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How Risk Parity Can Cope with Rising Rates

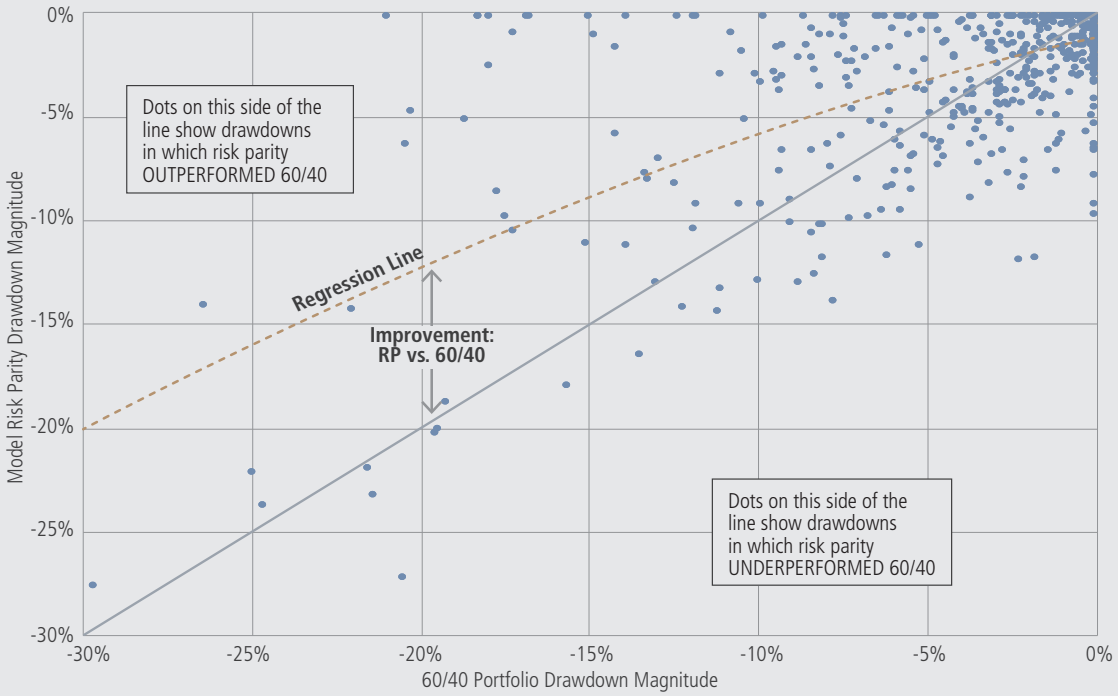
Because risk parity strategies are often mischaracterized as "leveraged bonds," many investors assume that they are destined to perform poorly when inflation, interest rates or bond yields are rising. However, whereas "leveraged bonds" implies a concentration in one risk factor, risk parity is all about balancing risk factors to achieve genuine diversification—before using leverage to attain a required overall risk or return objective. In this paper, we show that a simple model of a three-asset-class risk parity strategy generated positive returns, and outperformed a traditional 60/40 portfolio, during the late 1960s and 1970s, when inflation and rates were rising. We believe that in almost all economic environments, well-diversified risk parity strategies can be robust and can be used to improve portfolio efficiency.

Executive Summary

- We explore two reasons for the positive performance of a model risk parity strategy during a period of rising inflation and interest rates: the resilience of bond returns and the power of diversification.
- Bond risk is more prominent in risk parity strategies than in 60/40 portfolios, but bonds can generate a positive total return when yields are rising—as long as they do not rise too far or too rapidly.
- At the same time, bonds tend to perform strongly during periods of large losses in equities, delivering a powerful diversification benefit that helps to limit portfolio drawdowns and increase long-term compound returns.
- Adding commodities to a risk parity portfolio can further strengthen these diversification benefits: since 1960, when equities experienced their worst losses, bonds posted good positive returns, and sometimes commodities helped, too; when commodities performed most poorly, bonds were positive, and sometimes equities helped, too.
- We look at how a variety of risks—short- and long-dated interest rates, inflation, real interest rates and business activity—affect the model strategy compared with the 60/40 portfolio.
- Negative total returns to risk parity tend to occur only when interest rates and bond yields are exceptionally high or rising very rapidly, or when business activity is exceptionally depressed.
- The risk parity model tended to lag the 60/40 when real yields were rising and business activity was expanding exceptionally rapidly during recoveries from recessions—but even then, it still generally generated a positive return.
- The 60/40 portfolio tended to deliver negative total returns in a larger number of scenarios: when short rates were very high and long rates were rising rapidly; when inflation was rising rapidly and when real yields were low or declining rapidly; and when business activity was depressed and contracting rapidly. Periods of outperformance over the risk parity model strategy were rare.
- Overall, the risk parity model exhibits slightly more frequent but much lower drawdowns than the 60/40 portfolio.

RISK PARITY CAN HELP TAME LARGE DRAWDOWNS

Each dot shows the decline experienced by the two strategies in each drawdown between January 1963 and June 2018



Source: Ibbotson Associates, Neuberger Berman.

Whenever it appears that interest rates are rising, commentators warn of the reckoning that awaits risk parity investors.

That is understandable. In essence, risk parity is an approach to portfolio construction that attempts to get the most possible benefit from the diversifying characteristics of different asset classes by weighting them so that their contribution to the risk of a portfolio is roughly equal. It can define risk simply as volatility, or with some more sophisticated measure or combination of measures.

Because equities tend to be riskier than bonds (two or three times riskier, in volatility terms), the performance of a capital allocation split equally between equities and bonds will be determined mainly by equity risk—the bond characteristics will be largely drowned out. To get the benefit of the bonds, risk parity investors add to the bond allocation until its risk contribution is equal to that of the equities. To do that without compromising return expectations, however, it is necessary to leverage the resulting risk-balanced portfolio so that its overall exposure is greater than 100%, rather than simply switching some of the equity allocation for bonds. In this paper, when we build a model risk parity strategy, we leverage the portfolio to reach a volatility target of 10%—but once the risk parity portfolio is constructed, it can be leveraged to any calibration of risk or return objective.

That is why risk parity is often characterized as "leveraged bonds": because it involves adding more bonds and then leveraging the portfolio. And if you think of risk parity as "leveraged bonds", rising yields will seem like bad news.

We argue that this is a mischaracterization. Risk parity is not just leveraged bonds: it is a route to genuine multi-asset class diversification via the equalization of portfolio risk exposures. Moreover, most risk parity approaches do not confine themselves to equities and bonds, but add asset classes such as credit and commodities, also with equalized risk contributions. In most environments of high or rising yields, one or more of these other asset classes will perform well enough to balance negative performance of bonds. Finally, rising yields do not necessarily result in negative total returns to bonds—losses occur only when yields rise further than bond market expectations.

Add all of this together and we can begin to explain how risk parity portfolios can generate positive returns during high and rising-yield environments, as we will demonstrate in this article. We will show how a simple model risk parity portfolio might have fared, relative to a traditional 60/40 portfolio, through a range of scenarios, and explain some of the dynamics behind that performance.

Inflation and Rates May be Rising—But is that Necessarily Bad for Risk Parity?

Markets rarely move in a straight line, but it is fair to say that many investors assume that the 35-year period of declining inflation and a bull market in global interest rates has peaked and that rates will rise over the coming months and years. At the very least, many acknowledge that rates and yields have reached very low levels and the risk is skewed to the upside.

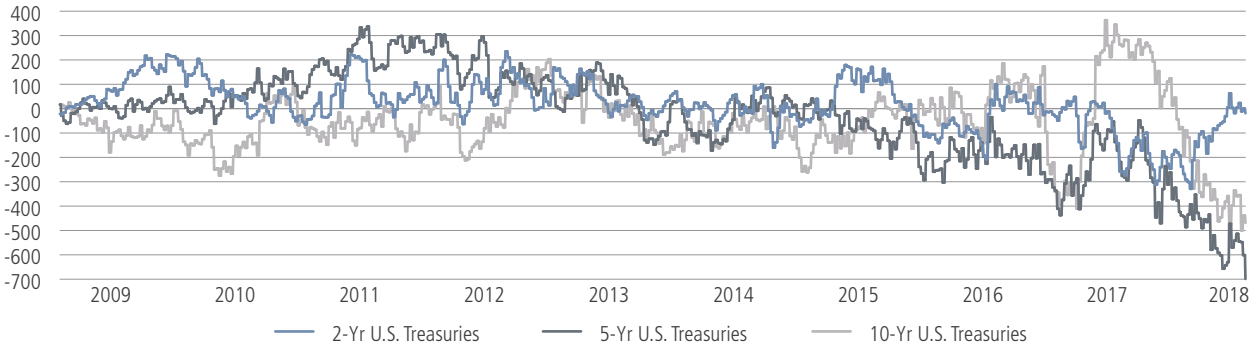
In the U.S., the Federal Reserve has started raising short-term rates and its published expectations signal more monetary policy tightening to come. That tightening will also take the form of a reversal of quantitative easing programs in the U.S., and later the Eurozone and possibly Japan, reducing demand for bonds and potentially adding to upward pressure on yields.

While there is a great deal of uncertainty around political risk and the maturity of the current business cycle, economic and business activity remains strong, especially but not exclusively in the U.S. That is reflected in stock market valuations, and investor demand for equity risk is sapping demand for low-yielding bonds with their unusually high downside risk. Furthermore, in the U.S., economic growth appears to be running ahead of capacity and unemployment is very low, adding to inflationary pressures that, in turn, reduce demand for low-yielding fixed income assets.

While rate hikes have attracted investors to the near end of the U.S. yield curve recently, markets have positioned heavily short in five- and 10-year Treasury futures, according to data from the Commodity Futures Trading Commission (Figure 1).

FIGURE 1. MARKETS ARE HEAVILY POSITIONED FOR HIGHER MEDIUM- AND LONG-DATED BOND YIELDS

U.S. Treasury futures net speculative length (thousands of contracts)



Source: CFTC. Data as of July 17, 2018.

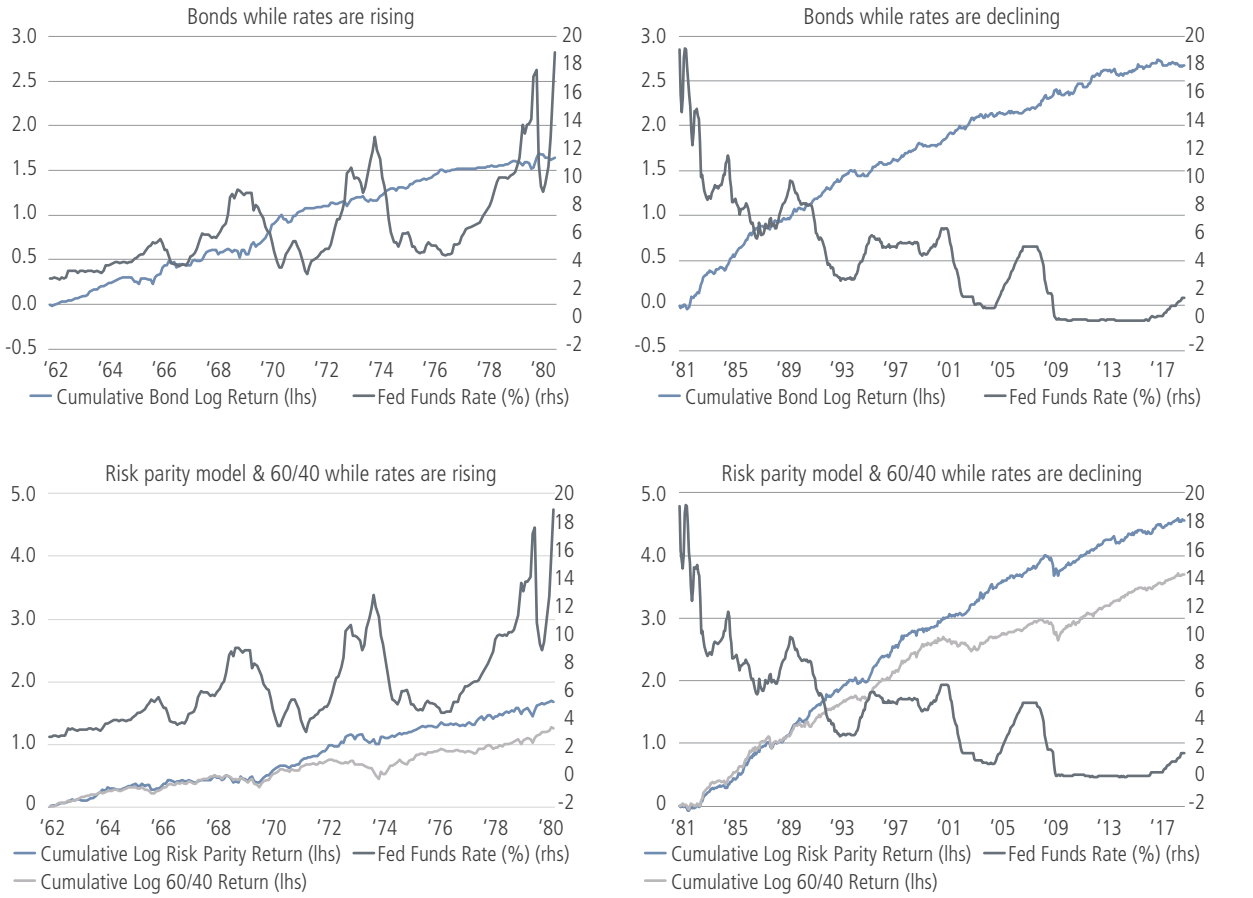
Critics of risk parity often say that backtests of the concept lack validity because performance data covers only the past 35 years, during which rates and inflation were declining. They then point to the evidence above to suggest that we are about to find out for the first time how poorly risk parity performs—due to its "leveraged bonds" exposure—when rates and inflation are rising.

These are questionable premises, however. It is simple to track the total returns of the bond market, in the form of the Ibbotson U.S. Intermediate-Term Government Bond Index, from 1960 to 1980. When we do so we find that returns were indeed considerably lower than they were over the more recent period—but they were still clearly positive.

We can add these bonds to the S&P 500 Index and commodities (the S&P GSCI Commodity Index after 1970, and commodity futures data from Bloomberg pre-1970) to create a simple, three-asset-class model risk parity strategy. We weight the asset classes to contribute an equal level of volatility, based on trailing two-year realized volatility. Then we leverage that portfolio to achieve annualized volatility of 10%.

This crude model risk parity strategy also exhibits significant positive total returns between 1960 and 1980. Moreover, the model outperformed a traditional 60/40 portfolio (comprised of a 60% allocation to the S&P 500 Index and a 40% allocation to the Ibbotson U.S. Intermediate-Term Government Bond Index, rebalanced monthly), with substantially lower drawdowns, despite the fact that it exhibited far more interest rate exposure and far less equity exposure (Figure 2).

FIGURE 2. BONDS—AND RISK PARITY—CAN THRIVE WHEN RATES ARE RISING



PERFORMANCE FROM JANUARY 1963 TO DECEMBER 1980

	Model Risk Parity	60/40	Stock	Bond	Commodity
Annualized Return	9.8%	7.3%	8.4%	5.0%	16.8%
Volatility	10.8%	9.3%	14.5%	5.4%	20.9%
Maximum Drawdown	14.0%	26.4%	42.6%	8.9%	37.5%
Sharpe Ratio	0.39	0.19	0.24	-0.13	0.57
Annualized Return / Max DD	0.70	0.28	0.20	0.56	0.45

PERFORMANCE FROM JANUARY 1981 TO JUNE 2018

	Model Risk Parity	60/40	Stock	Bond	Commodity
Annualized Return	12.9%	10.3%	11.3%	8.1%	7.2%
Volatility	9.8%	9.3%	14.7%	6.6%	14.0%
Maximum Drawdown	27.4%	29.6%	50.9%	8.6%	59.9%
Sharpe Ratio	0.87	0.67	0.53	0.60	0.28
Annualized Return / Max DD	0.47	0.35	0.22	0.93	0.12

Source: Ibbotson Associates, Federal Reserve Bank of St. Louis (FRED database). The model risk parity strategy includes bonds, equities and commodities, with volatility contributions equally weighted based on two-year trailing realized volatility, and a target portfolio volatility of 10% annualized; bonds are represented by the Ibbotson U.S. Intermediate-Term Government Bond Index, equities by the S&P 500 Index and commodities by the S&P GSCI Commodity Index after 1970, and commodity futures data from Bloomberg pre-1970. Please see "Hypothetical Backtested Performance Disclosures" at the end of this material. **Past performance is no guarantee of future results.**

Rising Rates Do Not Necessarily Lead to Negative Bond Returns

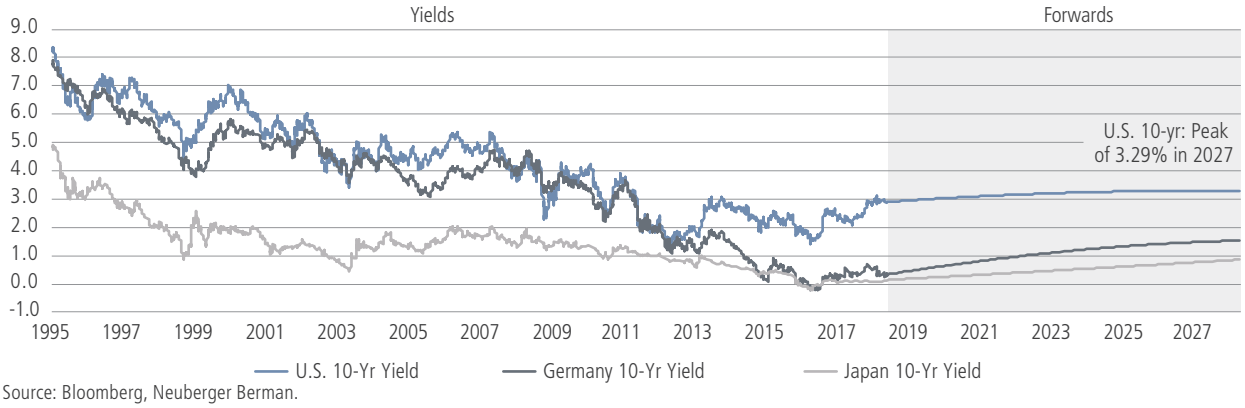
These results should make us reflect on two things: the ability of bonds to generate positive returns while rates are rising and the power of diversification.

It is intuitive that the price of a bond should decline as interest rates go up. But because a bond generates income, it remains possible for it to deliver a positive total return even though its price has declined. In theory, the market should demand a discount for that interest rate risk when it values bonds, pricing in what it considers to be a reasonable expectation for the future upside risk in yields in order to maintain the potential to receive a positive total return.

We can get a sense of how big this rising-yield "buffer" is for a given bond maturity by extrapolating forward rates from a current yield curve. If we want to know where the market expects a 10-year bond yield to be in one year's time, for example, it is called the 1Y10Y rate, and all we need to calculate it is today's one-year yield and 11-year yield. The 1Y10Y rate is the effect of short-selling the one-year rate at the same time as being long the 11-year rate. If we want to know where the market expects a 10-year bond yield to be in five years' time (the 5Y10Y rate), we can work that out using today's five-year and 15-year yields.

Of course, this market is not wholly efficient as it is subject to numerous technical supply-and-demand dynamics, but if we put a string of these forward rates together, we do begin to build a picture of how the market expects the 10-year bond yield to move over time.

FIGURE 3. FORWARD RATES INDICATE HOW FAR BOND YIELDS MUST RISE BEFORE A NEGATIVE TOTAL RETURN IS INCURRED
Historical 10-year yields, plus forward rates for the 10-year yield until 2028



Source: Bloomberg, Neuberger Berman.

That is what we have done for the 10-year U.S. Treasury yield in Figure 3, using the yield curve as of September 6, 2018. We can observe that the market, in aggregate, did not expect the 10-year yield to exceed 3.29% at any point over the next decade. The current 10-year yield is around 3%. The market would not buy a bond from which it expects a negative total return, and so we can extrapolate that the 10-year yield would need to rise by more than 29 basis points before the 10-year bond we bought on September 6 ate through that buffer and delivered a negative total return.

In other words, the fact that interest rates and bond yields are rising is not sufficient to impose losses on bondholders. They have to rise beyond the levels already priced in by the market at the time the bonds are bought. To bet against the 10-year U.S. Treasury on September 6, an investor would have had to be confident not only that yields were going up, but that they would go up more than 29 basis points.

Risk Parity is a Purer Way to Exploit the Power of Diversification

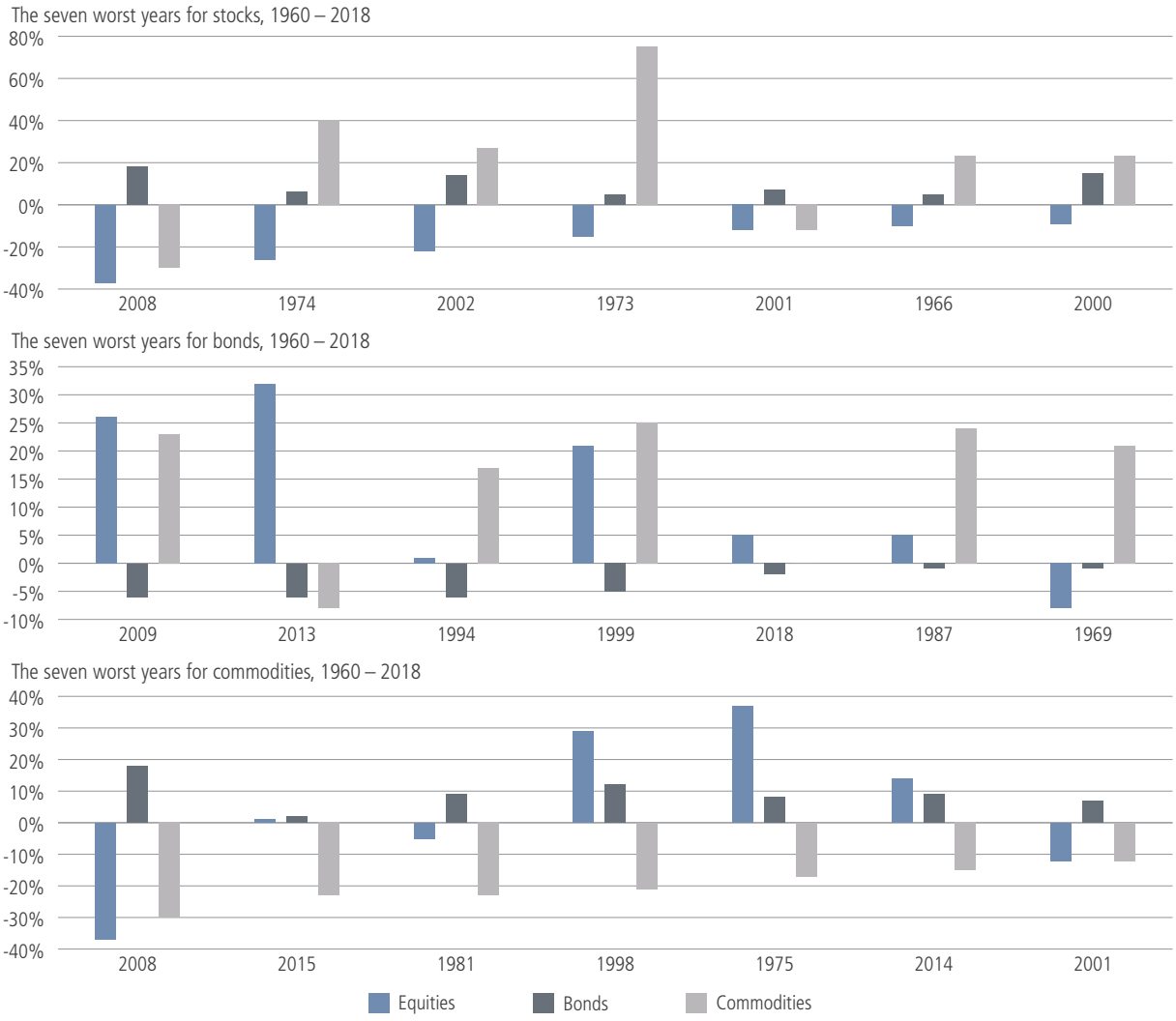
Diversification is really the main objective of a risk parity strategy.

The three components of our model risk parity portfolio are each natural hedges for the risks of the other two, and their diversifying characteristics tend to be strongest when one or both of the other asset classes are experiencing extreme drawdowns. Figure 4 shows total returns for each asset class in the seven worst calendar years for stocks, for bonds and for commodities, since 1960. When

equities experienced their worst losses, bonds always posted good positive returns—and sometimes commodities helped, too. When commodities performed most poorly, bonds were always positive—and sometimes equities helped, too.

We tend to assume that equities and bonds are negatively correlated with one another, particularly in extreme market conditions, but that has not always been the case. Consider 1969, which was one of the seven worst years for bonds for the period from 1960 to 2018. It was a fairly poor year for equities, too. The portfolio was balanced, however, by a near 20% return to commodities, which benefited from the same inflation shock that was hurting the other two asset classes. This shows the importance of all three sources of risk to the portfolio; they provide exposure to seemingly every type of economic environment, from deflationary recession through moderate expansion to growth or inflation shocks.

FIGURE 4. ASSET CLASS DIVERSIFICATION DURING THE WORST YEARS FOR STOCKS, BONDS AND COMMODITIES



Source: Ibbotson Associates. Bonds are represented by the Ibbotson U.S. Intermediate-Term Government Bond Index, equities by the S&P 500 Index and commodities by the S&P GSCI Commodity Index after 1970, and commodity futures data from Bloomberg pre-1970.

The benefits of genuine diversification can be seen in the tables in Figure 2, which show the risk parity strategy delivering a superior Sharpe ratio than equities, bonds or the traditional 60/40 portfolio during both the rising-rate and declining-rate environments.

Could an investor have created an even better risk-to-return ratio? We can find out by creating the "perfect hindsight" portfolio, the one that would have delivered the highest Sharpe ratio, and comparing it with our model risk parity strategy. This is what we have done in Figure 5 for the period of rising rates during the 1970s.

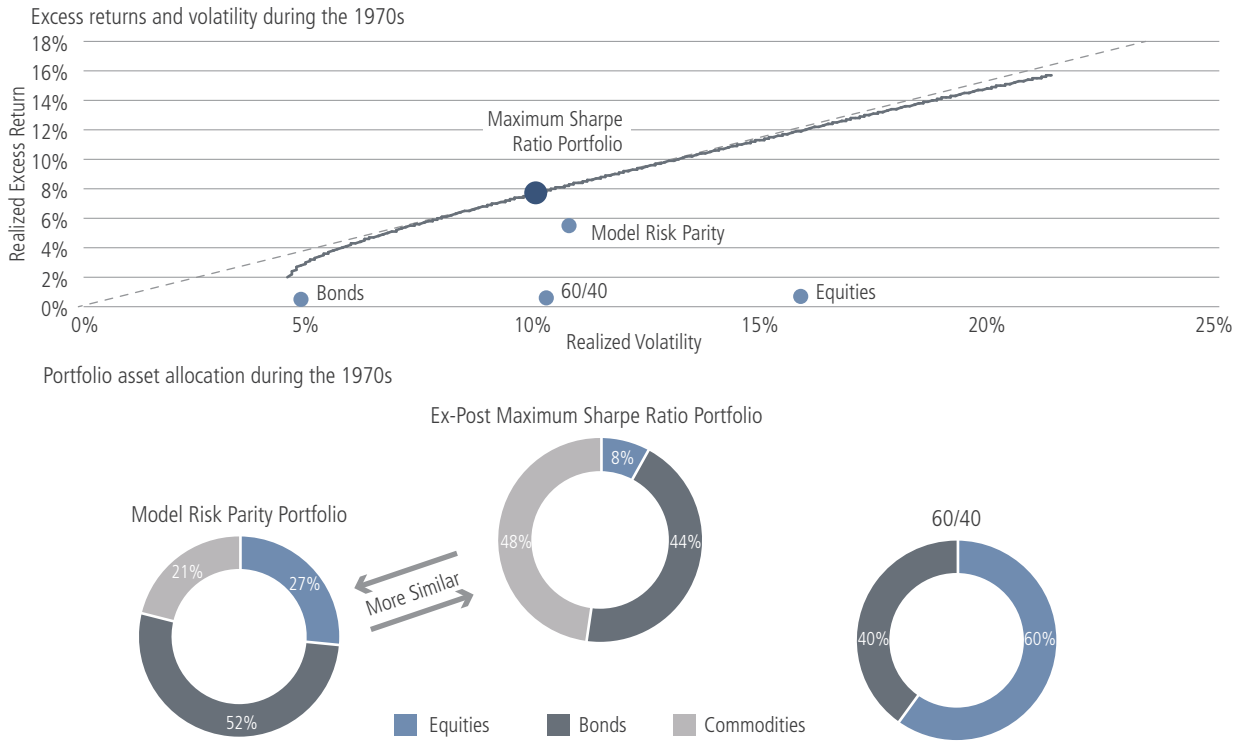
The first chart in Figure 5 shows the efficient frontier for the 1970s: the best rate of return available for each marginal point of volatility given the three available asset classes of equities, bonds and commodities. The "tangent portfolio", the one that delivered the highest Sharpe ratio from those available along the efficient frontier, is shown as the dark blue dot. It returned over 7% with volatility just over 10%.

Immediately, we can see that the risk parity portfolio is positioned very close to this ex-post optimal portfolio—and certainly much closer than the equities, bonds or 60/40 portfolios. Getting any closer than that with a similarly simple, rules-based portfolio allocation strategy would be a considerable challenge.

Now let us consider the second chart in Figure 5. This shows how the asset allocation of the ex-post optimal portfolio for the 1970s compares with the risk parity and 60/40 portfolios, and it gives us a sense of what helped risk parity to get so much closer to the maximum Sharpe ratio than 60/40 did. What we see is that there was not a huge difference in the bond allocation, but that opting for risk parity over 60/40 effectively swapped a large amount of equities exposure for commodities exposure, bringing the portfolio asset allocation somewhat closer to that of the ex-post optimal portfolio.

These findings reinforce the two observations we have already made: having a substantial bond allocation does not necessarily hurt you when rates are rising because bonds can generate return in these conditions while also balancing out those periods when equities experience large losses; and having the third allocation to commodities considerably improves diversification, and therefore risk-adjusted returns, relative to a simple equities-and-bonds portfolio.

FIGURE 5. HOW DID RISK PARITY COMPARE WITH THE MAXIMUM SHARPE RATIO PORTFOLIO DURING THE 1970S?



Source: Ibbotson Associates, Bloomberg, Neuberger Berman.

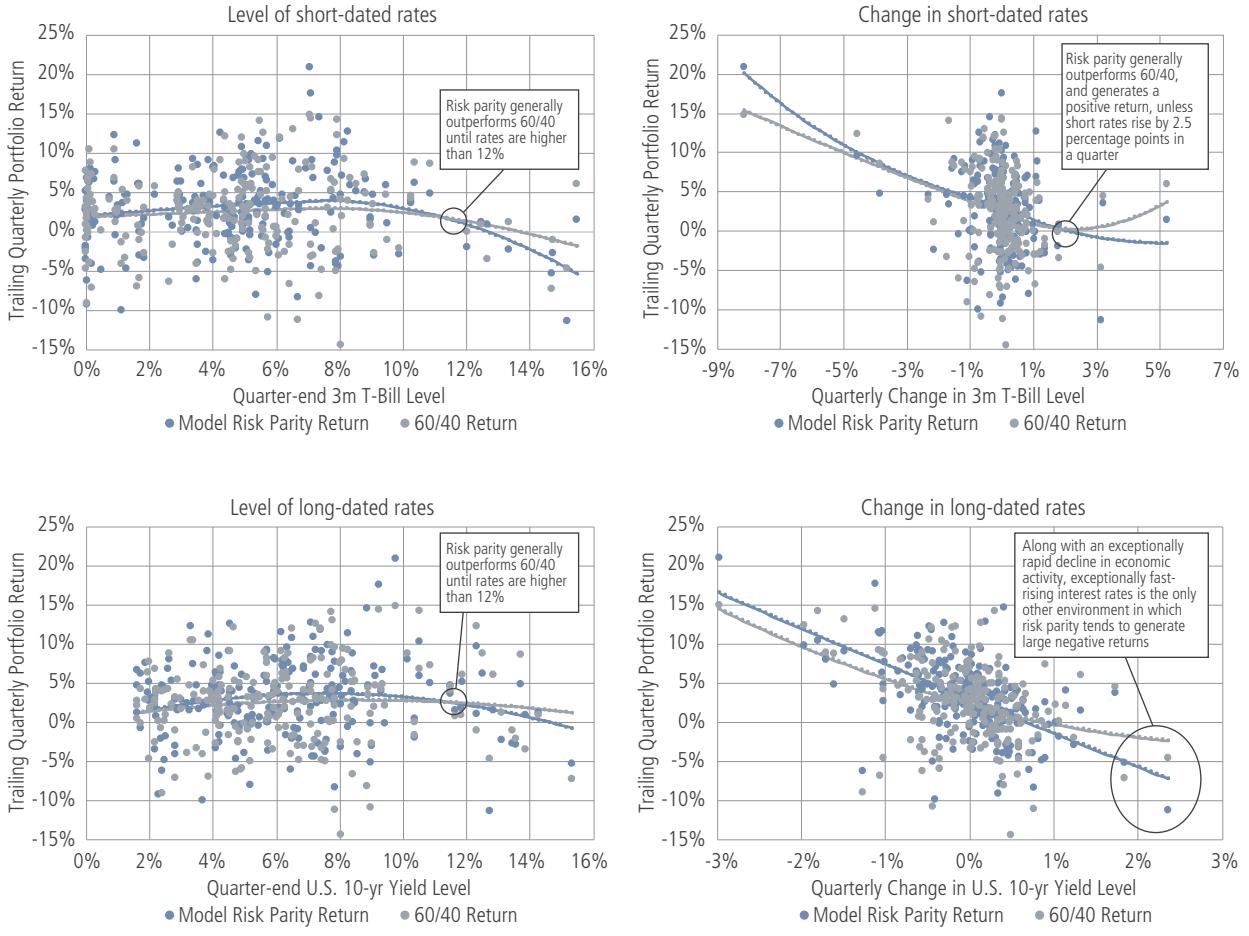
How Changes in Rates, Inflation and Economic Activity Affect Risk Parity

We have seen the performance of our model risk parity portfolio through both rising and declining rates, and considered the power of diversification in achieving that performance. Now we will look at how a variety of risks—short- and long-dated interest rates, inflation, real interest rates and business activity—would have affected the strategy compared with the 60/40 portfolio between January 1963 and June 2018.

Figure 6 looks at short- and long-dated U.S. interest rates. Risk parity outperforms the 60/40 portfolio, on average, unless the level of rates is above 12%—quite a high level, and even then the confidence in making such comparisons is low due to the small number of these extreme data points.

When we look at what happens when rates are moving, we see risk parity performing more strongly as rates decline, as we might expect. But, on average, risk parity also continues to generate a positive return, and to outperform 60/40, even as rates rise—as long as those rate rises are gradual. This partly reflects the income buffer that we described above. The lower bonds exposure in the 60/40 portfolio only tends to benefit the investor when rates have risen faster than 2.5 percentage points in a single quarter at the short end of the curve, or 0.4 percentage points in a quarter at the long end.

FIGURE 6. RISK PARITY AND HIGH OR RISING RATES



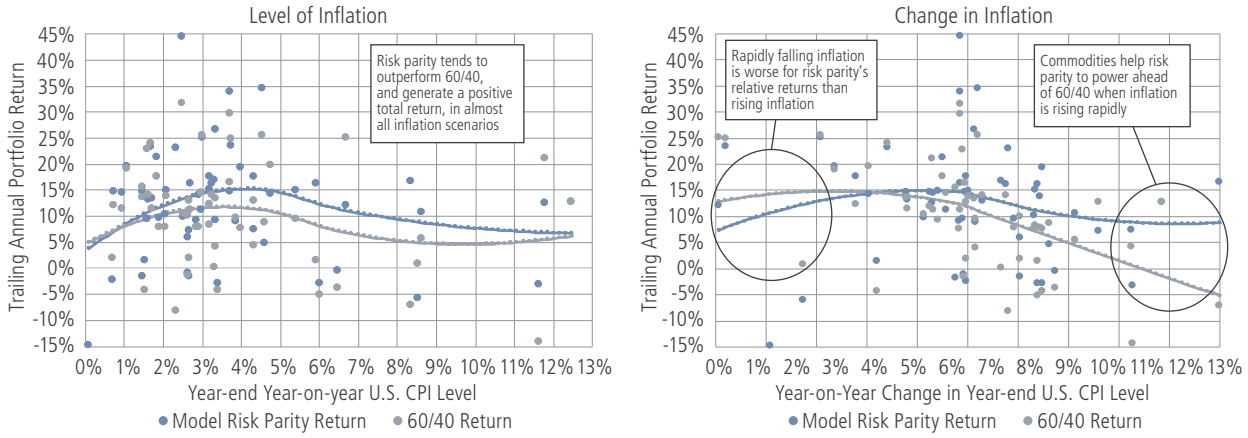
Source: Federal Reserve Bank of St. Louis (FRED database), Neuberger Berman.

Now let us move from interest rates to inflation rates.

Figure 7 shows the effects of the level and rate of change in U.S. Headline CPI. Risk parity tended to generate a positive return in most of the historical inflation environments, and managed to outperform 60/40 even when inflation was very high or rising rapidly. As we saw from the calendar year of 1969, this inflation protection comes from equities and commodities at moderate levels and from commodities at more extreme high levels, when risk parity tends to outperform 60/40 substantially. The risk parity investor with commodities in their portfolio has tended to give this relative outperformance back when inflation has fallen rapidly—at a rate of 2.5 percentage points or more, year-on-year.

That is the opposite of what one might expect were risk parity really just "leveraged bonds."

FIGURE 7. RISK PARITY AND HIGH OR RISING INFLATION

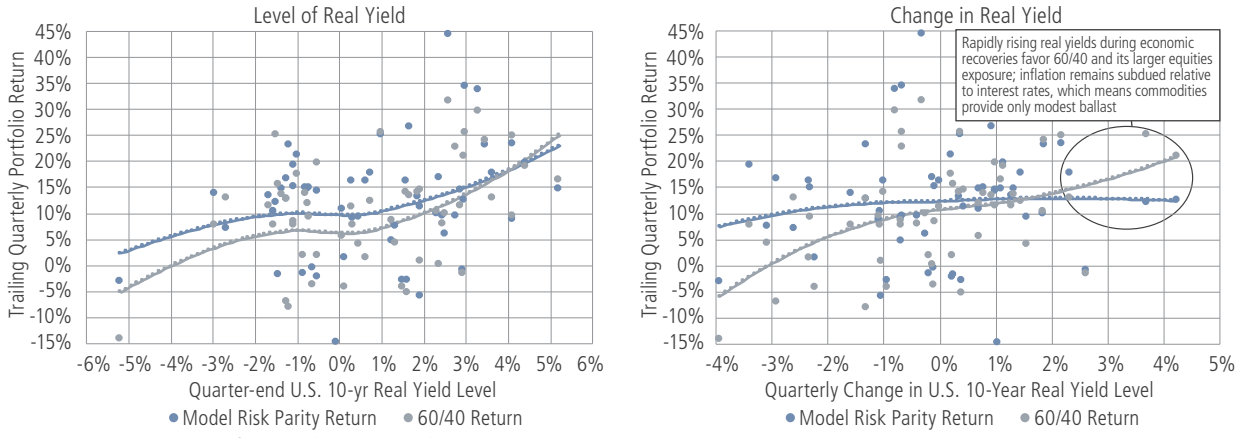


Source: Federal Reserve Bank of St. Louis (FRED database), Neuberger Berman.

From all of this, we can speculate that a challenging scenario for risk parity would be one in which bond yields are rising faster than inflation because rising yields would negatively affect the bonds and the commodities (which generate zero income) would do little to offset those losses.

Sure enough, an environment of fast-rising real yields results in the best relative performance from 60/40, driven by its outsized equities exposure (Figure 8). Still, to return to the diversification theme again, it is worth remembering that the risk parity portfolio is as equally exposed to equity risk as it is to bond risk, and that its absolute performance remains positive, and even improves, as real yields go higher.

FIGURE 8. RISK PARITY AND HIGH OR RISING REAL YIELDS



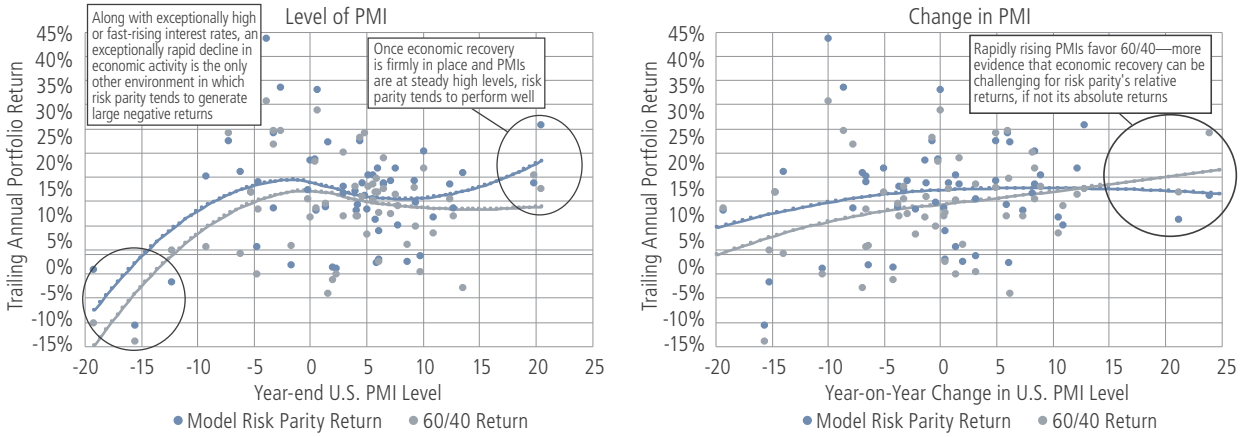
Source: Federal Reserve Bank of St. Louis (FRED database), Neuberger Berman.

Rapidly rising real yields have tended to characterize the recovery phase of an economic cycle, when business activity is expanding rapidly. Central banks are removing the loose monetary policy that was appropriate for a recession, but output gaps are yet to close and inflation remains subdued.

We can confirm that this is the most challenging part of the cycle for the model risk parity strategy relative to 60/40 by looking at the effects of changes in Purchasing Managers' Indexes (PMIs), which are surveys of business activity that indicate expansion when they show a level above 50 and contraction when they are below 50.

The right-hand chart in Figure 9 shows that risk parity starts to lag 60/40 when U.S. PMIs are strengthening significantly. As the magnitude of the strengthening suggests, these are recoveries from a low base, out of recessions or downturns. These are periods of rapid and substantial equity multiple expansions. It is important to note, however, that the left-hand chart shows that once PMIs have settled at higher levels of expansion, risk parity outperforms again, on average, often significantly; again, this reflects the fact that the strategy is as equally exposed to pro-growth equity and commodity risk as it is to bond risk.

FIGURE 9. RISK PARITY AND HIGH AND RISING BUSINESS ACTIVITY



Source: Bloomberg. The index used is the ISM Manufacturing Purchasing Managers' Index.

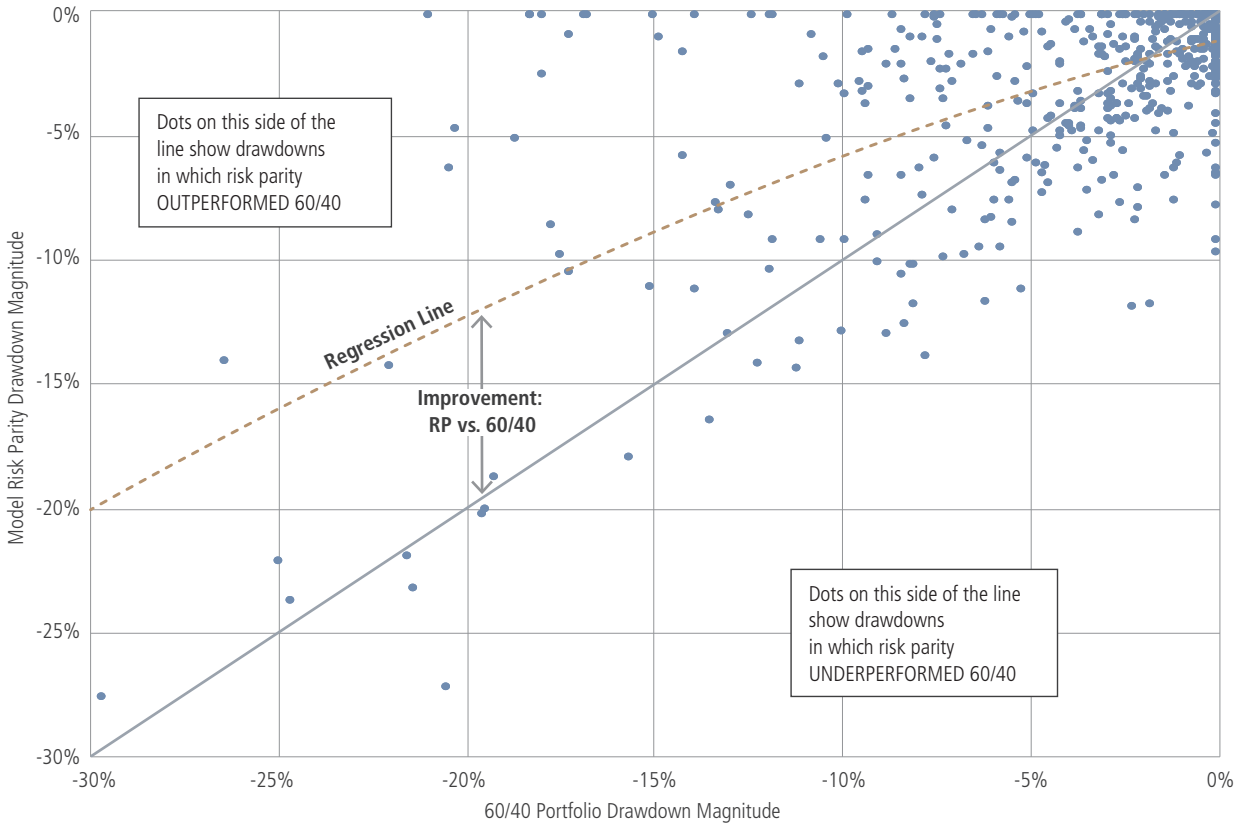
Conclusions: Risk Parity is Robust and Can Improve Portfolio Efficiency

What we learn from the charts in Figures 6 through 9 is that negative total returns to risk parity are rare; they tend to occur only when interest rates and bond yields are exceptionally high, or rising at a rate of 2.5 percentage points per quarter at the 10-year maturity, or when business activity is exceptionally depressed. It also lags the 60/40 portfolio in most of these periods.

Risk parity tends to lag the 60/40 portfolio when real yields are rising fast unexpectedly and when business activity is expanding exceptionally rapidly during recoveries from recessions; but even then, it still tends to generate meaningful positive returns.

The 60/40 portfolio, by contrast, has tended to endure negative total returns in a larger number of scenarios: when short rates are very high and long rates are rising rapidly; when inflation is rising rapidly and when real yields are low or declining rapidly; and when business activity is depressed and contracting rapidly. Periods of outperformance relative to our model risk parity strategy have been rare.

FIGURE 10. RISK PARITY CAN HELP TAME LARGE DRAWDOWNS



Source: Ibbotson Associates, Neuberger Berman. Drawdowns experienced between January 1963 and June 2018.

The long-term result is a performance profile that exhibits slightly more frequent but much lower drawdowns than the 60/40 portfolio, as shown in figure 10.

We can see that, while the 60/40 portfolio tended to perform better than risk parity during the very small drawdowns that are clustered in the top right corner of the scatter plot, risk parity tended to outperform significantly as we move toward the bottom left corner, where the drawdowns were bigger. Moving to a risk parity portfolio would have also markedly improved returns for a similar level of volatility as that generated by a 60/40 or equal-weighted equities-and-bonds portfolio. It is also notable that the maximum drawdown was significantly shallower during the rising-rates environment of 1960–80 than it has been during the supposedly more favorable environment since then (Figure 2).

These gains come from two sources: the robustness of the positive total returns to bonds in nearly all environments, including most rising-rate environments, together with the powerful diversification benefits of equally weighting the portfolio risk contributions of the three asset classes of equities, bonds and commodities. At least one of these tends to perform well when the others are suffering losses.

The risk-return profile of a risk parity strategy is attractive in its own right. In addition, the fact that a risk parity portfolio leveraged to achieve similar volatility to a non-leveraged equities-and-bonds mix will tend to generate higher returns means that it can be used as a component strategy to improve overall portfolio efficiency. For example, an investor substituting some of an existing equities-and-bonds allocation for risk parity will not need to move all of the allocation across to meet its previous expected-return objective. The lower-risk and diversifying exposures of the risk parity strategy leaves the investor with some cash and some risk budget that can be allocated to higher-return alternative assets such as private equity and other less-liquid asset classes.

We believe these are considerable benefits that risk parity can bring to any investor's portfolio. Mischaracterization of the strategy as merely "leveraged bonds" can cause investors to overlook it at a time when inflation, interest rates and bond yields are expected to rise. In this paper, we have tried to break down that mischaracterization and reveal the true power of diversification that drives this strategy through almost all environments—including those when rates are on the move.

Hypothetical Backtested Performance Disclosures

The hypothetical performance results included in this material are for a backtested model portfolio and are shown for illustrative purposes only. Neuberger Berman calculated the hypothetical results by running a model portfolio on a backtested basis using the methodology described herein. The results do not represent the performance of any Neuberger Berman managed account or product and do not reflect the fees and expenses associated with managing a portfolio.

The model risk parity strategy includes bonds, equities and commodities, with volatility contributions equally weighted based on two-year trailing realized volatility, and a target portfolio volatility of 10% annualized; bonds are represented by the Ibbotson U.S. Intermediate-Term Government Bond Index, equities by the S&P 500 Index and commodities by the GSCI Commodity Index after 1970, and commodity futures data from Bloomberg pre-1970.

There may be material differences between the hypothetical backtested performance results and actual results achieved by actual accounts. Backtested model performance is hypothetical and does not represent the performance of actual accounts. Hypothetical performance has certain inherent limitations. Unlike actual investment performance, hypothetical results do not represent actual trading and accordingly the performance results may have under- or over-compensated for the impact, if any, that certain economic or other market factors, such as lack of liquidity or price fluctuations, might have had on the investment decision-making process or results if assets were actually being managed. Hypothetical performance may also not accurately reflect the impact, if any, of other material economic and market factors, or the impact of financial risk and the ability to withstand losses. Hypothetical performance results are also subject to the fact that they are generally designed with the benefit of hindsight. As a result, the backtested models theoretically may be changed from time to time to obtain more favorable performance results. In addition, the results are based, in part, on hypothetical assumptions. Certain of the assumptions have been made for modeling purposes and may not have been realized in the actual management of accounts. No representation or warranty is made as to the reasonableness of the assumptions made or that all assumptions used in achieving the hypothetical results have been stated or fully considered. Changes in the model assumptions may have a material impact on the hypothetical returns presented. There are frequently material differences between hypothetical performance results and actual results achieved by any investment strategy. Neuberger Berman did not manage any accounts in this manner reflected in the models during the backtested time periods shown.

The GSCI Commodity Index, published by Standard & Poor's, is a world production-weighted index of the most liquid futures contracts in 24 commodity sectors.

Ibbotson U.S. Intermediate-Term Government Bond Index is a one-bond index that tracks the total return of the shortest non-callable bond with a maturity of not less than five years for one calendar year, before choosing a new bond on the same criteria.

The S&P 500 Index is a float-adjusted, market capitalization-weighted index of the 500 largest companies listed on the New York Stock Exchange or the Nasdaq Stock Market.

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