Strategic Asset Allocation

The last decade has delivered the full spectrum of highs and lows in global markets and the most recent years in particular will be remembered for increasing uncertainty and lackluster returns. While many have prematurely aged as a result of these experiences, the benefits are that institutional investors are dedicating fewer resources to searching for the theme du jour and are instead revisiting what is the appropriate mix of exposures to achieve their long-term objectives. It has been well documented that strategic asset allocation is the predominant determinant of total returns in the long run. Although strategic asset allocation has come back under the spotlight, determining the optimal long-term investment strategy can be a mine field given the plethora of investment options available today. This paper introduces the building blocks to designing a robust strategic asset allocation with a focus on consistency of process, comprehensiveness of analysis and the distillation of important ramifications on the implementation.

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First Sentier Investors

The level of returns in the long run is determined by the strategic asset allocation policy.

The importance of Strategic Asset Allocation

As implied by its very name, strategic asset allocation (SAA) seeks to provide a long-term policy anchor for a set of investment objectives subject to restrictions and constraints. There is an intuitive sense that it is imbued with deep importance as things labelled "strategic" usually are, but putting one's finger on the exact import has often proven elusive. Distilling SAA down to its essence it expresses an optimal long-term investment policy answering the fundamental question of "how much should I invest in equities and bonds?"

In practice the determination of a strategic investment strategy will delve deeper than the rudimentary equity/bonds question and in this paper we will show an innovative methodology that shows in detail how to derive a mix of assets that in the long term can be considered "optimal".

Quantifying the actual and intuited importance of SAA has been the subject of much academic debate over the years with seminal contributions from Brinson, Hood and Beebower 1986 establishing the dominance of long-term asset allocation policy as an explanatory power in returns. This was reprised and amplified by Hensel, Ezra and Ilkiw 1991 and more famously by Ibbotson and Kaplan 2000.

These studies show that SAA, depending on various interpretational subtleties, explains anywhere between 80% and 100% of long-term fund performance, while active management can be an important differentiator superposed on asset allocation. This also has become the received and established wisdom within the literature despite many pragmatic distortions in the field for marketing purposes.

Although the following decade was not a fallow one for research in this field it was not until fairly recently that the debate was resuscitated by Ibbotson 2010 who provided a good overview of the debate, followed by a detailed paper from Xiong, Ibbotson, Idzorek and Chen 2010 which posited that asset allocation and active management have equal importance.

Yet we maintain that SAA is the most important determinant of meeting one's long-term objectives along the lines of the 90%–100% cited by Ibbotson and Kaplan 2000, and this is not in contradiction with the Xiong, Ibbotson, Idzorek and Chen 2010 paper. The key innovation this paper introduced was an explicit disentangling of returns due to market movement from active asset allocation policy deviations in addition to active management. The approximately equal importance of the latter two shows that active management is important for asset allocation as well as security selection, but the relevance of SAA is quintessentially linked to market movements as well.

A comprehensive and consistent approach

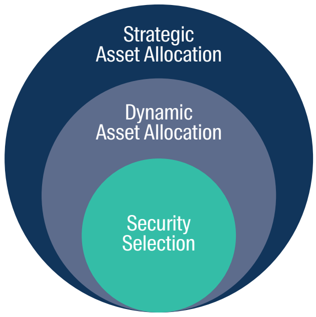
While SAA is concerned with the long term, there is a continuum of time horizons that shortens to dynamic asset allocation (DAA), with a horizon of a few months, and even further to the more dubious realms of market timing, day trading or high-frequency algorithmic trading at the microsecond level. A consistent approach to both SAA and DAA is key to successful implementation as neither can live in ignorance of the other. The first step in determining an optimal investment strategy is to define the objectives of the portfolio and the constraints under which it operates. Different types of institutions are typically subject to specific requirements and liabilities, and the recommended strategic benchmark must be tailored accordingly.

Consistency and comprehensive-ness of the analysis and implementation are essential to meeting investment

Through comprehensive quantitative analysis a mix of investments can be derived that accounts not only for an investor's return objectives but also for the risks that could threaten the achievement of those objectives. This typically finds a concrete expression in terms of a capital markets benchmark which should be monitored over time to ensure that the portfolio's objectives are being met[1].

Once the strategic benchmark has been determined, active overlays may have two components: DAA and security selection as sketched in Figure 1. DAA is a significant source of incremental returns over a longer time horizon but it can – or indeed even must – also serve as a risk control tool. Dynamic allocation shifts are not used just to seek incremental returns; one can also try to steer away from those markets that have an unattractive risk level associated with them in the short term.

Figure 1: Investment Decision Making Hierarchy



Strategic Asset Allocation:
Most important contributor to long-term performance
Based on total return objectives and risk tolerance

Dynamic Asset Allocation:
Active management at the macro level
Capture shorter-term opportunities in the markets
Add value over and above the strategic allocation

Security Selection:
Managers providing stock specific active management

In this paper, we mainly focus on SAA. We describe the process, as well as the inputs needed and the results that are produced. We provide a case study of an institutional investor to demonstrate the results and also walk through the required long term asset return assumptions that in our case are produced by our proprietary Long Term Asset Return Model[2].

In the case study we will assume that no liabilities are present. This allows us to use an analytical approach without having to resort to the stochastic toolkit that is at our disposal as well. The asset-only context will suffice in explaining the essence of our approach.

The design of a strategic benchmark contains the following components:

1. Formulation of objectives and risks
2. Determination of the investable universe subject to investor restrictions
3. Derivation of expected returns and (auto)covariances[3]
4. Optimization of asset mixes using inputs from 1) through 3)
5. Determination of an active risk budget and its impact of objectives and risks

Each of these steps requires assumptions and modelling choices; an exhaustive survey is outside the scope of this article though and we will focus on the approach we have decided on.

[1] For truly objective-based investment strategies the SAA concept is also used but the focus for day-to day management is very explicitly linked to achieving certain concrete objectives and less so to the actual exposures derived by the SAA effort. Please also refer to Baars, Kocourek and van der Lende (2012b) for an example of an SAA-based baseline approach for what ultimately becomes an Objective-Based portfolio in day-to-day management.

[2] Please refer to the Appendix for a brief description of our model.

[3] In this case we will not consider auto-covariances but in the more generic stochastic case they can be incorporated into the optimization process.

Balancing multiple contradictory objectives and constraints is the crux of strategic asset allocation.

For the first and second step we will make certain assumptions in this case study, while the aforementioned Long-Term Asset Return Model addresses the third item on the list. This model in itself contains a wealth of additional information and insight, not in the least because it allows us to abstract away from point-estimates for expected returns and covariances, but instead allows us to gain insight into the distribution of potential risk premia.

The fourth step requires the use of our proprietary Weighted Risk Metric (WRM). Typically an investor will have multiple, often contradictory, objectives within risk constraints and we developed the WRM to allow us to make a quantifiable trade-off[4].

With regard to step 5, while this paper describes some practical considerations, an earlier research paper by Baars, Kocourek and van der Lende June 2012a, provides the conceptual framework to incorporate active management into the risk budget, as well as analyses that allow for the separation of alpha (α) and beta (β) exposures.

Strategic Asset Allocation

The initial phase of SAA is to understand the objectives of the investor. The kinds of questions that one should seek to answer range from very basic to the more complex:

- What is the base currency?
- Should there be a domestic bias?
- How much risk in the short-term is one willing take on board?
  - Is a negative return in any given year a disaster?
  - Is a return of –5% in any given year a disaster?
- Where is the pain threshold of yearly losses?
  - Would a return of –10% cause major problems?
- How high does one set one's return ambitions?
  - Is there an absolute return target (e.g. 8%)?
  - Is there a relative return target (e.g. outperform cash by 200 basis points)?
- What is the time horizon for the strategy?
  - How long is the long-term? 3 years? 5 years? 10 years?
- Are there any liabilities underlying the assets?
  - Is the money earmarked to be spent in any particular way in the mandate's foreseeable future?

The answers need not be exact or quantitative as usually it is sufficient to have an indication. Finding these answers is a consultative process and forms the essential input required to conduct an SAA study.

Once we have an understanding of the risk tolerances and return ambitions, we then must decide on the asset classes to be used. This again depends on the constraints of each individual portfolio. Generally, our analyses include domestic government bonds, domestic and foreign equities, emerging markets equities and perhaps one or two "speciality" asset classes, such as high yield bonds or indirect real estate equities[5].

[4] The Appendix contains a brief description of the WRM, and the case study will show the output.

[5] Incorporating illiquid assets usually requires a stochastic approach.

The next step is to agree on the characteristics of these asset classes; the most crucial are the expected returns, which we base on our proprietary Long-Term Asset Return Model. We refer to the Appendix for a more thorough explanation of this model. An example is shown in the table below for an Australian dollar-based investor. For an investor with a different base currency the asset classes would obviously be different.

Table 1 provides the characteristics for various asset classes, which in this instance are the expected returns, volatility and their correlations.

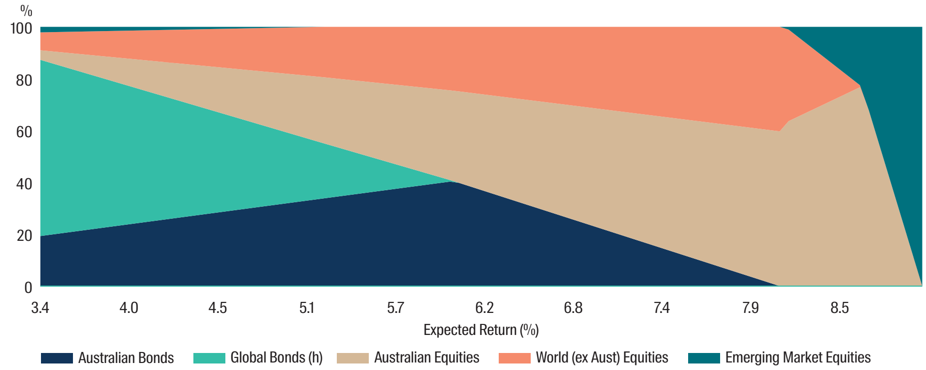
Table 1 – Expected asset class characteristics

			Correlations				
Asset Classes	Expected Return	Expected Volatility	Australian Bonds	Global Bonds (h)	Australian Equities	World (ex Aust) Equities	Emerging Market Equities
Australian Bonds	3.0%	3.8%	1.00	0.69	0.03	0.02	-0.07
Global Bonds (h)	2.7%	3.3%	0.69	1.00	-0.04	-0.15	-0.20
Australian Equities	8.5%	14.3%	0.03	-0.04	1.00	0.49	0.63
World (ex Aust) Equities	7.5%	13.6%	0.02	-0.15	0.49	1.00	0.60
Emerging Market Equities	9.0%	20.8%	-0.07	-0.20	0.63	0.60	1.00

Source: First Sentier Investors

The next step is to derive "efficient" portfolios consisting of these asset classes. A portfolio is "efficient" when, for a given level of risk, it maximizes the level of expected return, or equivalently for a given level of return it minimises the level of risk. The resulting set of efficient portfolios is generally known as the efficient frontier. A standard mean variance optimization uses volatility as the risk measure. In this case study the risk measure we use in the creation of the efficient frontier is Conditional Value at Risk[6]. This risk measure is generally accepted as a better risk measure than volatility or Value-at-Risk since it better captures the tail risks within a portfolio[7,8]. The results are depicted in Figure 2. The efficient portfolios are reflected based on the expected return increasing from left to right, with the respective allocations represented on the vertical axis.

Figure 2: Mean-Expected Conditional Value at Risk Efficient Frontier Weights



Source: First Sentier Investors

The final step is now choosing one of these many candidate portfolios to serve as the strategic benchmark. This is done by analysing several risk/return measures for all portfolios on the efficient frontier. These risks measures are shown in the tables below for a cross-section of the efficient frontier labelled by the equity weight.

[6] Alternative approaches to shrinking the number of candidate strategies are possible, especially with the emergence of risk parity or minimum variance approaches, which are appropriate in case one is of the view that nothing can be known about future returns with sufficient certainty, but future risks can be modelled adequately. For a discussion of these approaches see Lee 2010. We also employ various other refinements over traditional mean-variance optimization in order to improve robustness of outcomes but a discussion would be outside the scope of this article. For a brief related discussion see also Kritzman 2006.

[7] See for example the papers by Rockafellar and Uryasev 2000 and 2002.

[8] In general the concept of "risk" is broader than mere volatility, VaR or CVaR as the relevant criteria to investors are ultimately related to not achieving their objectives. This is where we will re-specify risk using the Weighted Risk Metric.

The multi-dimensional nature of risk leads to a surfeit of numbers, tables and graphs. While useful and relevant the trade-offs may be not clear.

Table 2 shows the compositions of a cross section of the efficient frontier together with the expected risk and return for each portfolio. For example, a portfolio with a 60% allocation to equities will result in an expected return of 6.1%, with a volatility of 7.5% and a Sharpe ratio of 0.41.

Table 2

	Strategic Asset Mix					Expected Risk/Return Characteristics		
Asset Mix	Australian Bonds	Global Bonds (h)	Australian Equities	World (ex Aust) Equities	Emerging Market Equities	Return	Volatility	Sharpe Ratio
20% Equities	22.6%	57.4%	8.6%	9.7%	1.6%	3.8%	3.4%	0.24
30% Equities	27.1%	42.9%	15.4%	13.6%	1.0%	4.4%	4.2%	0.33
40% Equities	31.6%	28.4%	22.2%	17.5%	0.3%	4.9%	5.2%	0.37
50% Equities	36.2%	13.8%	28.7%	21.3%	0.0%	5.5%	6.3%	0.39
60% Equities	39.9%	0.1%	35.2%	24.8%	0.0%	6.1%	7.5%	0.41
70% Equities	30.0%	0.0%	41.3%	28.7%	0.0%	6.6%	8.6%	0.41
80% Equities	20.0%	0.0%	47.4%	32.6%	0.0%	7.1%	9.8%	0.42
90% Equities	10.0%	0.0%	53.6%	36.4%	0.0%	7.6%	11.0%	0.42
100% Equities	0.0%	0.0%	63.6%	35.3%	1.1%	8.2%	12.3%	0.42

Source: First Sentier Investors

Table 3 shows several expected shortfall probabilities for each of the selected efficient portfolios[9]. The target of zero return is used to represent the probability of a negative return; other targets can be determined based on, for instance, 2.5% to represent a hurdle rate or 5% to represent a longer term return objective.

Table 3

	Expected Shortfall Risks: Risk of a return below...					
	1 Year Horizon			5 Year Horizon		
Asset Mix	r < 0%	r < 2.5%	r < 5%	r < 0%	r < 2.5%	r < 5%
20% Equities	12.8%	35.4%	64.3%	0.6%	20.1%	79.4%
30% Equities	14.6%	33.2%	56.8%	0.9%	16.6%	64.9%
40% Equities	17.1%	32.6%	54.5%	1.7%	15.7%	53.5%
50% Equities	19.3%	32.6%	48.1%	2.6%	15.6%	45.7%
60% Equities	21.3%	32.7%	45.8%	3.7%	15.9%	406%
70% Equities	22.8%	33.0%	44.3%	4.8%	16.2%	37.5%
80% Equities	24.1%	33.3%	43.3%	5.8%	16.7%	35.3%
90% Equities	25.2%	33.5%	42.5%	6.8%	17.1%	33.7%
100% Equities	26.4%	33.9%	41.9%	7.9%	17.2%	32.5%

Source: First Sentier Investors

The results in the table demonstrate that as the equity weight increases from 20% to 100%, the probability of a return below zero on a 1 year horizon increases from 12.8% to 26.4%. On the other hand the probability of a return below 5% on a 1 year horizon decreases from 64.3% to 41.9%. If one focuses on a longer horizon, the risk of a shortfall below zero drops significantly to 0.6% for the 20% equity portfolio and 7.9% for the 100% equity portfolio. This is also consistent with the intuitive interpretation of such portfolios as being "conservative" or "aggressive" depending on equity weight. Higher probabilities of negative returns are associated with those portfolios that have the higher equity weights and vice versa. This increased risk of negative returns is compensated for by the higher expected return as illustrated by the declining shortfall risk relative to the 5% target.

[9] A shortfall probability relative to a target return is the probability that the return on a given horizon will be below the target.

In Table 4 we display the Conditional Value-at-Risk (CVaR) over the same two time horizons of 1 year and 5 years and at multiple confidence levels[10].

Table 4

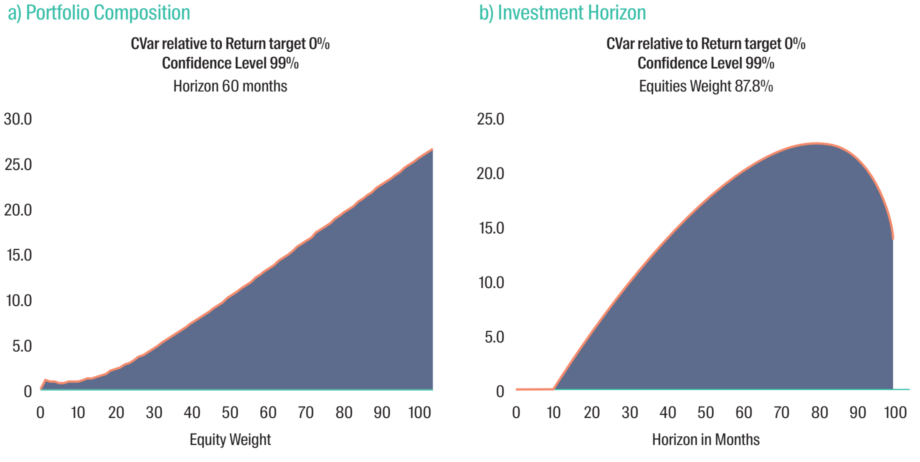
Asset Mix	Expected CVaR relative to target r at confidence level c, as percentage of capital					
	1 Year Horizon			5 Year Horizon		
	c =90%, r = 0%	c =95%, r = 0%	c =99%, r = 0%	c =90%, r = 0%	c =95%, r = 0%	c =99%, r = 0%
20% Equities	2.0%	3.0%	4.8%	0.0%	0.0%	0.9%
30% Equities	2.7%	3.9%	6.2%	0.0%	0.0%	2.7%
40% Equities	3.9%	5.3%	8.1%	0.0%	0.0%	5.7%
50% Equities	5.1%	6.9%	10.2%	0.0%	1.6%	9.2%
60% Equities	6.5%	8.5%	12.3%	0.0%	4.2%	12.9%
70% Equities	7.8%	10.1%	14.3%	1.3%	6.7%	16.4%
80% Equities	9.1%	11.6%	16.4%	3.3%	9.3%	19.8%
90% Equities	10.4%	13.2%	18.4%	5.4%	11.9%	23.2%
100% Equities	11.9%	14.9%	20.6%	7.8%	14.8%	27.0%

Source: First Sentier Investors

As can be observed the CVaR increases with an increasing weight to equities and also with an increasing confidence level. One would generally expect that with a longer time horizon the CVaR would fall, which is the case for the 90% and 95% confidence levels between the 1 year and 5 year horizons. Interestingly in this case, the 99% confidence interval does not comply with this expectation with equity allocations over 70%.

While at first glance this may be unexpected, when looking at the profile of the CVaR based on the equity weights and over time as shown in Figures 3(a) and (b), it can be seen that due to the sharp increase in CVaR when the equity weights exceed 80%, the investment horizon would need to be sufficiently longer than five years to see this risk diminish. This is an effect that is a consequence of our assumption that returns are log-normally distributed and the associated skewness of this distribution.

Figure 3: CVaR Sensitivity



[10] The Conditional Value-at-Risk relative to a target is the expected loss exceeding the Value at Risk at a given confidence level, where the Value at Risk relative to a target is the maximum loss at a given confidence level.

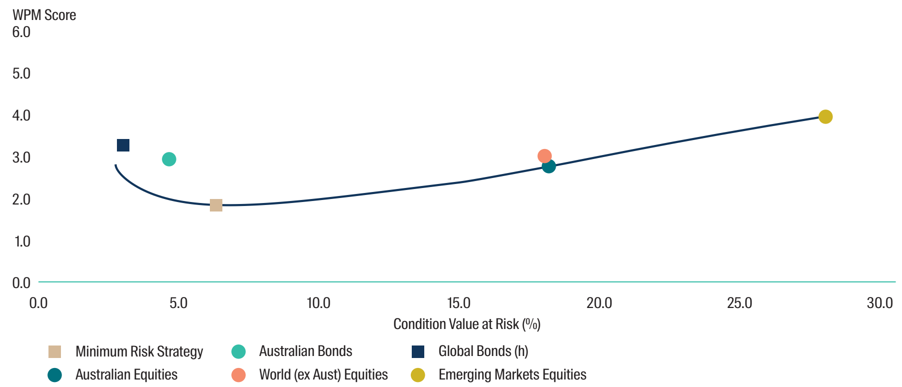
Conducting analyses in many risks dimensions can provide very interesting insights, however, in order to tailor an asset allocation solution, the risks and objectives relevant to the investor need to be incorporated and appropriately weighted. As we mentioned earlier, these objectives, risks and constraints are often at cross purposes in a portfolio. An investor indifferent to short-term drawdowns could opt or the portfolio with the highest expected return, while an exclusive focus on short-term risk would argue for a very conservative portfolio. In order to be able to make an informed decision on the trade-offs inherent in most investors' objectives and risks we have developed the Weighted Risk Metric (WRM), which incorporates the specific requirements in the calculation of an overall risk score for each candidate strategy[11].

This is also the point at which we harken back to the list of questions in this article. The answers to these questions form the inputs to the WRM, not only in their quantification of sometimes purely qualitative interpretations of investor preferences, but also in the weighting of the various considerations of optimality. In this instance we have chosen to construct the WRM on the basis of a five-year investment horizon with a 5% return objective, as well as a significant aversion to negative returns in any given year. We did not incorporate any specific liquidity requirement other than not being invested in illiquid assets such as private equity, direct real estate or hedge funds. A return of -5% in any given year is considered as very painful, and there are no biases imposed ex ante, such as a home country bias.

Our Weighted Risk Metric leads to an unambiguous recommendation.

Putting it all together we show the WRM scores for all portfolios on the efficient frontier in Figure 4.

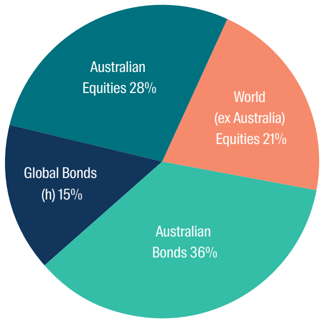
Figure 4: Weighted Risk Metric



The Minimum Risk Portfolio is the portfolio with the lowest WRM score and can be used as a recommendation for a strategic benchmark as well as the individual asset classes. As the latter lie significantly above the WRM line indicating their sub-optimality in terms of the aggregated weighted risk score. In fact a strategy that would be considered to be very "conservative" in the traditional sense, namely one consisting of 100% Australian bonds, is in fact a risky proposition in this case, exemplified by the high WRM score of the asset class. The Minimum Risk Strategy has an equity weight of approximately 47%. The detailed composition of this strategy is the following:

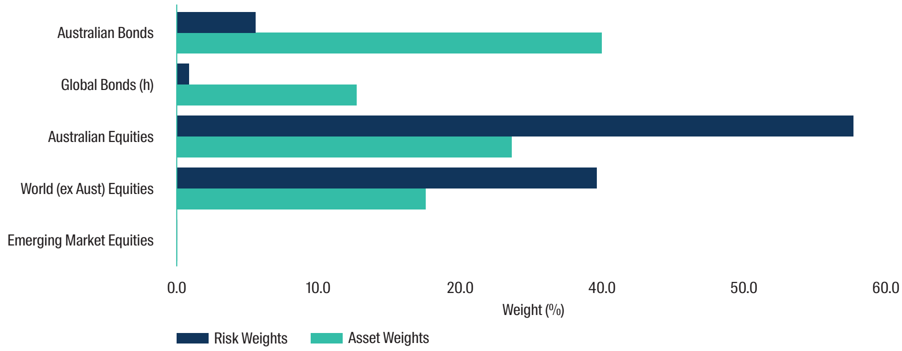
[11] For a more detailed explanation of the WRM we refer to the Appendix.

Figure 5: Asset Class Weights of Minimum Risk Portfolio



This strategic benchmark can be filled in with much more detailed asset classes where required, for instance by using US, European, Japanese and Asian equities to serve as the "World (ex-Australia) Equities" asset class. In performing an SAA study, a wide range of analytics can be produced at every step of the process with the end result being a recommendation for a strategic benchmark. This will then also serve as the yardstick by which performance is measured and monitored. For instance it is instructive to look at the risk weights of the various asset classes in the final portfolio; these measure the contributions to variance of the portfolio returns, and were they to be of equal weight one would have a "risk parity" portfolio[12]. While we typically do not use this as an optimization criterion or as an objective it is important to be aware of the risk weights of the asset classes as well as any factor exposures one might have in the final portfolio. We restrict ourselves to showing only the risk weights of the portfolio in Figure 6.

Figure 6: Asset Class Risk Weights



As might be expected of a portfolio with almost 50% equity weight the contribution to variance is dominated by equities, with the large asset weight of bonds contributing very little. In this instance this is a deliberate choice to seek exposure of this nature, but there are situations in which a more even spread in risk weights is required or desired.

[12] We also look at risk weights in other factors, such as the Fama-French market factors, economic factors and others, but we limit ourselves in this article to the asset class factors as an example.

Consistency in implementation is crucially affected by the risk budget and its impact, which in turn depends on the asset mix of the strategic benchmark.

Active Management and Risk Budgeting

Having established the benchmark allocation, the focus now shifts to actually implementing the desired exposures. This requires the consideration of which ingredients to use as the building blocks and the extent to which active management will be adopted within a given risk budget. We can incorporate this analytically and Figures 7 and 8 and Table 5 illustrate the impact that both tracking error and alpha can have on the risk and return characteristics of the portfolios on the efficient frontier, as well as for the strategic benchmark.

The portfolio designed in the previous section is represented on the charts by the portfolio 1, which is situated in between portfolios E1 and E2 along the efficient frontier in Figures 7(a) and (b).

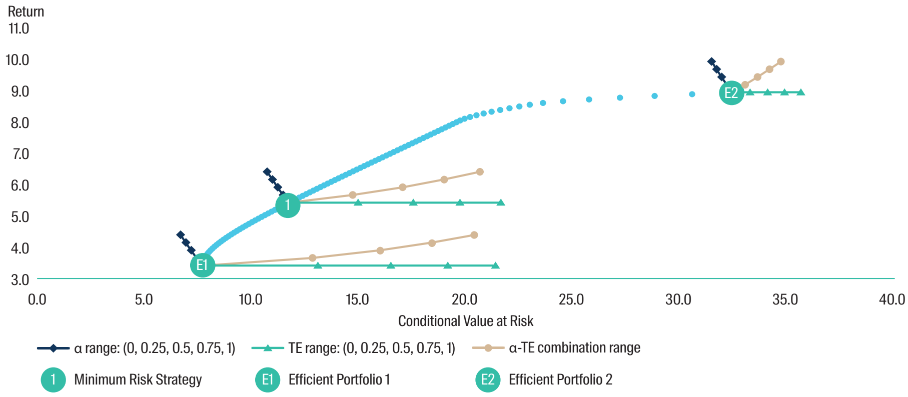
Portfolio E1 is the most conservative portfolio[13] on the efficient frontier and portfolio E2 is the most aggressive portfolio. Adding uncorrelated alpha without any tracking error – represented by the green line – to any portfolio increases the expected return and reduces the Conditional Value at Risk. Conversely adding tracking error without any alpha – represented by the green line – has no impact on the expected return but only increases the Conditional Value at Risk for the portfolio. Of more interest is the combination of adding alpha and tracking error, which is represented by the tan line. In this instance we have assumed a constant information ratio of 1 and the grey line shows the combined effects of the purple and green lines.

An interesting observation from Figures 7(a) and (b) is that the higher the equity weight the smaller the increase in CVaR becomes given the same amount of tracking error being added; this can be seen from the shortening of the green lines as one moves from E1 to 1 to E2.

Adding alpha though is fairly constant in its effect with relatively little difference of the purple lines radiating northwest from the three points. In combination this means that for the more conservative portfolio active management has a disproportionately large impact in terms of CVaR, indicating that care must be taken when implementing actively.

Figure 7: Impact of Active Management on Frontier

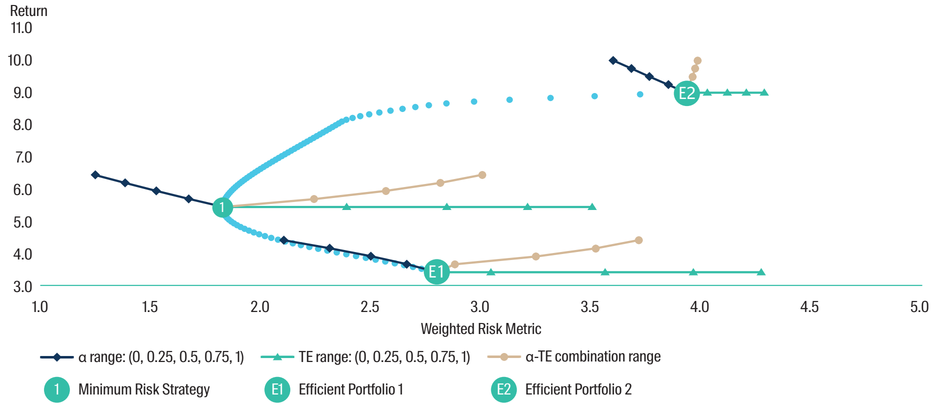
a) CVaR and Expected Return – Addition of Tracking Error and Alpha - Full View



x-axis: Conditional Value in figure 7a and figure 8a relative to target 5% at confidence level 95%, 1 Year Horizon

[13] "Most conservative" in this instance being defined as the portfolio with the lowest Conditional Value-at-Risk.

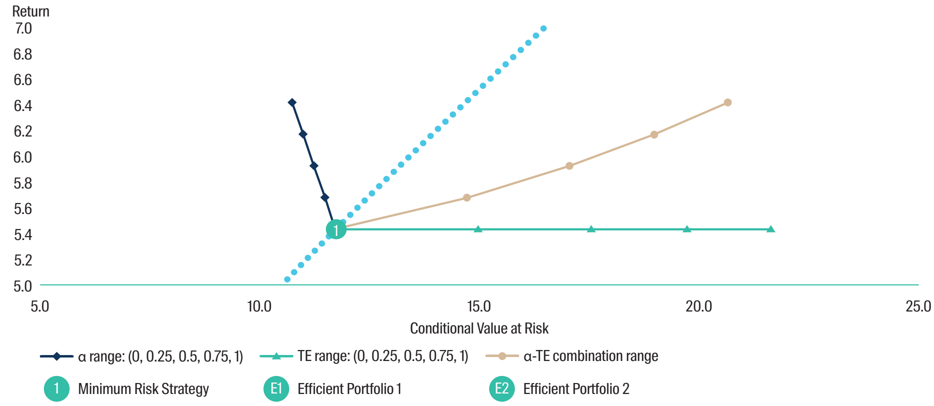
b) WRM and Expected Return – Addition of Tracking Error and Alpha - Full View



Figures 8(a) and (b) are zoomed-in views of the Figures 7(a) and (b), providing a clear and more granular perspective on the sensitivity to both parameters of the recommended portfolio.

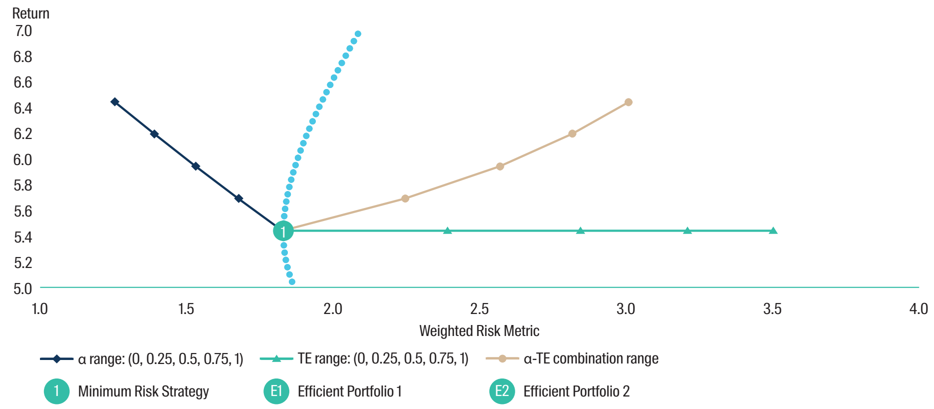
Figure 8: Impact of Active Management on Recommended Portfolio

a) CVaR and Expected Return – Addition of Tracking Error and Alpha - Zoomed View



x-axis: Conditional Value-at-Risk relative to target 5% at confidence level 95%, 1 Year Horizon

b) WRM and Expected Return – Addition of Tracking Error and Alpha - Zoomed View



Note that the CVaR approximately doubles as the tracking goes from zero to one percent as shown in Table 5 and the WRM also increases substantially.

Table 5

		Portfolio					
		Efficient Portfolio 1		Efficient Portfolio 2		Minimum Risk Strategy	
		Conditional Value at Risk	Return	Conditional Value at Risk	Return	Conditional Value at Risk	Return
Base Case		**7.7**	**3.4**	**32.4**	**9.0**	**11.7**	**5.4**
α Overlay	0.0%	7.7	3.4	32.4	9.0	11.7	5.4
	0.3%	7.5	3.7	32.2	9.3	11.5	5.7
	0.5%	7.2	3.9	31.9	9.5	11.2	5.9
	0.8%	7.0	4.2	31.7	9.8	11.0	6.2
	1.0%	6.7	4.4	31.4	10.0	10.7	6.4
Tracking Error Overlay	0.0%	7.7	3.4	32.4	9.0	11.7	5.4
	0.3%	13.1	3.4	33.2	9.0	15.0	5.4
	0.5%	16.5	3.4	34.1	9.0	17.5	5.4
	0.8%	19.2	3.4	34.8	9.0	19.7	5.4
	1.0%	21.4	3.4	35.6	9.0	21.6	5.4
α - Tracking Error Combination		7.7	3.4	32.4	9.0	11.7	5.4
		12.9	3.7	33.0	9.3	14.7	5.7
		16.0	3.9	33.6	9.5	17.1	5.9
		18.4	4.2	34.1	9.8	19.0	6.2
		20.4	4.4	34.7	10.0	20.6	6.4

Conditional Value-at-Risk relative to target 5% at confidence level 95%, 1 Year Horizon.

This is a specific illustration of the concept described in Baars, Kocourek and van der Lende June 2012a, but the interaction between risk criterion and underlying volatility of the asset mix does hold generically as well. In practice this means that an active implementation of this strategy has to be very mindful of the impact of adding tracking error relative to the risk criteria.

Summary

Research shows that the predominant driver of long-term investment outcomes is the portfolio's asset allocation policy. In this paper we presented our approach and philosophy to designing a strategic benchmark allocation. We addressed several important considerations, ranging from the inputs in terms of estimates for expected returns and covariances to tackling the problem of dealing with multiple contradictory objectives. These facets need to be handled consistently and comprehensively lest the final allocation bear little resemblance to the actual requirements of the investor. This also encompasses the appropriate setting of a risk budget and its implications for active management.

The end result of the design is a strategic benchmark allocation, which is well thought through, aligned with both the return objectives and risk tolerances but also provides a yardstick by which to measure the long term performance. Strategic asset allocation is a critical phase in delivering on long term outcomes, however, to implement these exposures requires consideration of how much to allocate to active overlays. These overlays have two components: dynamic asset allocation and security selection.

Dynamic Asset Allocation is the next phase of the asset allocation process. It can be a significant source of incremental returns over a longer time horizon and also can be considered as a risk control tool. Dynamic allocation shifts can be straight forward or intricate, depending on the implementation techniques adopted and require an investment process of their own. We will discuss this in more detail in a forthcoming paper.

Appendix

Long-Term Asset Return Model

In the determination of an optimal long-term investment strategy our approach relies on the output of our Long-Term Asset Return Model (LTARM) which sets the broad outline for the economic climate within which we expect the global markets and economies to operate. This setting is key to what follows as the determination of the global or regional economic climates allows for a discussion along the broader lines of macroeconomic equilibria rather than devolving into a debate about point estimates for expected returns.

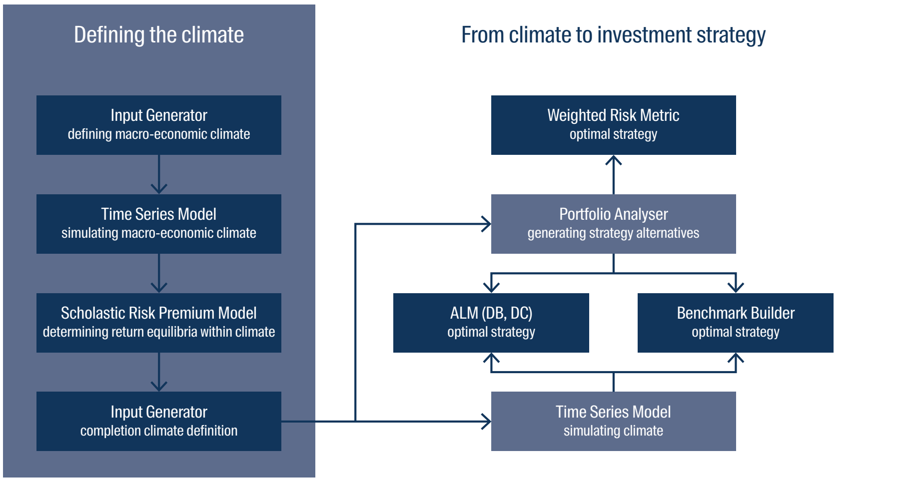
An underappreciated aspect of strategic modelling is the way long-term statistical characteristics are derived for the asset categories and the economic environment as a whole[14]. This is often reflected in the fact that one simply takes historical time series and extrapolates them going forward, potentially with a qualitatively derived value for the long-term return expectations.

We do however take this very seriously and this is why we use a separate asset return process, the results of which subsequently feed into our strategic analyses.

We start off by taking raw historical data of all relevant data series. This is where the characteristics of the economic climate are defined in terms of the base covariance and autocorrelation matrices, which can however be adjusted to account for expected future developments. For instance, in a simple case we can restrict the data set to those periods where inflation was moderate and economic growth low. The model is capable of much more sophisticated analyses and filtering of historical data if needed. The result is a historical dataset that is a reflection of the economic environment that we think will prevail. Adding consistent long-term equilibrium values for GDP growth, inflation, earnings growth, pay-out ratio and other relevant quantities, completes the economic setting. We should note that these long-term values are not ordinarily historical values, but incorporate forward-looking components as well. Thus the expected characteristics are not just a projection or extrapolation of the past.

The next step is to determine long-term return levels and risk premia. All economic parameters are fed into a set of stochastic simulation models which we use to determine the equilibrium distributions of risk premia. These models then run simulations and this output gives us thousands of scenarios for the future with time paths being consistent sets of data for future GDP growth, inflation, earnings and other relevant macroeconomic quantities.

Figure 9: Model Interaction Overview

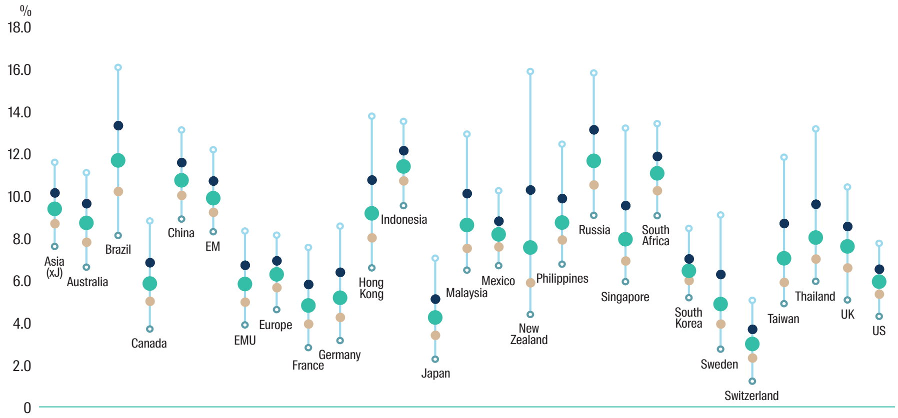


Schematic overview of our LTARM / SAA models.

[14] On the topic of estimating forward looking equity risk premia, see for example the papers by Arnott and Ryan 2001 and Arnott and Bernstein 2002.

By adding current valuations for markets it is possible to determine a bandwidth of scenario- dependent equilibrium values for internal rates of return (risk premia) for equity and bond returns for different countries and regions, again with both variances and (auto) correlations[15]. By using the median of these distributions as long-term return equilibriums, we are able to complete the full climate definition required for us to perform our SAA analyses. Such analyses are conducted by using our ALM Model[16]. Figure 10 shows sample output from our Long-Term Asset Return Model.

Figure 10: Sample LTARM Output



Source: First Sentier Investors

The Weighted Risk Metric

Every investor has a specific risk profile, investment horizon and return ambition level. To be able to address the issue of the relative attractiveness of portfolios with respect to this investor- specific profile we created the WRM, the Weighted Risk Metric.

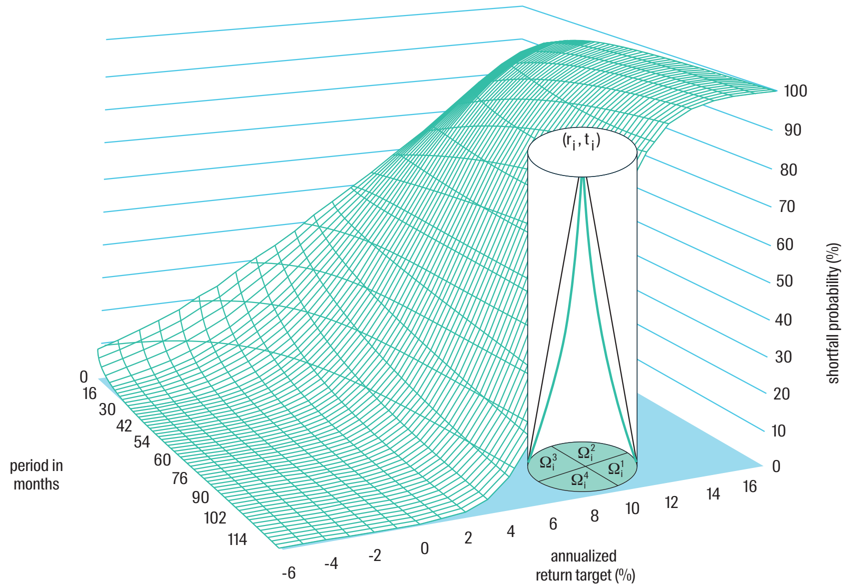
As the basis for the WRM calculation a number of target returns on several investment horizons should be specified. The WRM scores each portfolio with a weighted risk of not achieving those targets. This weighting can take place in a number of different ways (e.g. shortfall risks, value- at-risk, etc.) and combinations thereof. We will generically refer to these as target/horizon pairs, with coordinates (r, t).

This is done in the following way. For each alternative portfolio, for all potential target returns on all potential horizons (target/horizon pairs) the model determines the risks of not achieving the specified goal. This means that for each alternative portfolio an entire surface like the one below is generated. Each specific target/horizon pair (ri, ti)-then corresponds to a point in the (r, t)-base plane, the corresponding point on the portfolio dependent surface being the probability of not achieving that specific target on that specific horizon. We only show the shortfall probability in this case, but as earlier mentioned, the use of other risk criteria such as value-at-risk is possible too.

[15] An additional feature of this approach is that it can be put to use in a DAA context as well by comparing these long-term results with similar shorter-term output. This enables a consistent notion of regional attractiveness of equities versus bonds.

[16] The tools employed to derive the optimal investment strategy are collectively referred to as the ALM Model. This can be either stochastic or analytical.

Figure 11: Weighted Risk Metric Construction



The straight forward way to proceed would now be to put a weight to each target/horizon pair (ri, ti) and calculate for all alternative portfolios the weighted sum of shortfall probabilities. This would come down to simply calculating the (weighted) sum of the values on the surface corresponding with the relevant target/horizon pairs (ri, ti) in the base plane.

In case that just one target/return pair is relevant, the weighted risk metric would simply be the corresponding vertical (surface) value, i.e. the shortfall probability itself in this case.

However, this would not deal with the fact that in defining investor specific return/horizon pairs (ri, ti) the immediate neighbourhoods of these points are also relevant. If the risk of not achieving a 7% annualised return in 5 years is relevant (for instance) then also the risk of not achieving 7% in 59 months or 61 months should have some importance. Furthermore the risk of not achieving a return close to 7%, e.g. 6.9% or 7.1% over the specified period is also relevant. For this reason we look not only at the shortfall probabilities for the specified return/horizon pair (ri, ti) but rather at the shortfall probabilities of all risk/return pairs (r, t) close to the specified one. In order to do so we look at a (ellipse-shaped) neighbourhood Ωi of that point in the base plane and calculate the average shortfall probability in that neighbourhood. To be able to fine tune the analysis we divide that neighbourhood Ωi in four parts Ωij . These parts correspond with shorter/ longer horizon, lower/higher target slices of Ωi.

Furthermore, to reflect the diminishing relevance of return/horizon pairs (r, t) further away from the original target (ri, ti) we use a decay function that is equal to 1 in the target return/horizon pair (ri, ti) and 0 on the bound of Ωi and multiply all calculated shortfall probabilities by that decay function. The decay convexity is a parameter in the model that can be tuned to suit particular circumstances.

In the analysis we calculate the average value of the surface, e.g. the average shortfall probability with the above-mentioned decay factor over all points in Ωij and weigh them in to get to a weighted average shortfall probability for the entire Ωi area. The latter is interpreted as the score for the return/horizon pair (ri, ti). Weighing in all scores for all relevant return/horizon pairs leads to an overall risk score for the portfolio used in the calculations.

The weighted risk metric graph is nothing but a plot of all portfolio scores. Obviously the minimum risk portfolio is the specific portfolio where the risk score is minimal.

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