



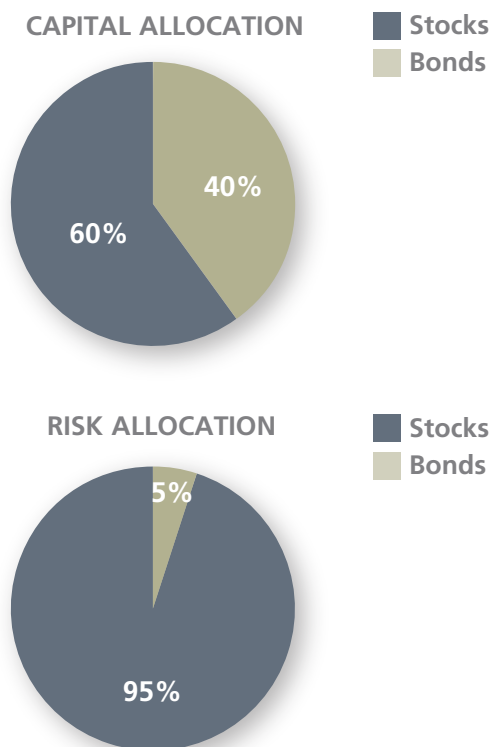
Risk Parity™: The solution to the unbalanced portfolio

To anyone who has researched the *risk allocation* of “balanced portfolios” and its return implications, the large drawdowns to many institutional portfolios in 2008 should not be that surprising. The fact is a “balanced portfolio” does not offer true diversification because 95% of its risk profile is contributed by equity or equity-like risky assets while the remaining fixed income assets contribute only 5% to overall risk. Equities are typically considered to be more risky than bonds; therefore, a meaningful allocation to equities or equity-like assets leads to a highly concentrated risk allocation. The balanced portfolio is truly *unbalanced*.

The unbalanced risk allocation has many consequences. For example, the return correlation between a so-called “balanced portfolio” and the S&P 500 is close to 0.98. But by far, the strongest financial implication of risk contribution is *loss contribution*, or the drawdown attribution due to the presence of an asset class in a portfolio.

From risk contribution to loss contribution

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. In a separate research paper¹, 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 balanced portfolio suffers a large loss, we can attribute almost all of the loss (on average 95% and often much more) on stocks.



60/40 portfolio: contribution to loss*		
LOSS >	STOCKS	BONDS
2%	95.6%	4.4%
3%	100.1%	-0.1%
4%	101.9%	-1.9%

* Source: Qian, Edward, 2006, “On the Financial Interpretation of Risk Contribution: Risk Budgets Do Add Up.” *Journal of Investment Management*, Vol. 4, No. 4, Fourth Quarter.

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 Dr. Eddie Qian, Chief Investment Officer of PanAgora’s Macro Strategies

group, that investors should combine the concept of risk contribution and the principle of diversification when constructing asset allocation portfolios. The idea was introduced in Qianⁱⁱ (2005) and led to the creation of Risk Parity portfolios, in which we allocate an equal amount of risk to “risky assets,” such as equities, and those with less “risk,” such as investment-grade bonds, over multiple market cycles to capture long-term risk premium embedded within various assets. Importantly, a well-diversified portfolio should include exposure to asset classes that help the portfolio deliver positive excess returns and protect it against unforeseen downside risk. Risk Parity portfolios also allocate a meaningful portion of their risk budgets to real return assets, such as commodities and inflation-linked bonds in order to protect against inflation. In subsequent years, other practitioners have followed our logic, and indeed some commonly use our original terminology (Risk Parity) as everyday language.

But what is the right number of assets to own to gain exposure to various risk premia? Most alternative beta portfolios that utilize a risk-budgeting approach to asset allocation deliver an “optical illusion” of diversifying into risky assets like mortgage-backed securities, credit default swaps, and/or currency swaps. In reality, these asset classes provide little to no downside protection when the correlations of risky assets rise dramatically, and their presence in an investor’s portfolio adds to the riskiness (by introducing liquidity and counterparty risk) rather than providing the risk diversification that investors seek.

Risk Parity portfolios are truly balanced in terms of risk allocation. There are many benefits to the Risk Parity approach, and we’ll highlight three here. The first benefit is in risk management. Due to the fact that risk contribution (and loss contribution) is similar for stocks and bonds, the overall Risk Parity portfolios are better protected should one of the underlying assets incur a large loss. The second key element is diversification. Risk Parity portfolios are truly diversified. 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. The third benefit is liquidity. Risk Parity portfolios are implemented using a minimal amount of physical investment to the underlying asset classes, and instead utilize exchange-

traded futures to gain market exposures. This provides for significant collateral within the portfolio, and protects the investor against liquidity traps. We are focused on both the return on our clients’ investments as well as the return of our clients’ investments.

Extending Risk Parity

Within Risk Parity portfolios, there are exposures to global equity, global bonds, and commodities. Using a passive/index approach to equity, bond, and commodity exposures is standard for most investors. However, our most recent research demonstrates that the Risk Parity methodology can be extended from the asset allocation decision into portfolio construction at the sub-asset class level. Most indices, whether they are based on market capitalization or output production, amount to capital allocation. A closer examination reveals that the indexes themselves also possess skewed risk contribution and lack true diversification.

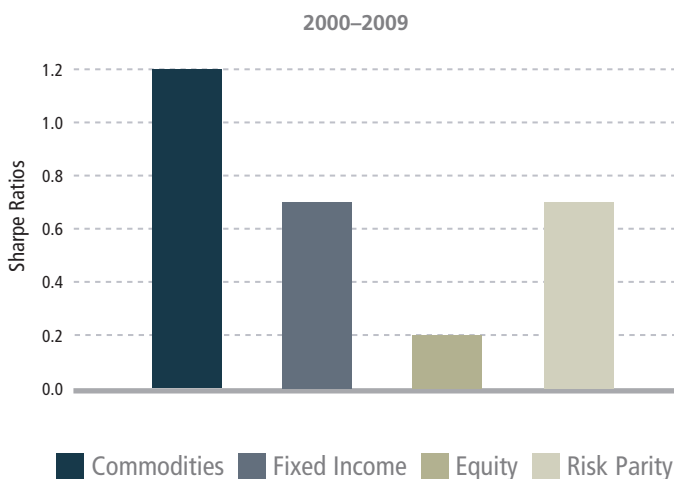
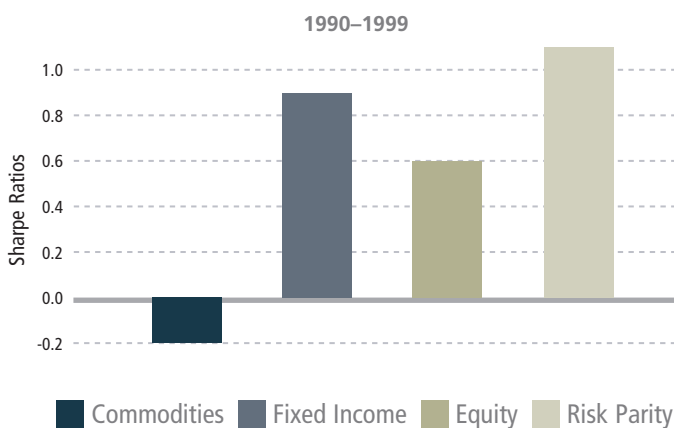
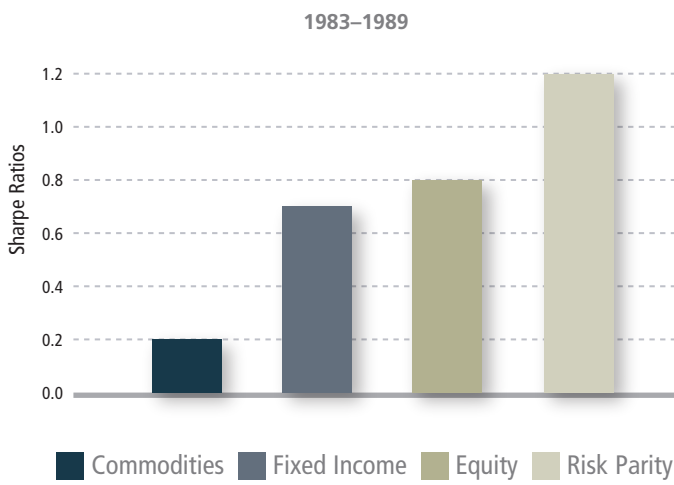
For example, energy composes 70% of the capital allocation and over 95% of the risk allocation within the GSCI Commodity Index. The situation is entirely similar to a balanced portfolio that has 95% of its risk in equity. As a result, the GSCI Index return depends largely on the fate of the energy markets, while other low-risk and non-cyclical commodities, such as precious metals and agriculture, provide little diversification benefits.

Both the Citigroup World Government Bond Index and the MSCI World Index are underdiversified portfolios with concentrated risk in a few countries. We extend the concept of equal risk contribution to each of those underlying indices as well, in order to create the most efficient market exposures available.

Dynamic risk allocation

Setting the course for a truly diversified portfolio is only the first step in Risk Parity portfolios. As the markets evolve and reward (or penalize) different risk premia, we must be able to reflect the dynamic nature of markets and capture those changes in real time; just look at the variations in Sharpe ratios of various asset classes over the past 30 years.

Hypothetical Sharpe ratios*



* The hypothetical performance information shown for the period 1983 to 2009 is supplemental to the Risk Parity GIPS-compliant presentation included as part of these materials. Past performance is not a guarantee of future results. See "Important Legal Disclosures" for information on the construction of the hypothetical information presented.

Source: PanAgora.

While all investors recognize that environments change constantly, most asset allocation approaches use regime shifts or arbitrary risk thresholds. This flawed approach relies on specific market events to drive the asset allocation process, and often in a passive manner, relying on a risk "trigger" or other metrics to signal a shift from one asset class to another.

Instead, we follow a much more systematic approach to construct Risk Parity portfolios. First, we select a number of countries or commodities based on economic and liquidity criteria. Next, we determine dynamic risk allocation by combining Risk Parity targets and proprietary models that forecast changes in relative risk/reward ratios of underlying assets. This approach combines long-term equilibrium in risk-adjusted returns of various assets, and intermediate-term market inefficiency brought out by economic change and investors' behavior bias. To put it all together, we derive capital allocation of the various asset classes based on the risk budgets, total risk level, and estimated risk metrics. The final outcome of this process is a Risk Parity portfolio that allocates risk budgets efficiently and reflects dynamic changes in volatilities and correlations in the marketplace.

Concluding thoughts

Risk Parity is always a better choice than a balanced portfolio when the expected Sharpe ratios are the same for both stocks and bonds. Due to maximum diversification, Risk Parity is also expected to outperform balanced funds even when stocks offer higher risk-adjusted return than bonds. Furthermore, only when stocks have much higher risk-adjusted returns than bonds, does something like a 60% high-risk/40% low-risk asset plan make sense. Plan sponsors need to carefully assess the probability of different scenarios in deciding whether a "balanced portfolio" is still appropriate.

For many investors, 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. Risk Parity portfolios provide a more efficient alternative to traditional asset allocation by: 1) limiting the risk of overexposure to any individual asset class; 2) simultaneously providing ample exposure to all of them; and 3)

eliminating extraneous allocations that do not provide additional risk diversification. With Risk Parity portfolios, investors know that the diversification, along with the required rate of return that they seek, is embedded in the risk allocation of their efficient market portfolio.

- i See Qian, Edward, E., "On the Financial Interpretation of Risk Contribution: Risk Budgets Do Add Up." *The Journal of Investment Management*, Fourth Quarter, 2006.
- ii Qian, Edward, E., "Risk Parity Portfolios." PanAgora Asset Management, 2005.

Important legal disclosures

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Past performance is not a guarantee of future results. As with any investment, there is a potential for profit as well as the possibility of loss. Historical performance presented herein is purely theoretical and involves the application of PanAgora quantitative strategies to historical financial data to show what decisions would have been made if the strategy were employed. These back-tested performance results are shown for illustrative purposes only and do not represent actual trading or the impact of material economic and market factors on PanAgora's decision-making process for an actual PanAgora client account. Back-tested performance results were achieved by means of a retroactive application of a model designed with the benefit of hindsight.

Hypothetical performance results have many inherent limitations, some of which are described below. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved by any particular investment program. One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or to adhere to a particular investment program in spite of trading losses are material points which can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific investment program that cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results.

The information presented is based upon the following hypothetical assumptions:

Commodities: Goldman Sachs Commodity Index; Fixed Income: Barclays Capital Government Bond Index (U.S. Gov.), Barclays Capital TIPS Index (TIPS), iShares iBoxx Investment-Grade Corporate Bond Fund (Corporate Credit), and Salomon Smith Barney World Government Bond Index ex-U.S. (Int'l Gov.); Equity: S&P 500 (U.S. Large Cap), Russell 2000 (U.S. Small Cap), MSCI Emerging Markets (EM Stocks), and MSCI EAFE (Int'l Stocks); Risk Parity: Hypothetical combination of nine index returns based on the above-listed indices. Weightings of the portfolio were adjusted over time based on forecasted Sharpe ratios.

Certain of the assumptions have been made for modeling purposes and are unlikely to be realized. No representation or warranty is made as to the reasonableness of the assumptions made or that all assumptions used in achieving the returns have been stated or fully considered. Changes in the assumptions may have a material impact on the hypothetical returns presented.

International investing involves certain risks, such as currency fluctuations, economic instability, and political developments. Additional risks may be associated with emerging market securities, including illiquidity and volatility. Active currency management, like any other investment strategy, involves risk, including market risk and event risk, and the risk of loss of principal amount invested. The use of alpha overlay strategies consists of hedging, which may in certain circumstances cause the value of a portfolio to appreciate or depreciate at a greater rate than if such techniques were not used, which in turn could result in significant losses. Derivative instruments may at times be illiquid, subject to wide swings in prices, difficult to value accurately, and subject to default by the issuer. Strategies that use leverage extensively to gain exposure to various markets may not be suitable for all investors. Any use of leverage exposes the strategy to risk of loss. In some cases, the risk may be substantial.

Benchmark descriptions

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

The Goldman Sachs Commodity Index (GSCI) is a composite index of commodity sector returns that represents a broadly diversified, unleveraged, long-only position in commodity futures.

The Citigroup World Government Bond Index (WGBI) includes the 23 government bond markets of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Malaysia, the Netherlands, Norway, Poland, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

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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