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# Special Report Risk Parity



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## Walking the tightrope Martin Steward

The practitioners of risk parity strategies have a killer fact: the 60% equities/40% bonds 'balanced' portfolio is far from balanced. Most of the time, 95% of the variation in performance is determined by what the (much more volatile) equities do. The bonds are in the portfolio, but they might as well not be for all the effect they have.

We can't just sell equities and buy bonds. But what we can do, the risk parity guys argue, is apply leverage to our bonds to bring their volatility contribution up to equity levels. Put 45% in equities and 125% in bonds and you are closer to the truly 'balanced' portfolio – it's a bit like the tightrope walker who knows he has to lean into the wind to stay upright.

Which is fine until the wind changes direction. Are equities always 50% more volatile than bonds? Of course not: during the recent crisis, bond volatility went up – but not nearly as much as equity volatility. And there have been periods – when equity volatility has been as low or even lower than bond volatility. Moreover, long-term averages cover-up short-term extremes – 'tail risk' – and that some asset classes are more susceptible to 'tail risk' than others. Equity investors who know they are at the bottom of the capital structure price in that risk, resulting in higher but more stable volatility. Bond investors are higher in the capital structure and receive a fixed income: returns are limited, volatility lower. But when a borrower goes bust, bond risk can end up just the same as equity risk – the risk of total loss – as lenders to certain European governments have discovered. Leveraging (low) bond volatility sounds great, but leveraging (extreme) 'tail risk' certainly does not.

Most risk parity backtests use US Treasuries, which have historically shown low 'tail risk' – the US isn't Greece, Argentina or Russia. But as investors price more credit risk into sovereigns, we should expect one of two things: bond volatility can stay the same if tail risk goes up, or tail risk can stay the same if volatility goes up.

This isn't necessarily a problem – we can simply adjust our leverage. Indeed, many practitioners in our supplement describe tactical adjustments that take account of changing volatility, correlation and tail-risk regimes. Classically, risk parity was meant to improve the mean variance optimised portfolio, a set-it-up-and-let-it-run solution – 'All Weather', as Bridgewater Associates puts it. Modern interpretations take us closer to tactical asset allocation methods developed to answer the limitations of mean variance optimisation.

But 'risk parity' is more than just marketing jargon. Its great contribution may be that it is a simple concept whose strengths and weaknesses remind us to ask pertinent questions about how multi-asset portfolios are managed. Next time you are pitched a 'diversified growth' fund, ask how it really achieves underlying economic diversification and balances risk – as opposed to capital – allocation. And if they call it 'risk parity', ask how it deals with changing volatility regimes and the dangers of leveraging 'tail risks'.

We hope that our supplement will raise some more detailed questions, too. You may not want buy into risk parity by the end of it, but it could well tell you something about your current portfolio that you are not aware of now.

*Martin Steward, Investment Editor, IPE*

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# Taking the long view

In the wake of the latest market crash, the name alone garnered a lot of attention for risk parity from US investors. But as investors calm down, reassured by rising equity markets, **Stephanie Schwartz** asks if it has staying power

The financial crisis highlighted the extent to which equity risk dominates most 'diversified' portfolios. A traditional 60% equity/40% bonds portfolio gets 90% of its risk from the equity portion. Investors tolerated this higher short-term risk because of the promise of long-term returns, but the market collapse proved to be more than many could accept. The result is a newly focused attention on risk and risk management on the part of investors worldwide.

In the US, where the cult of equities is very strong, there has been an alternative around since at least the 1990s. Risk parity is a new investment paradigm based on a very established principle – modern portfolio theory – that seeks to define diversification based on risk rather than asset class or investment type.

"The idea has its origins in the 1970s with modern portfolio theory. You can take the best portfolio and lever or delever it," says Michael Mendelson, a principal at AQR. "However, the instruments you needed to do this – such as futures – did not exist. The products we needed have only been around for the last 10 years or so." It took a long time to see some basic applications of established ideas.

Bridgewater Associates pioneered the risk parity style of risk management with its All Weather fund, launched in 1996. "It's interesting that the idea of risk parity goes back to the 1990s, when equity-centric portfolios served investors very well," notes Joe Flaherty, chief investment risk officer at MFS.

Risk parity "is about putting better balance in the portfolio, balancing risk exposures to generate more consistent returns," says Bob Prince, co-chief investment officer at Bridgewater. "Nearly every pension fund has concentrated exposure to the US stock market," he says, pointing out that 98% of pension fund returns are more than 75% correlated to the S&P 500.

"It is an interesting question – why do they do that? It is on purpose; they are choosing to have a concentrated portfolio," Prince observes. "The most common answer is that it makes economic sense for the fund because they see themselves as long-term investors and they can tolerate short-term risk for long-term returns. There is an important fallacy here. If you have a concentrated portfolio, you also have higher long-term risk, and you can have multiple decades of poor performance. We believe that investors fail to recognise that any one asset class presents a substantial long-term risk of underperformance, which jeopardises the ability to meet future pension obligations. Even though there are plenty of examples of this long-term risk, it seems to be underappreciated and not adequately communicated."

Although Bridgewater was the first to market a risk parity product, the firm did not coin the name. That credit goes to Edward Qian, chief investment officer and head of research, macro strategies, at PanAgora Asset Manage-



*"Some of us started talking to the markets, consultants picked up on the phrase, and from there it evolved into a category"*

**Robert Job**

ment, who used the term in a 2005 white paper. PanAgora followed this up by launching its first risk parity product in 2006. "You need a good name to start a revolution," jokes Qian. The name was popularised by consultants who advocated the approach, says the firm's head of business development, Robert Job: "Some of us started talking to the marketplace, consultants picked up on the phrase, and from there it evolved into a category."

AQR started to offer risk parity investment to its clients around six years ago. "We noticed that the partners at AQR had most of our personal investment in market-neutral funds – but we were not telling any of our clients to do that," Job recalls. The firm did not launch risk parity investment as a response to investor demand – rather, it had to introduce the concept to its clients and win support.

According to Clifford Asnes, AQR's founding principal, there is no doubt that risk parity is the right way to invest for the long term – the question is why people are starting to

listen now. The answer seems to be the ongoing shock of the financial crisis.

"Performance during the last crisis is one factor – portfolios that used some leverage held up better in the crisis than those that did not," he notes. "But the idea I like least is that risk parity has done better in the last two or three years. The important point is that the long-term evidence is really strong. An extreme event just shows that the nuts and bolts hold together."

Some of the newfound popularity of the risk parity approach is due to a higher concern with risk management across the spectrum, says MFS's Flaherty. "There was a widespread failure of risk management in so many institutions, along with an over-reliance on traditional quantitative models," he explains. "Understanding risk management as an integral part of the investment process helps you to meet your return expectation."

While the principles underlying risk parity portfolios are shared, the various providers of the strategy apply them differently.

Bridgewater sees its risk parity fund as the 'optimal beta portfolio'. The firm balances the portfolio by associating diversification with exposures to different drivers in the economic environment – a rise or fall in inflation or a pick-up or contraction in economic growth. "This provides a way that a fund will always be diversified no matter what the economy does," Prince explains. In other words, the All-Weather approach balances the drivers of returns, so that poor performance in one asset will be offset by good performance in another asset, based on its sensitivity to economic fundamentals. "The most significant difference in what we do is that we do not rely on any correlation assumptions," he says. "We look at the pricing of an asset related to its economic environment."

PanAgora views risk parity as balancing a portfolio based on equal risk allocation. The firm focuses on limiting tail risk and being very careful about the correlations. "We create our own risk parity underlying asset exposures," Job explains. "There will be deviation over time against traditional benchmarks but you will create a more consistent return pattern with less volatility and less fat-tail risk. That is a key appeal."

PanAgora establishes a balanced portfolio and then uses leverage to get returns from bonds. Qian calls this "a great application of modern portfolio theory". In addition, PanAgora does not sacrifice liquidity in order to gain the right balance of risk exposures, as it utilises exchange-traded derivatives that settle daily. In addition, Qian uses a proprietary method to adjust asset exposures in an extra layer of dynamic allocation, whereas many other risk parity practitioners use a static risk framework or arbitrary risk trigger to determine portfolio exposures.

To AQR, risk parity means "making



everything in the portfolio matter but nothing matter too much,” as Mendelson puts it. Asness elaborates: “There are two key factors. One is balancing assets by risk, not by dollars. We have essentially been doing this in some form since 1994 at Goldman Sachs. Then there is the academic notion that you take the best portfolio and then apply leverage to increase returns.” For AQR, risk parity is a strategic, not a tactical, approach. “We believe one should start from risk parity, then if you do have the ability to time the market, you can start from this basis,” he says.

AQR distinguishes itself on several counts. “We are among the most diversified,” says Asness. “Some risk parity portfolios will skip credit because it is comparable with equities – we do not.” AQR also uses a variety of vehicles, including ETFs and futures. In addition, AQR balances risk over time, not just across asset classes. “Once you have accepted that risks vary, they vary over time. We take that into account.”

**I**mplementation presents very real challenges. “It appears that theoretically there are benefits to the risk parity approach, but practically there are challenges,” notes Karyn Williams, managing director at US pension fund consultant Wilshire Associates. “In the practical world, sitting in front of trustees, it may be difficult to maintain as an ongoing strategy that potentially can have long periods of underperformance or one that requires leverage, liquidity and margin.”

The first step in implementing a risk parity strategy in all or part of the portfolio takes place on the governance side. “As with all things risk, I feel strongly that organisations must have governance principles in place,” says Williams. “Before implementing a risk parity approach, plans need to define the objective of the programmes and understand the risk of the fund. They also need to consider risk tolerance, recognising the downside potential and operational issues.” Williams notes that it could be extremely challenging to convince an investment committee to undertake a risk parity strategy if there is not a lot of understanding of risk or of the instruments used to engage the strategy. “Risk parity is a significantly different approach than traditional asset allocation,” she says. Ultimately she advises incorporating risk tolerance statements into the investment policy statement.

Those CIOs who have succeeded in implementing risk parity strategies have worked with boards that have been willing to put in the time to learn about risk and then about risk parity in particular and to feel comfortable with adopting something ahead of the curve.

There is ‘maverick risk’ to adopting a risk parity strategy, maintains John Meier, a consultant with Strategic Investment Solutions (SIS), which advised the State of Wisconsin Investment Board on its allocations with AQR and Bridgewater. “It takes a lot of education of the board. Even once the policy was approved, it is constantly being reviewed.”

Job at Panagora sees a variety of options for institutional investors that want to implement a risk parity portfolio, either as a discrete allocation or as an overlay. “We will work with a plan sponsor to construct a risk parity overlay,” he explains. “This will allow them to keep some of their existing positions while enhancing the likelihood of achieving their desired risk target and return expectation for the overall plan. A client may also invest in one



*“The important point is that the long-term evidence is really strong. An extreme event just shows that the nuts and bolts hold together”*

**Clifford Asness**



*“It may be difficult to maintain as an ongoing strategy that potentially can have long periods of underperformance or one that requires leverage, liquidity and margin”*

**Karyn Williams**

of our risk parity funds, in one strike obtaining risk diversification and gaining immediate broad exposure.”

Alternatively, a client can create a total return portfolio by allocating a portion of assets to risk parity as a beta portfolio and giving the balance to alpha strategies. Job also notes that clients can now choose to invest in commodities, equities, and other individual asset categories, where PanAgora has applied risk parity. “We see many applications to risk parity and offer a suite of alternatives,” says Job. “We can customise solutions for plans, consultants, and platforms.”

In terms of allocations, AQR takes a realistic look at what institutional investors can do. “There is a theoretical answer: we believe that risk parity is better than traditional allocations, and we would run the core portfolio on that basis,” says Asness. “In the real world, everyone is benchmarked against the traditional 60/40 allocation. Any form of change is an attempt at alpha, to outperform, but risking short-term underperformance.” He advises funds to be conservative, and to assume that ‘going forward is doubly bad as history for the next two to three years’, while putting in ‘as much as they can tolerate with an outside manager’, seeing it as an unlevered investment into a levered vehicle. “It is more important to put in the amount they can tolerate for the long term,” he says.

Panagora’s Job notes that it is challenging for funds to implement risk parity at the entire portfolio level because of the leverage involved. “This is a big change to make, and it can be expensive,” he says.

Bridgewater avoids this problem by managing both leveraged and unleveraged portfolios. “You can build a better portfolio if you use leverage because leverage allows you to create a broad choice of assets at any level of desired return or risk, which allows maximum possible diversification,” says Prince. “But you do not have to use leverage. You can apply the same concepts by buying long-duration bonds and by utilising assets that have higher volatility on a nonleveraged basis.”

Indeed, it is the leverage aspect of risk parity that has created the most controversy. Risk parity advocates all assert that the traditional 60/40 portfolio relies on leverage, but this leverage is invisible because it is held by the underlying equities, embedded in companies’ debt-to-equity ratios. “With PanAgora’s risk parity, the leverage is transparent,” says Qian – it is achieved through the use of exchanged-traded instruments, such as futures.

Asness of AQR sees the criticism of leverage in risk parity as a “Luddite attack”, assessing much of the criticism as being “quite naïve”. Mendelson observes that investors face a choice between “moderate leverage risk or excessive concentration risk”.

**I**n practical terms, leverage presents issues. “Return expectations for asset classes change through time,” says Wilshire’s Williams. “Given the same level of risk, do you want to lever a portfolio? Sometimes the answer is yes, and sometimes leverage may not improve the efficiency of the portfolio. Sometimes the cost of leverage is higher than the expected return benefits of the strategy.” She also points out that plans need to determine the type of leverage to use.

“Leverage does create additional risk,” says Joe Flaherty of MFS, “including the ability to borrow in all environments, maintaining your line of credit.” He also notes that the evolving shape of the yield curve means that ▶

◀ leverage is not always as attractive as it is today. Flaherty also points out that risk parity's heavier allocation to fixed income exposes those portfolios to greater fixed income risk and a greater sensitivity to rising interest rates.

In some ways, the criticism of risk parity is an indication of its strength. As Qian notes: "A lot of asset managers have a lot invested in the 60/40 approach, and they have an entrenched interest in preserving this framework."

Its advocates maintain that risk parity as an investment approach has legs. It will be a long time before people fully forget 2008, as Asness puts it, and even when they do, that change in sentiment does not mean that risk parity portfolios will underperform. His colleague Mendelson concurs: "It is a solid concept. The fear level may wax and wane, but good ideas stay around."

Asness likens risk parity to the idea of international diversification – despite some rough years for internationally diversified portfolios, the principle has persisted. However, Flaherty wonders whether asset liability management (ALM) might not be the more apt comparison: "There was a lot of talk, but very few investors acted on it." He does not doubt that risk parity has some value. "Some



managers have done it for a long period of time, and if you know what you are doing, it can make sense," he acknowledges. "However, given investors' tendency to lose patience, if they had put a risk parity portfolio in place at the start of the 1990s then missed out on the equity boom, would they have stuck with it?"

*"Given investors' tendency to lose patience, if they had put a risk parity portfolio in place at the start of the 1990s then missed out on the equity boom, would they have stuck with it?"*

Joe Flaherty

Even though risk parity managers have modelled performance of a strategy going back decades, these strategies remain broadly untested, and it is this need to maintain the strategy for the long term that presents one of the biggest challenges to risk parity. "Our research shows that risk reduction can be large if you can hold the portfolio for a long time, but there are periods when the strategy does not work," notes Williams. "It will take time to learn whether risk parity is supportable among investment committees for the long term. I do not see broad adoption, but rather the gradual implementation of different forms of risk parity within portions of the portfolio. Plans will test the strategies out that way. But even now, that is a very young conversation."

## Nice idea, awkward reality

The tweaking and adjustments managers force upon 'risk parity' strategies betray the risks at the heart of the concept, writes **Joseph Mariathan**

Whether they have used a mean variance optimisation approach or some other methodology, many European institutional investors would regard their asset allocation strategies over the past decade as a failure, primarily because of the large weightings to equities. During the 10 years to 30 September 2010, the annualised return (in euros) on the MSCI World was -1%. Moreover, in a typical UK- or US-style 60/40 equity bond mix, over 90% of whole portfolio volatility over the past 40 years or so would have been due to the equity component. Given the disappointing performance of equities, and the historical overweighting to them, institutions are grappling with the idea that there could be better alternatives to variations on 60/40.

That is where risk parity comes in. An intuitively attractive strategy, it has gained attention in the US and is now spreading to Europe. One reason is the fact that the traditional mean-variance optimisation process for asset allocation famously outlined by Nobel prize winner Harry Markowitz has always looked far better in theory than in practice. The efficient frontier of portfolios is produced by finding portfolios with the maximum return for a given level of risk, based on expected returns of each asset class, and the historical volatilities of and correlations between them.

The problem – as anyone who has tried to adopt this approach has found – is that the portfolios are very sensitive to exactly the information that is least reliable, namely the expected returns. Indeed, the sensitivity can be an order

of magnitude greater than the sensitivity to changes in volatilities and correlations. This means that many asset classes may be ignored because their expected returns may be just a few basis points less than others, even though any sensible error margin would completely swamp such differences. One remedy has been to impose constraints (on maximum and minimum

*"Clearly, what are described as risk parity strategies can vary tremendously. Sometimes there can be only a loose connection to the idea of using a reference benchmark with equally weighted risk allocations. Even similar strategies can differ considerably because they may allocate to a different set of asset classes"*

weightings, for example). But then portfolios end up being more a function of the constraints than the optimisation.

By contrast, a 'classic' benchmark risk parity portfolio makes no assumptions about future returns – although it does assume that all assets included have the same Sharpe ratio (that is, the same ratio of expected excess return to volatility). As such, a risk parity portfolio is not a risk-minimising portfolio and can lie below

the efficient frontier produced by mean-variance optimisation. The way risk parity portfolios achieve higher returns is through leveraging their exposures to asset classes with lower volatility.

Paul Goldwhite, director of research at First Quadrant, attributes the increasing interest in risk parity to supply, demand and innovation. "In terms of the supply of investments, there has been a decade of disappointing asset class returns," he says. "Active management has been disappointing, volatility has been higher than expected and diversification also disappointed as correlations turned out to be higher than expected. In terms of demand, the pressures are greater for both private and public pension schemes facing shortfalls. Finally, a wave of innovation has made risk parity approaches more acceptable: greater use of derivatives, shorting and investment in hedge funds has made it more acceptable to move away from conventional strategies."

Still the classical approach, with its agnosticism about expected returns, might limit the attractiveness of the approach, particularly in Europe. "In the US, there is more scepticism on active management, whereas in Europe it is very difficult for investors to believe in a process that is completely agnostic with respect to asset class returns," says Jean-Louis Nakamura, CIO of asset allocation for Lombard Odier. Moreover, portfolios will invariably have much higher weightings to bonds and cash-type instruments, which also raises issues, according to Nakamura.

Nonetheless, Lombard Odier is using an asset allocation strategy that employs risk parity concepts. And in Germany, CIO Harold Heuschmidt says that since 2008 Aquila Capital has attracted significant inflows to what it calls a risk parity fund, launched in 2004 and based on equalising the volatility components in a portfolio of just



four asset classes, namely equities, government bonds, short-term interest rates and commodities. Its great attraction has been that its returns are robust and uncorrelated with equity markets. This is not surprising when the actual weightings are compared with the risk profile. As figure 1 shows, weightings to equities are much less than 10%, with nearly three quarters in short-term interest rates. As one can imagine, the return of such a portfolio would be low in the absence of leverage, and this is a key feature of risk parity approaches.

Ben Inker of GMO has questioned the usefulness of risk parity, pointing to three weaknesses. First is the identification of volatility with risk, a failing found in all value-at-risk approaches based on modern portfolio theory. Historical values of volatility and correlations are dependent on the time periods chosen and tend to ignore events that have not occurred frequently or recently. Second, having no view on future returns means that asset classes can be included that may have zero or even negative risk premiums. Commodities are a case in point; government bonds are potentially another example – Inker, along with many others, believes that the risk premium on bonds may be negative for an inconveniently long time. Third, and related to the incomplete view of risk represented by volatility alone, several asset classes exhibit negative skew – negative returns tending to be larger than positive returns. This is particularly true of credit: one can lose all of an investment, but the upside is limited to the coupons and return of principal.

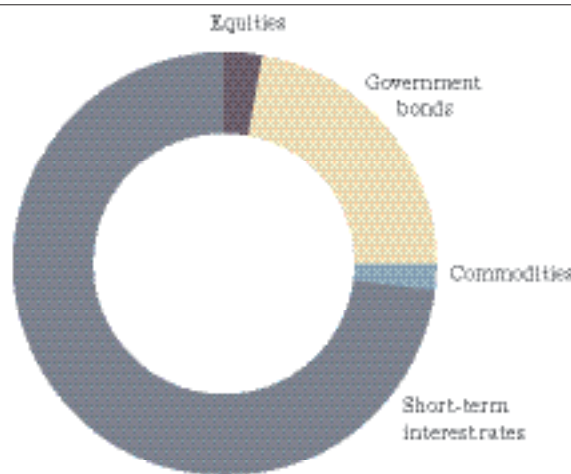
When these three flaws are combined with leverage, Inker argues, it will give a result that probably looks well-behaved until the moment when it suddenly doesn't. The problem with leveraged strategies that are marked to market is that an unleveraged investor can generally afford to wait for prices to converge towards economic reality, but a leveraged investor may not have that luxury. This was indeed the case during the market crash, when hedge funds were forced to liquidate holdings on the basis of marked-to-market losses caused by a market



*"In Europe, it is very difficult for investors to believe in a process that is completely agnostic with respect to asset class returns"*

Jean-Louis Nakamura

## I. Money allocation for equal risk contribution in a typical risk parity portfolio



Source: Aquila Capital

panic, as against real defaults on their bond cashflows. Historically, the evidence appears to be that a leveraged risk parity portfolio would have significantly underperformed during the 1990s and significantly outperformed during the past decade.

"If equities had delivered 10% every year, risk parity would not have appeared," declares Goldwhite. It is worth bearing this in mind when trying to understand what role it might play within European institutional portfolios. Risk parity has some appealing aspects, but it encompasses a number of different approaches. There needs to be a distinction made between using a pure risk parity strategy to invest a complete portfolio, using risk parity as a benchmark for an active process and using risk parity funds as an additional component to a multi-strategy portfolio.

Most fund managers offering risk parity products are invariably combining a passive benchmark with an active overlay. Aquila's fund for example, despite its name, has had a pure risk parity portfolio for only 10% of its six and a half years, according to Heuschmidt. At the moment by far its most significant position is the nearly 75% of capital it has in three-month Euribor and Eurodollar interest rate futures – a position that generates a terrific carry as long as money market yield curves remain as steep as they are. Should interest rates rise to the extent that the curve inverts, it would start incurring costs. But, as Heuschmidt admits, the strategy's active overlay could then cut in and suggest alternative assets.

Lombard Odier also explicitly combines a risk parity benchmark with a tactical active asset allocation strategy. Its approach differs in using rolling nine-month historical volatility and correlation figures, rather than Aquila's figures based on 10 years or more of data. Nakamura's argument for such a short period is that it enables progressive changes to the portfolio as risks change – although, as he admits, the strategy cannot really adjust to sudden shocks. So, while it lags the marketplace, it nonetheless adjusts risks in a significant way rather than simply taking risk as a fixed figure.

Nakamura believes this approach can be applied to individual asset classes with very heterogeneous components such as the commodity markets and emerging market equities, and Lombard Odier is looking to launch funds on this basis.

The active risk parity strategies being marketed are seen by consultants as alternatives to diversified growth strategies, according to Goldwhite. They can look attractive when that comparison is made. "A typical diversified growth strategy has lots of asset classes but they tend to be highly correlated to equity markets," he says.

One area where they may have a role is as the default option for DC pension schemes, and this has been the background behind First Quadrant's launch of a pooled fund in the UK which aims to improve the risk/return profile of currently available default fund options by diversifying risk more equally across global developed and emerging equity markets, global sovereign bonds, US inflation-linked bonds, commodities and real estate. The approach has proved successful in the US 401(k) market.

Goldwhite describes three components. Global equities are accessed using futures for developed markets and ETFs for emerging. Individual countries are equally risk-weighted. The same applies with country exposures in the global sovereign bonds section. The third component consists of assets that aim to provide inflation hedges – index-linked bonds and commodities. On top of this benchmark allocation, First Quadrant adjusts the exposure to risky assets based on a dynamic assessment of risk that uses variables such as the VIX index (tracking the implied volatility of S&P 500 options), credit spreads and macro-economic indicators. Volatility is assessed on an even shorter time frame than at Lombard Odier, with figures averaged over one to three months.

Clearly, what are described as risk parity strategies can vary tremendously. Sometimes there can be only a loose connection to the idea of using a reference benchmark with equally weighted risk allocations. Even similar strategies can differ considerably because they may allocate to a different set of asset classes. Deciding whether US equities are a separate asset class to EAFE or whether both should be grouped together as global equities can end up the chief determinant as to whether the allocation to global equities is 5% or 10%.

Risk parity may have an intuitive attraction and a pragmatic utilisation of the concept may have value as a benchmark – but there is no fundamental rationale for it. As a result, investors wedded to liability-driven investment will see no benefit to another approach also advocating high fixed income exposures, while equity-focused investors can argue that returns to equity come predominantly from dividends, so that even if equity prices do not increase substantially, real yields represent at least an approximate match for pension-type liabilities.

Inker perhaps sums up the real problem with risk parity that will limit its appeal in Europe: "Whilst investors need to take advantage of risk premiums if they are going to have any hope of meeting the targets they have set for themselves, those risk premiums can neither be assumed into existence nor counted on to continue because they were there in some historical backtest." As such, he argues that no particular fixed weight benchmark is a good solution for all time or all environments. "Risk parity portfolios are no exception."

With a few notable exceptions, most of the fund managers offering 'risk parity' products would probably agree. Indeed, that is precisely why those products so often employ some kind of active overlay. Ultimately, that should make us ask whether 'risk parity' is just the latest marketing slogan to be applied to strategies that, one way or another, we have seen before.

# Missed opportunity?

Investment managers are launching risk parity funds in response to investor demand in the US market place. **Matthew Roberts** wonders why there hasn't been the same level of demand in the UK

Risk-based asset allocation is designed to provide a less volatile return stream over a full economic and market cycle through the building of a portfolio that is genuinely balanced across a range of different return premia or economic outcomes. If the objective is to achieve a return similar to that of equities, then applying leverage to lower risk assets (government and corporate bonds, for example) is required. While this sort of risk-parity based asset allocation is simply an extension of basic diversification theory, in practice risk parity strategies vary significantly. Different fund implementations can include very different betas or alternative betas, use different instruments and take different approaches to asset allocation and position sizing. This heterogeneity means that the merits of each risk parity fund need to be considered carefully and individually.

In general, there are many clear benefits associated with a strategy of this nature. A broader balance of risks should lead to less severe underperformance in equity bear markets and the overall volatility of a risk parity fund should be lower than that of a traditional 60/40 portfolio. In addition, risk parity funds are typically very liquid and financially efficient.

However there are moderate risks, which may have limited demand by investors for these funds to date. These include:

- The challenges associated with understanding a different way of approaching diversification.
- Susceptibility to periods where diversification isn't as effective – the events of 2008 were an example of this. Hence, it is important to understand the contingencies that are built into investment processes for periods such as this.
- Market timing risks associated with initial

implementation. The drawdowns associated with risk parity strategies are expected to be less severe than with a traditional portfolio. Nevertheless, at a high level, moving from a traditional portfolio to a risk parity solution means selling equities and buying bonds and investors need to be comfortable with that transition and with making a reasonably significant asset allocation switch. While there is nothing intrinsically wrong with current low government bond yields, in terms of the outlook for a risk parity portfolio, it is worth highlighting that a sharp or unanticipated rise in nominal bond yields, led by real yields, may cause relative

*“Some of the more sophisticated UK pension schemes have already moved towards more diversified overall portfolios with the objective of balancing risk premia across their entire portfolio of return-seeking assets”*

underperformance. This simply reflects that risk parity and traditional portfolios will experience drawdowns at different times.

- Curve fitting. Historical data will often be used for portfolio construction in a systematic way, so unforeseen market events could impact the portfolios.
- Meaningful use of leverage and derivatives, which can entail greater than average counterparty risk – although most risk parity funds leverage through futures with central clear-

ing and margin requirements which helps to mitigate this risk.

➤ Basis risks. Whilst it is not likely to be material there can be basis risks associated with the use of derivatives. This is where the return from derivative investments diverges from that of the underlying physical securities.

Structural changes in the management of UK pension fund assets may also have played a part in limiting recent demand for risk parity funds. Many UK pension schemes pursue liability-driven investment solutions that require a LIBOR-based return stream. Risk parity funds may represent a sensible solution in this regard as we would expect them to provide a more stable return stream. However, some of the more sophisticated UK pension schemes have already moved towards more diversified overall portfolios with the objective of balancing risk premia across their entire portfolio of return-seeking assets. This might include less liquid assets that are not typically included in risk parity fund solutions.

Depending on beliefs, a bespoke return-seeking portfolio could comprise specialist managers across the full range of asset classes or a range of different beta solutions, potentially including 'smart' or 'alternative' betas, to achieve the desired balance. As a result, a 'standard' risk parity fund solution may not be required for these investors.

Many defined contribution schemes are still at a relatively early stage in their life cycle and so a move to risk parity would represent a significant governance leap. As such, to date there has not been significant demand for these strategies from this UK investor group either.

We think a risk-balanced asset allocation approach is an attractive investment solution in theory and, when carefully applied, in practice. A fund solution may not be appropriate for some of the more sophisticated funds and may represent a governance leap too far for governance constrained clients. Nevertheless, we do expect that a number of UK pension schemes will find that they fit in neatly with their investment risk and return requirements.

*Matthew Roberts is a senior investment consultant at Towers Watson*

## Case study: ATP

Risk parity alone cannot do the trick of maximising risk-adjusted returns and minimising the risk of large drawdowns. **Henrik Gade Jepsen** describes the additional pillars on which ATP's investment approach rests

Risk parity has been a very important component of ATP's investment approach for the past five years. In the investment portfolio we focus on generating a return that is sufficient to preserve the long-term purchasing power of pensions – that is, to ensure that pensions can be increased in line with inflation while being able to cover the provisions to finance life-expectancy increases. At the same time, the risk of large losses on investments should be low, given that heavy losses could make it difficult to bear investment risks going forward – and thus affect the ability to deliver high returns in the future.

Accordingly, the investment portfolio is managed with the aim of delivering positive

returns in most financial climates. The challenge is to maximise risk-adjusted returns while minimising the risk of large investment losses. The question is how one should approach this problem in a world characterised by fat tails, unstable asset class correlations and stricter solvency requirements.

Risk parity has been an important part of the solution but should be combined with a number of other components, described below. We define risk parity as an allocation exercise which aims to spread risk more or less evenly among risk factors in order to generate higher risk-adjusted returns than equity-centric institutional portfolios. Risk parity partly solves the dilemma created by the need for high invest-

ment returns and the imperative of remaining solvent at all times. In order to ensure that the return stream is as stable and as independent of economic trends as possible, ATP's portfolio is invested in five risk classes with very different risk profiles. The five risk classes focus on interest-rate sensitive bonds (the interest rate risk class), the ability of issuers to repay debt obligations (the credit risk class), corporate earnings (the equity risk class), general price developments (the inflation risk class) and oil prices (the commodity risk class).

### Risk parity – a necessary but not a sufficient condition

On its own, risk parity cannot do the trick of maximising risk-adjusted returns and minimising the risk of large drawdowns. ATP's investment approach thus rests on three additional pillars.

First, to generate the highest possible risk-adjusted returns it is necessary to hedge all uncompensated risks. For ATP the main uncompensated risk is the interest rate risk on pension liabilities. Hedging is performed through a separate hedging portfolio consisting of very long-dated interest rate swaps and government bonds.

Second, in recent years, ATP has been focus-



ing on protecting itself against ‘tail risks’, such as sharp drops in the value of the investment portfolio: a 30% plunge in equity or commodity prices, for example. Tail risks can represent a significant risk to ATP, and so it is prudent to safeguard against heavy losses if the events were to occur. Tail-risk protection also makes leverage an acceptable way to balance risks in the portfolio as the potential larger losses from leveraging can be eliminated by buying downside protection.

Third, ATP cannot invest freely if the value of its assets approaches the value of the guaranteed benefits. Should this happen, the risk must be reduced to ensure that sudden losses do not further weaken the solvency ratio. This weighting is explicitly formulated in the dynamic rule, ensuring that the level of risk is appropriate at all times. The dynamic rule defines a risk budget based on ATP’s reserves. ATP’s board has determined that risk must not exceed the risk budget. Accordingly, high investment returns mean that it is possible to increase the risk further by purchasing risky assets while major losses result in active divestment. Reducing the risk budget is the last line of defence if diversification and tail hedges fail to mitigate the impact of large financial market declines.

**Constructing a balanced portfolio**

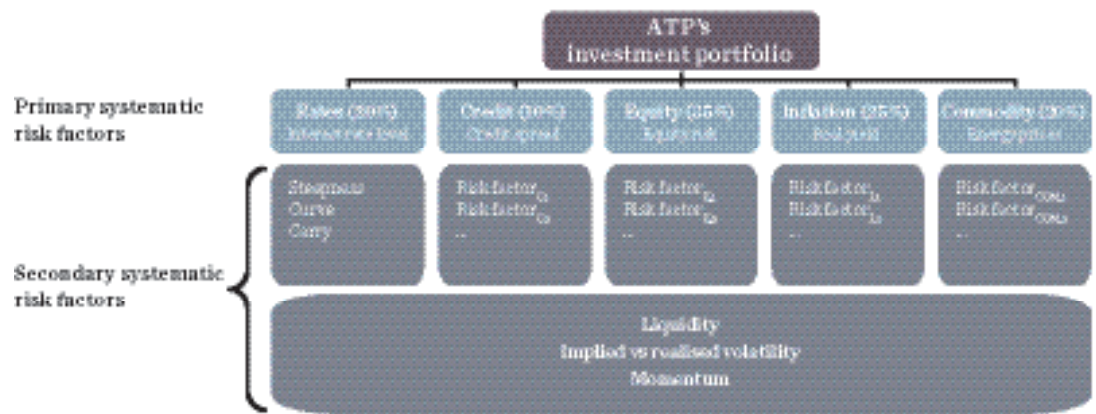
Instead of looking at the investment universe as asset classes, we allocate to five risk classes: rates, credit, equities, inflation hedges and commodities. Moreover, we allocate the entire investment portfolio risk according to risk parity principles, which probably distinguishes ATP’s approach from that of most others’ risk parity investments. The risk classes reflect very important underlying economic risk factors which are the primary determinants for return. Having a risk factor approach for the entire portfolio enables us to focus on the most important return drivers and avoid spending time on less relevant investment discussions.

We allocate risk between the risk factors to obtain the most effective diversification. The whole idea of allocating risk instead of cash is to avoid a single asset class (or risk factor) dominating the portfolio return merely because of the way the underlying investment is structured. One dollar invested in equity is much more risky than one dollar invested in Treasury bonds because equity is a leveraged investment (being the lowest part of the capital structure leveraged up by bank loans, corporate bonds, mezzanine debt and so on). Letting that determine portfolio characteristics would be like letting the tail wag the dog. Nevertheless, this is what happens in many institutional portfolios.

Merely allocating risk between the five risk classes reflects a passive investment approach. We have taken things a step further by making the investment approach dynamic by introducing other systematic risk factors that are important for the investment returns (figure 1). For example, the risk class rates reflects changes in the level of interest rates, which is the most dominant investment return driver for bonds. But the steepness of the yield curve is also a systematic risk factor that is an important determinant for investment returns over time. If attention is not drawn to these other factors a high potential return can be lost. And since these risk factors reflect systematic market risk they should be addressed directly in the investment portfolio and not in an alpha overlay.

The starting point for us is to get the exposure within each risk class that gives the highest expected risk-adjusted return over time. On top of that we develop and imple-

**1. ATP’s risk allocation and risk factor approach**



Source: ATP.



*“One dollar invested in equity is much more risky than one dollar invested in Treasury bonds because equity is a leveraged investment. Letting that determine portfolio characteristics would be like letting the tail wag the dog”*

Henrik Gade Jepsen

ment strategies which dynamically change the exposure to other secondary – but important – risk factors within each of the five risk classes. In this way we achieve a portfolio that captures changes in systematic market risks.

For example, in the risk class rates we have a strategy for the systematic risk factor ‘steepness’ that dynamically changes the exposure to the yield curve by switching the total government bond portfolio between bonds with short time to maturity and bonds with long time to maturity. Thanks to this strategy ATP’s investment

portfolio has gained more than 1% compared to being ‘passively’ invested in bonds with 10 years to maturity.

We pursue similar strategies within the other four risk classes. For example, in the risk class commodities – where we only invest in oil futures – we use a similar ‘steepness’ strategy to determine the maturity profile of the futures contracts in which we invest. While many investors in recent years have experienced high negative carry from investing in oil, our strategy has generated significantly better return characteristics. In the risk class inflation we allocate a part of the risk budget to illiquid investments like real estate, infrastructure, alternative energy and forestry. The aim of these investments is to give us stable inflation-adjusted cash flows in addition to the illiquidity premium. The liquid part of the portfolio is primarily placed in index-linked bonds and inflation swaps. For the liquid part we have curve strategies for the real yield and break-even curves and a strategy that switches the exposure between real yield and breakeven inflation.

The risk factor approach also ensures that we implement the portfolio exposures in their most ‘clean’ form, thereby avoiding unwanted risks. For example, we have not had holdings in bonds issued by peripheral EU countries in the portfolio as these are adding spread exposure – in other words, credit risk. If we want to use these bonds for spread exposure they will belong to the risk class credit and will be scaled accordingly.

**Long-term return results**

The investment approach has delivered very satisfactory results. Since 2006 the excess return of ATP’s investment portfolio (return after funding, tax and costs) amounted to almost €7bn – which is above the target of €6bn that is sufficient to adjust ATP’s guaranteed pensions for inflation and longevity over the same period. Compared to a portfolio where each of the five risk classes are represented by a simple index, the implementation strategies have added a significant excess return of more than 5% over the last four years (figure 2).

During times with very high uncertainty about economic development a balanced portfolio is even more justified, as it is not betting on one single outcome. We believe that a balanced portfolio is a very important building block to get high risk-adjusted rewards, but to get superior risk-return characteristics over time one should add a dynamic investment approach on top of it.

*Henrik Gade Jepsen is chief investment officer at ATP*

**2. Returns on ATP’s investment portfolio**



Source: ATP.

# Risk parity, risk management and the real world

AQR's Adam Berger, Michael Mendelson and Daniel Villalon discuss risk, and the practical challenges of managing it successfully

At the heart of risk parity, there is risk management. Risk parity's core benefit – improved portfolio diversification – ultimately is a product of how well risk is assessed and managed. For investment managers, the practical considerations are important.

In this article we consider two essential aspects of risk management for risk parity portfolios: maintaining balanced risk exposures through time and managing portfolios through periods of significant market stress. We conclude that risk parity portfolios require dynamic management; their holdings need to be regularly adjusted to reflect the dynamics of underlying market risk. Further, we conclude that risk parity portfolios should incorporate a planned capital preservation strategy to try to avoid significant disruptions in a crisis.

## Common goals, divergent choices

Risk parity strategies share two common elements: (1) balanced risk exposures, which usually mean less capital exposure to stocks than traditional portfolios (and more exposure to everything else); and (2) the use of leverage to scale the portfolio risk to about the level of traditional portfolios.

The goal of risk parity strategies is for everything in the portfolio to matter, but for nothing to matter too much. Implicit is the assumption that risk parity managers can make reasonable assessments of risk, and make those assessments in a constantly changing market environment. Generally, there are two approaches:

➤ **The static approach.** On initial portfolio construction, the manager determines the exposures needed to deliver comparable risk across asset classes, generally based on long-term historical behaviour. These exposures are held steady through time. Managers may adjust exposures, but these changes are based on subjective views about risk and return.

➤ **The dynamic approach.** The manager frequently re-estimates asset and portfolio risks and adjusts the portfolio's holdings to try to maintain a constant allocation of risk among the asset classes and a steady level of total portfolio risk. The dynamic manager requires a systematic method to estimate changes in risk levels, and may also have a systematic approach for preserving capital in periods of extreme stress.

## A balancing act

Though the goal is to balance risk exposures, managers hold capital exposures, and make transactions only in capital terms. Managers must therefore have a method for translating risk exposures into position sizes.

Static risk management, based on long-term asset-class characteristics, does not account for how risks evolve through time, so position sizes are relatively fixed. Static risk parity portfolios constructed in periods of relative calm become violently risky during periods of extreme market stress. For example, during the 2008 financial crisis, a static risk parity portfolio would have become dominated by the assets

## I. Dynamic risk management realises more consistent portfolios

Volatility of two approaches to risk parity portfolio management



Sample risk parity portfolios created using equities (S&P 500 index), bonds (Barclays Capital Aggregate Bond index) and commodities (Goldman Sachs Commodities index). Notional exposures for static portfolio are set at inception. Notional exposures for dynamic portfolio are adjusted based on a volatility forecasting model. Source: AQR. For illustrative purposes only.

whose risks had experienced the greatest relative increases, such as equities and inflation-linked bonds. Just when diversification of risk would have been most valuable, these portfolios became concentrated in risk, behaving much like traditional portfolios – undiversified and highly volatile.

Dynamic risk management seeks to target a portfolio's risk exposures both across assets and through time, and so must regularly reassess risk and adjust exposures. The goal is not to time markets based on forecasting expected returns but instead to assess and manage the current risk environment, which can be done far more accurately. This process allows a dynamically managed portfolio to remain much closer to its risk targets.

Figure 1 illustrates the limitations of static risk management by comparing the volatility of two sample risk parity portfolios during the financial crisis. Both portfolios target 10% volatility, and at the height of the crisis both exceed that target. But the portfolio with static risk management experiences a dramatic four-fold increase in volatility, while the volatility of the portfolio with dynamic risk management increases far more modestly.

The risk level realised by the static portfolio is far too high and presents risks that are likely unacceptable to most investors. In contrast, the short-term and modest increase in risk of the dynamically managed portfolio will likely fall within acceptable tolerances.

Of course, a manager employing a static approach may make any subjective decision, including a good one, leading to somewhat better performance. However, the success of dynamic risk management – its more reliable ability to remain on risk target – argues against a subjective approach. Errors in human judgment over just one or two periods can have a lasting impact on portfolio results. AQR's

research suggests that dynamic risk management can offer risk parity investors significantly more consistent volatility across a range of asset classes and time periods.

## Managing risk in the face of investment losses

Risk management becomes perhaps even more challenging during times of crisis. Managers without a pre-determined strategy for weathering a crisis are challenged to shield investors from tail events, which can dominate long-term returns. One reason a manager might maintain static exposures during a crisis is fear of getting whipsawed during a rebound. Investors fear 'selling at the bottom' and so become inclined to hold on, hoping for the storm to pass.

In practice, however, there is no such thing as static portfolio management during a crisis. Risk parity managers manage leveraged portfolios and do not realistically have the option to stand fast, particularly with a strategy that employs leverage. The actual choice is whether risk management decisions are planned by the manager or forced upon him.

A manager without a crisis management strategy is more likely to hold on to deteriorating positions for too long, only to be forced to sell anyway as market conditions deteriorate. Then, having cut positions, the manager may be reluctant to rebuild risk positions until it's clear that the worst is over. Alas, markets seldom provide an 'all-clear' signal, and this approach often means missing out on all or part of a rebound.

A pre-determined drawdown control strategy addresses these shortcomings. The goal is to cut risk incrementally before a full-blown crisis, without relying on perfect foresight to time the bottom. A planned drawdown control seeks to make gradual rather than sudden reductions in portfolio exposure when returns are very poor; it doesn't require foresight that the environment



is getting worse. An additional benefit is that in contrast to an unplanned portfolio deleveraging, it can be designed to preserve the risk balance of the portfolio during a market crisis.

Figure 2 is a stylised illustration of the way two approaches to risk management react to a market crisis and recovery. Markets always may present us with the need to rapidly reduce risky positions. A manager who waits until he is confronted with that decision must choose among very poor alternatives. The option to remain static in the face of any crisis is an illusion. The real value of a planned drawdown policy is in steering portfolio managers clear of this Hobson's choice.

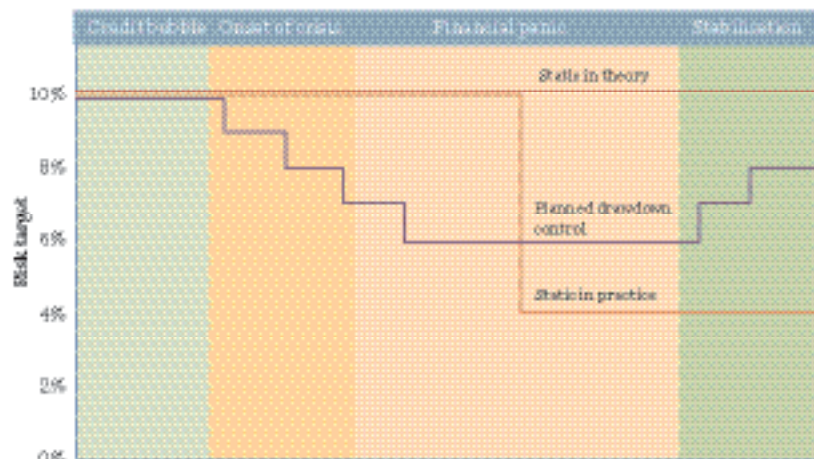
### Can it really be done?

Investors may ask whether dynamic risk management is possible. Whereas it is notoriously difficult to consistently predict market returns, consistently predicting risk is much easier. There can be occasional surprises, but on the whole we can make some very useful estimates.

Risk, unlike return, is persistent. This week's stock market return tells us little about next week's return, but the risk characteristics of the market this week give us significant, useful information about next week's risk. Markets rarely shift from volatile to placid over a day or a week. On occasion, they do shift from placid to volatile quite quickly, though our research suggests that large changes in risk in either direction are much more likely to happen

## 2. A systematic drawdown control process may limit losses

Illustration of two types of risk management in a crisis



A drawdown control policy may not always be successful at controlling a run's risk or limiting portfolio losses. Source: AQR. For illustrative purposes only.

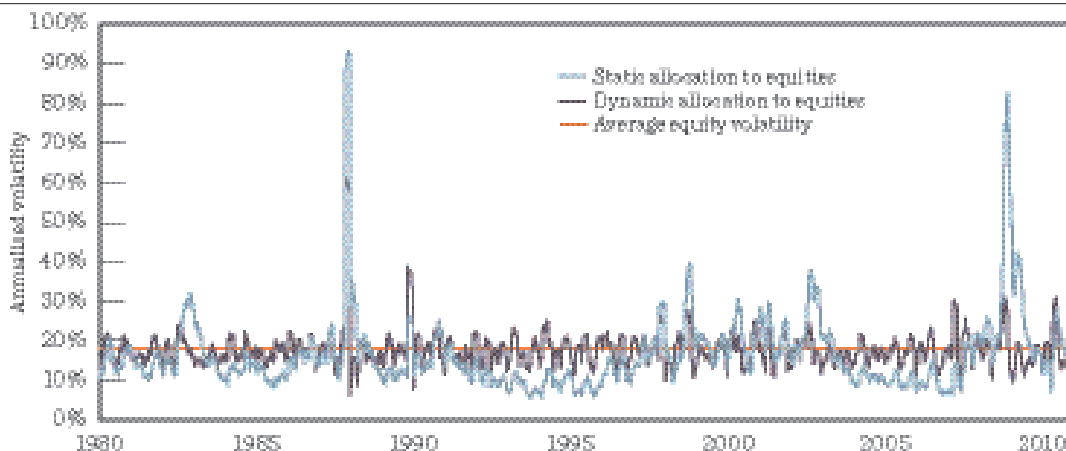
with some market warning. In most periods of unusually high equity risk, volatility builds slowly, gathering steam as markets veer toward a crisis. Even a relatively sudden event like the crash of 1987 was preceded by several days of significant market turbulence, enough warning for a dynamically risk targeted portfolio to make some valuable adjustments.

Figure 3 highlights the ability of dynamic

risk management to create relatively steady risk exposures. The pale blue line represents a static (constant value) exposure to equities. The purple line represents a dynamically managed portfolio that seeks to maintain constant volatility over time by adjusting capital exposures. The volatility of both portfolios varies, but the volatility of the dynamically managed portfolio varies much less, particularly during market crashes, minimising exposure to tail events.

## 3. Risk forecasting is worth the effort

Realised volatility of static and dynamic equity portfolios



Equity portfolios created using S&P 500 index. Static allocation portfolio holds constant notional exposure to equities. Dynamic allocation portfolio adjusts holdings based on a volatility forecasting model. Source: AQR. For illustrative purposes only.

### The proof is in the pudding

The past three years have proved once again that risk management is critical for investment success. Investors were hurt in 2008 if their risk management methods were inadequate, and again in 2009 if drastic risk management steps taken during the crisis prevented them from re-entering the market during the rebound.

For many investors (not just those managing risk parity portfolios), a static approach to managing market risk contributed to significant losses. Too many investors held on too long only to reduce their market exposures after suffering very substantial losses, then waited too long to return to the markets. In contrast, a dynamic approach worked, cutting risk incrementally well before the worst of the crisis, and systematically increasing it to capture the rebound.

Risk management is important in more normal markets, too. AQR has managed a live risk parity strategy since 2006, and our dynamic process for setting exposures to the full spectrum of asset classes in our portfolio has enhanced our investors' returns. Figure 4 shows a simplified version of our approach, plotting the returns of a dynamic risk parity strategy, which incorporates drawdown control.

We at AQR are enthusiastic proponents of risk parity, and the risk-diversified portfolios it creates. We also recognise that risk parity strategies demand effective risk management. We think it is inconsistent to be a proponent of risk parity, and to use a very slow or static approach to risk management. At its core, risk parity is an argument about the importance of diversification – across time and across asset classes. In the long term, we think the best risk parity portfolios will be those that both adopt a dynamic approach to risk management and have a planned capital preservation strategy to avoid significant disruptions in a crisis.

## 4. With the right risk management, risk parity outperforms

Five-year performance of a model risk parity portfolio versus a traditional 60/40 blend



Sample risk parity portfolios created using equities (MSCI World index), bonds (Barclays Capital US Government Bond index) and commodities (Goldman Sachs Commodities index). International 60/40 portfolio created using equities (MSCI World index) and bonds (Citigroup World Government Bond index). Source: AQR. For illustrative purposes only.

*Adam Berger is head of portfolio solutions, Michael Mendelson a principal and portfolio manager and Daniel Villalon an associate at AQR Capital Management.*



# Achieving targeted returns with an 'All Weather' asset allocation

Bob Prince and Paul Ross discuss the approach of Bridgewater Associates, founder of risk parity

All sophisticated investors understand the basic principle that a diversified portfolio is better than an undiversified portfolio. And yet, nearly all institutional investors hold an undiversified portfolio that is concentrated in a single asset class – equities. When we surveyed the strategic asset allocation of nearly 200 US pension funds we found that 98% of them were more than 75% correlated to a single equity index, the S&P 500. Given the sophistication of these investors and the degree of oversight of their activities, it seems obvious that this pervasive concentration of risk is intentional. Why would such capable investors, who know the benefits of diversification, intentionally hold an undiversified portfolio?

The traditional approach to asset allocation forces investors to trade off diversification for high returns. Most institutions are long-term investors and believe they can absorb short-term risk in exchange for higher long-term returns. And higher long-term returns reduce the cost of funding future liabilities. So most believe it to be economical to target high returns and bear the additional risk of having an undiversified portfolio that is concentrated in equities.

But there is a dangerous flaw in this thinking. Assets have short-term risk as well as long-term risk. Every asset class, including equities, will go through sustained periods of underperformance that can last for decades or more. And any portfolio that is concentrated in a single asset class will similarly go through sustained periods of underperformance. Such underperformance jeopardises the ability of investors to meet their obligations. Today's public pension funding crisis is a direct result of this flaw.

We believe there is a better approach to asset allocation. We believe that investors can have high returns and limit their risk through diversification by holding an 'All Weather' risk parity portfolio. By holding a diversified portfolio that has the same expected return as the existing undiversified portfolio, both short-term risk and, more importantly, long-term risk will be reduced, and the cost of funding future liabilities will be the same or less.

In this article, we discuss why long-term risks exist in a concentrated portfolio. We describe the rationale and methodology for what we believe is a reliable alternative approach to strategic asset allocation, which produces the same high expected returns as the existing approach but with less risk, or higher returns with the same risk.

Since 1996, we have applied this All Weather risk parity approach through significant bull and bear markets in equities, two recessions, a real estate bubble, two periods of Fed tightening and Fed easing, a global financial crisis and periods of calm in between. Throughout these varied environments the All Weather asset allocation mix achieved approximately a 0.6 Sharpe ratio, consistent with its performance in simulated back tests through the Great Depression and across a variety of other countries. At the normal 10% targeted risk it has outperformed stocks, bonds and the conventional asset allocation portfolio, with much less risk.

## Balancing your beta: the 'All Weather' approach

Twenty years ago we asked ourselves the following simple question: What mix of assets will perform well across all economic environments? We knew we couldn't get to an answer through the traditional approach because that approach relies on correlation and volatility assumptions. Correlations are unstable and unpredictable, particularly when things go badly. Similarly, asset risk is difficult to predict and when things get bad, risks tend to spike higher. And most measures of risk do not adequately reflect the potential for sustained adverse environments that produce sustained poor returns.

So to answer our question we started with a blank slate, a state of 'not knowing', and from there built up the most basic elements of asset pricing. This blank slate approach led us to recognise two fundamental characteristics of asset pricing which we think are universal truths we can count on to hold true in the future: (1) asset classes outperform cash over time; and (2) asset prices discount future economic scenarios. We believe that these two conditions form the primary basis of all asset pricing because they reflect the essential ingredients that investors require from an investment transaction.

Regarding the first, an investment is simply an exchange of money today for money tomorrow. When you make that exchange, you transfer liquidity from your pocket to someone else's, and you need to be compensated for that transfer because it carries risk (ie, giving up liquidity today creates the risk that you lose an opportunity to put that liquidity to work tomorrow). And generally, the more risk you take, the more compensation you require. More broadly, the existence of a risk premium is essential to the functioning of the capitalist system. Without an adequate risk premium capital would not be transferred, and the system would seize up. The amount of risk premium required changes over time, but in order for the system to function, the risk premium must reach a level that allows for the transfer of capital from those who have liquidity to those who need it.

Regarding the second, the pricing of an investment will reflect a discounted set of cash flows, and these cash flows will be impacted by future conditions such as the level of inflation, earnings growth, the probability of default and so forth. As conditions and expectations change, the pricing of assets change. For example, if inflation rises, expectations of the value of money tomorrow changes, and this change in conditions will be priced into the value of assets today.

Given these two structural elements of pricing, the returns of assets will be driven by how conditions unfold in relation to what was discounted and by how discounted conditions change, plus an accrual of the risk premium. From this fundamental understanding, we built up a new approach to asset allocation which we call the 'All Weather' approach. We call it that because it's geared to weather whatever environment is thrown its way.

## Key conceptual underpinning

Each principle above is connected to a key concept which we explore before we explain how to implement the approach in the next section.

Given the first principle, which states that 'assets outperform cash over time', we are confident that we want to hold assets versus cash. Of course, we don't know which assets will outperform the others, so we want a balanced mix of assets. And the best mix of assets – the one that will most reliably capture the risk premium – is the one that will have the lowest asset cross-correlations. But unfortunately we don't know what the correlations between assets will be.

This brings us to the second principle, that 'asset prices discount future economic scenarios', which reveals the fundamental driver of the variability in asset returns: how actual conditions transpire in relation to what was discounted and changes in these discounted conditions.

Because assets discount future economic conditions, and because equities and other investment assets have a long duration, their long-term risk is much higher than is normally captured by most measures of risk. Sustained underperformance in assets results from sustained shifts in actual conditions in relation to what is discounted. For example, in 1960 long-term bonds were discounting low inflation far into the future; instead, inflation trended higher for 20 years, causing long-term bonds to perform poorly during that period. In 1990 the Japanese stock market was discounting decades of strong growth. But instead Japan experienced a depression and 20 years of weak economic growth, which produced two decades of poor Japanese equity performance. As a result of the long duration of investment assets and the normal tendency for sustained shifts in the economic environment, the true long-term risk of an asset is many times larger than what is commonly understood.

A portfolio that is concentrated in a particular asset class runs the risk of sustained underperformance which jeopardises its ability to meet its future funding obligations. By understanding what causes these sustained periods of underperformance, you are able to balance the portfolio's exposures to achieve the required return more reliably over shorter and longer periods of time.

It is because assets have both long-term and short-term risks that you need diversification, even if you are a long-term investor. Instead of balancing assets based on unknown correlations, we believe the best asset allocation weights can be achieved by balancing the knowable drivers of asset prices. While there are many fundamental drivers of asset returns, we believe the most important are growth and inflation. And that a portfolio that is balanced to changes in discounted economic growth and inflation will capture nearly all of the potential diversification available to a strategic asset allocation mix, because these two conditions dominate the cash flows of asset classes and are therefore the primary drivers of variations in asset

class returns. Other important factors, such as changes in credit risk and monetary policy, are derivative factors. For example, credit risk rises when cash flows fall because growth underperforms expectations. Similarly, while monetary policy has a clear impact on asset prices through its influence on the interest rate structure, it is driven by changes in growth and inflation (for example, easy monetary policy comes in response to weaker growth and/or lower inflation, all else being equal).

The best way to illustrate this concept is through a simple example. Consider the correlation of stocks and bonds in light of how they discount future economic conditions. Figure 1 shows how shifts in economic growth and inflation structurally influence the returns of stocks and bonds.

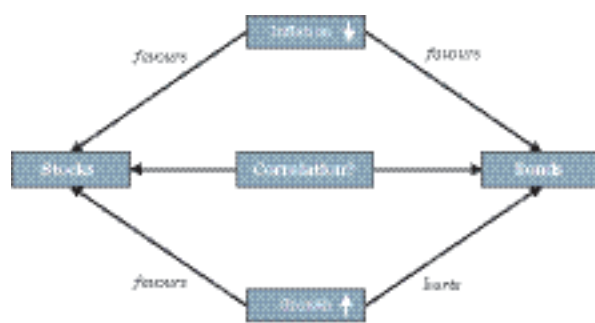
As shown, falling inflation is generally good for both stocks and bonds and vice versa. So if inflation was the only thing that mattered, you would think that stocks and bonds would be positively correlated. But economic growth is also an influence. Strong economic growth is good for stocks and bad for bonds and vice versa. So if economic growth was the only thing that mattered, you would think that stocks and bonds would be negatively correlated. Given this, what will be the future correlation of stocks and bonds? You really can't know without knowing the future economic environment, which is a problem if you are trying to build a portfolio for all environments.

Because of these fundamental connections, we believe that shifts in the relative volatility of economic growth and inflation cause understandable but not predictable shifts in the correlation between assets. For example, the dominant volatility of inflation and inflation expectations in the 1970s and 1980s led to a positive correlation between stocks and bonds. And in the 2000s the dominant volatility of economic growth in relation to inflation expectations led to a negative correlation between stocks and bonds. Given their structural pricing characteristics and the instability of the economic environment you really can't make a reliable assumption about the future correlation of stocks and bonds. Figure 2 shows the radically different correlation of stocks and bonds in the past two decades.

While this instability of asset cross-correlations would pose a problem if the approach relied on an assumption of the future correlation of assets, it is not a problem because the approach does not rely on such assumptions. Instead, by balancing the portfolio to the drivers of the volatility of returns, you could balance your allocation across lowly or negatively correlated asset returns without having to predict which assets those will be at any particular time. This happens through the natural cause-effect linkages of each asset to any given environment. The particular blend of lowly correlated (or negatively correlated) assets will shift over time based on whether changes in economic growth or inflation are the dominant influence on asset returns. You naturally get the most diversification where you most need it.

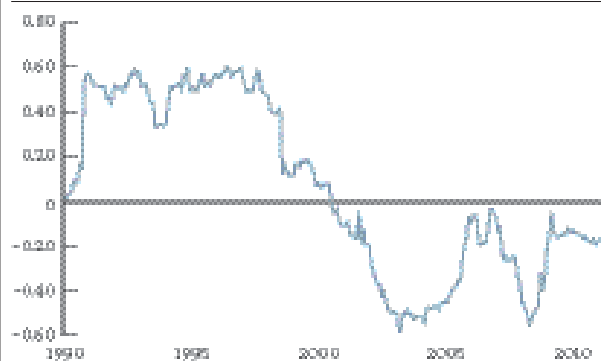
For example, if economic growth is the primary source of the volatility of market returns, then assets exposed to shifts in economic growth will tend to be the most volatile and the least correlated to one another. And the more volatile economic growth expectations are, the more negatively correlated those assets should be. And if changes in inflation and inflation expectations are the primary source of the volatility of returns, assets exposed to these shifts will tend to be the most volatile and the least correlated. And the more volatile inflation

### 1. Economic growth and inflation influence returns of stocks and bonds



Source: Bridgewater Associates.

### 2. Rolling three-year correlation of stocks and nominal bonds



Source: Bridgewater Associates.

is, the more negatively correlated those assets will be. Through this process, you don't have to predict the future correlations of assets or the future environments in order to achieve diversification. It happens naturally by balancing our exposure to the fundamental drivers of

asset returns. And this is true both for short and long time frames.

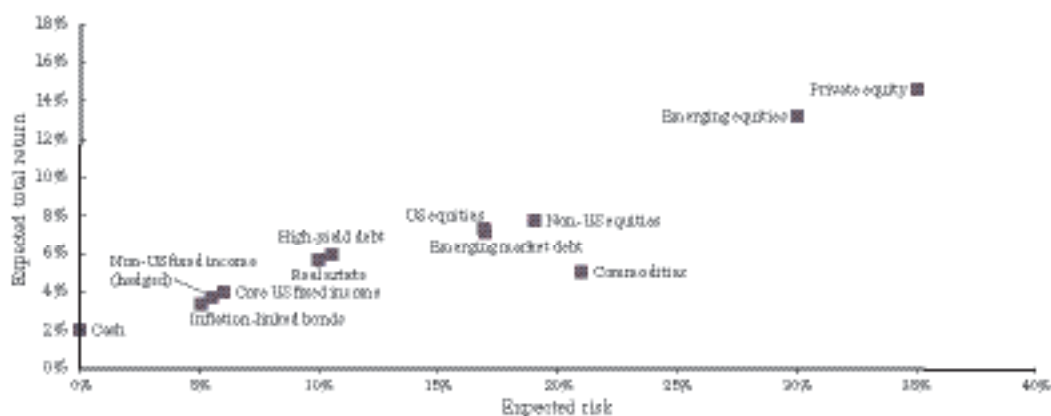
In short, the All Weather approach seeks to maximise the diversification of a portfolio by balancing the allocation of risk across structurally unrelated asset classes so that their environmental exposures offset one other, leaving the accrual of the risk premium as the dominant element of returns. This environmental balancing is the key to performing well across all environments and producing the highest risk-adjusted returns possible.

#### In practice

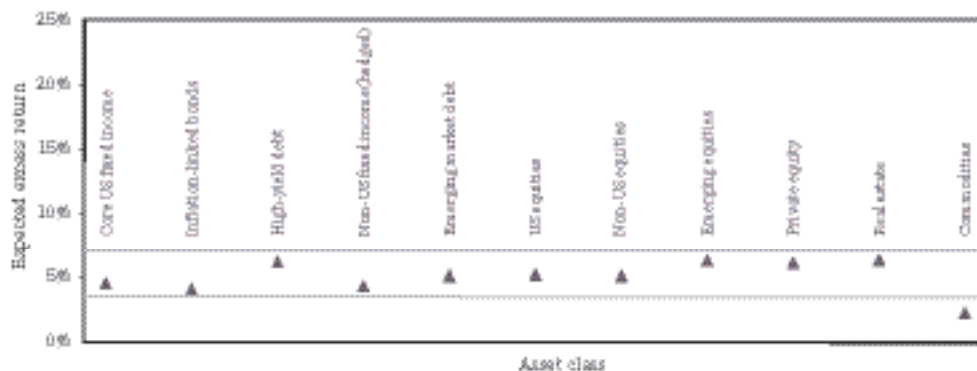
The All Weather balancing process occurs in two essential steps. First, you can increase and decrease the risk levels of all asset classes so that they have similar expected returns and risks. This provides you with many asset classes that have similar expected returns and risks. Second, you can balance these assets against one another so that the portfolio doesn't have any bias to perform well or poorly in different economic environments. This is accomplished by holding a similar risk exposure to assets that do well when (1) inflation rises, (2) inflation falls, (3) growth rises and (4) growth falls.

Because higher risk assets have higher returns and all risk assets are higher returning than cash, you can borrow or lend at the return of cash and adjust the risk of these assets to any level, and when you do, you also raise or lower their returns. Through leverage you can adjust the risk of any asset to any desired level, giving you the full range of asset choices at any level of risk. Figure 3a shows commonly held expectations of return and risk. Using these expectations, when you adjust these assets to a common risk, for example to the risk of stocks, the expected returns of the assets are all about the same, allowing you to choose among them on the basis of their diversification potential (figure 3b).

### 3a. Expected rates of return for selected asset classes



### 3b. Leverage-adjusted expected excess returns (standardised to risk level of S&P 500)



Data sources (3a and 3b): Rocaton Investment Advisors, LLC.

4. The advantage of a balanced portfolio



Source: Bridgewater Associates.

This approach can be illustrated through a simple example. Consider the case of stocks and bonds. Once you adjust bonds to have the same risk as stocks, they have had almost exactly the same returns over the past 40 years. But the asset classes made and lost money at different times. Why would you pick just one? It makes a lot more sense to have both in a balanced portfolio, and if you do, you experience returns that lie between the two. You get the same ultimate return much more smoothly.

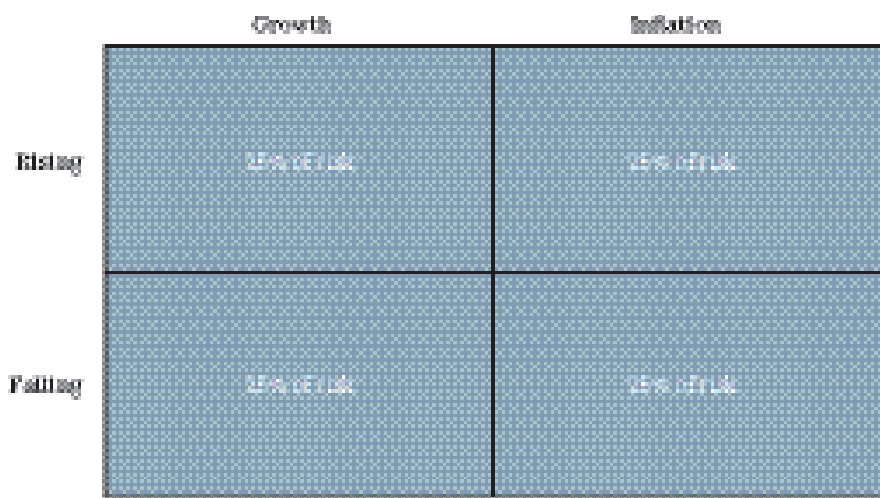
Figure 4 shows this historical picture with relevant statistics. You can see that stocks and bonds diversified one another well in relation to shifts in economic growth. Stocks made most of their money when growth conditions were good, and bonds made most of their money when growth conditions were poor.

*“Balancing equal-risk stocks and bonds achieves a more reliable return pattern than either asset alone. But because both asset classes are hurt by rising inflation, to have a more fully balanced portfolio, you need to hold assets that do well when inflation rises – such as commodities and inflation-linked bonds”*

But because they both benefited from falling inflation and were hurt by rising inflation, they both made most of their money when inflation was falling and did poorly when inflation was rising. They were not good diversifiers when changes in inflation expectations were a dominant influence.

So, balancing equal-risk stocks and bonds achieves a more reliable return pattern than either asset alone. But because both asset classes are hurt by rising inflation, to have a more fully balanced portfolio, you need to hold assets that do well when inflation rises – such as commodities and inflation-linked bonds. In order to achieve a more fully balanced portfolio, the portfolio allocates an equal amount of risk to assets that do well

5. Achieving a more fully balanced portfolio



Source: Bridgewater Associates.

when growth is strong, growth is weak, inflation is rising and inflation is falling (figure 5). And in all cases we are referring to strong or weak in relation to what is discounted in prices. This balancing of risks is where the term ‘risk parity’ comes from.

A balanced portfolio is not necessarily a low-returning portfolio. In fact, by raising the risk-adjusted returns of the portfolio you will generate higher returns at the same risk or less for the same return. Remember that a portfolio’s return will roughly equal the average of the returns of its component assets. And the return of each asset can be adjusted to any reasonable level by borrowing or lending at the risk-free rate. So a balanced portfolio can be adjusted to any level of return that an investor desires. For example, a balanced portfolio can match the expected return of a portfolio that is 100% invested in equities, but will do so at a much lower level of risk. It is useful to compare a balanced All Weather portfolio with a 100% equity portfolio because many investors believe that a portfolio that is fully invested in equities would be their highest-returning portfolio but would have too much risk.

*“A balanced portfolio is not necessarily a low-returning portfolio. In fact, by raising the risk-adjusted returns of the portfolio you will generate higher returns at the same risk or less for the same return. Remember that a portfolio’s return will roughly equal the average of the returns of its component assets”*

Figure 6a shows the cumulative return of a balanced portfolio and the cumulative return of a portfolio that is 100% invested in global equities. The balanced portfolio achieved the same return as equities with about one-third of the risk. The same returns were achieved with much smaller losing periods, and these losing periods passed relatively quickly rather



than lasting for many years. And because today's conventional institutional portfolio is heavily weighted toward equities, the diversified All Weather asset mix produced the same return as the conventional asset mix with much less risk – around half (figure 6b). As mentioned, the benefits of the higher risk-adjusted returns can be realised through a lower level of risk at the same return or a higher level of return at the same risk (figure 6c).

In order to understand how much of the potential benefits of diversification you could capture through the All Weather approach, we compared the All Weather asset allocation return with a hypothetical 'optimised portfolio' which had the benefit of perfect foreknowledge of correlations from 1970 to 2010. The historical Sharpe ratio of the All Weather asset mix was 0.7, very close to the 0.8 Sharpe ratio of the hypothetical optimised portfolio, which was achieved without making any correlation assumptions.

This indicates that nearly all of the asset class volatility and correlations over the past

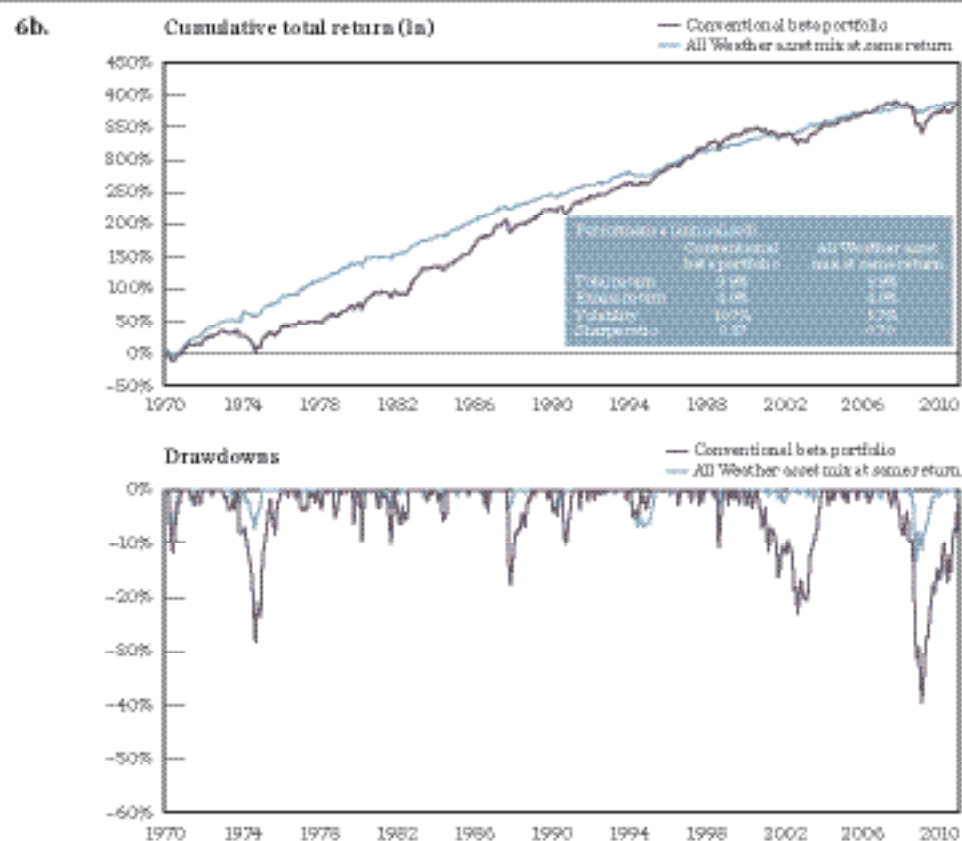
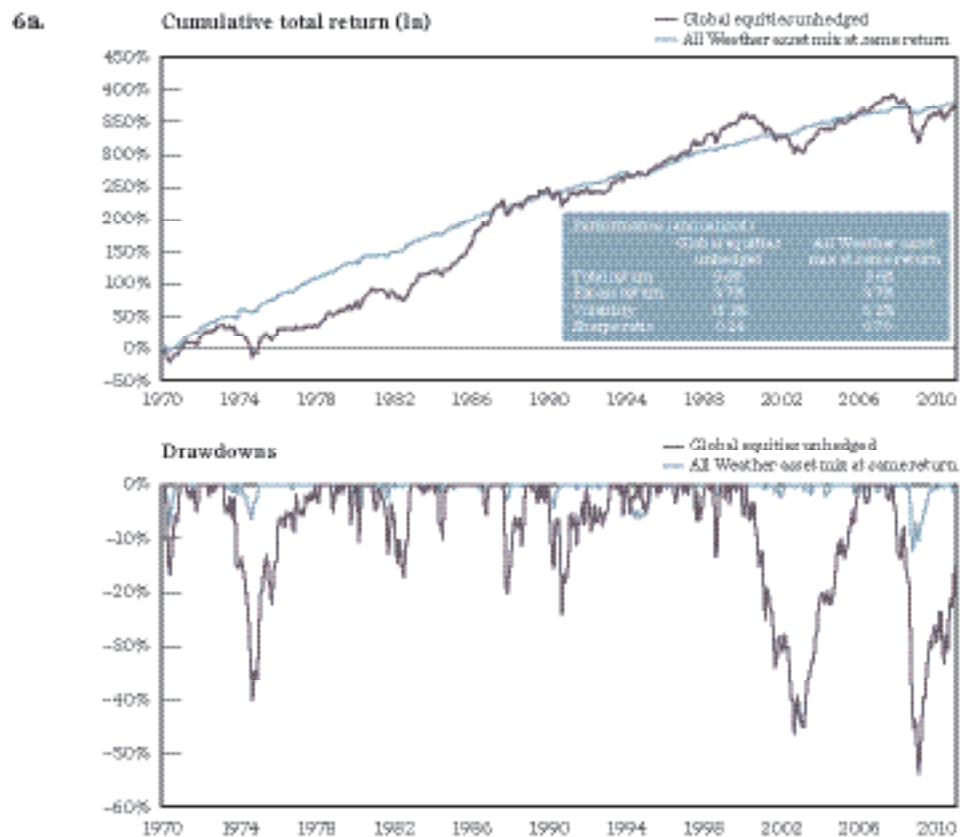
*“Longer-term risks derived from sustained shifts in the economic environment produced sustained outperformance in some assets which offset sustained underperformance in others, minimising the time span of losing periods”*

40 years were driven by shifts in economic growth and inflation, and that asset returns corresponded in a logical way to these changes. By balancing the portfolio's exposure to economic growth and inflation, it derived a diversification benefit from holding offsetting amounts of whichever assets happened to be negatively correlated without having to predict which assets those would be. And this diversification advantage was not limited to a particular time frame. Longer-term risks derived from sustained shifts in the economic environment produced sustained outperformance in some assets which offset sustained underperformance in others, minimising the time span of losing periods.

We believe that our approach to asset allocation is based on reliable fundamental truths about asset pricing and is realistically grounded in 'not knowing' what will happen. We are very pleased to see that this approach is now gaining in popularity through the growing field of risk parity. Though we are not comfortable with some approaches to risk parity (particularly those based on unreliable assumptions about the behaviour of returns), we think that the basic idea of balancing risks represented by risk parity is right. We believe that as this approach is increasingly adopted, it will have a radical, beneficial impact on institutions and the people they serve.

*Bob Prince is co-CIO and Paul Ross is senior investment associate at Bridgewater Associates. Bridgewater Associates, LP advises certain private investment funds and institutional investors only.*

## 6. Better risk-adjusted returns from a balanced portfolio



**6c. January 1970 to January 2011**

	Conventional beta portfolio	All Weather asset mix at same return	All Weather asset mix at same risk
Annualised total return	2.9%	9.0%	18.2%
Annualised excess return	4.0%	4.0%	7.2%
Annualised risk	10.7%	6.7%	10.7%
Sharpe ratio	0.87	0.70	0.68
Worst one-year return	-84.1%	-9.2%	-22.2%
Worst two-year return	-84.4%	-4.9%	-15.8%
	Mar 08 to Feb 09	Nov 07 to Oct 08	Nov 08 to Feb 09
	Nov 07 to Feb 09	Nov 06 to Oct 08	Nov 06 to Oct 08

Sources (6a, 6b and 6c): Bridgewater Associates. Data shown is net of fees total returns.

Hypothetical or simulated performance results have certain inherent limitations. Unlike an actual performance record, simulated results do not represent actual trading or the costs of managing the portfolio. Also, since the trades have not actually been executed, the results may have under or over compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown.

# Risk parity and portfolio design

Sanjoy Ghosh of PanAgora Asset Management explains how the risk parity methodology can be used to create a diversified and risk-balanced portfolio, without sacrificing returns

A well-diversified portfolio is important for proper wealth creation. A portfolio with many holdings within a single asset class, or with holdings that span multiple asset classes, is often thought to be well diversified. However, this sort of diversification is misleading. In reality, these portfolios may actually suffer from risk concentration. Often the investor may find himself exposed to risks of which he was unaware.

For example, common stock indices such as the S&P 500, published by Standard & Poor's, have sector and style risk concentration. Similarly, the S&P Goldman Sachs commodity index has risk concentration in a particular sector. This form of risk concentration reveals that widely used market indices are less diversified than previously thought. We illustrate the risk concentrations in several commonly used indices in figure 1.

To reap the true benefits of diversification, there is a need for a suite of offerings that equally balances risks across its constituents, resulting in higher risk-adjusted returns. This assertion was made, and proven, in an important paper published in *The Journal of Investment Management* in 2006 by Edward Qian, 'On the financial interpretation of risk contribution: risk budgets do add up', which noted a linkage between risk distribution and financial outcomes. Risk parity – the term was coined by Qian – is a methodology that is used to balance risk among its constituents in an optimal fashion, so as to avoid risk concentration – be it in asset class, or in a risk cluster within the asset class. Thus, the risk parity methodology offers true diversification, which is crucial in any risk or wealth management process.

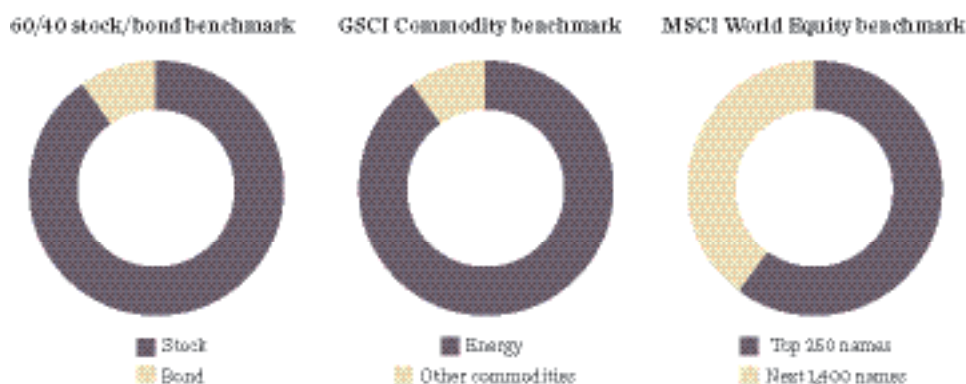
## Risk parity methodology – horizontal and vertical

The methodology behind risk parity can be applied in a multi-asset-class portfolio that



Edward Qian

## 1. Risk concentration in commonly used indices



Source: PanAgora Asset Management

has exposure to equities, bonds, commodities, alternative investments and inflation-hedging instruments. In this form of 'horizontal risk parity', we apply risk balance across several asset classes, thus ensuring there is no risk concentration within any given asset, such as equities. There are several academic and practitioner papers that explain the details as to why this methodology results in better diversification and protects the portfolio from severe losses when equity markets perform poorly. These papers argue that by leveraging up less volatile asset classes, such as bonds, risk parity results in more 'balanced' portfolios, through a reduction in equity risk concentration.

While the 60/40 stock/bond portfolio is often thought of as 'balanced', it has a significant amount of risk concentrated in equities. It fails to offer true diversification because 95% of the risk profile is from equity-like risky assets. This holds true for different measures of risk – be it standard deviation, or value at risk. Recent market events have provided further validation of the downside risk in these portfolios. Clearly there is a need for a portfolio that is 'truly' diversified.

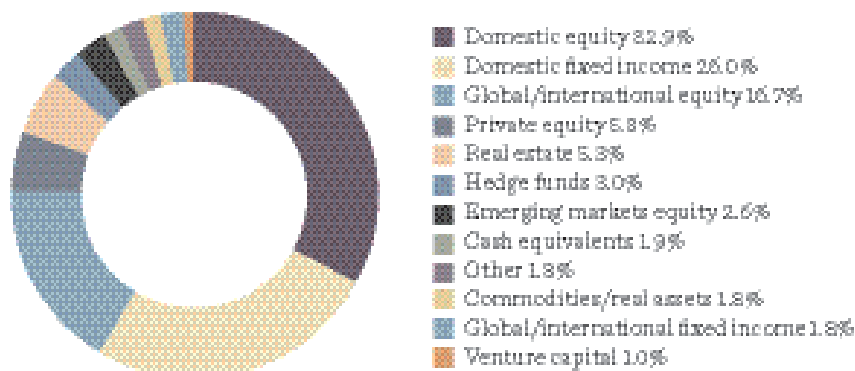
Even though typical pension fund portfolios contain several other asset classes – like real estate, hedge funds, private equity, commodities – the portfolios still have risk concentrations both across and within asset classes. Figure 2

*“Risk parity is a methodology that is used to balance risk among its constituents in an optimal fashion, so as to avoid risk concentration – be it in an asset class, or in a risk cluster within the asset class”*

shows data from the latest Asset Allocation Survey from the Council of Institutional Investors on the average asset mix of corporate, public and union pension funds.

However, there is a large disconnect between

## 2. Corporate, public and union pension funds: average asset mix



Source: US Council of Institutional Investors, Asset Allocation Survey 2010

◀ risk allocation and capital allocation, a distinction that is critical when creating a truly diversified portfolio. We see an illustration of this in figure 3, with the pie chart on the left representing capital allocation of a typical fund, where about 60% is invested in risky assets. However, this results in over 95% of the risk being allocated to risky assets. The fact that risk allocation can differ substantially from capital allocation is illustrated below.

'Horizontal' risk parity balances risk between different kinds of risk premia – equity risk

*“Investors seek compensation for taking on risk – and so, every asset class that is risky must offer some sort of risk premium. However, capturing this premium is both an art and a science”*

premia, real interest rate risk premia, and inflation risk premia. This form of risk allocation leads to better risk premium capture – this is the essence of risk parity methodology.

The risk parity methodology can also be applied in order to avoid risk concentration within a single asset class. In this form of 'vertical risk parity', risk is balanced along dimensions that are particular to that asset class. For example, applying risk parity within equities avoids risk concentration in sectors, countries, as well as individual stocks. Similarly, applying the risk parity methodology in bonds prevents risk concentration within certain segments of the credit or duration spectrums. Lastly, the application of the risk parity methodology in the commodity space reduces concentration in pro-cyclical sectors, such as energy.

### **Better 'premium capture' through risk parity**

Investors seek compensation for taking on risk – and so, every asset class that is risky must offer some sort of risk premium. However, capturing this premium is both an art and a science. We assert that the risk parity framework is a methodology that better captures associated risk premium than some commonly used alternatives.

Risk concentration is often overlooked. We illustrate the benefits of risk parity within an asset class using equities as an example. Within equities itself, there can be too much risk concentration in certain groups, or clusters. These clusters are sectors, industries, countries, regions, or even risk styles like value, momentum, beta and market capitalisation, among others.

Consider the commonly used MSCI World index. Even though this index has more than 1,500 names from over 20 countries, it is not truly diversified. The benchmark has sector and country concentration risk, as well as risk concentration in certain styles, such as size and momentum. Application of risk parity within equities can be used to balance several different types of risk concentration: factor risk, country risk, sector risk, as well as stock specific risk.

## 3. Risk allocation and capital allocation



Source: PanAgora Asset Management

Due to its weighting scheme, the capitalisation-weighted portfolio has risk concentration in stocks that have had the greatest price appreciation. This leaves the portfolio very exposed to 'bubbles'. During bubble years, the index tends to load up most heavily on the frothiest stocks. When the bubble bursts, the investor suffers badly. This popular index has risk concentration along the size spectrum. Most of the risk is concentrated in the mega-cap names, and consequently the smaller names have very little impact on actual performance. Thus, performance is being driven by few factors – clearly illustrating that there is risk concentration. The S&P 500 also suffers from risk concentration. Even though it is hugely popular and widely used since its first publication in the 1920s, it does not represent a truly diversified equity portfolio. While the perceived benefits of capitalisation weighting – minimal rebalancing requirement, high liquidity and supposed easy access to a diversified portfolio – are well

*“Consider the commonly used MSCI World index. Even though this index has more than 1,500 names from over 20 countries, it is not truly diversified. The benchmark has sector and country concentration risk, as well as risk concentration in certain styles, such as size and momentum”*

known, the inherent perils of risk concentration are often ignored.

The risk parity construct not only results in a more stable return stream (lower volatility), but also results in higher risk-adjusted returns. In practice, the risk parity methodology tends to overweight lower volatility groups that have lower inter-group correlation. Consequently, the portfolio does well in risk-averse environments. It could be argued that these environments are exactly the times when downside protection is most valuable. Risk parity is based on risk allocation, which is much more stable than capital allocation (since capitalisation weighting is driven by notoriously volatile prices).

### **Empirical robustness**

Back-tests were run using the risk parity equity construct in multiple universes to test for robustness. The back-tests were run from December 1994 to September 2010. Universes tested include regional, as well as global, stocks. Results were compared against commonly used equity indices, namely MSCI World (Global), S&P 500 (US), MSCI Japan, MSCI Europe and MSCI Emerging Markets. The gains from using risk parity were robust across all indices. Interestingly, not only did the risk parity construct lead to higher risk-adjusted returns, it actually resulted in higher raw returns.

In the risk parity construct, weightings on different groups such as sector and country are far more stable, and less exposed to bubble formation and bubble bursting, than a cap-weighted portfolio. Stability of portfolio characteristics is critical in diversifying away 'timing risk'. Investors who bought into the S&P 500 around 1999 when the dot-com bubble peaked would have paid a big premium to gain equity exposure – something that could have been avoided in the risk parity construct. Cap-weighted portfolios would have had too much risk allocated to the technology sector, which had become increasingly expensive, leaving the investor with high exposure to the internet bubble. Alternatively, the capital and risk allocation to the technology sector in the risk parity portfolio was far more stable before, during and after the bubble.

### **Risk balance results in higher risk-adjusted returns**

One reason why the balanced risk allocation approach yields higher risk-adjusted returns, is that it diversifies, to a certain extent, the risk of incorrectly timing the investments. When the components of the portfolio have similar risk-adjusted returns, then allocating risk equally across these components represents not only a balanced allocation of risk, but also an optimal one. Risk parity can be applied across asset classes, as well as within. This results in better diversification. Empirical results affirm these efficiency gains and are very robust across and within different asset classes. Thus risk parity methodology is a valuable construct that can be used to create a truly diversified and risk-balanced portfolio, without sacrificing returns.

*Sanjoy Ghosh is a director at PanAgora Asset Management.*



# Risk parity primer

Andrew J Dudley explains how Putnam's dynamically allocated risk parity approach balances risk contributions

The ultimate goal of asset allocation strategies should be to improve investment outcomes with higher returns and reduce performance volatility. In other words, asset allocation investment strategies should achieve both higher returns and a greater efficiency of returns measured as higher returns per unit of risk. At Putnam, we believe that the asset allocation investment strategy defined as risk parity can be utilised to help reach these goals. What's more, we think that actively managing allocations within the context of risk parity can achieve better return potential than a more static approach. This paper seeks to define the underpinnings of a risk parity concept relative to traditional balanced portfolios, reflects on what historical return data says about the strategy, and outlines Putnam's approach.

## What is a 'balanced' portfolio?

The purpose of traditional asset allocation is to achieve better returns with less risk by mixing asset classes with different risk premia and risk factors. Determining appropriate allocations begins with an analysis of the performance and risk derived from the raw risk premia of individual asset classes. A typical starting point for the effort to achieve portfolio 'balance,' for example, is the choice to move from a portfolio of 100% equity to a portfolio of 60% US equity and 40% US bonds in order to reduce the volatility associated with equities. Investors moving to this allocation do so with the knowledge of the trade-offs involved in trying to smooth out performance: Long-term returns will likely be lower, but an allocation to bonds will reduce the overall variability. Simply stated, because the long-term risk premium from bonds is less than equities, portfolio returns *and* variability will both decline.

We can examine the effort to find balance with a simplified example using two asset classes, stocks and bonds, as represented by US large-cap stocks and intermediate-term US Treasuries, through the prism of the past 40 years of return data. As expected, compared with a 100% equity portfolio, a 60% equity/40% bond portfolio reduces overall risk and returns (figure 1).

Next, we can examine how the move from 100% equity to a 60/40 split affects the efficiency of returns. Despite having a lower abso-

lute return, the new portfolio has an improved efficiency of returns, as measured by the Sharpe ratio, which is equal to the excess returns to a risk-free investment like Treasury bills divided by the volatility of those returns. There are two reasons for this outcome. During this period, bonds had a higher Sharpe ratio than stocks and so, all else being equal, the allocation to bonds produces a higher combined efficiency. But even if the Sharpe ratios of stocks and bonds had been the same, the low correlation between these asset classes created a diversification benefit that also contributed to the portfolio's improved efficiency.

It is important to recognise that these factors alone do not fully explain portfolio risk. Investors should also consider the composition

*"Even at a 60% weight, more than 90% of the contribution to variability still comes from the equity portion of the portfolio. In short, while the 60/40 allocations reduced total risk, the risk contribution is still concentrated in equities. By this measure, risk has not been 'balanced' at all."*

of portfolio risk, which is the breakdown in the sources of total risk. Defining risk in terms of its composition of variability reveals that the 60/40 portfolio actually behaves very similar to the all-equity portfolio. Namely, even at a 60% weight, more than 90% of the contribution to variability still comes from the equity portion of the portfolio. In short, while the 60/40 allocations reduced total risk, the risk contribution is still concentrated in equities. By this measure, risk has not been 'balanced' at all.

## Investors need to consider risk contributions

The first major step in moving from traditional asset allocation towards a risk parity strategy is

to re-define the allocation decision with a new metric. Instead of making portfolio allocations by percentage of capital, the investor calibrates the allocation in terms of contribution to portfolio risk. Although one can question the reliability of prospective asset class risk estimations, investors can still utilise the historical data as an initial guide.

What we find is that, in our simple example with two asset classes, reducing the equity risk contribution to 50% of the total during the past 40 years would have required a 25% stock/75% bond allocation.

Why choose a 50% equity risk contribution in this two-asset-class example? After all, in this particular 40-year period, bonds had a better Sharpe ratio than stocks (0.41 versus 0.34). If efficiency were the only consideration, it would argue in favour of allocating more of the risk contribution to bonds. The reason for 50/50 risk contributions is that the past 40 years might not be a representative period. In the fullness of time, we are not confident that bonds inherently are more efficient return instruments. We believe it is just as likely that Sharpe ratios are more similar across asset classes over long periods of time than structurally different. In other words, it is better to balance risk contributions than to concentrate them.

Establishing risk contributions with an approximately equal balance between stocks and bonds also further improves the efficiency of returns relative to both the all-equity and the traditional balanced portfolios (figure 1). However, despite (or perhaps because of) the effort to balance risk contributions, this allocation still puts us at a lower expected return point. How can we make up the return difference?

## Leverage required

The next step in building a risk parity strategy is allowing the use of a modest amount of leverage. Using leverage creates 'equity-like' alternatives to our equity exposure. Leverage allows the investor to generate greater performance from the balance of risk contributions in a way that either targets a specific return (if one has a view of prospective risk premiums) or a specific overall risk point (using historical risk estimates as a guide). In our simple two-asset case, if we substitute a greater proportion of bond risk for equity risk, it will require a greater US dollar exposure to bonds. With leverage, investors are not required to give up the potential return of the equity exposure when allocating to an asset class with lower absolute returns and lower volatility.

As an example, we can return to our original traditional balanced 60/40 portfolio to obtain our desired risk level. We then analyse performance data of the past 40 years to estimate the leverage necessary to build a risk parity portfolio with the same risk level. The result shows that the appropriate portfolio allocation is 42.5% stock/127.5% bonds, and would involve using a reasonably modest amount of leverage of 1.7x. With these parameters, we can build a portfolio that has the same overall risk as the 60/40 portfolio, but has a better return profile. We can also maintain the better Sharpe ratio

## 1. Comparison of portfolio attributes based on performance from 31 January 1970 to 31 December 2010

	100% US large cap equities	100% US government IT bonds	60% stocks/40% bonds	25% stocks/75% bonds	42.5% stocks/127.5% bonds	Policy portfolio
Excess return	5.34%	2.11%	4.05%	2.92%	4.96%	4.31%
Volatility	15.83%	5.15%	9.99%	5.90%	9.98%	7.60%
Sharpe ratio	0.34	0.41	0.40	0.49	0.50	0.57
Equity contribution to risk	100.0%	0.0%	93.1%	51.0%	51.0%	na
Bond contribution to risk	0.0%	100.0%	6.9%	49.0%	49.0%	na
Correlation with equities	1.00	0.14	0.98	0.76	0.76	0.57
Correlation with bonds	0.14	1.00	0.34	0.75	0.74	0.51

Source: Putnam. Data based on performance from 31 January 1970 to 31 December 2010. Stocks are represented by the S&P 500 Total Return index prior to 1979, and Russell 1000 index Total Return thereafter. Bonds are represented by the Ibbotson US Intermediate Term Government Bonds Total Return index prior to 1990, and Barclays Capital US Treasury: Intermediate Total Return index thereafter.

when moving from the unlevered portfolio to the levered portfolio.

### Other asset classes/risk factors

Of course, in the full application of risk parity, we draw from a broader set of asset classes. The full menu of options is more substantial and more diverse than our simple two-asset example. It includes foreign equity and debt markets, credit-sensitive assets, and inflation protection – or real return – assets. Adding these exposures creates further potential benefits from diversification across a larger set of less correlated choices. Incorporating these markets in a way that both accounts for their risk overlap and makes use of their differences can contribute additional return efficiency beyond the benefits of risk parity.

### The Putnam Policy Portfolio

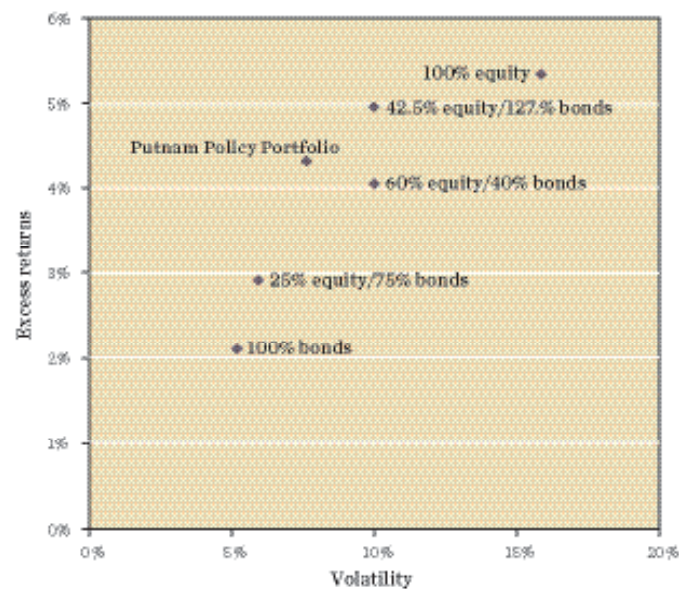
The outcome of this analysis is the Putnam Policy Portfolio, which defines the starting point for our risk parity strategy. Generally speaking, the Policy Portfolio maintains a balance in the risk contributions from equities versus the three other major risk factors: interest rate-sensitive fixed income, credit and inflation protection. The portfolio employs 1.5-to-1.0 (50%) leverage, which is slightly below the level suggested by the dual-asset example. This more conservative stance acknowledges the potential concern around dependence on significant leverage in the long term. The allocations lean in favour of asset classes that have performed strongly in periods of economic prosperity while reducing the overwhelming dependence on equities that characterises traditional balanced portfolios. Comparing the Policy Portfolio with the previous alternatives, we see a return profile that is better than the 60/40 portfolio, at a risk point that is lower than the traditional 60/40 balanced portfolio. Most importantly, it carries the highest Sharpe ratio of the portfolios considered.

### Dynamic allocation is essential

However, Putnam's investment process does not stop at the allocations and leverage points of the Policy Portfolio. We do not pretend that a set of returns from any arbitrarily chosen historical period necessarily provides an accurate measure of either expected risk premiums for specific asset classes or their future risk profiles. Stated a different way, we believe that a static application of a risk parity portfolio strategy that has performed well historically would be dangerous. Instead, we believe that ongoing management and dynamic asset allocation is necessary. We regard risk parity as an active and flexible process that must incorporate shorter-term valuation measures and dynamic estimates of statistical relationships used to adjust allocations towards more attractive exposures. As mentioned, we explore these and other issues in a separate paper titled 'Risk disparity'.

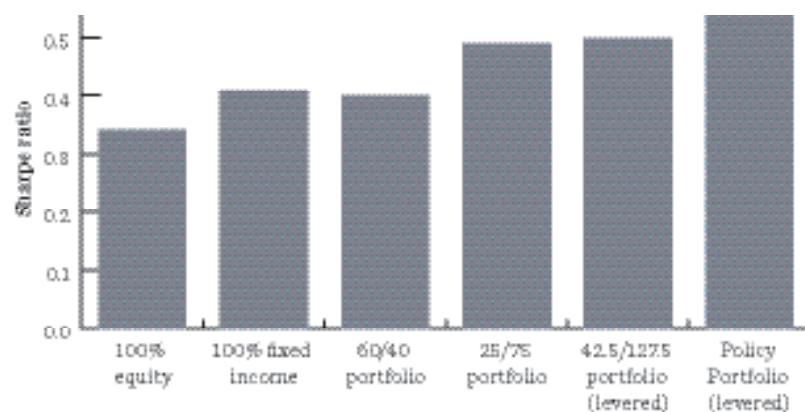
There are operational considerations in the application of a risk parity strategy as well. The use of leverage raises the question of how to achieve market exposures in a way that balances the risks of leverage and the need for portfolio liquidity. We find that over-the-counter and exchange-traded index derivatives have evolved to become a liquid investment option for taking market risk. More than that, they have greatly simplified the task of achieving modest leverage. These derivatives have dramatically reduced the challenges of achieving leverage through traditional borrowing and lines of credit, which can come with unwanted risks. Although index derivatives do not entirely eliminate these con-

## 2. Leverage can enhance the trade-off between return and volatility



Source: Putnam. Data based on performance from 31 January 1970 to 31 December 2010. Stocks are represented by the S&P 500 Total Return index prior to 1979, and Russell 1000 index Total Return thereafter. Bonds are represented by the Ibbotson US Intermediate Term Government Bonds Total Return index prior to 1990, and Barclays Capital US Treasury: Intermediate Total Return index thereafter.

## 3. Putnam's Policy Portfolio has the highest Sharpe ratio



Source: Putnam. Data based on performance from 31 January 1970 to 31 December 2010. Stocks are represented by the S&P 500 Total Return index prior to 1979, and Russell 1000 index Total Return thereafter. Bonds are represented by the Ibbotson US Intermediate Term Government Bonds Total Return index prior to 1990, and Barclays Capital US Treasury: Intermediate Total Return index thereafter.

cerns, the year 2008 was an interesting test for these instruments and for their application in a risk parity strategy. Many 'unfunded' derivative instruments, somewhat ironically, traded in a more liquid fashion than their cash market counterparts during the credit crisis and provided sufficient market depth during that challenging period. We are comfortable that such market instruments can provide substantial liquidity to the Policy Portfolio and make risk parity strategies a strong potential complement to other less liquid 'alternative beta' strategies. We intend to explore this and other issues in a forthcoming paper appraising the advantages and limitations of leverage and derivatives.

### The continuing debate

Despite the successes of risk parity strategies, an industry dialogue continues in an effort to understand this success and the outlook for the strategy in changing market conditions. After all, strategies that allocated more to fixed income and other non-equity risk factors during the past 10 years – the 'lost decade' for equities – might not find the coming decade to be nearly so friendly.

We offer the following observations. First, there can be environments when risk parity

strategies underperform – most notably, when equities outperform in a risk-adjusted fashion over other classes for a sustained period. As they did during the late 1990s, risk parity strategies as currently constituted would be hard pressed to keep pace. Second, we question the confidence that a number of practitioners place in the stability of risk premiums and risk factors over all time periods. From this confidence comes a commitment to more static allocations that equally weight three to four risk factors, and requires a higher degree of leverage, as much as 3x. We do not see a strong basis in evidence either for these equal weightings or for this consistent use of a higher level of leverage. We prefer a more flexible approach.

We see stronger evidence for approaching risk parity as an active and flexible process incorporating shorter-term valuation measures and analysis of dynamic statistical relationships. At Putnam, we try to strike the right balance in our design between exposure to equity risk, leverage, and the operational considerations of the strategy.

*Andrew J Dudley is an investment director for Putnam Investments' Global Asset Allocation team.*



# Taking risk parity a step further

Wegelin & Co's Oldrik Verloop and Frank Haeusler show how incorporating active tail-risk management in the portfolio construction process can help prevent painful surprises

The past decade, as many investors know so well, has been very much a roller-coaster ride – a lot of ups and downs arriving back close to where we started. A cursory look at the quarterly returns of the main asset classes for Dutch pension funds from 2007–10 confirms such a ride, with equity returns fluctuating between –22.7% and +16.3%. Fixed income capital allocations were on average higher than equities, yet the variability of returns to equities was far more pronounced, as can be seen in figure 1. The risk contribution, however, appears to be heavily skewed towards equities, despite the capital allocation being diversified across different asset classes.

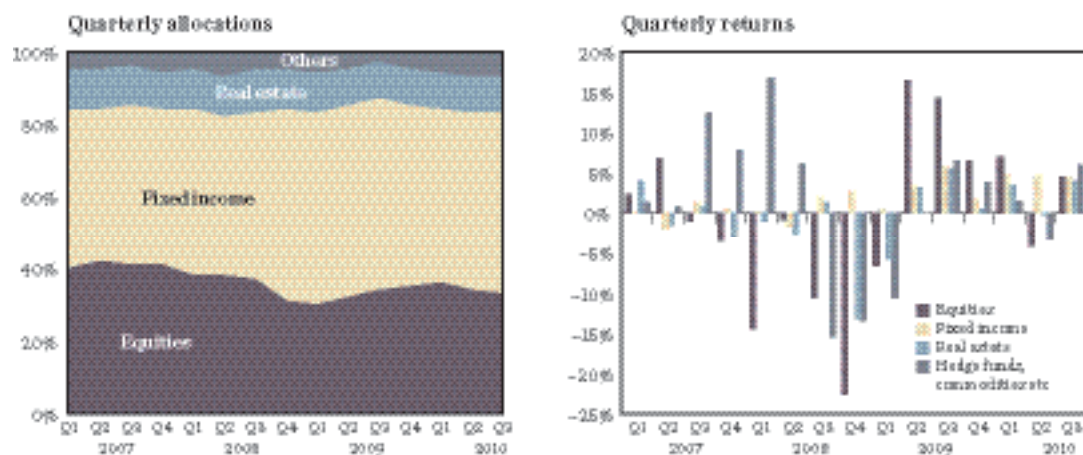
Across the globe, the investment management industry and investors are starting to acknowledge this dilemma and a new breed of asset allocation is emerging, namely risk parity.

Back in the 1980s, investors constructed their balanced portfolios from a simple mix of large cap equities and government bonds, with a prevailing home bias. During the 1990s, investors acknowledged the potential weaknesses of this approach and took diversification one step further as new investment classes such as commodities, real estate and private equity became more accessible. Additionally, diversification came not only from incorporating new investment ideas, but also from increasing the global reach of the investments. Endowment funds like that for Yale University became pioneers of such techniques.

Many of these US endowments gained worldwide recognition as they survived the 2000–03 bear market unscathed. The results were not repeated during the recent credit crisis. Despite the additional diversification, virtues such as liquidity and transparency are also highly prized.

Considering the strong influence of the equity exposure on traditional asset allocation portfolios and the liquidity constraints of several alternative investments, the question arises: how can one sensibly exploit the merits of diversification to make the roller-coaster ride a little more palatable?

## 1. Asset allocation and returns of Dutch pension funds 2007–10



Source: DNB Statistical Bulletin.

### The risk parity approach

Risk parity, or the so-called equal contribution to risk approach, is based on weighting risk, not capital. This is achieved by reducing the exposure to riskier asset classes (such as equities and commodities) and increasing exposure to less risky asset classes (such as bonds) so that each asset class has a similar risk impact on the portfolio. In a portfolio of four asset classes, each asset class should contribute 25% of the risk of the total portfolio. Risk can be expressed using different measures and therefore risk parity can be achieved according to different risk metrics, such as volatility, value at risk or others.

One issue with this approach is that when risk parity is achieved, low-volatility/low-returning assets dominate the portfolio. This often leads to expected growth that is below the minimum acceptable return. By introducing leverage into the portfolio, this 'return gap' can be filled without upsetting the risk/return relationship of the new equal risk-weighted portfolio. Invariably, this involves leveraging lower volatility assets.

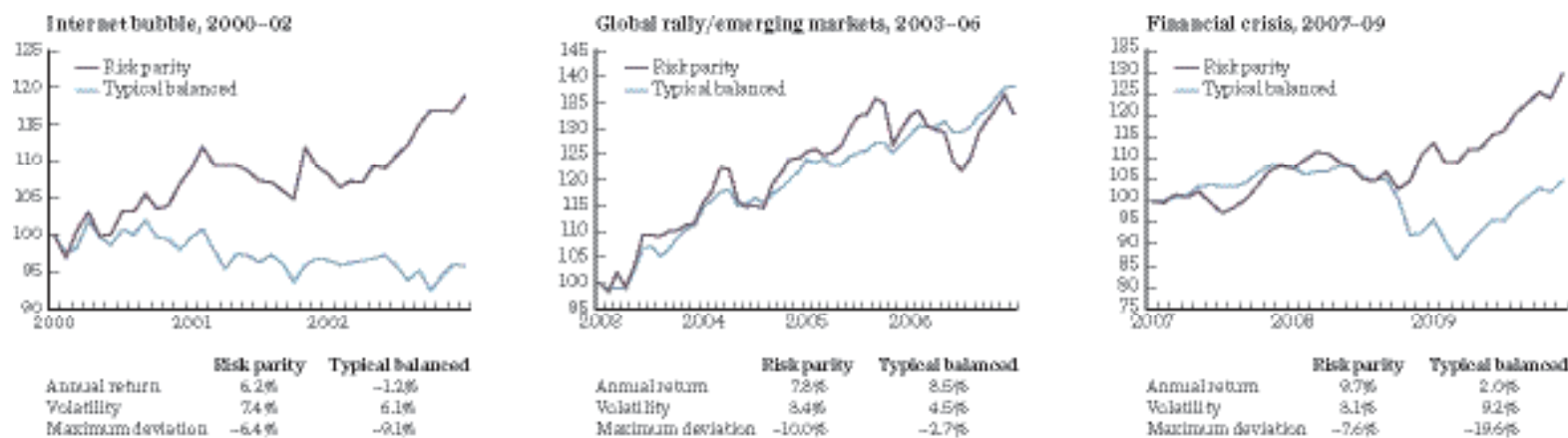
The risks of asset classes and instruments also change, resulting in the need for portfolio rebalancing on a higher frequency than traditional investments (such as traditional balanced type of portfolios). Consequently, the liquidity of the chosen instruments becomes an important consideration.

### Merits of a risk parity approach

With risk parity investing, no single asset class dominates the portfolio. Consequently, large drawdowns often associated with capital-weighted portfolios are significantly reduced. Return patterns are stabilised, giving investors a steady return series within a risk-controlled environment.

The three charts in figure 2 depict the behaviour of a traditional portfolio allocating 60% to bonds and 40% to equities, versus a portfolio setting the portfolio weights using a risk parity approach. In both bear markets, the risk parity approach had significantly lower drawdowns than the traditional portfolio, especially when measured relative to the achieved return.

## 2. Wegelin risk parity approach compared to typical balanced approach: 60% world government bonds (SBWGU) euro/40% MSCI World (NDDUWI) euro hedged



Source: Wegelin & Co.



During the 2003–06 market rally, a risk parity approach was able to participate in the upward trending market. However, in a strong equity bull market, the realised total risk of a risk parity portfolio can exceed the risk of a typical balanced portfolio and does not necessarily achieve superior returns.

### Risk diversification is not enough

When the risks of asset classes themselves change, they can do so quite dramatically – these are the so-called ‘fat-tail events’. Tail risk is often underestimated and can result in large and frequent drawdowns and significant portfolio losses. Wegelin Asset Management takes the risk parity approach one step further and uses a unique multi-dimensional tail-risk management engine. Due to the complex nature of tail risk, the engine uses multiple risk indicators such as volatility, correlation,

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value at risk, skewness and kurtosis, as well as proprietary risk measures, and aggregates them into a single additional risk indicator. The tail-risk engine then adjusts the risk parity allocation, if necessary, to reduce further the probability of significant drawdowns.

In most market environments the tail-risk engine has little impact. But in more turbulent conditions, it can make a considerable difference. A recent example in the bond market is illustrated in figure 3. Investors fled the German Bund in 2010, putting pressure on the 10-year Bund price.

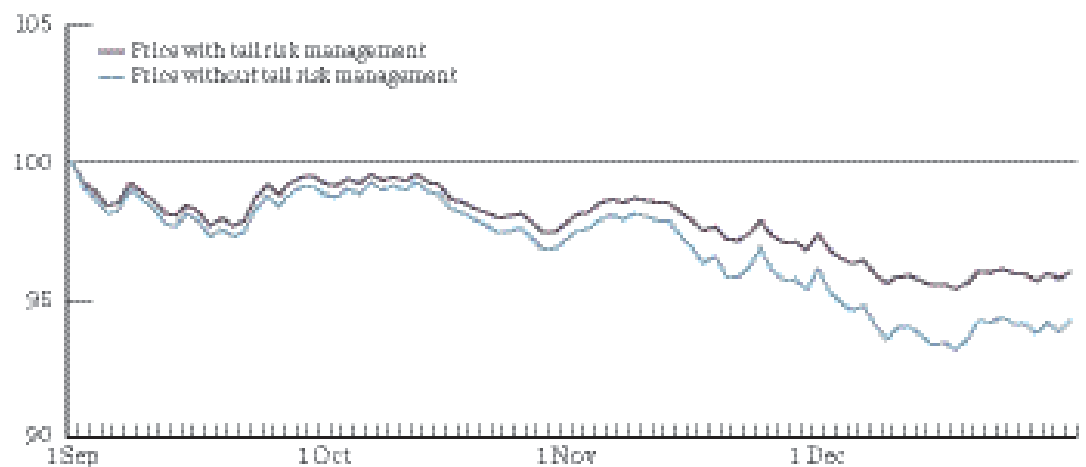
The distribution of daily returns from 2001–10 for the Wegelin risk parity approach is compared with a traditional 60/40 bond/equity portfolio in figure 4. For comparison purposes, the returns are scaled in such a way that both approaches have the same return over the given period. The returns of Wegelin’s approach are mostly found around the mean and are much more concentrated than the traditional ‘balanced’ portfolio. The advantage of a risk parity approach with active tail-risk management is that investors make small and mostly positive returns, while minimising the extreme negative (left fat tail) events.

### Drawbacks of a risk parity approach

A risk parity approach manages and controls the absolute risk of a portfolio. It does not, unfortunately, control the absolute returns – that would be the Holy Grail! Many risk parity approaches are long-only strategies and if several asset classes and underlying instruments exhibit negative performance at the same time, a long-only strategy will not be able to counter market forces. However, by including tail-risk management, it is expected to reduce drawdowns significantly.

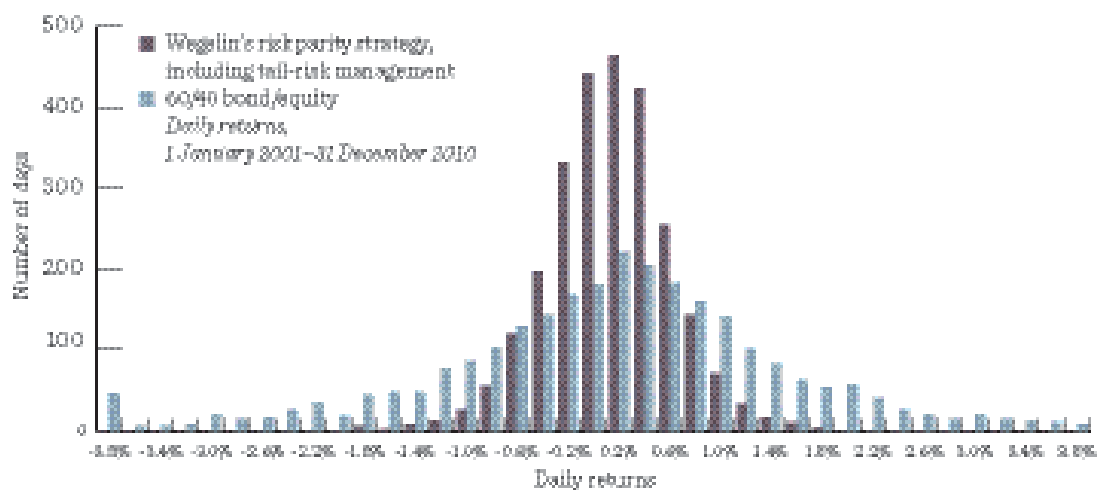
Another component that has been criticised is the use of leverage. Many risk parity strate-

### 3. The advantage of active tail-risk management on a 10-year German Bund future exposure from September–December 2010



Source: Wegelin & Co.

### 4. Daily returns of Wegelin risk parity strategy versus balanced 60/40 bond/equity portfolio, 2001–10



Source: Wegelin & Co.

gies are implemented with futures, whereby the leverage is solely used to increase the notional leverage of the exposure – in other words, it is not used as a return driver or for lending. The leverage depends on the risk appetite only and is scalable.

The current low bond yield and possible looming inflation environment both pose additional challenges. History (extensive back-testing and theory) has taught us that risk parity profits from the long-term risk premia in asset classes. As long as the limited upside potential in the fixed income market is compensated by other asset classes such as equities or commodities, low bond yields or inflation do not automatically mean losses. However, if we are heading for stagflation, risk parity strategies will face difficult times.

### Conclusion

Asset allocation methodologies continue to evolve. For many years the cornerstone of asset allocation was diversifying across different asset classes according to capital. Risk parity turns that concept on its head with risk alloca-

tion now driving capital allocation.

Pension funds are long-term investors and are able to absorb market turbulence more than most. However, they too are becoming more interested in how they can better manage their way through periods of extreme price volatility. Risk parity offers a new way to engineer better risk/return trade-offs, better manage downside risk and take advantage of traditional asset classes in a non-traditional way. By reducing the risk concentration away from any single asset class, both the level and the consistency of returns should improve.

Furthermore, to answer certain criticisms of risk parity – uncontrolled leverage, extreme left tail events, and so on – it is vital to incorporate active tail-risk management in the portfolio construction process to capture those unwanted and painful surprises.

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# Case study: Alaska Permanent

When the Alaska Permanent Fund revamped its asset allocation, two risk parity specialists were among the managers selected for the new strategy. Stephanie Schwartz reports

Risk parity principles have influenced the way the Alaska Permanent Fund thinks about investing. While it does not manage its fund completely along risk parity lines, its investment framework groups investment types by their risk and return profiles in order to devise asset allocation targets.

This change was initiated by Jeff Scott, who became CIO of the fund in 2008. Scott's background was in the private sector, with time spent managing an absolute return portfolio at Microsoft, as well as at a hedge fund and as a consultant.

"When I started at the Alaska Permanent Fund two and a half years ago, the focus on risk was predominantly about dollar allocations and manager allocations, compared to the multitude of risks monitored at prior employers," said Scott. "The asset allocation was designed via the Markowitz mean variance optimisation model. Given the assumptions and instability in returns and correlations, the model is not really practical, but that's what the public space is using. I wonder if Warren Buffett or George Soros are using the Markowitz model?"

*"The trustees are asking more questions, questions that are actually getting to the point, which are focused on the big picture of risk and asset allocation"*

To change the fund's approach, Scott had to educate the fund's staff and its trustees on alternative approaches to asset allocation and risk management. "I was just one voice, and I needed to recruit other voices," he said. To do this, he used the concept of the "external CIO" and, with consultant Callan Associates, eventually narrowed his choices down to a field of five: Bridgewater and AQR, which both offer risk parity investment management, PIMCO, Goldman Sachs and GMO.

"I looked for leading-edge, thought-provoking fund managers, which were recognised in the industry," explained Scott. "I also looked at all the 'endowment in a box' models."

Each firm was given \$500m (€360m) to manage, with only a few stipulations. The goal is to protect the principal and produce a 5% real return, with a few broad constraints: they cannot have more than 120% additional risk than the internal risk benchmark; the tail risk cannot be greater than 30%; they cannot put the funds into private assets, such as timber, real estate or private equity; and there can be no lockup greater than two years.

These fund managers all have different strengths. And even though both Bridgewater and AQR are both risk parity managers, they take different approaches.

Bridgewater bases its risk parity strategy on

economic conditions, looking at which assets will do well with economic growth, with a falling economy, in an inflationary environment and under deflation. The firm assigns assets to each of these buckets, then equal-weights them for volatility based on a proprietary process. The firm manages around 73% of the Alaska allocation according to this 'All Weather' strategy and the balance according to its 'Pure Alpha' strategy.

AQR, on the other hand, identifies several basic risk factors that can drive returns, such as interest rates, credit, equities, and inflation and balances its portfolio based on these risk factors. Around 60% of the Alaska fund allocation is under risk parity management; around 30% is in a delta fund, which follows traditional hedge fund strategies, and around 10% is in a pure alpha fund.

Both Bridgewater and AQR outperformed the 60/40 benchmark in 2010, giving +20% returns, putting paid to the thinking that risk parity does not perform well in strong equity markets.

In addition to managing the money, Scott was looking for a great deal of interaction between the Alaska Permanent staff and trustees and the external managers. There are, at minimum, weekly reports, monthly calls and annual attendance at one board meeting, at which the fund managers speak about asset allocation and risk. "This arrangement has worked better than expected," explained Scott. "It has resulted in a changing dynamic at board meetings. The trustees are asking more questions, questions that are actually getting to the point, which are focused on the big picture of risk and asset allocation." In Scott's view, "it is a testament to the drive and willingness of the board that we were able to change our culture and way of thinking about risk and asset allocation."

While there are plans to increase the allocations to the external CIOs, the bulk of the fund – 87% – is still in the basic building blocks. The Alaska Permanent Fund had \$39.5bn under management at the end of January 2011. Of this around \$3bn is managed as part of the Real Return/External CIO programme, with the bulk of assets in equities (around \$19.6bn) and bonds (some \$7bn). Real estate, cash and alternatives make up the balance.

"The trustees are now concerned with governance policy, risk management, and broad asset allocation," said Scott. "The trustees, as a group, may not have the background for picking managers or markets. However, what they do have is the trust of their constituents and the skill to build a sound governance policy."

Since 2009, the fund's target allocations are defined not by asset class but by a risk parity type of approach, grouping them "by their risk and return profiles, and by the market condition or liability that each group is intended to address," according to fund information. For example, the fund aims for 'company exposure' of 53%, made up of equities, corporate investment grade and high



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Jeff Scott

yield bonds, bank loans and private equity. These are investments that perform well during periods of economic growth. This strategic allocation results in an equities target of 36%, a bonds target of 23%, and a private equity target of 6%.

"The trustees are now at the point where they want to enhance the risk symmetry in the portfolio," said Scott. "If you have fear of regret, an equity bull market is hard to stomach. If you have a fear of losing money, risk parity may be what you are looking for," said Scott.

"However, given Alaska Permanent's 5% real return objective and public operating environment, we will continue to have a significant allocation toward the equity risk premium," pointed out Scott. That said, the fund has no intention to transition to a 100% risk parity approach. "I like the combination of what our managers bring to the table," he noted.

The experience of the Alaska Permanent Fund has a lot of relevance to other public funds, even though it operates under different constraints. It is more like a sovereign wealth fund than a pension fund: its annual payouts are determined based on the return the fund has achieved and as such it does not have to manage assets relative to liabilities or manage to a dividend.

Scott likens the way majority of public funds stick to a 60/40 asset allocation to buffalo running in a herd. "It is much easier to run with the herd – in the middle, it is very warm. And it is still easier to run on the edge than it is to go outside the herd," he says.

Scott also stresses the importance of the CIO and other investment staff and the trustees working as a team. "It is clearly an education process. Trustees have to re-focus on how much risk to undertake and how you will structure that risk, along with a prudent governance policy," Scott said. "I am not trying to fight yesterday's battles, but many public funds were too focused on picking managers rather than focusing on the tougher issues of risk allocation and governance."





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