Rethinking the Asset Allocation Approach for Plan Sponsors

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Abstract

Most plan sponsors formulate a single long term asset allocation for their assets, and then spend a great deal of effort to select a number of active managers within each silo of asset class or style. This process, they hope, combines their top down asset class return expectations (beta) with alpha from a diversified set of external active managers.

This structure however ignores the fact that the single most important decision responsible for the risk and performance of the plan is the asset allocation decision, which remains as an undiversified single decision, is in many cases outsourced or done with minimal internal resources, and is the primary cause of many plans having funding gaps.

We argue that the traditional plan sponsor asset allocation process needs to be redesigned, with the maximum amount of effort being directed to this compared to other activities. This paper proposes that a multi-strategy structure should be implemented for plan sponsor asset allocation, using a range of approaches. Different views and methodologies will therefore reduce the plan's exposure to a single point of failure, and provide diversification where it's needed most.

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Rethinking the Asset Allocation Approach for Plan Sponsors

1 Introduction

In large-scale asset management organizations, the asset allocation decision is undoubtedly of fundamental importance. In one of the asset management industries' most influential articles Brinson, Hood and Beebower (1986) find that "Asset allocation explains on average 93.6% of the variation in total plan return." It is difficult to refute the simple mathematics underlying this finding. A typical 60/40 allocation to equity and fixed income results in a volatility of around 10%. Moreover, a common active management policy is to allocate a 3% tracking error limit for the asset manager. These two assumptions alone are sufficient to arrive at a variance contribution of the asset allocation decision in excess of 90%.

It is notable that in spite of its significance for total fund returns, the high level asset allocation is often managed with less rigor in plan sponsors than the active management part. Greater effort is devoted to diversifying the set of active portfolio managers, often hiring multiple managers within the same area, and well-formulated routines typically exist for evaluating and handling candidate investment processes.

This disproportionate attention to active management could be motivated if the asset allocation decision was a clear given, and had been 'solved' with near certainty for a given plan sponsor. However, experience over the last few decades with results of plan sponsors is proof to the contrary. The funding gaps which exist today in most plan sponsor organizations, can be traced back to poor asset allocation decisions in general.

Secondly, there are findings on asset allocation which in recent years have received recognition as possible alternatives. For instance, risk parity has been proposed as an alternative method for balancing between equities and fixed income. Also, within both equities and fixed income there are alternative ways for constructing the benchmarks, e.g. constructing country weights by GDP rather than market capitalization. Within equities there are also benchmarks allocating higher weight to stocks with low volatility.

Amid this richness in views on asset allocation, the asset base of plan sponsors has experienced significant variability over the past decade. This has spurred an increased focus on risk management, including a demanding growth in regulatory reporting. However, it is not difficult to argue that focus should also be directed towards the plan sponsor asset allocation decision, since this is where the investment risk originates. The plan sponsor is in the unique position to provide for an environment where an efficient asset allocation can take place, and is ultimately the one responsible for keeping the asset allocation well informed and efficiently implemented. In this paper we present a view on how such an asset allocation organization might be designed.

The remainder of the document is organized as follows. Section 2 defines the asset allocation problem specific for our study. This section also discusses some recurrent issues with regards to asset allocation – market timing, allocation to alpha and diversification.

Section 3 is devoted to the proposed asset allocation framework. Starting with a review of the traditional asset allocation process, and we follow up with some approaches to asset allocation which have appeared in the industry in recent years. With this as background the multi-strategy asset allocation design is then presented in Section 3.3, leaving the remainder of the section to diversification and risk management in the proposed structure as well as some notes on total performance. The document in then concluded in Section 4.

2 The Asset Allocation Problem

As base case for the study we assume that we are creating the asset allocation for a large typical plan sponsor with the following characteristics.

- An asset base of USD 100bn.
- A requirement that with 90% confidence level the maximum drawdown should not exceed 10% within a year.
- The objective of maximizing capital appreciation, with the highest efficiency.

2.1 The Asset Classes

We assume that allocation is possible over the eight major asset classes as presented in Table 1. To facilitate time series analysis the list currently excludes illiquid assets such as real estate, venture capital, private equity, infrastructure and real assets. At the moment oil and bulk commodities are also left out. These can be built in later as the framework is developed.

A point to notice in Table 1 is that the maximum drawdown of most asset classes exceeds the 10% threshold by far, the exception being global sovereigns. With the additional consideration that at the time of writing sovereign yields in developed markets are at historically low levels, an allocation solely based on sovereigns does not look attractive.

Table 1 also includes a statistic on the 10% maximum drawdown Value at Risk. This is the 10% quantile for the maximum drawdown over a one-year horizon using monthly returns, which aligns the risk measure with the investment risk constraint defined earlier. The numbers are calculated by stochastic simulations using the historical mean and volatility estimates. Note that these numbers also exceed the 10% constraint in most cases.

The question is then how to allocate across these asset classes, while maintaining the constraints. Most asset allocators believe that that they have some foresight into the short term expected return of asset classes, and hence believe that by taking an active decision to allocate across the 8 asset classes, the resultant portfolio is diversified, and incorporates a tilt towards the asset classes with the expected returns. We will leave this assumption aside for a minute, and look at the second foundation of this philosophy - the presumption that by allocating across these 8 asset classes we get a diversified portfolio.

2.2 The Presumption of Diversification

Figure 1 gives the performance of the eight asset classes of the previous section. Also included are two composite portfolios – firstly, a perfect foresight portfolio, constructed as equally weighted in the top two performers over the subsequent year, annually rebalanced; and secondly an equal weighted portfolio of all asset classes, signifying a zero skill asset allocation process. We will refer to these in a later section.

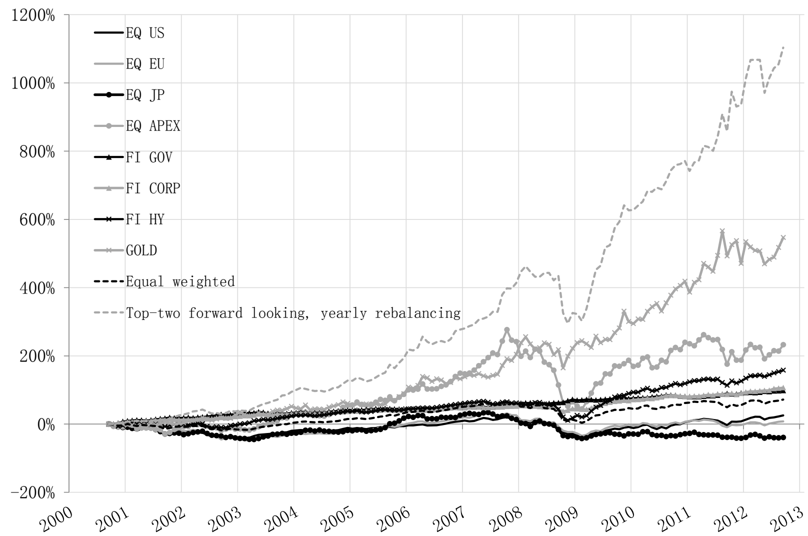

Figure 1: Performance of the eight asset classes defined in Table 1. Also included are the equally weighted portfolio and the portfolio equally weighted in the top two performing indices over the subsequent year, rebalanced end of September each year.

Figure 2a shows rolling correlations of the four equity asset classes and hi-yield (which bears characteristics similar to equity in the capital structure). The correlation matrix over the period is shown in Table 3. At the end of the sample period, with the exception of Japan, all correlations are above 75%, at which level the scope for diversification is considerably reduced. This is not to say that equity allocation is irrelevant, and indeed a portfolio should be well diversified to be efficient, but these correlation levels show that when allocating to equities, we are basically taking a bet on global equity markets as a single factor. Among the four equity indices the first principal component accounts for 80% of total variance.

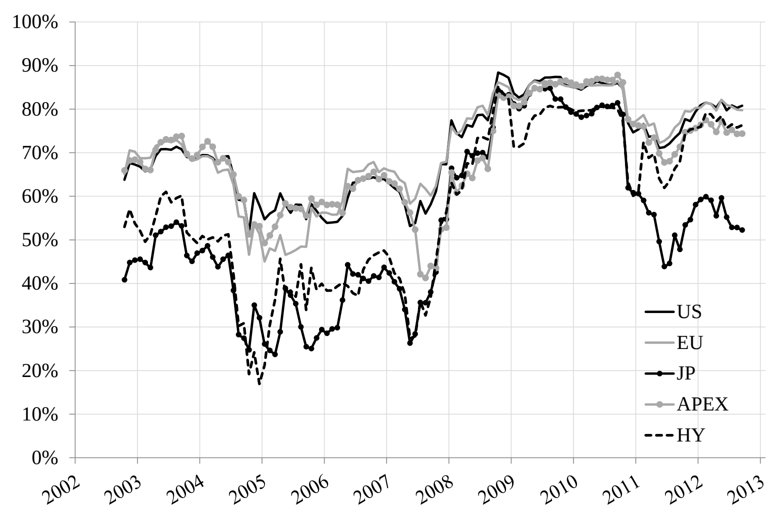

Figure 2a: Rolling correlations of five major indices. Each line represents the average of the index's correlation with the other four, using monthly total returns over preceding 24 months.

One consideration is that even if countries are highly correlated, it is possible in principle that other partitions of the investment space provide better diversification. There has been significant interest recently in proposing factor allocation methods as an improvement over country or sector allocation. Figure 2b gives rolling correlations for six equity indices, with factors of size, value and growth. Here the correlation levels are even higher, suggesting that factor allocation has the same challenges and that global equity markets are a single factor.

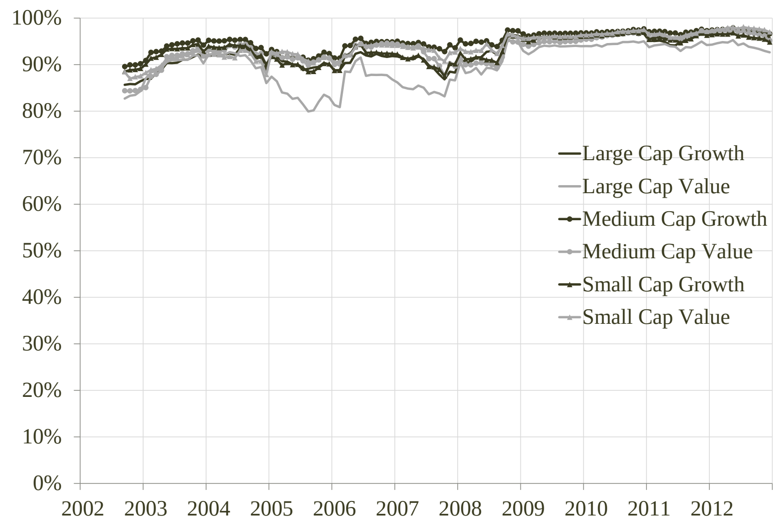

Figure 2b: Rolling correlations of six MSCI indices (All Countries). Each line represents the average of the index's correlation with the other four. Calculations based on monthly total returns over the preceding 24 months.

The second question then is to what extent diversification is available within fixed income. Corporates and fixed income sovereigns differ in the amount of credit risk that is taken by the investor in each asset class. This is analogous to the beta for equity markets. A higher beta (ie: more credit risk), implies a riskier portfolio, for which the investor expects to get paid an additional return. By extracting this credit beta from corporate returns to get an additional allocation silo, and then calculating the correlation within fixed income, we get the results shown in Figure 3 (The full correlation matrix is shown in Table 4 and 5). It is to be noted, that again in fixed income, the correlation of the sovereign and corporate asset classes is over 90%, signifying that there is minimal diversification possible within the fixed income silos.

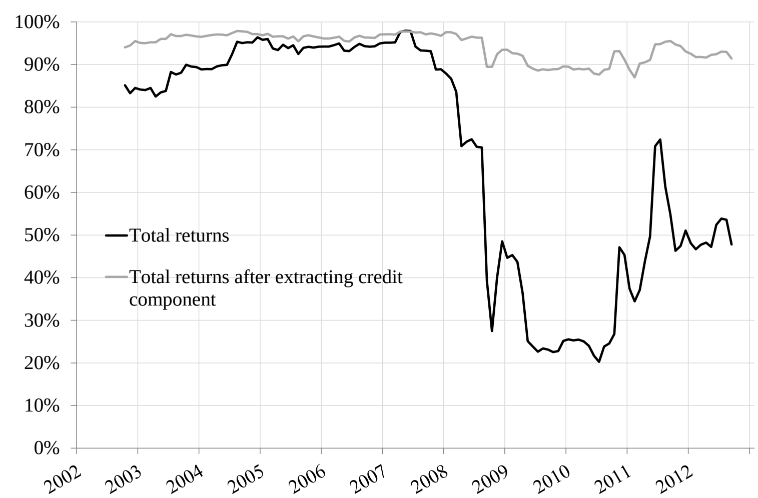

Figure 3: Rolling correlations of sovereigns and corporates. Black line based on total returns. Grey line after extracting the credit component calculated as index duration times change in index asset swap spread. Calculations over the preceding 24 months.

Hence what we believe to be an asset allocation decision across the eight asset classes leading us to a diversified portfolio, is in reality a simply a decision of how much equity risk and how much credit risk to take in the portfolio. Figure 4 depicts the real and only diversification benefit that actually exists in an asset allocation process – shown as the correlation between equities and the credit spread.

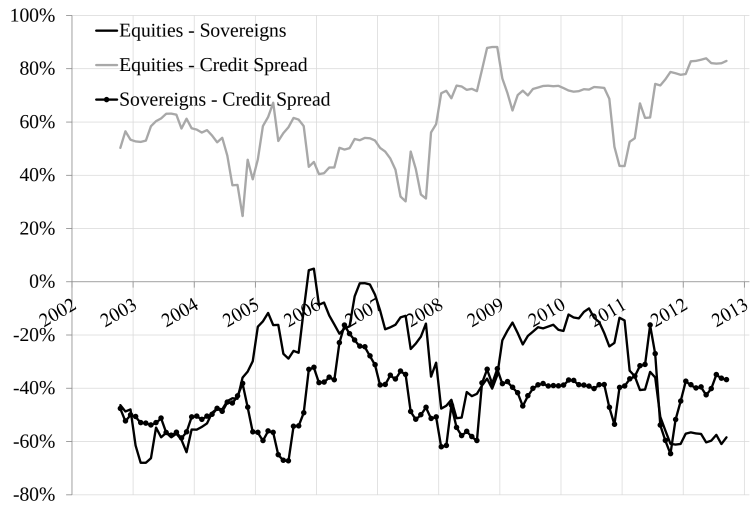

Figure 4: Rolling correlations of (1) Global Equities (MSCI World), (2) Global Sovereigns and (3) the asset swap spread of Global Corporates. Calculations based on monthly total returns over the preceding 24 months.

2.3 Implications for Skill Required in Asset Allocation

It is obvious that not getting the diversification we originally believed, makes the task of the asset allocator more difficult ie: a higher skill is required to construct a portfolio with the same maximum drawdown threshold, than if the portfolio diversification was more.

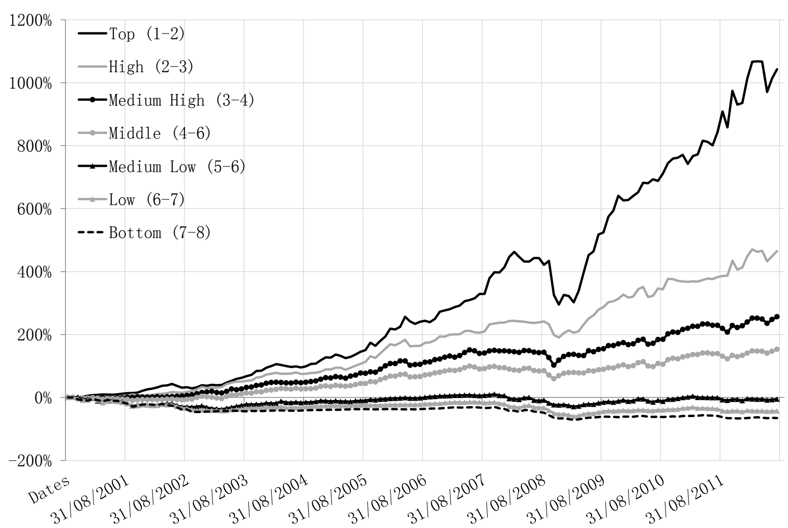

Figure 5: Performance of portfolios with perfect foresight over the following year, rebalanced yearly end September. Each portfolio is equally weighted in two asset classes- the solid black line invested in the top two performers, down to the dashed line invested in the worst two.

Figure 5 depicts the return profiles of various asset allocators with different levels of skill. Note the Top portfolio is the perfect foresight portfolio depicted in Figure 1. The remainder of the profiles, represent lower skill in the asset allocation decision, as the assumption of perfect foresight is relaxed. The Bottom being the worst possible skill in asset allocation.

A point to note that while the perfect foresight portfolio unsurprisingly has an extraordinary return, it's maximum drawdown is 29.8%. Even if we apply the 10% maximum drawdown VaR statistic the number is still 12.1%. This implies that it is impossible to construct a portfolio within these asset classes, which would meet the constraint of a 10% maximum drawdown with a 90% confidence level. This fact is depicted in Figure 6, showing the probability distribution of the 12 month maximum drawdown.

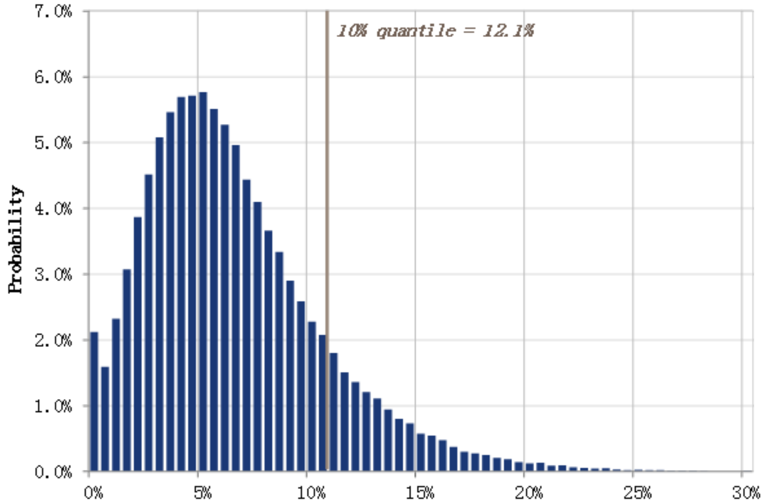

Figure 6: Frequency diagram for the 12-month max drawdown. Based on 10,000 simulations of 12 monthly returns with annual volatility and mean as of Top (1-2) from Figure 5.

2.4 Investing Only in Alpha Strategies

One approach to the asset allocation problem is to steer away from the traditional asset classes altogether and instead seek exposure to alpha strategies only. This is a setup where traditional beta exposures are hedged out for the most part, thus freeing up space in the risk budget and allowing it to be redirected elsewhere. The premise for this approach is that the Sharpe ratios of all betas, in general, tends to be much lower than that of pure alpha strategies, and the presumption that alpha strategies are uncorrelated with anything.

We use the HFR index classification as proxies for pure alpha strategies. Summary statistics for the main composites are given in Table 2. As seen in the table the 10% maximum drawdown bound is still breached in most cases, although applying the 10% VaR statistic the number for the total portfolio is likely to come down below 10%.

Figure 7 depicts the rolling correlations between the four HFR indices, and shows that even through the drawdown characteristics seem more favorable, the average correlation between these strategies, with the exception of macro, is in the 70-80% range, again a level at which meaningful strategy diversification is difficult.

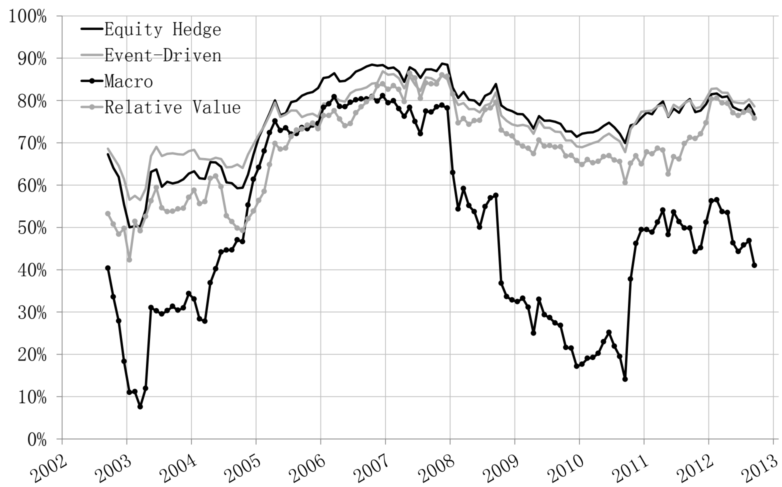

Figure 7: Rolling correlations of four HFR indices. Each line represents the average of the index's correlation with the other three, using monthly total returns over preceding 24 months.

This finding does make a case for alpha strategies, but the question is then whether it is possible to proceed and invest the full USD 100bn in hedge funds. Experience has shown that this does not appear to be the case. A major drawback with alpha strategies is the constraint on their capacity. High quality managers may be possible to identify up to a certain point, but beyond that there is a degradation of alpha. Hence, while this may be a possible solution for a small fund (say less than USD10bn), it can only be a part of the total solution for a large fund, which perforce will need to have a beta allocation investment process.

2.5 Summary of the Asset Allocation Problem

In summarizing the asset allocation problem therefore, we find that:

- The eight asset classes which are traditionally used for asset allocation, each have maximum drawdown characteristics in excess of 10%.
- Equity asset classes are far more correlated between themselves than anticipated. Fixed income asset classes are the same. Hence the scope for diversification using an asset allocation process is limited.
- Hence asset allocation devolves to a simple decision of when and how much of equity and credit risk to take in a portfolio ie: it is equivalent to market timing, which history has taught us is almost impossible to do consistently over time.
- For a large plan sponsor, even the perfect foresight asset allocation will breach a 12 month maximum drawdown threshold of 10% at the 90% confidence level.
- Alpha strategies can form part of an overall plan as they have good drawdown characteristics, but capacity constraints on their availability prevents them being the full solution for a large plan sponsor.

With this background we now turn to the main task of the paper, the design of a multi-strategy allocation framework.

3 The Multi-strategy Asset Allocation Framework

3.1 The Traditional Asset Management Structure

The traditional investment process of a plan sponsor is depicted in Figure 8. This originates with the plan sponsor formulating a return target together with a risk acceptance level. Given these parameters the sponsor formulates an asset allocation, with an in-house research group or in consultation with an external advisor, to arrive at an allocation to the major asset classes. These allocated assets are then placed with selected external asset managers, each of whom are required to operate within specified tracking error limits of their asset class silo benchmarks. Monitoring of performance and risk, and rebalancing of the overall portfolio id done at appropriate intervals..

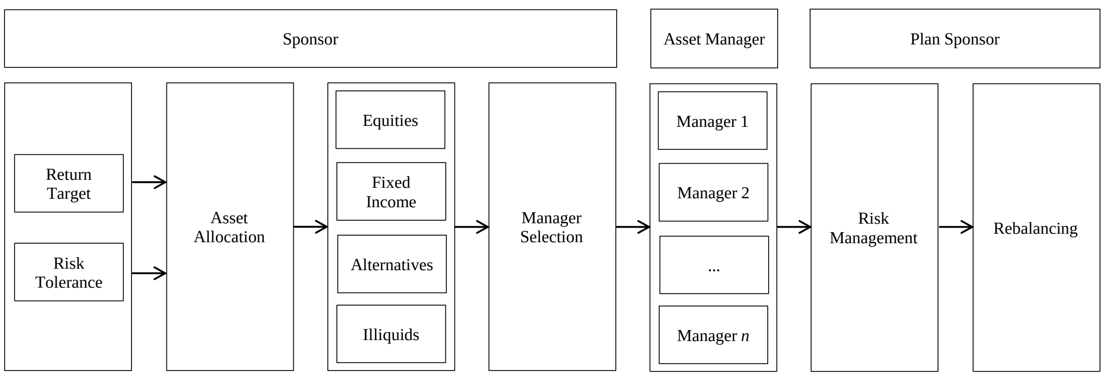

Figure 8: Schematic overview of the traditional plan sponsor investment process.

Two points are of great importance in this structure. Firstly, significant effort is devoted to diversifying the set of external portfolio managers, often including multiple managers within the same area. However, this efficient mindset of diversification across strategies rarely carries over to the high-level asset allocation decision, which in almost all firms continues to be a single decision (point of failure), which is responsible for the majority of the risk, and yet remains undiversified. Secondly, although most of the risk and return is determined by the high level asset allocation decision, most resources, skill, time and effort are in general devoted to the selection and monitoring of external managers.

It therefore seems that there are some efficiency gains possible in this structure.

3.2 (Re) Designing the Asset Allocation Framework – The Building Blocks

As building blocks for the asset allocation framework, this section takes a look at the various possible approaches to asset allocation. A broad classification is presented in Figure 9, which distinguishes three main categories. This categorization is not definitive and subject to views, and the intention is to group the variety of methodologies into a succinct set of groups.

1. *Active*: based on specific judgmental views on pricing and risk.
2. *Semi-passive:* following a rule-based or systematic approach without views
3. *Non-beta:* where allocation to beta asset silos is close to zero.

Within the active and the semi-passive space we can further identify a range of methodologies. Among active methodologies, we find

1. *Economic weighted:* where asset class weights are a function of economic fundamentals, such as GDP.
2. *Thematic:* where exposure to some broad concepts determines weights
3. *Economic view based:* where asset allocation is based on judgmental views on the current economic environment.
4. *Fundamental systematic:* where a set of systematic rules are used to determine the asset allocation.
5. *Macro hedge funds:* which base their investment philosophies on a higher frequency of asset allocation across asset classes.
6. *CTAs / Managed futures:* where a systematic set of rules (which tend to follow mean reversion) are used in higher frequency allocation decisions.

The semi-passive category also spans a number of approaches:

1. *Long-term risk premia:* Allocation based on estimates of asset class risk premia using long-term historical data spanning several business cycles.
2. *Balanced portfolio:* based on fixed proportions, such as e.g. the 60/40 allocation to equities and fixed income.
3. *Target date funds:* where the funds have a fixed termination date, and the asset allocation changes systematically during the fund's life towards as the target date approaches.
4. *Minimum variance:* where we seek to minimize the variance of the portfolio.
5. *Risk parity:* where the risk contribution of each asset class is equated.

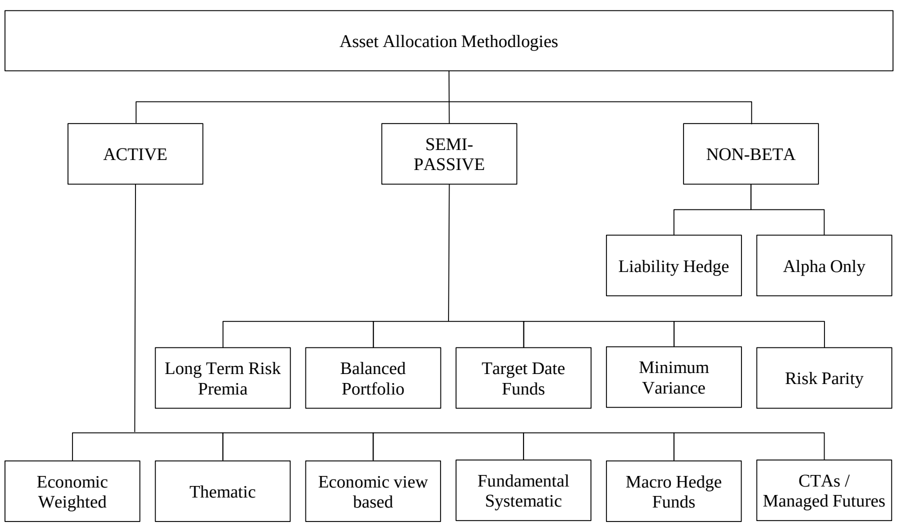

Figure 9: Risk based classification scheme of approaches to asset allocation.

Note how the investment horizon decreases as we move down the lists. This holds both for the active and the semi-passive approaches. For instance, economic weighted approaches tend to change only slowly as the economic fundamentals on which they are based normally evolve slowly over time. Macro hedge funds on the other hand are in good position to respond quickly to changing market conditions. In contrast to the above variety in approaches plan sponsors often adopt a single method, such as economic views, which is taken over a static horizon.

Should there be a single investment process for the decision which contributes to the maximal risk and return of the overall plan? The answer is clearly no, and this issue marks a fundamental flaw in plan sponsors worldwide. In Gupta and Straatman (2006) we showed in a stylized framework how a fund's information ratio improves as more alpha strategies are included. Here we propose in a similar manner that multiple investment processes be applied to the asset allocation decision. This opens up for diversity in allocation approaches, reduces the plan's exposure to a single view, and allows asset allocation to be done at multiple horizons within the same plan, thereby facilitating time diversification.

3.3 The Multi-strategy Asset Allocation Framework

We are now in position to formulate a first attempt on a multi-strategy asset allocation framework. For a practical implementation we seek a categorization of the various allocation approaches where each category represents a set of methods unified by a common philosophy, and where the categories are in some sense mutually distinct. Figure 10 depicts a proposed asset allocation framework, which splits the overall plan into five categories.

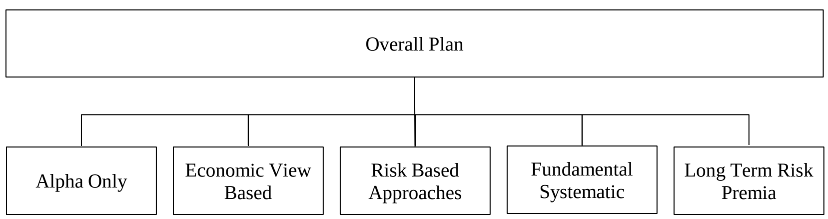

Figure 10: Investment process based classification of asset allocation methodologies.

Alpha Only
The main advantage with alpha strategies is their low correlation with other asset classes. In addition they tend to be less volatile than equities, which with our current risk limit is a benefit. The disadvantage is the limit on their capacity, which can make it difficult to fill the entire allocation mandate.

Economic View Based
Economic views rely on subjective assessments of the current economic environment, which are formulated by an individual or a group of individuals with particular skills and experience. This offers a way to apply “common sense” or identify such market disruptions which are not easily uncovered by other methods.

Risk-based Approaches
Risk-based approaches disregard expected returns and focus entirely on the risk side. Notably these include the risk parity portfolio, where the allocation is determined such that the total risk contribution of each asset class in the portfolio is the same.

Risk parity typically overturns the classical 60/40 allocation mix, directing a significantly higher proportion to fixed income with a common result being a weighting around 20/80 of equities versus bonds. The allocation has performed well over the past 10-20 years, but an unsettling fact is that this coincides with a regime of declining bond yields. As interest rates drifted downwards bonds experienced a rare capital gain. In the process interest rates have reached a level where the scope for further capital gains is limited, and where the risk in bond performance over the longer term is more skewed towards the downside. The observation does not rule out the risk parity approach altogether, but it does raise a concern and suggests that diversification is pursued into other directions as well.

Among the risk-based approaches we also find the minimum variance portfolio. This is usually not applied in the high level allocation decision as it tends to push everything into fixed income, but it may serve a role when constructing benchmarks on the asset class level. Particularly within equities it has been found that low volatility stocks tend to perform better on a risk-adjusted basis. This appears to pick up a pricing anomaly similar to the Fama-French factors, which can justify a place in the total portfolio.

Risk-based approaches have deep capacity. Also, the investment horizon is primarily determined by the risk cycle, which means that as long as volatilities and correlations remain stable the risk-based allocations should not change materially.

Fundamental Systematic

Fundamental systematic strategies come in two kinds – Thematic and Economic Fundamentals. Thematic approaches identify a set of investment themes or factors, each of which is expected to carry a premium. Typical examples are again the Fama-French factors, although investment themes can also be more subjective.

In the second strategy type, Economic Fundamentals, systematic rules are constructed based on observable economic fundamentals. A typical example is a benchmark that is weighted according to GDP rather than market capitalization. Another example is where assets are weighted by the income that they generate.

Long Term Risk Premia

Long term risk premia rely on estimates of risk and reward over a longer historical time period, typically 50 - 100 years. These are then used as a base for the asset allocation policy, although assessments about the economy’s long term growth potential and inflation rate are usually included as well. The analysis forms a regular part of consultancy firm recommendations for pension funds’ asset allocation policies, and it is an approach with broad acceptance among both academics and practitioners.

Moreover, the solid theoretical foundation makes a good case that expected returns will realize over the long term, thus making it well-suited for pension funds which typically have longer investment horizons. A problem however is that performance tends to come at the cost of significant intra-horizon draw-downs, which requires that the asset owner have a high tolerance for drawdown. In practice however, this is untrue, as both the managers of the firm and the regulators, impose decisions once a much smaller maximum intra-horizon drawdown threshold has been reached. It is therefore ironical that while this is the most popular single method followed by plan sponsors, it is almost certain that the plan breaches its risk tolerance limits at some point, and thus fails to realize the very benefit that the methodology advocates.

The above framework achieves our main aim of extending a range of approaches. Further it is to be noted that each category has a different investment horizon. An economic based view generally has relevance for the intermediate term, while long term risk premia expresses a view for the long term. The structure can further be complemented with an additional allocation layer, allowing more capital to be allocated to the allocation categories that perform better or where conviction is higher.

3.4 Diversification

With a multi-strategy approach to asset allocation we come to express a range of views on a very narrow set of assets. In its most purified form the decision involves only two assets, equities and fixed income. This is a setting where diversification takes a somewhat different shape as compared to when applied through a direct broadening of the investment universe.

Investment breadth does not come from an increase in the number of assets. Neither does it come from an increase in rebalancing frequency, since the mere size of the asset base imposes natural bounds on the turnover. Breadth instead comes from an increase in the decision making processes on the same assets, each of which use a different set of information sources, have unique investment horizons, rebalancing frequencies, and are each independently viable. This in itself is no novel innovation. For instance, breadth in information is regularly applied in portfolio management when a broad range of signals are blended together to a composite view on the attractiveness of a given asset. However, to our experience, when it comes to asset allocation decisions this is a less regular practice.

How can it then be demonstrated that the proposed structure does in fact provide diversification and improvements in the Sharpe ratio? The common and established method is to look at historically realized performance, as is in fact done below. However, historical performance has its limitations.

Firstly, a given investment philosophy can prove successful for a long period of time, only to then reverse. For example, although risk parity has performed well over the past 20 years we still question its reliability for the next two decades. In a similar fashion hedge funds experienced an exceptional performance over the decade leading up to 2007, when losses started to accrue uniformly. Another example is real estate, which is an asset class where sustained trends in the pricing can be observed.

Secondly, even if we restrict our reliance on historical performance, we could still investigate diversification benefits by focusing on the correlation structure between the approaches. Indeed, in the proposed setup Alpha only provides exactly such diversification, but there are other areas where a straightforward application of correlations is less informative. For example, a 60/40 equity-fixed income mix can perform very differently from a 20/80 mix, but because they derive from the same time series, correlations will still be high.

In the current setting the benefit of diversification more resembles that arising in Bayesian blending. Different views on how to perform asset allocation are taken into consideration. Each view is associated with a range of possible outcomes for long term performance, but by averaging across them, the range of possibilities is narrowed down. Provided the average view is positive, the likelihood of positive performance overall is increased.

Ideally diversification should also assist in moderating intra-horizon volatility, drawdowns and exposure to event risk. In part this benefit is achieved by the averaging across investment approaches, but it is also something that can be addressed by complementing the setup with an allocation layer managing the allocation between the various strategies. To illustrate this, we give an example from the management of event risk exposure. Although many events tend to be outside the asset manager’s range of forecast, several are in fact possible to anticipate if not with certainty then as occurring with non-negligible probability. At the time of writing two examples are -

1. A rise in global inflation resulting in a fall in sovereign bond prices, and
2. A conflict in the Middle East with a consequent spike in the oil price.

In both these cases the events can be related directly to market prices such as e.g. as a given shift in the 10-year yield, or a certain percentage increase in the oil price. This is advantageous because for a given allocation we can in principle calculate its beta against the corresponding shift in market prices. This in turn makes it possible to impose bounds on the allocation's event beta exposure. In Gupta, Straatman, Skallsjo, and Krol (2005) we applied this methodology in a portfolio optimization for a multi-strategy fund. By gradually adjusting the level of the constraint it is possible to see how the allocation responds to event exposure.

3.5 An Example of a Diversified Allocation Approach

With the allocation categories defined, this section concludes with an example of how the approach might perform in practice. Due to the high-level nature of the proposal, results have to be treated as indicative, and in particular we do not have a good proxy for the economic views, where we simply rely on simulated return series. Further, it is obvious that the time period for this study is far too short for a meaningful conclusion, hence the results are meant as an illustration of the proposed structure.

The various silos are approximated as in Table 6. The composite is constructed as equally weighted across the categories, and statistics on risk and performance for the equally weighted allocation are given in Table 7, and depicted in Figure 10. As seen in the table the proposed structure has a realized drawdown of 14.4%, which primarily results from a significant equity exposure. While this still exceeds the 10% bound, note that it is less than half that of Long term risk premia. Moreover, the 10% maximum drawdown VaR statistic is now down to 5.1%.

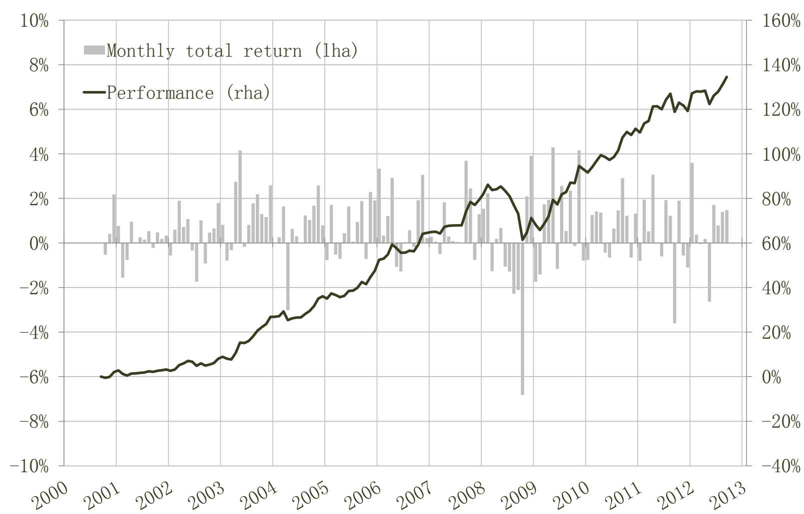

Figure 10: Performance graph for the allocation approach defined in Table 6.

The Sharpe ratio over the sample period is 0.59, about the same as Alpha only. The outperforming category is the Risk-based, which is proxied with a risk parity allocation between equities and fixed income. Here the framework thus takes the more cautious view, restricting the allocation and allowing for other approaches to contribute.

The average realized Sharpe ratio among the categories is 0.44, implying that the proposed structure improves upon the average by a factor 1.32. If we were to not rely on the historically realized Sharpe ratio, but instead make an assumption that they are equal and positive across the categories, then this is sufficient to show that the equally weighted structure improves upon the average by a factor 1.49.

Note that the results are based on the equally weighted allocation, which need not be optimal. Complementing the structure with an allocation layer above the allocation silos, can also add significantly to improving the risk-return characteristics of the asset allocation decision. We leave this subject for future research however.

4 Conclusion

This paper has presented a multi-strategy approach to asset allocation for plan sponsors. The first part of the paper discussed how efficient asset allocation is made difficult by a number of factors. From the risk side, traditional asset classes typically exhibit downside characteristics exceeding the risk tolerance of plan sponsors. Next, this is a setting where market timing tends to be an unreliable strategy, and where the scope for diversification is limited. Alpha strategies may be utilized up to a certain point, but beyond that constraints on capacity set boundaries on the allocation.

The second part of the paper was devoted to the multi-strategy framework. After reviewing a set of modern approaches to asset allocation, the multi-strategy organization was constructed by partitioning the strategy space into five main categories – Alpha only, Economic view based, Risk based approaches, Fundamental systematic and Long term risk premia. We discussed how this structure achieves diversification and how it can be used to manage tail risk. We concluded with an example where the diversified approach leads to a more balanced historical performance.

In the current setting the allocation layer still assumes a simple form, balancing equally across the strategies. A more efficient approach could be investigated, allowing capital to be allocated as a function of risk, correlation structure and expected performance. This is left as a direction for future research however.

References

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Asset Class	Index	Mean return	Volatility	Sharpe ratio	Maximum drawdown	Maximum drawdown VaR (10%)
US Equities	MSCI USA	3.2%	16.1%	0.05	51%	22.7%
Europe Equities	MSCI Europe	2.1%	16.7%	-0.02	50%	24.2%
Japan Equities	MSCI Japan	-2.6%	18.2%	-0.27	57%	28.7%
APEX Equities	MSCI AC APac ex JP	12.6%	22.6%	0.45	62%	27%
Global Sovereigns	Barcl Gl Agg. Gov (H)	5.7%	3.4%	1.01	4%	2.8%
Global Corporate	ML Gl Broad Corp (H)	6.2%	4.3%	0.87	11%	3.8%
Global High Yield	ML Gl High Yield (H)	8.5%	11.0%	0.55	33%	12.7%
Gold	Gold spot price	17.2%	17.5%	0.84	26%	18.1%

Table 1: Descriptive statistics of major asset classes. '(H)' indicates FX hedged. Equity indices all FX un-hedged. Mean calculated as arithmetic. Sharpe ratio calculated using the one-year US treasury yield.

HFR Sub-index	Mean return	Volatility	Sharpe ratio	Maximum drawdown	Maximum drawdown VaR (10%)
Equity Hedge	4.3%	8.7%	0.24	31%	11.3%
Event-Driven	7.0%	6.9%	0.69	25%	7.3%
Macro	6.8%	5.3%	0.89	7%	5%
Relative Value	6.5%	4.6%	0.94	18%	4.2%

Table 2: Descriptive statistics for HFR sub-indices. Sharpe ratio calculated using the one-year US treasury yield.

	US Equities	Europe Equities	Japan Equities	APEX Equities	Global High Yield
US Equities	100.0%	90.7%	60.6%	81.1%	69.1%
Europe Equities	90.7%	100.0%	65.3%	77.8%	64.9%
Japan Equities	60.6%	65.3%	100.0%	63.1%	53.4%
APEX Equities	81.1%	77.8%	63.1%	100.0%	73.3%
Global High Yield	69.1%	64.9%	53.4%	73.3%	100.0%

Table 3a: Correlations between the four equity categories and high yield. Time period Sep 2000 – Sep 2012, monthly returns.

	Large Cap Growth	Large Cap Value	Mid Cap Growth	Mid Cap Value	Small Cap Growth	Small Cap Value
Large Cap Growth	100.0%	88.3%	96.0%	85.1%	93.3%	83.8%
Large Cap Value	88.3%	100.0%	86.6%	95.8%	88.3%	92.8%
Mid Cap Growth	96.0%	86.6%	100.0%	88.4%	98.0%	88.6%
Mid Cap Value	85.1%	95.8%	88.4%	100.0%	92.3%	98.3%
Small Cap Growth	93.3%	88.3%	98.0%	92.3%	100.0%	93.9%
Small Cap Value	83.8%	92.8%	88.6%	98.3%	93.9%	100.0%

Table 3b: Correlations between six MSCI indices. Time period Sep 2000 – Sep 2012, monthly returns.

	Global Equities	Global Sovereigns	Asset swap spread
Global equities	100.0%	-38.3%	64.9%
Global sovereigns	-38.3%	100.0%	-33.9%
Asset swap spread	64.9%	-33.9%	100.0%

Table 4: Correlations between (1) Global equities (MSCI World), (2) Global sovereigns and (3) the asset swap spread of Global corporates. Time period Sep 2000 – Sep 2012, monthly returns.

Asset Class	Correlation between Corporates and Sovereigns
Total returns	56.0%
Total returns after extracting credit component	93.1%

Table 5: Correlations between Corporate and Sovereigns. Time period Sep 2000 – Sep 2012, monthly returns. Credit component extracted by multiplying index duration with index asset swap spread.

Alpha only	50% HFRX Macro + 50% HFR Macro / CTA
Risk-based approaches	Risk parity between MSCI AC World and Barclays Global Aggregate (FX-hedged). Annual rebalancing with covariance matrix calculated over the preceding 5 years, monthly returns.
Economic view based	Simulated as a random walk uncorrelated with the other strategies. Volatility set equal to 7% and realized information ratio to 0.09. The information ratio is based on assumption of a portfolio manager investing in 500 uncorrelated stocks and having a composite Sharpe ratio of 0.7. Translating this to an 8 asset universe decreases breadth by a factor $\sqrt{500/8} \approx 8$. This implies a Sharpe ratio of $0.7/8 \approx 0.09$.
Fundamental systematic	40% MSCI AC (GDP) + 60% Barclays Global Aggregate, GDP weighted. The 40/60 allocation based on the relative market capitalization of the two indices.
Long term risk premia	60% MSCI World + 40% Barclays Global Aggregate (FX-hedged).

Table 6: Time series used to approximate the allocation categories.

	Mean return	Volatility	Sharpe ratio	Maximum drawdown	Maximum drawdown VaR (10%)
Alpha only	5.6%	6.2%	0.60	9.5%	6.8%
Risk-based	5.5%	4.3%	0.82	13.2%	4.1%
Economic views	2.6%	7.0%	0.09	13.4%	8.1%
Fundamental systematic	6.2%	8.0%	0.53	24.6%	9.3%
Long-term risk premia	3.7%	9.0%	0.19	32.0%	12.1%
Equal weighted	4.7%	4.6%	0.59	14.4%	5.1%

Table 7: Performance and risk statistics for the approximated allocation categories.

	Alpha only	Risk-based	Economic views	Fundamental systematic	Long-term risk premia
Alpha only	100.0%	28.2%	2.2%	28.7%	12.3%
Risk-based	28.2%	100.0%	3.3%	84.4%	72.0%
Economic views	2.2%	3.3%	100.0%	-1.2%	-9.8%
Fundamental systematic	28.7%	84.4%	-1.2%	100.0%	87.9%
Long-term risk premia	12.3%	72.0%	-9.8%	87.9%	100.0%

Table 8: Correlations between the five allocation categories. Time period Sep 2000 – Sep 2012, monthly returns.