Investment Insight

The Risk Parity Conundrum: Rising Interest Rates and Rising Returns

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The fundamental principle of bond math teaches us that a bond portfolio loses value when interest rates rise and common sense dictates that a levered bond portfolio loses even more value when interest rates rise. While we agree with bond math, as well as common sense, we reject the popular, yet unsubstantiated notion that a Risk Parity portfolio is also destined to lose value in a rising interest rate environment. In fact, our experience has been quite the opposite.

Exhibit 1

Period	Chg in 10Yr Yield (bps)	Chg in 5Yr Yield (bps)	S&P 500 APR	US WGBI APR	Risk Parity APR
1/06–6/06	+75	+74	3.54%	-2.50%	-5.89%
12/06-6/07	+57	+48	12.90%	0.31%	0.96%
4/08-5/08	+65	+99	40.83%	-16.23%	17.56%
1/09-12/09	+163	+113	23.45%	-3.69%	7.16%
9/10-3/11	+100	+95	49.32%	-4.67%	19.20%
Avg	+92	+86	26.01%	-5.36%	7.80%

For illustrative purposes only. Source: PanAgora

We have been running Risk Parity portfolios for clients since 2006. During that period, even though interest rates have declined in general due to the Fed policy, weak economic recovery and low inflation, we have actually experienced five different episodes of rising interest rates as listed in Exhibit 1.

Over these sub-periods, interest rates increased nearly 100 basis points on average while Risk Parity delivered an average annualized return of 7.80%. The success of Risk Parity in rising interest rate environments should not come as a surprise. Risk Parity portfolios are designed to capture market risk premium efficiently in a variety of different market cycles including rising, declining and range-bound interest rate environments. In this note, we seek to demystify the relationship between rising interest rates and a properly constructed Risk Parity portfolio by making three points. First, it is important to understand that seemingly contrary to the fundamental principle of bond math, bonds do not always decline in value in a rising interest rate environment. Second, it is important to understand that a well constructed Risk Parity portfolio should not allow the contribution to return from any asset class including, but not limited to, fixed income to have an undue influence on the entire portfolio. In the example of a rising interest rate environment, we would expect other asset classes to provide positive returns in a similar magnitude to the potential loss contribution of the portfolio's fixed income positions. Finally, we believe that a well designed Risk Parity portfolio has a systematic flexibility built into its investment process to allow the portfolio to be

adaptive to changes in market cycles of interest rates.

Don't Let Bond Math Fool You

Duration is the most common measure of a portfolio's sensitivity to changes in interest rates. Duration can be used to approximate a bond portfolio's return due to a change in interest rates:

$$r = -Dur \cdot \Delta y$$

This expression suggests that a Risk Parity portfolio with a duration of 10 years (assuming 160% notional weight times an average bond duration of 6.25 years), would lose 10 percent of its value for a 100 basis point increase in interest rates. While this expression accurately captures the inverse relationship between bond prices and bond yields, it does so only for parallel changes in yields that occur as the result of an instantaneous shock in the yield curve.

Experience tells us that changes in interest rates rarely occur instantaneously. Rather, they typically occur across a cycle that will last weeks, months, or years. When interest rates rise over time, one must factor in the slope of the yield curve to estimate the likely impact on bond returns. For example, a steep yield curve is indicative of a bond market that is expecting a dramatic increase in interest rates in the future. Forward yields provide a buffer that compensates investors for these future increases in interest rates. This "buffer" means that not only are bond investors not guaranteed to lose money in a rising interest rate environment, but **they can actually earn positive returns as long as spot yields increase by less than what was priced by the forward yield curve.** In other words, this is the interest rate premium that a Risk Parity portfolio is designed to capture.

Exhibit 2

	3 Mo	2 Yr	5 Yr	10 Yr	5X5 Fwd
Yield	0.05%	0.25%	0.50%	1.75%	3.02%

For illustrative purposes only. Source: PanAgora

Exhibit 2 shows the term structure of interest rates for a theoretical yield curve, which is close to the US Treasury curve at the time of this writing. While the yield levels shown in Exhibit 2 are extremely low relative to their historical standards, the slope of the curve is fairly steep. The steepness in the slope of the yield curve is indicative of a market that is pricing in an aggressive increase in interest rates. Bond markets price in a "buffer" for future increases in interest rates by offering forward yields that are substantively higher than spot yields. As a result, the determining factor of whether a bond contributes positively or negatively to portfolio performance is not whether interest rates rise or fall, but rather whether interest rates rise or fall more than the level of forward yields implied by the term structure of interest rates. Using the theoretical yield curve summarized in Exhibit 2 we can use a bootstrapping technique to derive forward yields. An investment in a 10-year bond can be decomposed into a spot investment in a 5-year bond yielding 0.50% and a forward starting investment in a 5-year bond starting five years from today, yielding 3.02%. The implied 5-year forward yield suggests that the bond market is anticipating that 5-year yields will increase by 250 basis points (a six-fold increase from their current level) over the course of the next five years. An investor who has exposure to this steep part of the term structure (125 basis points from 5Yr-10Yr) will earn a positive return

on their investment even if five-year yields increase by 250 basis points over the course of the next five years. Exhibit 3 shows the expected return on this investment [1] under various interest rate scenarios.

Exhibit 3

Shift in 5YR Spot Yields 5 years from today	HPR in 5 Years
Unchanged	+16.10%
+50 bps	+13.17%
+100 bps	+10.41%
+150 bps	+7.73%
+200 bps	+5.13%
+250 bps	+2.60%
+300 bps	0.15%
+350 bps	-2.24%
+400 bps	-4.55%
+450 bps	-6.80%
+500 bps	-8.99%
+550 bps	-11.12%

For illustrative purposes only. Source: PanAgora

The scenario analysis summarized in Exhibit 3 shows the expected holding period return of an investment today in a zero coupon, 10-year bond yielding 1.75% over the course of the next five years. In five years time, the 10-year zero coupon bond will age and effectively become a 5-year zero coupon bond. If five years from now 5-year Treasury yields remained unchanged at 0.50%, today's investment in a 10-year zero coupon bond would have gained 16.10% over the course of five years. In order for this forward starting investment to detract value, 5-year Treasury yields would have to yield over 3.50% (a 300 basis point increase from the 5-year spot level today). For example, if 5-year Treasury yields increased 550 basis points to yield 6.00% by 2017, the forward starting bond investment would have only declined by 11.12% over the course of five years. This holding period loss translates into an average annualized loss contribution of 233 basis points a year.

Risk Parity is NOT a Levered Bond Portfolio

In our August 2012 Investment Insight piece titled "See the Forest for the Trees", we encouraged our readers to appreciate the role that different asset classes are expected to play throughout various macroeconomic environments or market cycles. In the paper we show that the performance of various forms of market risk premium is time varying. We believe that asset class performance is contemporaneously influenced by the macroeconomic environment or business cycle. For example, in a low-growth and low-inflation environment (similar to what we have experienced over the last several years), we would expect that nominal sovereign bonds would deliver above average performance. In contrast, in a high-growth environment, we would expect that equities and commodities would deliver above average performance. While there are an unlimited amount of permutations of macroeconomic environments and market cycles, a well-constructed Risk Parity portfolio balances the contribution to risk (and consequently contribution to return) across a diverse set of asset classes so that regardless of the environment, neither the above-average nor the below-average performing asset classes will exert an undue influence on the total portfolio's performance. Risk Parity portfolios achieve this balance by

[1] In this scenario the investment represents an initial investment in a 10-year zero coupon bond today and measures the return on that investment 5 years later under various assumptions for the level of 5-year spot yields

targeting balanced risk exposures. From this perspective, a Risk Parity portfolio's total performance, as measured by its Sharpe Ratio, is related to the risk-weighted average of each asset class' component Sharpe Ratios.

Exhibit 4

	2008	2009	2010
US WGBI Sharpe Ratio	1.87	-0.69	1.37
S&P 500 Sharpe Ratio	-1.89	1.04	0.65
160/40 RP Port Sharpe Ratio	0.09	0.17	2.99
Correlation US WGBI, S&P 500	-0.20	0.42	-0.73

For illustrative purposes only. Source: PanAgora

Exhibit 4 summarizes the performance of a hypothetical Risk Parity portfolio consisting of a 160% notional weighting to the US World Government Bond Index and a 40% notional weighting to the S&P 500 Index. While the hypothetical Risk Parity portfolio delivered similar performance in 2008 (declining interest rates and equity prices) and 2009 (rising interest rates and equity prices) its best performance over the period was in 2010 when both equities and bonds delivered above average risk-adjusted returns. Focusing on an asset's risk-weighted contribution to the total portfolio's Sharpe Ratio rather than its notional-weighted contribution is an important distinction that is often lost by Risk Parity skeptics. This oversight is the primary reason many people mistakenly believe that Risk Parity portfolios are levered bond portfolios excessively vulnerable to rising interest rate environments. Exhibit 4 helps to dispel this myth. Just like in 2008 when poor equity market performance didn't dominate the total portfolio, the poor bond market performance in the rising interest rate environment of 2009 didn't cause the Risk Parity portfolio to endure a catastrophic drawdown.

Dynamic Risk Allocation

While we believe that bonds can contribute positively to portfolio performance in a rising interest rate environment we acknowledge that it is dependent upon the steepness of the yield curve, the length of the cycle and the magnitude of the yield increase. A scenario with a flat or inverted yield curve, where interest rates spike higher over a short horizon, would be a scenario where the allocation to nominal fixed income would significantly detract value from a Risk Parity portfolio. This scenario represents a structural re-pricing of market risk premium, as the bond market was not expecting changes in interest rates (as evidenced by a flat yield curve) yet interest rates suddenly spiked higher. The last time this happened was in 1994.

In our view, structural market shifts require flexibility to allow the portfolio to become adaptive to changing market conditions. We introduce flexibility to our Risk Parity portfolios through the use of our Dynamic Risk Allocation (DRA) process. DRA is a structured framework that allows us to tactically shift our risk budget away from its long-term strategic targets in order to allow the portfolio to adapt to changing market conditions. This process is applied across two dimensions, both of which provide important protection against a structural re-pricing of fixed income market risk premium. First, we use DRA to tactically shift the risk budget across asset classes. In an environment with a flat yield curve and spiking interest rates we would expect DRA to bias us toward holding a lower risk allocation to fixed income from both a valuation perspective, as well as a technical perspective. The flatness of the yield curve would suggest lower-term premium, causing it to look less attractive from

a valuation perspective. The sharp jump in yields would also increase the contribution of our momentum signal, causing a further decline in our Risk Parity portfolio's risk allocation to fixed income as yields climbed higher.

In addition to applying DRA across asset classes, we also apply DRA within asset classes. Having the flexibility to be tactical across the term structure of interest rates offers another important form of protection to our Risk Parity investors in a rising interest rate environment. A structural re-pricing of fixed income term premium will likely not impact each part of the term structure equally. If interest rates spike higher due to an unexpected increase in inflation, the yield curve will likely bear-steepen, causing longer-term yields to increase more than shorter-term yields. If interest rates jump higher due to unexpected policy tightening by the central bank, the yield curve will likely bear-flatten as short-term interest rates increase more than longer-term interest rates. DRA allows our Risk Parity portfolios to be systematically tactical in response to these very different interest rate environments.

Conclusion

As we travel the globe to talk to our existing and prospective clients, we spend a lot of time assuaging investors' fears as to how Risk Parity will perform in a rising interest rate environment. Despite embracing the intuitive appeal of constructing a risk-balanced portfolio, many investors struggle to get comfortable with the portfolio's unconventionally large notional exposure to fixed income in an environment with historically low fixed income yield levels that are more likely to move higher than lower. In this note we address this concern directly by making three points. First, the return contribution from fixed income is not guaranteed to be negative in a rising interest rate environment. When a yield curve is steep, and increases in interest rates occur over time, the portfolio's fixed income positions can contribute positively to return if rates increase less than what is priced in by the forward yields. Second, a well-constructed Risk Parity portfolio should not be unduly influenced by the performance of any one asset class. In a rising interest rate environment, the magnitude of the loss contribution from the portfolio's fixed income positions is not expected to be larger than the return contribution from other uncorrelated assets (e.g. equities and commodities). Our experience managing Risk Parity portfolios for our clients supports this expectation. In four out of the five periods with rising interest rates the return contribution from equities and commodities more than offset the loss contribution from fixed income resulting in positive total portfolio returns. Finally, when interest rate increases occur as a result of a structural re-pricing in market risk premium, it is important to have flexibility incorporated into your investment process in order to ensure that the portfolio is adaptive to changing market conditions. Our Dynamic Risk Allocation process allows us to be systematically tactical across asset classes as well as within asset classes.

Index Descriptions

The S&P 500 Index is an unmanaged list of common stocks that is frequently used as a general measure of U.S. stock market performance.

The Barclays Capital U.S. Treasury Index includes public obligations of the U.S. Treasury.

The Citigroup World Government Bond Index (formerly Salomon Smith Barney World Government Bond Index (WGBI)) is a market-capitalization-weighted benchmark that tracks the performance of 19 government bond markets including Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

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