

## To bond or not to bond, that is the question

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By **Harold Heuschmidt and Dr. Torsten von Bartenwerffer, Aquila Capital Quant Team**

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## **About Aquila Capital**

Established in 2001, Aquila Capital is a leading independent investment manager with a focus on alternative investments. The company specialises in the structuring and management of market-independent investment strategies that are driven by global macro trends, target above average, long-term returns and are uncorrelated with traditional asset classes.

Aquila Capital's ability to pioneer major developments as a first mover is based on a strong operational backbone and a research-driven corporate culture.

With over 80 employees, Aquila Capital currently manages EUR 4.1 billion in assets from six international offices in Europe and Asia.

**Harold Heuschmidt** is Head of Quant Fund Management within the Aquila Capital Quant Team and the key person responsible behind the conception and implementation of the Risk Parity strategy in 2004. Harold Heuschmidt has over 20 years of experience in the financial markets. Prior to joining Aquila, he held senior positions at Morgan Stanley and Credit Suisse First Boston in New York and London in their equity and equity derivatives divisions. He studied engineering and graduated with a MSc from the University of Twente in the Netherlands. Harold Heuschmidt received his MBA, with cum laude, from INSEAD in Fontainebleau, France.

**Dr. Torsten von Bartenwerffer** is Director of Portfolio Management within the Aquila Capital Quant Team. Prior to joining Aquila Capital, Torsten von Bartenwerffer was a Portfolio Manager and Quantitative Analyst at IS Partners Investment Solutions in Zurich, where he was responsible for the conception and implementation of multi asset strategies. Previous roles include positions held at Clariden Leu as well as at UBS in Zurich. Torsten von Bartenwerffer holds a doctorate in economics (Dr. oec, summa cum laude) from the University of St. Gallen and has over 10 years of financial market experience.

## **Introduction**

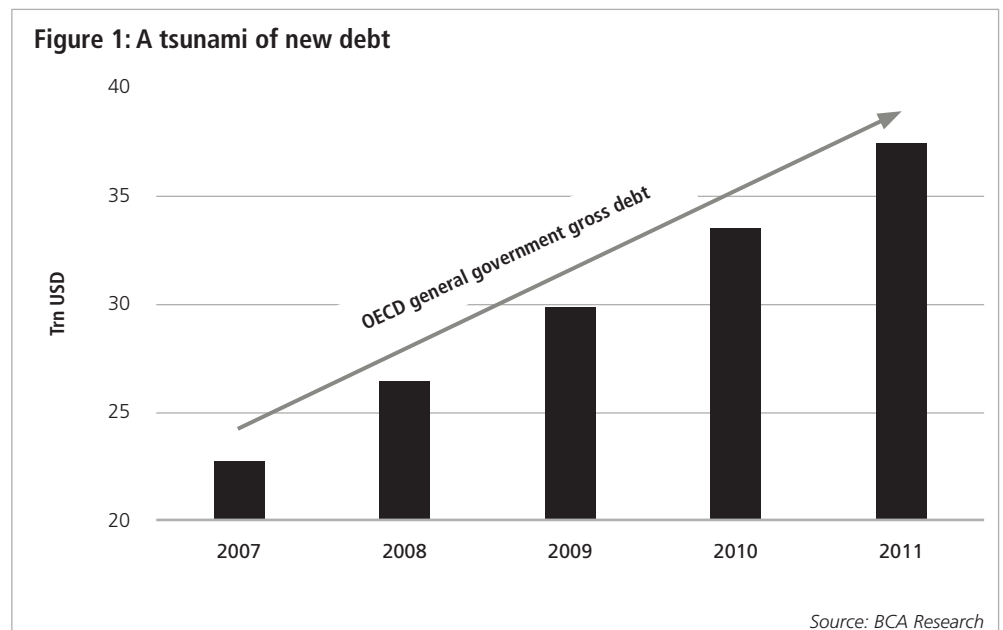
Having the right exposure to fixed income markets is an important part of any Risk Parity strategy. Clearly, investors are (very) worried about sovereign risk and the viciousness of interest rate cycles. In this paper we will take a closer look and evaluate the implications of interest rate changes on the performance of bonds and Risk Parity strategies. It appears that the impact of rising interest rates is much more limited than you might expect.

## Bonds have come a long way

An analysis of government activity clearly shows that while the period before 1985 was characterized by classical Keynesian fiscal policy, the era leading up to today is influenced by monetarism, inflation targeting and the micro-management of interest rates by central banks.

In the wake of every recent economic crisis, governments and central banks have produced a wall of liquidity through the rapid lowering of interest rates and the accumulation of debt. The drop in interest rates over the last 30 years has boosted bond returns and fixed income investors have done very well.

But there is also a darker side. The lowering of interest rates may have lured governments into giving up on fiscal prudence. BCA Research shows that there has been a tsunami of debt issuance in the last few years and that the overall OECD government debt has risen by a staggering 15trn USD since 2007<sup>i</sup> (see figure 1).



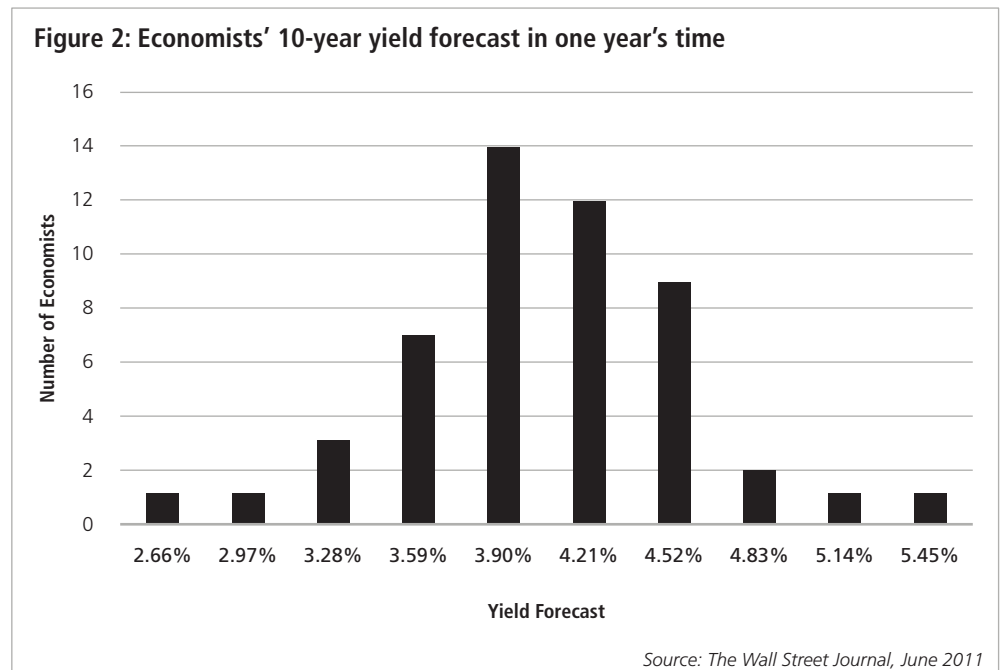
New debt faces increasing resistance from markets as it becomes ever clearer that eventually all the borrowed money will have to be either paid back or subject to default. Most sovereign balance sheets have been pushed to the limit and weak governments have become prey to the financial markets. It seems counterintuitive, but in the future there may even be a shortage of AAA issuers relative to demand as fewer and fewer sovereigns remain “safe”.

Today, as yields are at record lows, there seems to be little room for yields to fall. Most investors therefore think that rates have only one way to go: up. But although this seems to be a convincing conclusion, it is not necessarily true. Interest rates may just as well stay unchanged or decline even further. As the Danish physicist Niels Bohr once said: “It’s tough to make predictions, especially about the future.”

## Hindsight is easy, predictions are not

Timing interest rate movements is much more difficult than most people think. So how good are the so-called experts? In the last few years, a lot of people have called the bottom for yields. One such famous bond bear is James Grant, publisher of Grant's Interest Rate Observer<sup>2</sup>. Markets did not listen to his predictions. They went the other way. Yields continued to drop.

And he's not the only one to get it wrong. In June 2011, The Wall Street Journal asked 50 well known economists about their prediction for the 10-year bond yield in one year's time<sup>3</sup>. The average prediction was about 4.0%. One year later, yields were at 1.7%. Figure 2 shows the range of interest rate predictions by this group, ranging from 2.5% to 5.6%. Amazingly, not a single economist asked came even close to 1.7%.



<sup>2</sup> <http://www.grantspub.com/>

<sup>3</sup> <http://online.wsj.com/public/resources/documents/wsjecon0611.xls>

## Hindsight is easy, predictions are not

Even Pimco's Bill Gross, arguably one of the world's most prominent and successful bond investors, finds it difficult to make predictions. In the fall of 2011, The Wall Street Journal wrote:

*"In recent weeks, Pacific Investment Management Co. founder Bill Gross says he has 'lost sleep' over an ill-timed bet on Treasuries."*

If individual practitioners have had trouble determining the direction of future yield movements, perhaps we can use hard science. Surely there are sophisticated quantitative models that are able to predict future yield movements?

Here too, results have been mixed to say the least. Neither the level of interest rates, nor the spread between short term and long term rates (i.e. the "carry") contain any information that can be used to make reliable predictions. This is neatly summed up in a paper by Cochrane and Piazzesi<sup>11</sup> where they state that:

*"[...] the hypotheses that slope, or any combination of level, slope, and curvature, are enough to forecast excess returns is decisively rejected."*

It's a sobering conclusion, but it should not be a surprising one. Quantitative models that try to predict equity markets fail too. Why should it be easier with bonds? Perhaps both asset classes are more similar in terms of unpredictability than the average investor thinks?

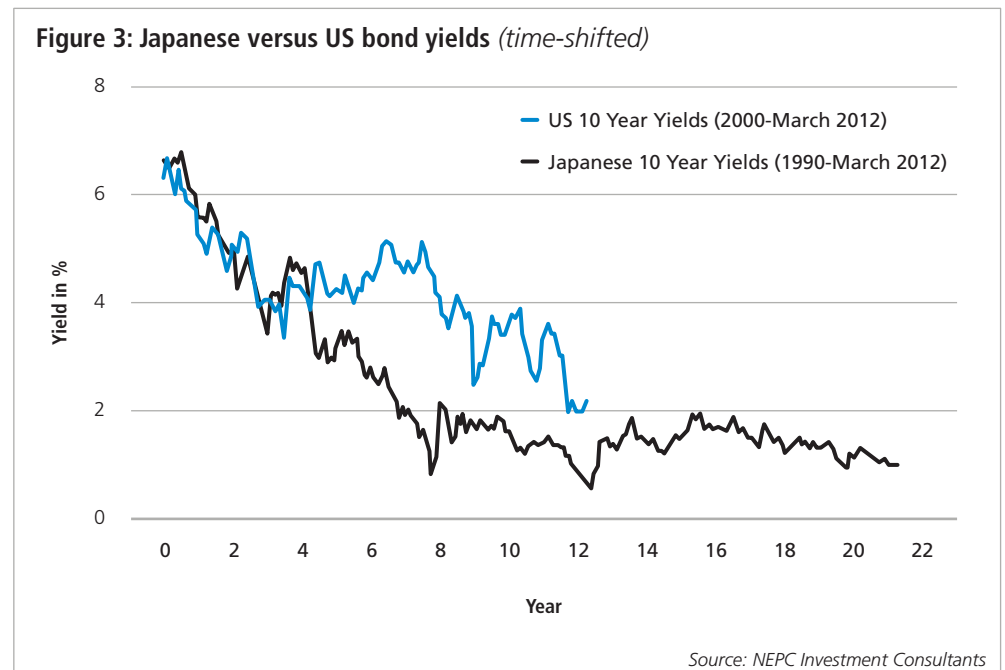
## Three scenarios for bond markets

Since useful interest rate models do not seem to exist and expert predictions often fail, what other tools are available? One approach is simply to look at the three main scenarios for interest rates (no change, down and up) and to assess what impact those scenarios could have on bond portfolios. Then, no matter what happens, we at least know where we stand.

### Scenario 1: Interest rates stay the same

This is the simplest scenario; nothing changes. And it could actually happen; interest rates may stay low for longer than many investors expect.

The one country with the most experience in low yields is Japan. As far back as 10 years ago, Japan had the low yields that the USA, UK, Switzerland and Germany have now. Of course, all sorts of reasons can be put forward to explain why the Japanese case is special: a very large proportion of government debt is held by loyal domestic investors, it has an aging population which saves more, and so on. But the fact remains that interest rates in Japan have been exceptionally low for a very long time. So how have investors in Japanese bonds fared during this period?

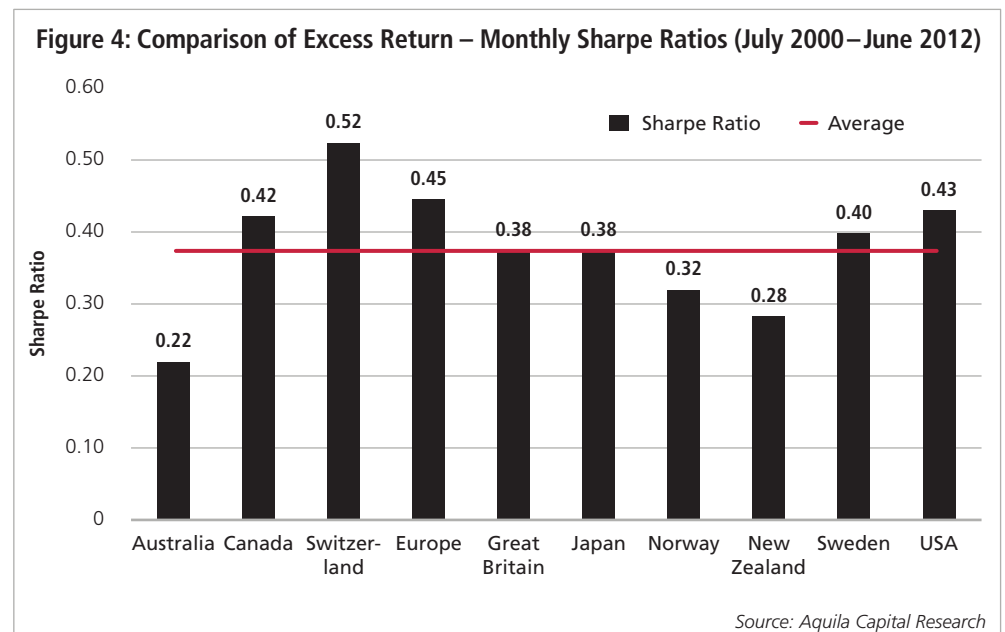


One would intuitively expect low returns over the last 10 years. But intuition can be wrong. The data tells quite a different story. Intriguingly, the Sharpe Ratio (return over the risk-free rate divided by the standard deviation of that return) of the Japanese government bond market over the last decade is very similar to, for example, the Sharpe Ratio of the US government bond market over the same period, something nobody would have expected. It is true that Japanese investors received less return, but they received that return with less volatility compared to the US. So the Sharpe Ratios turn out to be quite similar. Maybe the answer to this paradox is that markets are more efficient than most people think. They are big equalizers.

## Three scenarios for bond markets

As figure 4 shows<sup>4</sup>, the same appears to be true with the other G10 countries (or even G20 countries). Low-yielding Switzerland has actually the highest Sharpe Ratio of all, while high-yielding Australia is at the bottom of the league. And that is excluding currency risk and just looking at the behavior of the yield curve. The impact of currencies has been stripped out, so the high Sharpe Ratio of Switzerland has not been artificially boosted by the appreciating Swiss Franc. And still, low yielding Swiss Franc bonds did best. In other words, just looking at yield levels does not add very much. The level of yields contains no information about future performance. This might be hard to swallow, but the data is pretty clear.

Since Risk Parity strategies are constructed by looking at risk-adjusted returns instead of absolute levels of return, it does not matter much whether 10 years ago you invested your money in the USA or Japan. On a risk-adjusted basis, all markets have been very similar.



<sup>4</sup> For calculating the Sharpe Ratios we used monthly 5Y G10 excess return swaps. The same class of instruments we use in our products.

## Three scenarios for bond markets

### Scenario 2: Interest rates fall

As The Wall Street Journal survey cited above shows, interest rates can go much lower than even “expert” investors expect. But why are they so low in the first place? This obviously has something to do with the economic environment we are in. Richard Koo from the Nomura Research Institute states<sup>iii</sup>:

*“The key difference between an ordinary recession and one that can produce a lost decade is that in the latter, a large portion of the private sector is actually minimizing debt instead of maximizing profits following the bursting of a nation-wide asset price bubble. When a debt-financed bubble bursts, asset prices collapse while liabilities remain, leaving millions of private sector balance sheets underwater. In order to regain their financial health and credit ratings, households and businesses are forced to repair their balance sheets by increasing savings or paying down debt. This act of deleveraging reduces aggregate demand and throws the economy into a very special type of recession.”*

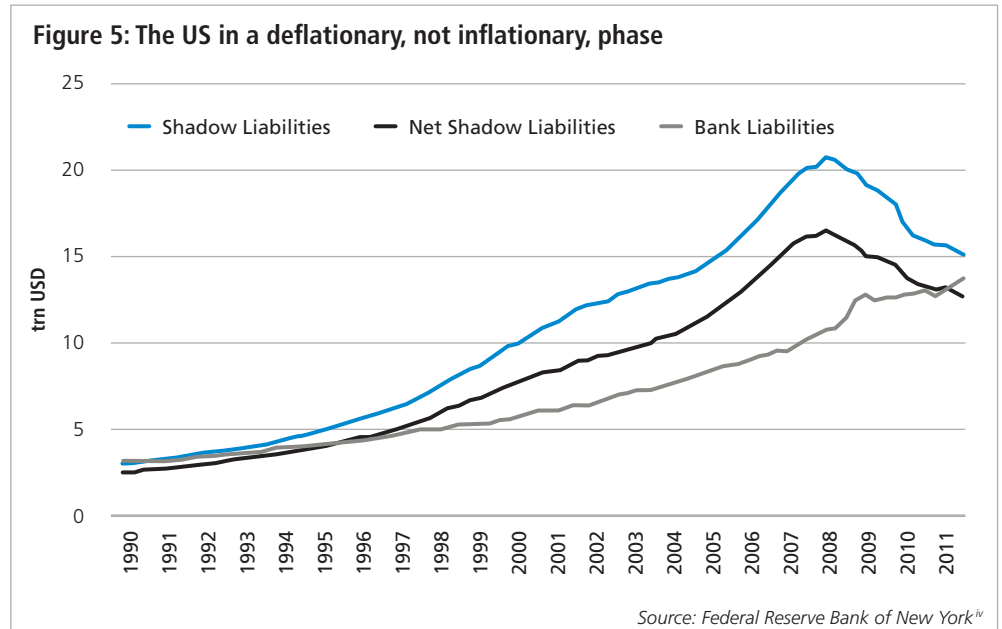
In the last few years, governments and central banks have been feverishly trying to stimulate growth by making money as cheap as possible. But the impact is still small because the cost of credit is not the real problem. Instead, there is simply no demand for credit from businesses and individuals, no matter how low rates are. That is because they are all deleveraging their balance sheets. Like the old saying, you can lead a horse to water but you cannot make it drink.

If we are indeed in a long-term deflationary deleveraging process, interest rates could go even lower. Many doubt that we are actually in a deflationary environment since central banks are printing money in spades. But the data suggests otherwise. In the US for example, if one takes into account not only bank liabilities but also the so-called Shadow Banking System (in the US consisting of money market funds, government-sponsored enterprises and agency paper, asset-backed paper, funding corporations, open market paper and repos), total liabilities hit a high of 21trn USD in March 2008 – and have been shrinking ever since.

If you accept that inflation is a net increase in money and credit (essentially the supply of money), then the deflationary forces are at full blast.



## Three scenarios for bond markets



In addition to a contraction in the aggregates of money and credit, there are more arguments for even lower yields. On the supply side, the issuance of AAA debt is shrinking fast (think of all the country downgrades), while on the demand-side the need for safe-haven investments may actually rise significantly due to new regulatory demands. As BCA states in their June 2012 report:

*"[...] captive global bank demand for safe assets has the potential to double in the coming five years in order to fulfill the requirements of prudential regulations, especially the Basel accords."*<sup>v</sup>

In other words, it is quite possible that the demand for government debt that is perceived as "safe", will outstrip the future supply of such debt. Moreover, if Asian economies continue to produce trade surpluses, they will have to find a way to recycle their money into investments in the currency they hold. The primary target for such funds is sovereign debt. China cannot just decide to stop buying US debt. China needs to buy US debt as long as it is running a current account surplus with the US. China and the USA are like Siamese twins; it will be painful for them to go separate ways.

Last but not least, there is "demographics". Aging populations are more likely to invest in fixed income assets. The older you become, the more you (and your pension fund) prefer the safety of bonds over equities. Regulatory demands and changes are forcing this preference even more (think Basel again).

In summary, not only is a continuing low interest environment a real possibility but interest rates may well fall even further. And if that happens, bond investors obviously will continue to do well.

## Three scenarios for bond markets

### Scenario 3: Interest rates rise

There will come a time when global interest rates will rise. Historically, interest rates in developed countries have averaged around 4–5% per year and eventually rates could return to that level or even exceed it. Such an increase does not happen over night, but plays out over time. Since nobody can say when interest rates will start to rise again, it is worthwhile to look at how the process is likely to work and what the implications are for bond investors.

Firstly, fixed income investments behave differently from equity investments. The idea that investors will wake up one day to see their bond investments down 80% (as with the dot-com bubble) is not very realistic. As Vanguard states<sup>vi</sup>:

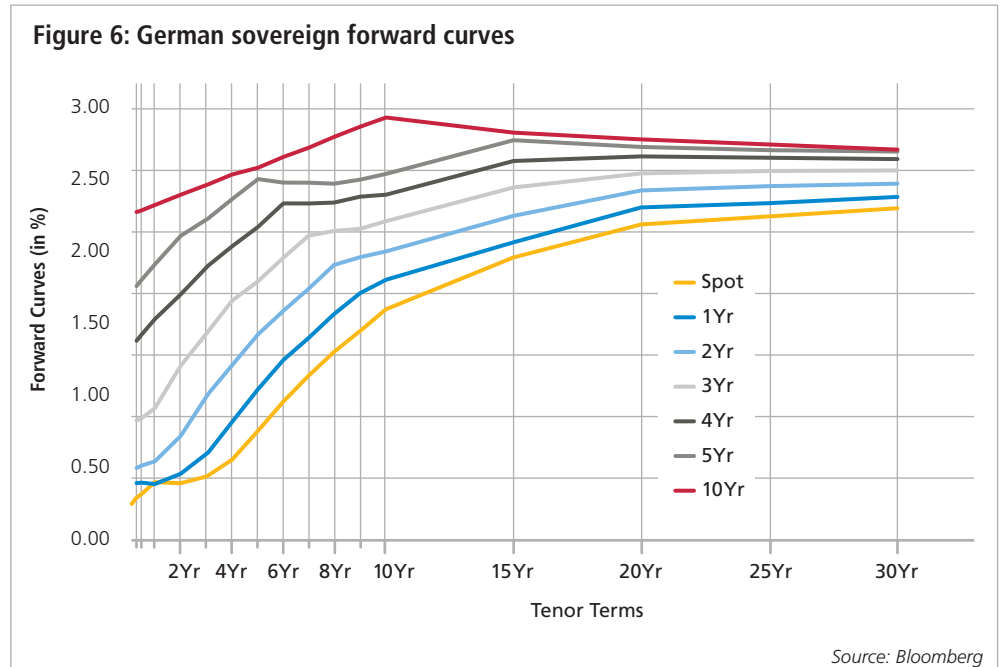
*“[...] the worst calendar year for the broad bond market was 1994, when due to an unexpected upward shift in interest rates, the bond market returned –2.9% (in 1995, the bond market returned 18.5%). Contrast this to the experience of stock investors in 2008, when the Standard & Poor’s 500 Index lost more than –2.9% in 27 individual trading days.”*

Reinforcing that notion is the fact that interest rates (as micro-managed by central banks) are very unlikely to jump by hundreds of basis points in a single day. Instead, they move relatively slowly over time. Typically, central banks will hint at increases in interest rates rather than surprise the market (as they did for the last time in 1994). This leaves time to cut losses.

Secondly, there is even a gauge as to what increase in interest rates the market expects and which are, therefore, already priced in. This gauge is called the forward curve.

The forward curves in figure 6 show that the market already expects quite substantial increases in German interest rates over time. A forward yield curve represents the yields that the market expects for the future. It is not based on estimates, but on the current level of interest rates and the current shape of the yield curve. In fact, it is the opposite of an estimate; it can mathematically be derived from the current curve. So there is nothing subjective about it. It is a bit like a time-machine: The current yield curve tells you what the market expects at some point in the future. For example, the 10-year interest rate one year forward shows what the current yield curve is predicting that the 10-year interest rate will look like one year in the future. The picture is similar for all other G10 markets. Of course, such expectations are often wrong as we explained before. But the point is not whether they are correct or not. The point is to be able to quantify the “buffer” below which curve shifts do not harm a fixed income investment. That is what forward curves allow us to do.

## Three scenarios for bond markets

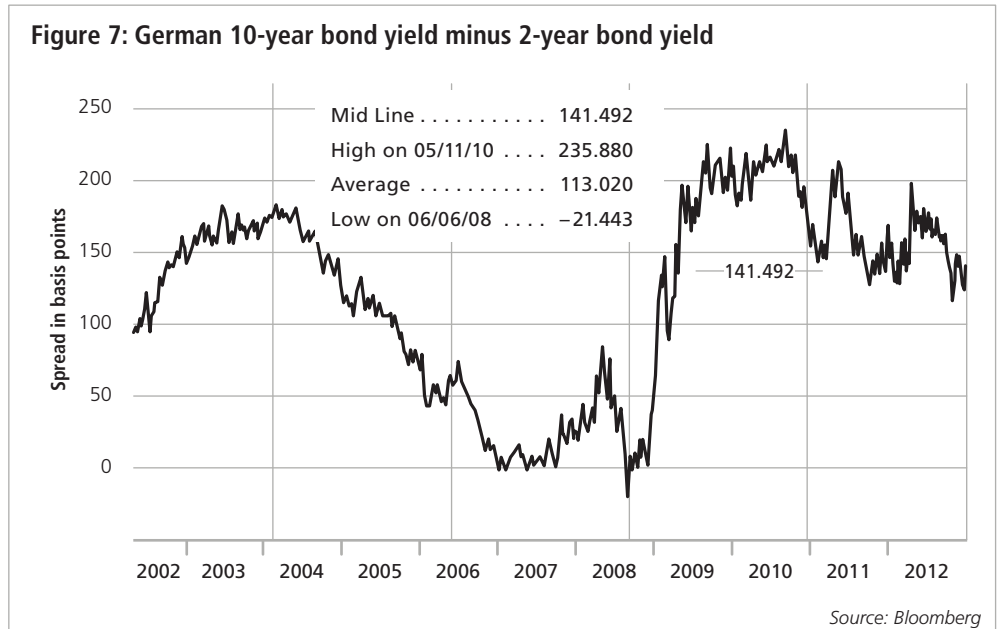


The story that the forward curves tell us is that one can stay invested at the long-end of the curve, even in periods of rising rates, as long as the actual increase in yields remains below the yields that are predicted by the forwards. In their research, Antwerpen et al. (2004) conclude:

*“An obvious strategy in the current historically low interest rate environment is to invest in short-dated bonds only. We showed, however, that this is far from optimal, as it does not take into account the spread between long and short-term interest rates, which is typically positive and currently quite large. [...] In a risk-return context, we showed that investing in longer-dated bonds not only adds expected return, but also reduces risk at the same time.”<sup>vii</sup>*

So if the current spread between the long and short end of the curve is so important in providing a protective buffer for bond investors, how large is that spread? In other words, are current yield curves steep or not? Although it may seem surprising for some, current yield curves are actually quite steep. See the difference between the German 10-year versus the 2-year in the chart below. That spread is actually higher than the average over the last 12 years as shown in figure 7. At least in terms of yield spread, it is currently “business as usual”.

## Three scenarios for bond markets



## The historical performance of bonds in periods of rising rates

History tends to teach important lessons. It is the same with the history of bond markets. Figure 8 shows stock and bond returns during periods in which either short or long rates rose significantly (more than 200 basis points during 12 months). The chart contains data from non-US-markets, comprising Australia, France, Germany, Italy, Japan, Norway, Spain, Sweden, and the United Kingdom. This selection should be comprehensive as it includes the Japanese deflationary environment and the fiscal crises of Norway and Sweden in the 1990s, as well as the respective fiscal and economic environments across the Eurozone<sup>viii</sup>.

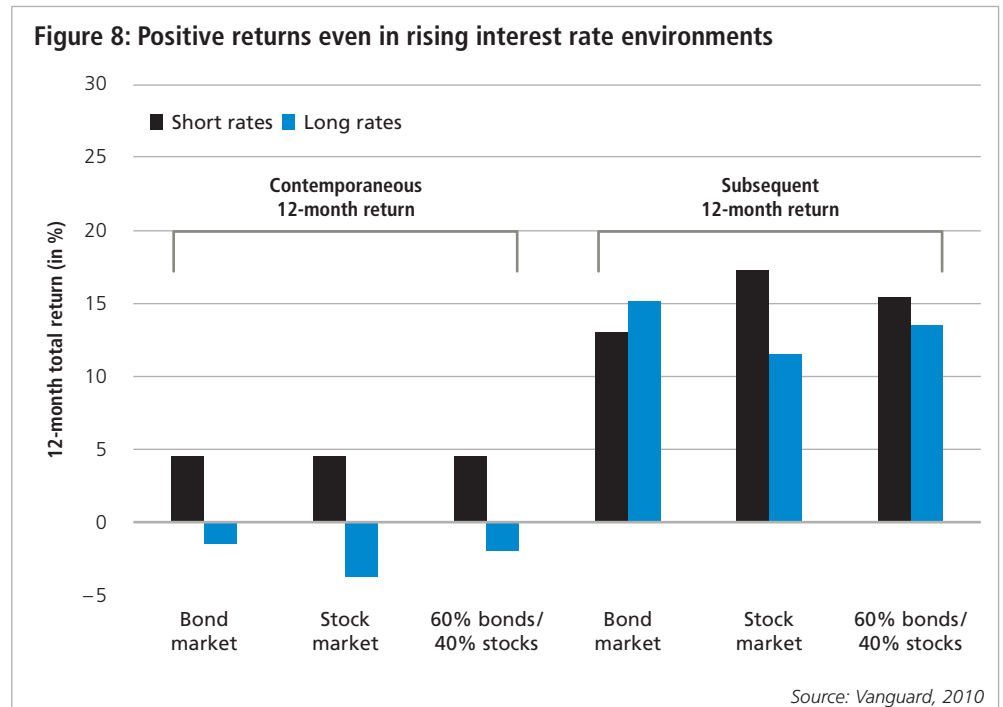
In the graph, there are two time-frames, one showing returns in the 12-month period in which the rate increase took place and the other the 12-month period thereafter. As short term rates went up, investors were still earning positive returns on the short end. Most importantly, in the subsequent 12-month period, all bond returns have been on average very positive. Vanguard (2010) concludes:

*“A reasonable investment strategy should not be abandoned in the face of a potential bond bear market, whether driven by inflation or some other market force. [...]*

- 1) A majority of diversified, long-term investors should not view a bond bear market with the same level of apprehension as an equity bear market. Indeed, even the worst bond market historically saw less than one-sixth of the losses of the worst equity market;*
- 2) Should a bond bear market occur, investors can somewhat offset price declines with higher nominal yields and potentially higher subsequent nominal returns; and*
- 3) The historical experience of global markets supports a policy of reasonable asset allocation within a solid investment plan. Indeed, in most historical global scenarios, a balanced, diversified investor not only withstood the 12-month period of rapidly rising rates, but also realized significantly positive returns in the subsequent months.”*

## The historical performance of bonds in periods of rising rates

Vanguard also confirms our thinking; it does not pay to time bond markets. It is better to stick to a well balanced portfolio, even in periods of rising rates, as shown on the right side of the graph.



# Diversification helps

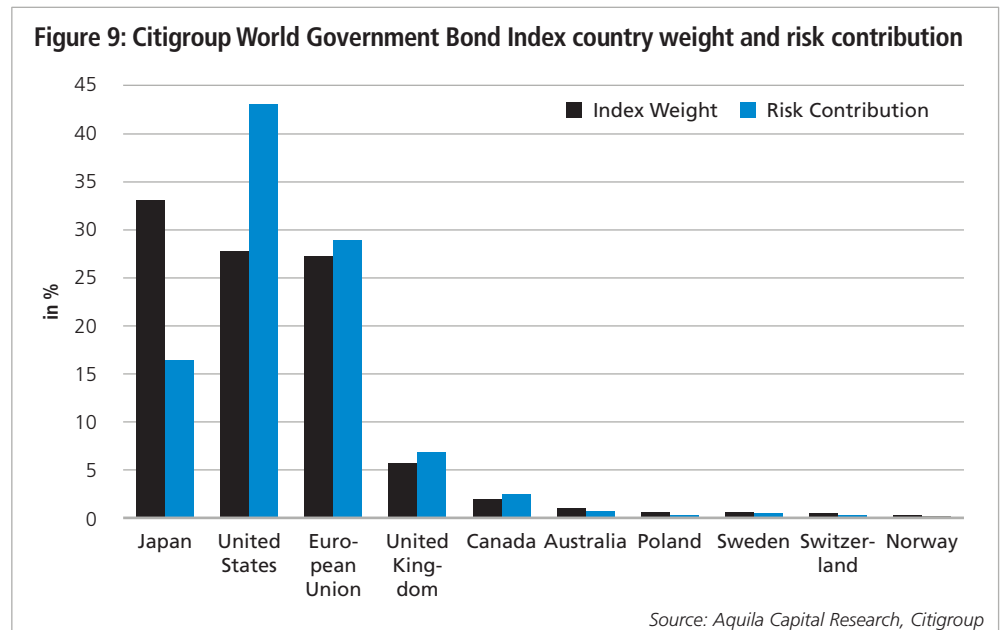
## Diversification across bond markets

If bond markets cannot be timed, what else can we do to protect ourselves against risk? The answer is fortunately relatively simple; diversify as much as you can, for example across global bond markets. But that is easier said than done.

One approach is to buy one of the “off-the-shelf” global bond indexes such as the well-known Citigroup World Government Bond Index (WGBI). Unfortunately, almost all of the standard global bond indexes such as the WGBI suffer from the same handicap: they are not diversified at all.

For example, the WGBI consists mainly of the four largest global bond markets (US, EU, Japan and Great Britain). The portfolio is therefore actually quite concentrated. No professional equity investor would argue that a portfolio with four stocks is diversified.

To make matters worse, the selection criterion of global bond indexes such as the WGBI is the relative size of the local bond market (see figure 9). The more debt a country has, the larger its share in the index. From an investor’s point of view, that does not seem particularly smart.



Our approach is somewhat different. To provide an additional layer of safety for our investors, we are more geographically diversified than your regular “off-the-shelf” global bond index.

## Diversification helps

Our methodology is to diversify amongst a broad range of fixed income markets on an equally weighted basis. As we have seen before, the Sharpe Ratios across the world are very similar so in terms of risk-adjusted return nothing is lost by following this approach. But diversification does wonders for the reduction of tail risk. Having 10 or more equally weighted markets is very helpful in diluting tail risk events such as credit problems of individual sovereigns.

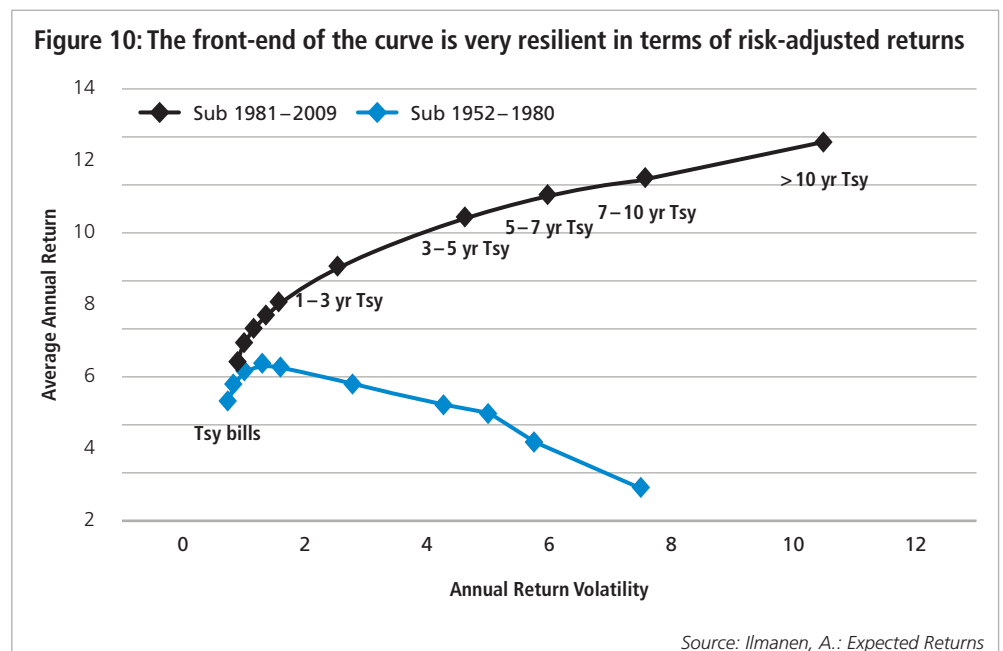
As a next step, we move away from diversification across markets to diversification across the curve.

It is worthwhile to dissect the yield curve since different parts of the curve respond differently to rising rates. Aquila's Risk Parity approach invests in the very front-end of the curve, plus the intermediate 5 and 10 year sections.

### The front-end of the curve

Let's look at the front-end first. As shown in figure 10, the front-end in the US yield curve exhibits favorable risk/return characteristics in both rising (1952–1980) and falling (from 1981) interest rate environments. The Sharpe Ratio based on the section of the curve with a maturity of up to three months is on average about 1.5 (for the whole 60 year period since 1952). That is quite impressive. The reason for the high Sharpe Ratio is that investors in that part of the curve are mostly focused on safety, liquidity or regulatory needs instead of profit maximization. It seems hard to arbitrage it out.

In summary, the short-end seems to be a good spot, both in terms of absolute but particularly in terms of risk-adjusted returns. That, in a nutshell, is why we own short-term interest futures.



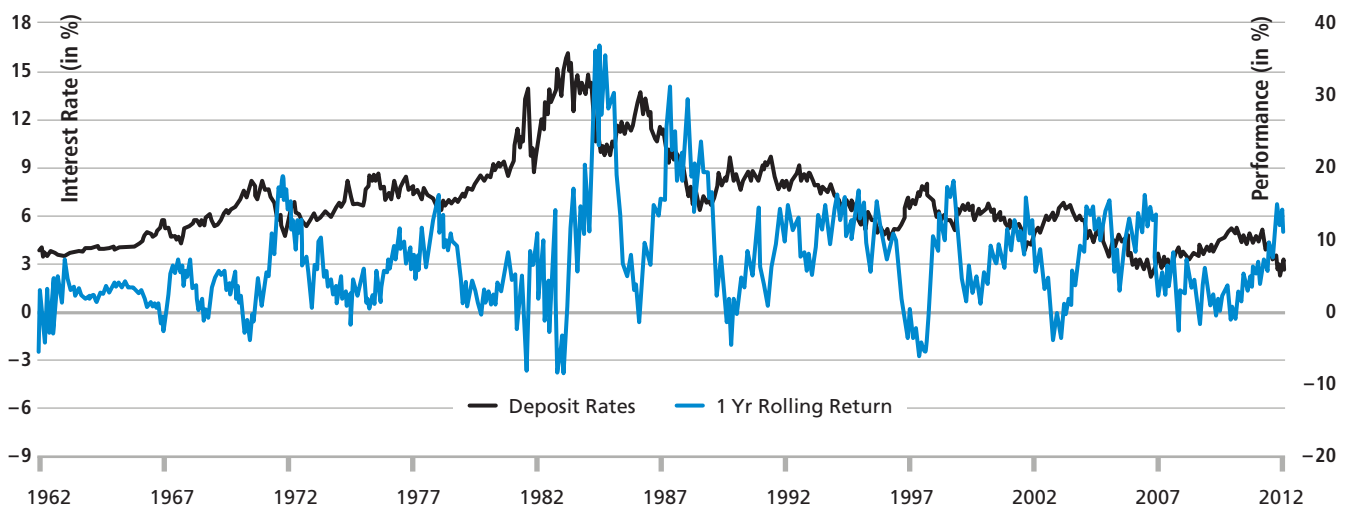


## Diversification helps

### The intermediate segment of the curve

How about the behavior further out on the curve, for example bonds with a maturity of 5 years? Surely, they must produce negative returns when rates go up? Again, the prediction business is not that simple. 1-year rolling returns over a very long period of time (see figure 11) seem to be independent of whether rates go up (such as in the period before 1980) or down (after 1980). Moreover, the amplitude of these returns has remained relatively constant since 1962. Visually, it does not seem to matter very much at what level yields are. It is all priced in.

**Figure 11: One-year rolling returns exhibit the same dynamics in both rising as well as falling interest rate environments (Fed Fund Deposits Duration 4.5 vs. 5-Year Treasury Note Constant Maturity TR Index)**



Source: Aquila Capital Research

## The impact of rising rates in a Risk Parity context

We can of course continue to talk about the theoretical and historical impact of rising rates on a diversified bond portfolio, but that is losing sight of the wood for the trees. The Risk Parity approach not only invests in bond markets, but in a well-balanced portfolio of uncorrelated assets.

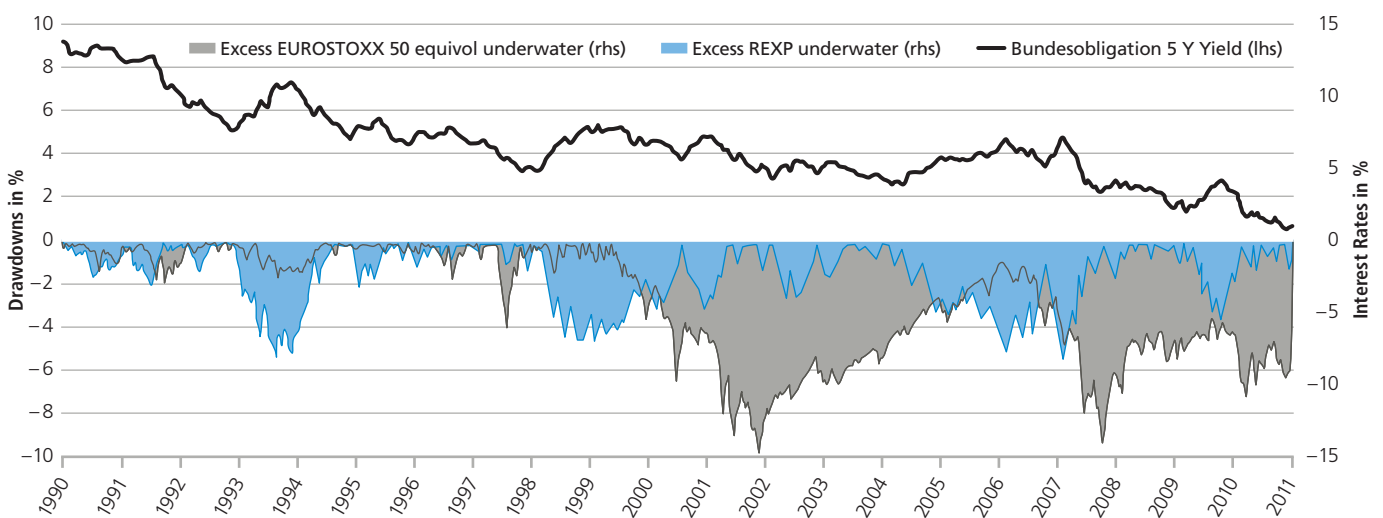
Bonds are an integral part of a balanced asset allocation because they diversify the risk of the other asset classes. Bonds, rates, equities and commodities cover almost the entire investment universe. Normally, something will be in favor and will contribute positively. It does not always have to be bonds. And even if bonds do badly, Risk Parity can still perform as we will show below.

Remember that with a Risk Parity approach the asset classes are treated as equals. Since bonds are much less volatile than equities, and because each asset class is required to contribute equally to portfolio risk, Risk Parity portfolios contain significantly more bonds than equities. That is the nature of the beast. But given the anxiety about bond markets, is that not risky?

### The riskiness of bonds compared to equities

It is useful to look at the “riskiness” of our positions by looking through the lens of draw-downs. The graph below shows the draw-downs, since 1990, of the German bond market (as measured by the REXP) versus the draw-downs of the EUROSTOXX 50 Index (deleveraged so that its volatility is made equal to that of the REXP). The actual volatilities and exposures are similar to what we have in the AC – Risk Parity 7 Fund (ISIN LU0374107992). So this is an apple-to-apple comparison of bonds and equities over a relatively long period of time, and provides a fair proxy for what we do in the AC – Risk Parity 7 Fund.

**Figure 12: Historical 5-year interest rates (upper chart, right axis) and volatility-adjusted draw-downs of REXP and EUROSTOXX 50 (lower chart, left axis, both shown as excess returns)**



Source: Aquila Capital Research

## The impact of rising rates in a Risk Parity context

By looking at figure 12, several observations can be made about historical bond risk:

1. Equities and bonds have been excellent companions within a Risk Parity portfolio context. Their maximum draw-downs do not coincide very much. When one goes through a difficult patch, the other picks up the slack.
2. In terms of draw-downs, the equity component of our portfolios is actually “riskier” than the bonds. And that is after adjusting for the volatility difference. It’s an intriguing finding, and one that runs contrary to what many people expect from Risk Parity.
3. Interestingly, the various draw-downs in bond markets over the last 22 years are all of similar magnitude. The often quoted 1994 bond bear market was actually of the same depth as the recent down-turn of 2007/2008, and was also similar to the draw-down of late 2010/early 2011.
4. Most importantly, because the AC – Risk Parity 7 Fund was launched as a UCITS fund in February 2008, we have shown with live data that even in periods when bonds lose, our performance does not necessarily suffer. In fact, the opposite is the case. The AC – Risk Parity 7 Fund continued to deliver robust results even during periods with weak bond markets.

### Long-term performance of Risk Parity portfolios

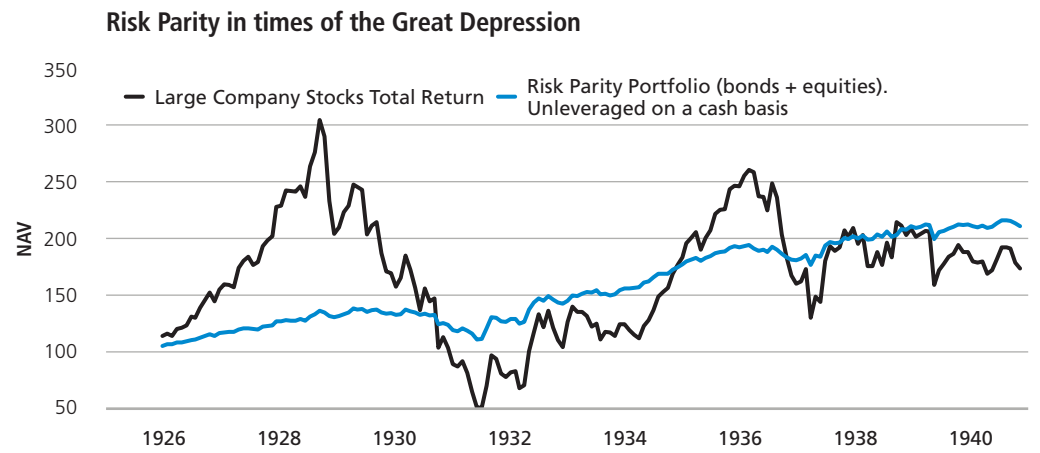
Turning more general again, the next question is how a basic Risk Parity portfolio would have performed in the three most extreme environments of the last 100 years;

1. the depression of the 30s;
2. the inflation of the 70s; and
3. the post-2000 roller-coaster

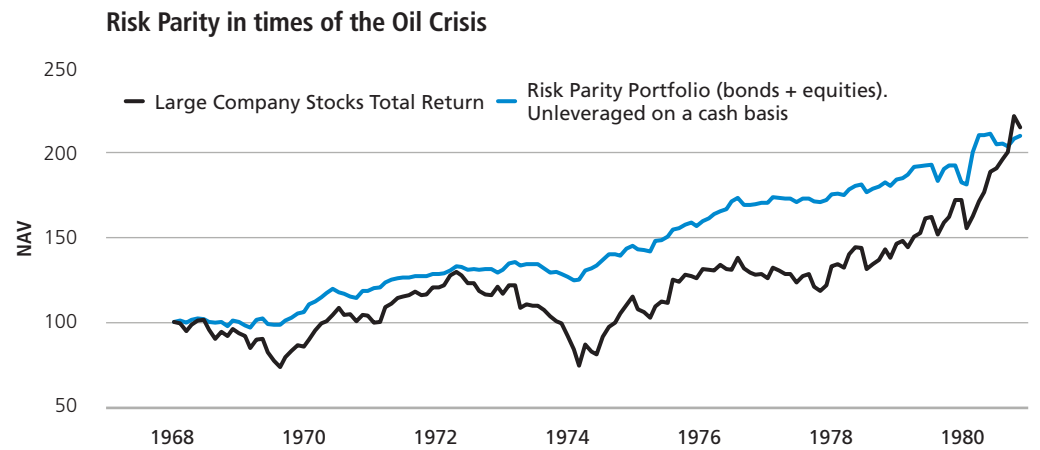
To be able to go back that far in time, we needed to reduce our standard four-asset Risk Parity portfolio to a subset of equities and bonds only. There are no clean long-term data on the other asset classes that we own. As a proxy for bonds we have taken US intermediate term government bonds and for equities the S&P 500.

# The impact of rising rates in a Risk Parity context

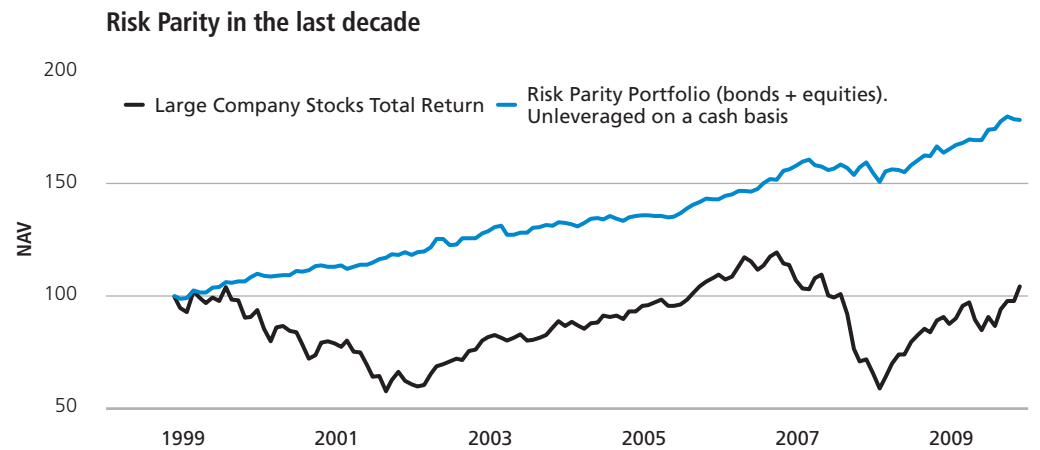
Figure 13: Risk Parity in times of crisis



Source: Aquila Capital Research, data source: Ibbotson



Source: Aquila Capital Research, data source: Ibbotson



Source: Aquila Capital Research, data source: Ibbotson

## The impact of rising rates in a Risk Parity context

Figure 13 shows that across all three time frames – the Great Depression, the Oil Crisis of the 70s and the last decade – our “proxy” Risk Parity portfolio would have performed quite well. It is maybe not surprising that during the depression of the 30s the performance is good (a doubling of value between 1926 and 1940). After all, our simple Risk Parity portfolio consists of almost 80 % government bonds, and government bonds do well in depressions. How about an inflationary period then? Well, the picture for the inflationary 70s is similar. Against all odds, Risk Parity again performed well.

In the last of the three graphs, the interesting period is the years between 2005 and 2008. That is because those years include a major draw-down for bonds. Investors have largely forgotten, but five year yields went up by almost 3%. Very few people expect this to happen now. In spite of bond losses during those years, and with our proxy Risk Parity portfolio being 80 % in bonds, the performance was still positive.

The reason is the offsetting effect of the 20 % allocation to equities. Although equities have only a smallish share, risk-wise they are equals with the bond allocation. It is like a seesaw; if one side goes down, the other goes up. If you are on both sides, it does not matter who wins or loses.

### Stress testing the Risk Parity portfolio with interest rate shocks

To dig a little deeper, we are now going to look into the performance of the AC – Risk Parity 7 Fund during days in which there have been major losses in fixed income markets.

Figure 14 shows the main fixed income instruments that we use in the AC – Risk Parity 7 Fund. It also shows the largest negative daily and monthly returns of each instrument since Jan 1st 1993 as well as the actual performance of the AC – Risk Parity 7 Fund EUR A over that same time period (using both daily<sup>5</sup> and monthly data).

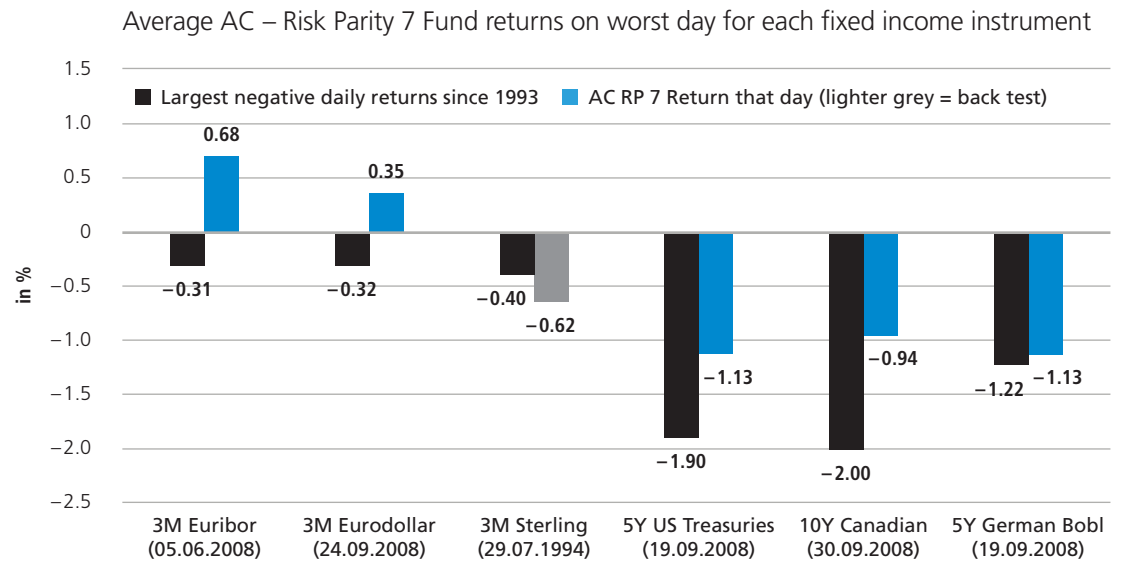
The performance of each of the asset classes is shown without applying leverage. The performance of the AC – Risk Parity 7 Fund is based on its reported results. Since we wanted to extend the scenario period as far back as possible, we used proxies<sup>6</sup> in case the worst daily/monthly loss occurred before the inception of the Fund.

<sup>5</sup> Same day is T+1, since before the 1st of August 2011 the NAV of day T+1 is based on closing prices of day T. After the 1st of August 2011 the NAV of day T is based on the closing prices of day T.

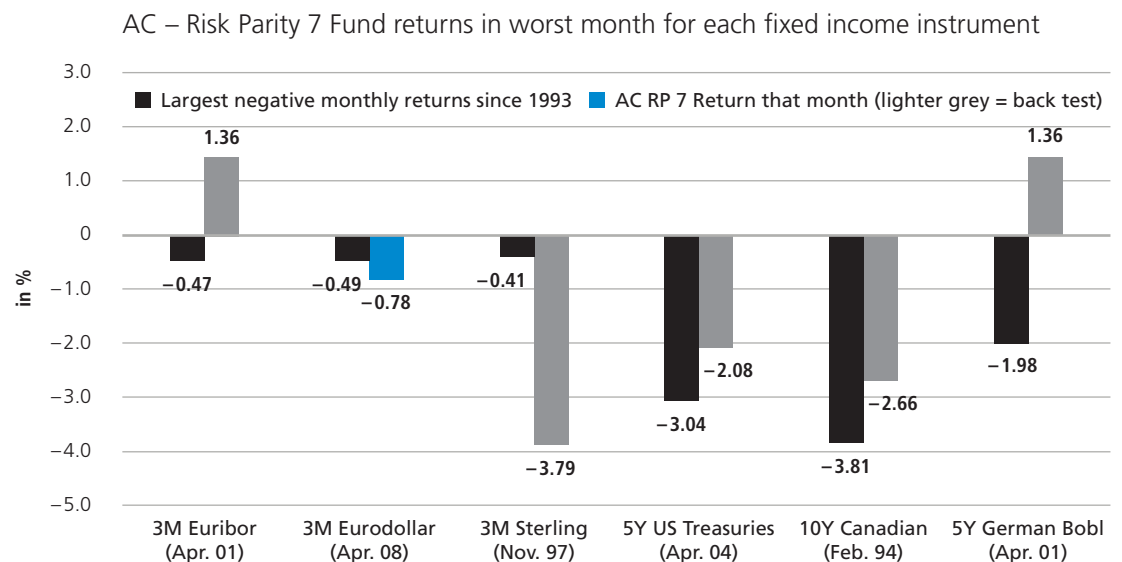
<sup>6</sup> Bonds (10Y Canada, 5Y US, 5Y Germany), Rates (3M EUR, 3M Sterling, 3M Eurodollar), Equities (MSCI World), Commodities (S&P GSCI TR). Figures shown before the inception of the AC – Risk Parity strategy in July 2004 are based on proxies. Figures shown after the inception of the AC – Risk Parity strategy in July 2004 are based on the live performance of the strategy.

## The impact of rising rates in a Risk Parity context

**Figure 14: Worst days/months of fixed income assets in our portfolio and the Fund's reaction**



Source: Aquila Capital Research



Source: Aquila Capital Research

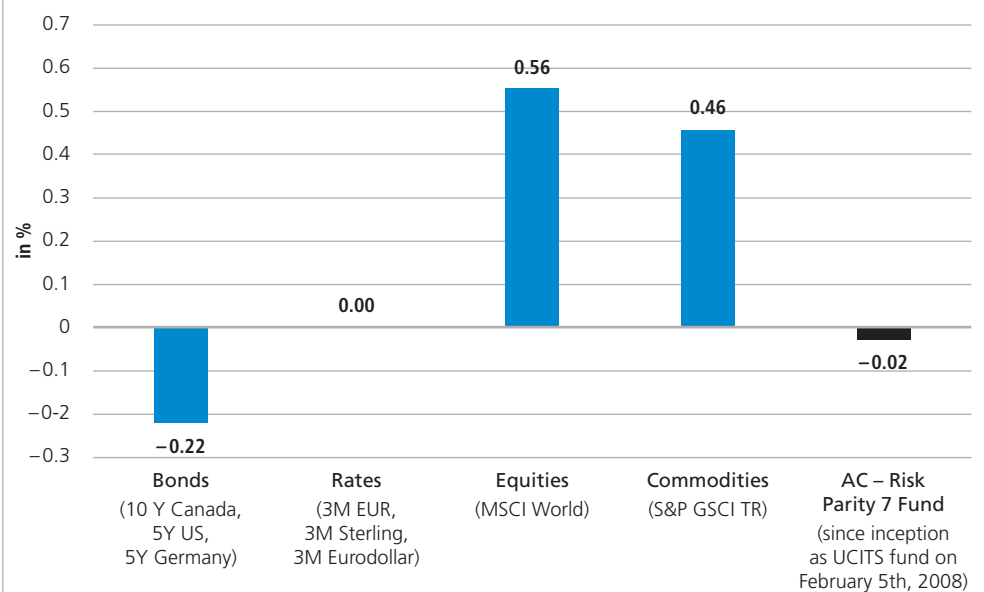
## The impact of rising rates in a Risk Parity context

Although all our positions had significant losses on their worst days/months, the overall impact on the AC – Risk Parity 7 Fund portfolio was quite limited, and in all cases within our 4 % monthly stop loss limit. Note that there are even instances where the overall fund performance was positive, in spite of the worst days or months on the fixed-income side.

The final step in the stress analysis is to look at the actual AC – Risk Parity 7 Fund trading days and months when bonds had a negative performance. Since the inception of the Fund, this has happened in 504 out of 1105 days and 20 out of 53 months. Figure 15 and figure 16 show those time scales.

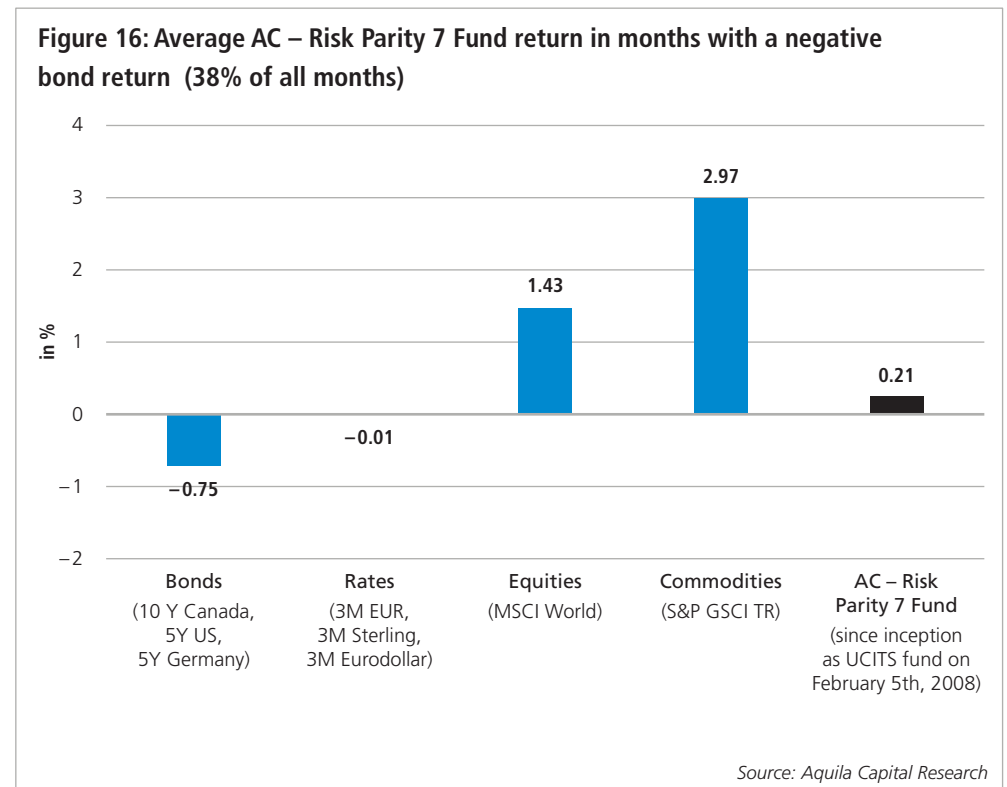
The average daily loss in bonds during the days when bonds were down was –0.22 %. On a monthly time scale, the average loss for bonds was –0.75 %. But since we do not just own bonds, but a risk-balanced portfolio that consists of four asset classes, we have to look at the behavior of the whole portfolio, rather than just the bonds.

**Figure 15: Average AC – Risk Parity 7 Fund return on days with a negative bond return (46 % of all days)**



Source: Aquila Capital Research

## The impact of rising rates in a Risk Parity context



On days when bonds were down, the AC – Risk Parity 7 Fund lost an average of only about 2 basis points. The same calculation on a monthly scale shows that the AC – Risk Parity 7 Fund was even up by about 21 basis points during months when bonds were weak. Clearly, in Risk Parity, the whole is more than the sum of its parts.



## Conclusion

In this paper, we have reviewed interest rates and historical bond returns. We have outlined that it is difficult (bordering on the impossible) to time bond markets (as with any other market) and have sketched different scenarios for interest rates that rise, fall, or stay the same.

We extended the analysis, showing that even in a rising rates environment it may in fact be advantageous to remain invested across the whole yield curve, including the long end. Much depends on the speed of the interest rate adjustment and whether that speed exceeds the projections made by the forward markets. Clearly, that is something nobody can predict with any accuracy.

If nothing can be forecasted – which is our base assumption – the best approach to managing bond risk remains diversification across uncorrelated asset classes (as in our Risk Parity Fund) and, within fixed income, across as many global bond markets as possible. It is the old adage: don't put all your eggs in one basket.

To us, there is therefore no objective reason to believe that rising interest rates would change the assumption of achieving robust and consistent returns with our Risk Parity strategy.

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