>
</tr>
<tr>
<td>2006</td>
<td>$10,000</td>
<td>$2,600</td>
</tr>
<tr>
<td>2011</td>
<td>$12,000</td>
<td>$2,800</td>
</tr>
</tbody>
</table>

It’s evident that stocks earned their long-term excess returns at a substantially higher level of volatility of year-to-year returns than did bonds. Did stocks earn a “sufficiently” greater return given their risk? Exhibit 3 illustrates the reward per unit of risk of stocks and bonds in rolling 10-year windows over the 1926-2011 period.

5 Ratio of cumulative wealth of an investment in U.S. stocks (Dow Jones U.S. Total Stock Market index, supplemented by the CRSP broad market index) and bonds (Barclays Aggregate Bond supplemented by Ibbotson intermediate government bonds returns) relative to Treasury bills, 1926-2010.

6 Exhibit 2 shows Sharpe ratios, defined as the annualized 10-year average excess monthly return over Treasury bills divided by the annualized 10-year standard deviation of excess monthly return over Treasury bills. Negative Sharpe ratios are not shown in the exhibit as Sharpe ratios are only reliably calculated when excess return is positive.
Two observations are worth noting from the results of this analysis. First, stocks and bonds have exhibited wide variations in risk-adjusted return even over 10-year periods. An investment policy that remained agnostic about returns, relying on risk being rewarded fairly consistently across time and asset classes, as risk-parity strategies often do, would produce disappointment over stretches of time consistent with many investors’ planning horizons. Second, while a combination of stocks and bonds clearly would have produced diversification benefits, in some of the worst periods (the 1970s) and best (1982-2000) for risky assets, bonds produced a comparable pattern of risk-adjusted returns. Diversification, while being the one true “free lunch” in investing, offers better benefits in some periods than others.

Stocks have delivered on their promise of growth in the long run. Neither stocks nor bonds have dominated after adjusting for risk. What should be the role of bonds?

The role of the bond allocation
Bonds traditionally have served one or more of the following roles in institutional portfolios:

- **Reduce risk**: The traditional role of fixed income; downside protection or, especially in recent times, the hedging of pension liabilities.

- **Capture risk premium**: Earning excess returns from credit and interest rate risk, as well as from high yield, emerging market debt and other riskier bonds.

- **Exploit active manager skill**: The use of fixed income as an opportunity set for skilled active managers seeking to generate excess return

- **Earn total return**: A combination of the above roles, active management against a broad bond benchmark seeks to combine the general characteristics of fixed income with value added through portfolio construction within the boundaries of the benchmark and allocation, opportunistic or strategic, to riskier out-of-benchmark sectors.
For many institutional investors, fixed income played the total return role for many years. Falling rates, low bond volatility, the ever-growing role of riskier securities in portfolios benchmarked to investment-grade bond indexes, and a stable of truly skilled active managers available to those who selected carefully, contributed to the consistent outperformance of the total return strategy. The events of 2008, however, revealed the costs of hidden or unappreciated risks in bond portfolios. And the shift in corporate defined benefit pension investment strategies has recast the role of fixed income as a hedge of liabilities first and foremost.

Equities (and other return-driven assets) serve the role of growth in an investment program. To balance the potential for growth, investors need an asset that primarily provides risk reduction. This asset is the first of two tiers of fixed-income allocation that separates bonds into clearly defined roles.

- **Low-risk fixed income** provides some compensation for interest rate and credit risk, while minimizing downside risk exposure. Investment-grade fixed income plays this role. In this construct, its primary role is not to generate a risk premium or to diversify other risk exposures. Leverage of the low-risk portfolio removes this reliable anchor to windward. For those seeking to hedge interest rate risk in their liabilities, physical long bonds and derivatives offer an efficient method of doing so without the use of explicit leverage.

- The second tier, return-seeking fixed income, allows the investor to capture excess return from riskier bonds, and exploit active manager skill. Here, fixed income joins with the other return-seeking assets in a role of growth. A significant part of their role in a total portfolio is to capture the premium associated with credit risk. Return-seeking fixed income includes emerging market debt, high yield bonds, bank loans, and strategies whose risk arises significantly more from active decisions than market exposures. They might reside in a fixed-income or opportunistic asset class.

  The inherent risks and asymmetric return patterns of return-seeking fixed income, often characterized by steady positive returns interrupted by occasional, but significant, downside events, make it unsuitable for leverage. For these reasons, professional managers of risk-parity products typically, although not always, steer clear of leverage here.

In a risk-parity framework, the natural risk reduction role of fixed income is eliminated, and bonds become one more risky asset whose only downside protection potential comes from its diversification benefit — its imperfect correlation with other risks in the portfolio. But correlations are notoriously unreliable. How much value can a leveraged bond strategy add in return for diminished risk control?

---

We do not claim that investment-grade, market duration fixed income is without risk, or that it plays the role of the “risk-free” asset in a portfolio theory context — simply that it plays a significant role of risk reduction relative to equities and equity-like assets. Note that an analysis of portfolio risk factor exposures allows for investment managers that operate in more than one risk classification to play a role in the two-tiered fixed-income framework.
It's true that risk parity need not be an all-or-nothing strategy, and the role of fixed income should be considered in the context of the total portfolio rather than as an asset class alone. That is, a strategy of leveraging a portion of the bond allocation (while retaining some unleveraged fixed income in a risk reduction role), and simultaneously reducing equity exposure, might offer added diversification benefits while not unduly affecting total fund risk. Whether a full or partial leverage strategy is being considered, it's useful to consider the benefits and limits of leverage at the total portfolio level.

**The limits of leverage**

Risk-parity strategies share many characteristics with the concept of levering a low-risk portfolio. This theoretical idea, developed decades ago, involves combining an investment in risky assets with an allocation to cash, either positive or negative (leverage). In a pure version of the approach, the risky asset portfolio here is unchanged regardless of risk level, and it is the best portfolio in terms of risk-reward trade-off. Let's assume we can identify this portfolio.

Exhibit 4 illustrates the projected benefit of such a strategy using our capital markets modeling assumptions. The baseline efficient frontier represents an optimal combination of asset classes across the spectrum of risk. At low levels of risk, the strategy involves a combination of riskless cash (Treasuries) and the portfolio on the baseline efficient frontier with the best risk/return trade-off (but a low level of risk and associated expected return). At high levels of risk, that desirable portfolio is leveraged, with financing available at a more costly rate of LIBOR. The benefits of leverage are quantified in how much higher the leveraged efficient frontier rises above the baseline.

---

9 See Tobin [1958] and many further treatments of the subject (referred to as the "separation theorem") since. For detail on the capital markets modeling assumptions used in this paper, see [https://ctech.proxy.hewitt.com/hig/filehandler.ashx?fileid=5704](https://ctech.proxy.hewitt.com/hig/filehandler.ashx?fileid=5704)

10 The tangent line in the exhibit appears curved, because the analysis employs geometric rather than arithmetic expected returns. Geometric returns account for the negative impact on long-term compounded investment results of higher volatility, such as introduced with allocations to higher-risk asset classes or significant levels of portfolio leverage.
Exhibit 4

15%
Expected 10-Year Return (Geometric)
10%

With Leverage

Traditional Efficient Frontier

With Cash

Typical Institutional Risk Level

Volatility
The benefits of leverage accrue more to investors with higher-risk portfolios; they are nil at low levels of risk. At a level of volatility consistent with a portfolio of 60% stocks and 40% bonds, the maximum benefit to a leveraged strategy is approximately 0.60% annually, before any costs of leverage. Leverage in the optimal portfolio at that risk point, incidentally, is 200% at the total fund level.\textsuperscript{12}

These theoretical benefits of leverage have some caveats. First, we assume that the optimal portfolio of assets that is being leveraged. The optimal portfolio is unknowable in advance; we do know, though, that in the real world, it will not be equally risk-weighted. In an optimal portfolio, risk allocation to an asset class is proportional to its reward per unit of risk and diversification benefit.\textsuperscript{13} An equally risk-weighted portfolio will be optimal only when every asset class is equal in these regards.\textsuperscript{14} While this may (or may not) turn out to be true over the very long run, we know that asset classes perform very different over periods of 10 years or more, consistent with the time horizon for real world investment policy setting. Second, the benefits of leverage as described above assume that there are no additional fees or costs associated with a leveraged portfolio.

It is difficult to generalize about the long-run behavior of a leveraged total fund strategy since, though the theoretical benefits of leveraging the tangent or market portfolio have been understood for decades, our real world experience is relatively limited. The financial instruments needed to efficiently implement a diversified leveraged strategy were not readily available over the full history of 20\textsuperscript{th} century market returns typically used to back-test investment strategies. Anderson, Bianchi and Goldberg attempt to estimate the long-run performance of a simple risk-parity strategy over the 1926-2010, making reasonable assumptions about

\textsuperscript{2} Represents an annualized volatility level of approximately 13% over a 10-year period. \textsuperscript{13} See Maillard, et al. [2008] for a discussion of this concept. \textsuperscript{14} Specifically, that each asset class has an equal Sharpe ratio and equal correlation coefficient with all other assets.
the costs of leverage and trading. While they find that a leveraged Risk Parity strategy handily outperforms value-weighted and traditional 60/40 strategies before adjusting for costs, after deducting transaction and leverage costs, they estimate that the risk-parity strategy would have underperformed both of those alternatives over the full period. The future of risk-parity strategies may well prove to be different from this historical analysis, but investors should take some caution when considering long-term back-tests.

Our analysis illustrates the additional benefit to a diversified investor of employing leverage. The benefits are zero until the point at which a combination of a leveraged portfolio of risky assets and borrowing exceeds the risk/return trade-off of the traditional efficient frontier. And they do not become significant until high levels of risk, consistent with an all-equity portfolio, are reached. Leverage can bring benefits to a portfolio, but only when investors operate at a sufficiently high risk level — perhaps higher than that with which most institutional investors are comfortable at the total fund level.

The message of this is twofold; First, leveraged strategies fulfill the promise of finance theory of being optimal, with real but modest maximum benefits at typical institutional levels of risk. And those investors who consider leveraged strategies will likely find the greatest benefits at high levels of risk, which becomes more relevant in the consideration of third-party strategies where the investor has potential control of risk level combined with limited exposure (and liability).

**Time-varying risk and reward**

The late 1990s, when few were talking about diversifying away from equities, would have been an excellent time to have done so. Exhibit 5 illustrates 1) an efficient frontier based on expectations that could have been held for the broad U.S. equity market based on conditions existing in 1999, before the bursting of the technology bubble and the start of a decade of weakness for stocks, 2) an efficient frontier based on actual results over the period since 1999, and 3) the results over the same period for a leading risk-parity strategy. High equity valuations and interest rates pointed toward a difficult time for stocks and a rewarding one for bonds. As a result, the efficient frontier of stock and bond investments for a 1999 investor might have appeared upside down, with stocks inhabiting the low-return alternatives and bonds, especially leveraged bonds, offering more substantial rewards. The next decade delivered on that promise. And the risk parity strategy outperformed a portfolio of 60% stocks and 40% bonds, as promised — with the strong tailwind of a market environment that favored bond-heavy strategies.

---

15 See Anderson, Bianchi and Goldberg [2011].
16 Equity market expectations are based on a building block approach consisting of expected inflation and real corporate earnings growth (based on a 1999 survey of economists), dividend yield (the then-current market yield) and an assumption that valuations would revert to the long-term 90th percentile value over the 10-year forecasting period.
17 The efficient frontiers might appear unusual in that they include the lower half — portfolios with minimum level of risk for a given level of return, but with returns that fall short of what is available on the top half of the efficient frontier. The exhibit is shown this way to illustrate the results of portfolios with significant stock allocations over the period.
Note that we do not claim that those developing assumptions about future market returns in 1999, including us, widely anticipated that bonds would outperform stocks over the following decade, or that most investors at that time correctly positioned their portfolios for such an occurrence. Rather, we suggest that investors could have built a strong case for a difficult decade for risky investments, and acted on that expectation, but chose not to, in part because an equity-oriented strategy had proven a wise one for almost 20 years. Today, equity investors have suffered for the past decade, and debate how best to reduce their stock exposure in favor of assets that have performed admirably in recent times.

While the future remains uncertain, the potential rewards to taking equity risk appear to be as high as they’ve been in recent years. The same efficient frontier of stock and bond investments (Exhibit 6) has returned to its normal appearance, with stocks leading the way to higher-return outcomes over the next 10 years, and bonds, especially if leveraged, offering anemic returns.
Accurately forecasting market returns is exceedingly difficult. Virtually the only certainty about forecasts is that they will not turn out to be precisely correct. However, developing some kind of expectations about future returns is a necessary evil of investing. Even strategies that seek only to estimate other characteristics of returns, such as volatility and correlation, contain implicit assumptions about returns (such as, that asset classes produce similar risk-adjusted returns over long periods.) We believe that investors are well-served by developing reasonable expectations about market returns and developing investment policies that are informed by those views.

A way forward

Current market conditions provide some comfort for equity-oriented investors. What should investors do when the rewards for risk don’t look attractive? We would suggest the following:

• **Keep primary focus on the long term.** Equity strategies are suited for long-term investors that can weather short-term volatility, tempered with careful diversification into additional markets and active strategies.

• **Remain flexible.** Medium term (one- to three-year) views on asset classes help a long-term investor dynamically alter investment strategy, within careful risk controls, to minimize risk and boost return.

• **Develop policies with an outlook on risk in mind.** The relative attractiveness of asset classes, and risk in general, does vary materially from period to period. Even long-term (with a time horizon of 10 years or more) asset allocation decisions are best designed to take advantage of differing expectations regarding risk and return, and shifting the overall risk posture of the fund based on the likely rewards for taking risk helps maximize success in the long term.

The reward of investing in equity will fluctuate over time. Incorporate the potential rewards to equity risk in your asset allocation process, and consider reflecting shorter-term views in your investment strategy for a more flexible approach.
Risk parity in an opportunistic allocation

This paper has discussed risk parity as a total fund asset allocation strategy. An alternative approach to accessing a leveraged strategy is as one component among many of a total fund, provided by a third-party investment manager. Risk parity is, after all, an active approach, as even its most plain-vanilla execution requires skilled analysis of risk and market conditions. And risk parity is evolving into traditional active management, with elements of return forecasting, tactical asset allocation and even security selection, as managers seek to differentiate themselves from their competitors. Investors would be well-served to evaluate risk-parity opportunities the way they would other active strategies, by assessing the manager’s perceived skill, organizational strength, risk controls and other relevant factors.

Risk-parity strategies offer a potential diversifier to a traditional portfolio, to the extent that their performance is driven mostly by factors that are less emphasized in the remainder of a fund’s total asset allocation strategy. Their equity risk-light approach might appeal to those skeptical about stocks. They offer a way to access skill in risk analysis and forecasting from some leading investment managers — and increasingly, they simply offer those firms’ traditional active management skill. And they are generally still available at reasonable fee levels.

For those who desire a risk-parity allocation, the strategy fits most neatly in an opportunistic or alternatives allocation, designed for strategies that don’t fit well in a traditional asset allocation framework. And given the substantially increased benefits to leveraged strategies at higher risk levels, we recommend that clients consider risk-parity products offered at relatively high levels of volatility, with a more modest allocation if needed to control risk.
References


“Engineering Targeted Returns and Risks,” Ray Dalio, Bridgewater, 2004


“Leverage Aversion and Risk Parity,” Cliff Asness, Andrea Frazzini, and Lasse Heje Pedersen 2011


“Risk Parity Portfolios: Efficient Portfolios through True Diversification,” Edward Qian, PanAgora, 2005


2011 Ibbotson Stocks, Bonds, Bills and Inflation Classic Yearbook, Morningstar, Inc.

Contact Information:

Mike Sebastian
Partner Investment Solutions +1.312.715.3352 mike.sebastian@aonhewitt.com
About Hewitt EnnisKnupp
Hewitt EnnisKnupp Inc., an Aon company, provides investment consulting services to more than 500 clients in the U.S. and abroad with total client assets of more than $2 trillion. Its more than 200 investment consulting professionals – a result of the merger of Hewitt Investment Group, Ennis, Knupp & Associates, and Aon Investment Consulting – advise endowment, foundation, not-for-profit, corporate and public pension plan clients ranging in size from $3 million to more than $740 billion. For more information, please visit www.aonhewitt.com