

The wrong type of snow

Risk revisited

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The wrong type of snow

When severe winter weather caused disruption to British train services in February 1991, British Rail's Director of Operations commented, "we are having particular problems with the type of snow". This prompted the London Evening Standard headline 'British Rail blames the wrong type of snow'. Ironically, the railways had prepared for adverse weather that month but the snow proved too soft and powdery for their snowploughs. The phrase 'wrong type of snow' has become shorthand in British media for poor organisation and failure to prepare properly. In contrast the Sami people, an indigenous group in northern Scandinavia, who cannot afford to be ill-prepared for snow, recognise about 300 different types of snow each with different words in their language.

Executive summary

In an increasingly interconnected and complex world, asset owners need better risk management.

This relatively young discipline has witnessed advances in the last 50 years. These have focused on the harnessing of technology for risk measurement rather than a deeper understanding of risk itself. It is time to redress the imbalance and promote better management over more measurement. This publication shares the Thinking Ahead Group's work on risk. In revisiting the subject, we have come to a growing conviction that better risk management can give competitive advantage.

This advantage can accrue to asset owners who:

- Shift their thinking to align risk with mission
- Modify practices to adopt a better risk framework
- Bring this together through stronger risk governance.

This publication includes a study of existing practices, a new way of thinking about risk in the context of mission and some proposals for improving risk management by institutional funds.

Risk concepts

We begin by asking 'What is risk?' Risk has many facets and can be both good and bad for the investor. For asset owners to create wealth, some risk needs to be taken. We argue that risk should be redefined in terms of impairment to mission.

We then evaluate current practice, in particular in the light of the global financial crisis. Risk models have been criticised in the last few years and we consider why that is. Funds operate under a number of tensions, for example, an over-emphasis on short-term success over long-term goals and on return over risk. In addition, risk models fail to deal adequately with complexity, and in particular with endogenous risk – that investors' own decisions and actions themselves alter the risk landscape. We note that investing over multiple periods and taking account of the motivations of agents considerably complicates risk management. Models have value, but only where they are employed with good understanding. By implication current practice needs significant enhancement.

We need to be careful not to mistake measurement for understanding. While the rest of the publication emphasises greater understanding, we pause to consider what makes for good risk measures. We suggest two improvements:

- First, the use of Continuous Value at Risk as a risk measure.
- Second, the introduction of risk ‘dashboards’ (or their enhancement where already in use).

Central to our new thinking on risk is the context of a fund’s mission – the long-term value creation proposition. This publication defines risk as impairment to mission. We introduce the concept of adaptive buffers, those mechanisms (both financial and non-financial) that are available to the investor to support them through adverse periods. Examples of adaptive buffers include financial capital that can be called upon on a contingent basis should there be actual or projected shortfall compared to liabilities or wealth targets. They also include harder-to-evaluate examples such as the political capital of decision makers or the emotional capital needed to stay invested in volatile assets for the long term. We show how adaptive buffers can be used with a consideration of different potential future scenarios to evaluate how much risk a fund should be taking. We argue that a risk ‘sweet spot’ exists; taking enough risk to generate wealth, given the available buffers, but not so much that mission is likely to be permanently impaired.

Improving risk management

After looking at benchmarks and the emergence of risk-based asset allocation, we turn to how risk related to mission, adaptive buffers and the use of appropriate risk measures can be implemented through a new risk framework. We argue that this framework requires stronger risk governance. We build upon existing work on governance to consider how asset owners need to organise themselves to implement best practice risk management. This governance element includes the need for organisations to develop a risk culture where responsibility is shared appropriately and risk matters are given appropriate prominence on agendas and in communication. Framework and governance considerations find their expression through a number of tools, such as a risk register and dashboard. We end with some notes on the complex challenges of long-termism and proposals for doing risk better.

Better risk framework

- Mission clarity
 - Mission statement/memorandum of understanding between stakeholders
 - Journey plans incorporating adaptive buffers
 - Multiple key performance indicators on the risk dashboard
- Wider, deeper beliefs (covering, amongst other things, complexity and endogenous risk)
- Real-time risk budgets, allowing for different scenarios
- Long termism, changed incentive structures

Better risk governance

- Organisational design – rights and responsibilities
- Culture – action plan to foster risk-management culture
- Compensation – ensuring internal team rewarded for desired behaviours

Better tools

- Better benchmark framework
- Improved risk models
- Customised risk dashboard

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What is risk?

Risk is a familiar subject so why revisit it? At the beginning of Graham Greene's 1969 novel *Travels with My Aunt*¹ the main character, Henry Pulling – a retired bank manager – thinks he understands his quiet, conventional, suburban life.

Henry is then drawn into his aunt's world of travel, going on the Orient Express to Istanbul. Upon returning to his house and garden, Henry starts to realise that his life was not quite what he thought it was. As the book progresses, so more of his real identity is revealed to Henry. We find the subject of risk a bit like Henry Pulling.

What we thought were familiar surroundings of risk measurement and management are now being revealed as something quite different. Our quiet, conventional view of risk is being disturbed. This publication explores a deeper understanding of risk and risk management. We believe that risk should be defined in terms of impairment to mission. We propose a number of actions available to asset owners, in particular a stronger risk framework including strategies that link to the fund's mission, incorporating risk scenarios, and fostering a more risk-aware culture.

Multi-faceted concept

What is risk? The term is widely used (and misused) and has different meanings to different people. Our interest is in the context of investment decision making, particularly by asset owners, and should be directly related to the mission of the fund. The mission combines the purpose of a fund (usually creating value to meet liabilities or other future outflows in

a cost-effective way), the stakes of various parties (usually multiple) and the time horizon (usually long). This mission focus means that short-term risk measurement alone (where the finance industry has spent much of its time and effort) will not suffice. Risk in relation to a fund's mission is a multi-faceted concept which focuses on the possibility of shortfall. Risk combines four facets: size, likelihood, impact and significance.

Figure 01. Risk facets

Size	Likelihood	Impact	Significance
Possible outcomes which fall below expectation or objectives	The probabilities of the events that are associated with those outcomes	The distribution of the effects of those outcomes on the fund's balance sheet	An assessment of the impact on the fund's mission, including the effect of the stakeholders' responses
Example: Equities fall 25%	Example: 1 in 20 chance	Example: Fund suffers 10% hit to its solvency	Example: Fund could not expect to recover from this event without new funding

Part of stronger risk management is being able to switch focus between these facets, and being able to change the relative importance attached to each of them as circumstances change. For example, day-to-day management may choose to ignore low likelihood events, but periodic reviews may choose to magnify them; 'assume this unlikely event happened, what then?' Similarly, a defined benefit (DB) pension fund may need to quickly change its emphasis on significance if the corporate sponsor falls on hard times.

As well as being multi-faceted, risk comes from many sources. These include economic conditions, financial markets, capital structure, leverage, counterparty, liquidity, operational and threat to reputation. The likelihood and impact elements of risk are harder to estimate in some of these sources.

We see immediately that risk is more than the volatility or tracking error measures that are most commonly used. We suggest that there is an expanded framework for seeing risk that better captures its critical features (see **Figure 02**). The left hand side, Risk 1, describes the history in which simplifying assumptions were necessary in order to produce quantitative answers. We believe current practice is overly influenced by history and the time is right to move to Risk 2, even though this makes quantification considerably harder and messier.

Figure 02. A wider view of risk

Risk 1	Risk 2
In assessing risks, look back and extrapolate	In assessing risks, look back but blend in forward estimates
Consider stationary distributions of markets with stable means and volatilities	Consider non-stationary distributions with means and volatilities varying over time; use regimes
Use the normal (Gaussian) distribution of returns	Allow for fat tails in distributions, having regard to Extreme Value Theory and power laws
Risk is modelled from exogenous sources so the model progresses linearly	Risk includes endogenous sources so the model progresses non-linearly with feedback loops
Returns over successive periods are independent	Returns over successive periods are linked and dependent
The long term can be modelled as the sum of short terms	The long term cannot be modelled as the sum of short terms
Assume that all risks are being modelled	Assume that some risks in the form of 'black swans' cannot be modelled

Risk and uncertainty

We live in a complex world that is full of unpredictability, much of it seemingly random. The implications of this are important for finance and economics. That complexity and unpredictability gives rise to uncertainty. We find different levels of uncertainty in various situations, something that Andrew Lo and Mark Mueller have attempted to codify with their taxonomy of uncertainty,² shown in **Figure 03**.

Figure 03. Taxonomy of uncertainty

1. Complete certainty	The past and future are determined exactly if initial conditions are fixed and known – nothing is random.
2. Risk without uncertainty	There is randomness but it is governed by a known probability distribution (for example, the game of roulette).
3. Fully reducible uncertainty	The randomness is governed by an unknown probability distribution, but one that stays stable over time and can be inferred. With enough data you can reduce this to level 2 above (for example, playing with loaded dice).
4. Partially reducible uncertainty	Either the parameters of the probability distribution change over time (there are 'regime shifts') or the non-linear nature of the problem make it too complex to be captured by today's models (for example, playing poker).
5. Irreducible uncertainty	Something beyond the reach of reasoning where we remain completely ignorant.

It is important to understand the difference between **risk** and **uncertainty**. Risk is that part of the unpredictability of future outcomes that can be captured using a probability distribution; the rest is uncertainty. Much work in finance uses quantitative modelling built using probability distributions. In the Lo and Mueller taxonomy, investment modelling tends to assume the system is type 3 when in practice it is probably type 4 or 5 as shown previously. This uncertainty is the natural consequence of shifts in investors' preferences through pricing regimes and the effects of decision makers' responses to risk outcomes. When commentators criticise the reliance of investors on simplified investment models as 'physics envy', they challenge the preference for a science-based approach (governed by laws and axioms) over a social science-based approach (with much less precision). Behavioural finance and other variants

on classical finance theory align with a social science approach and reflect the body of investor opinion moving in that direction.

The simplification of modelling does not necessarily invalidate conclusions being drawn. Such simplification may yield more helpful information than using a more complex model or not using any model at all. But we must ensure that the limitations of the model are recognised, which should include an understanding of the level of uncertainty in the system. We can model for risk but will almost invariably be left with some **uncertainty**.

A more populist version of this academic treatment came from US Defence Secretary Donald Rumsfeld coining the phrase 'unknown unknowns' (irreducible uncertainty) in his analysis of progress in the Iraq war.³

Risk factors

In popular press, risk is something we would prefer was not there or, at the very least, something to be measured or assessed to manage expectations. This is too narrow a way of seeing this critical concept.

We have already said that risk should be seen in the context of a mission with a purpose to create value. We are taught early on in investing that risk and return are related. To create value – and classically we judge this by achieving returns in excess of the risk-free rate (however defined) – we need to open up the possibility of an outcome that is less than the risk-free rate. To the informed asset owner, certain risks are something to be taken deliberately in the expectation of creating value, but also in the knowledge that the possibility of poor outcomes has been introduced. Hence, risk can be seen as both good and bad – bad in terms of poor outcomes, but more importantly potentially good in terms of whether the exposure can be economically justified. We use economic justification to describe investments that create value in a fund's mission after allowing for their risks. We can also describe these investments as having a positive risk-adjusted return although this concept

is somewhat nebulous as there is no accepted theory as to how this could be measured.

This **deliberate** taking of risk involves looking for investments with economically justifiable drivers that help asset owners secure their mission. As an aside we would also note that the very concept of a risk-free rate is now being challenged. The threat of sovereign default in Europe, the downgrading of US long-term debt and the negative real yield on cash in many developed countries suggest that investors must now think hard even about where they place their safe assets. They must be deliberate in their decisions.

The identification of those economically justifiable factors is one of the most important subjects in investment. These factors can be thought of in two groups: those that have secular properties and enduring features, and those that seem more likely to exist for a limited period and have transient characteristics. At Towers Watson our model portfolios have focused on eight secular factors: equity risk, credit, term, inflation, currency, insurance, liquidity and skill. In addition, we focus on one temporal factor: the currency of emerging wealth economies.

These risk factors are summarised in **Figure 04**. Recently we have observed a small number of well-governed funds taking the use of these risk factors one stage further with risk-based asset allocation. Rather than decide allocations to traditional asset classes (bond, equity and so on), they seek to manage allocations to risk factors capturing diversity in asset allocation in this dimension. We cover this subject in greater detail below. We would expect to see more developments over the next few years on how to establish and rebalance weightings to different risk factors.

Figure 04. Risk factors

Factor	Description of adverse outcome
Equity	Being lower down the capital structure in the event of corporate default
Credit	Corporate bond issuers defaulting on their bond obligations
Illiquidity	Holding an asset that cannot be quickly or cheaply sold
Insurance	Providing protection against extreme losses
Term	The uncertain return and mark-to-market volatility of an index-linked bond compared to holding cash
Inflation	Inflation being higher than anticipated and therefore reducing real returns on fixed-interest bonds
Currency	The purchasing power of the currency falling
Skill	A manager, considered skilful, underperforming its benchmark

Which factors contribute to value creation will vary by reference to investor circumstances. We think it is a poorly understood idea that risk plays so differently in the circumstances of different funds. The Chinese characters for risk

which combine the idea of danger and opportunity express this aptly; a risk that is good for one fund (that is, economically justified in this context) may be bad for another (that is, economically unjustified in that context).



Current practice

Our understanding and practice of risk measurement and management in investment has continued to evolve since the early 1950s when Markowitz published his seminal work. This included the key concept of the risk-reward trade-off which he addressed in mean-variance optimisation.⁴

The pace of development has increased with greater computational capacity, but arguably our ability to calculate measures of risk has grown faster than our ability to understand it effectively. Nonetheless we should think of this as natural evolution, given that this is still a relatively young science.

Risk models under fire

The global financial crisis was an instructive event in demonstrating the limits of our abilities. Risk models in wide investment usage at the time were over-simplified, over-trusted and in many cases overwhelmed by the extreme events of that period. This experience has shown that we all still have much to learn. The temptation to blame risk models, however, is overdone. What we should criticise is our undue reliance on models and misunderstanding of their limitations.

With highly-complex dynamics at work in markets, models must use simplification. Given this reality, inevitably investors must employ effective abstraction to use the models well. Too much reliance on simplified models should be the principal target of any criticism.

Most investors seek to manage risk ex ante and measure it ex post. In one sense, there is little alternative. But what are we 'manage-measuring' and why? We suggest that current practice in risk models is struggling with five tensions:

- The emphasis on return over risk.
- The emphasis on the short term over the long term.
- The emphasis on normal distributions of returns over fat-tailed ones.
- The emphasis on marked-to-market measures over valuation measures.
- The emphasis on absolute risk measures over relative to liability risk measures.

We know that we ought to manage risk but we remain seduced by returns. Funds are in competition for scarce returns, as they are the only outcome of the investment process with economic significance. This makes investors focus on returns without paying sufficient regard to the risks that are being taken to achieve these returns. Rarely do funds make their principal focus risk-adjusted return. We have commented already that there is no theoretically pure basis for this measurement. This simple factor explains why funds rarely seek competitive advantage in superior risk management.

The competition for return also leads to a focus on the short term. If we look at where most of the development in risk technology has been focused, it is in short-term measurement and its application. Those risk models also tend to be used by asset managers rather than asset owners. Most risk models are short term and single period – often looking at one year rather than longer periods and certainly not as long as the duration of mission. These models are also heavy users of past data giving 'now-casts' rather

than forecasts.⁵ The objectivity in this process may have merits, but models that incorporate more anticipation of changes to the pricing regime are likely to do better when it comes to longer-term risk measures.

As most models do not deal with returns and risks over multiple periods, they fail to capture any potential path dependence – situations where returns in one period correlate with returns in another. This means models are likely to fail to incorporate endogenous risk sources (like asset-owner decisions and the impacts of flows and sentiment on pricing – so-called reflexivity).

We conclude that short-term risk measures have their uses, but they cannot provide significant guidance for the decision making of long-term funds.

The next tension lies in the convenience and tractability of using normal (bell-shaped) distributions of return when little in investment exactly follows a normal distribution. This underestimates the effect of so called 'fat-tailed' events which are examples of extreme risk.⁶ The more popular term for the most extreme risks are 'black swans'.⁷ These are risks with high impact that come from completely unexpected sources. Of course, deeper exploration of the left tail is needed in any risk model because of its impact on the fund. But the lack of data about that tail (a more uncertain place in Lo and Mueller parlance) can severely hinder models' reliability.

Both short-term measurement and modelling with normal distributions are used in mark-to-market solvency calculations. Volatility and Value at Risk use market value data. This accounting requirement and single-period focus means that current risk measurement is dangerously dependent on market prices being well-behaved and normal. But there are many instances where periods of below average market volatility coincide with above average market valuations. Most investors should think risk was high at such times because of the risk to the real purchasing power of the fund's assets (we use the term wealth risk for this) and the increased likelihood of adverse consequences to the mission.

The last tension we highlighted above concerns the limited reference to risk relative to liabilities (or any other frame of reference related to a fund's obligations, such as spending policy in the case of endowments). The pensions industry (influenced by numerous stakeholder interests) has tended to measure liabilities in multiple ways which has made relative-to-liability measures difficult to manage against.

Which measure should guide the investor?
 We observe that a risk-free discount basis for liabilities has proved most tractable but also that the risk-free portfolio is often tricky to determine. Some funds have adopted the

alternative practice of using low-risk portfolios (an example being discounting with AA credit yield), but this can introduce circularity and bias into the methodology.

Asset owner risk models not coping

On top of these five tensions, asset owners have to come to terms with how much more complex their funds are when looking out over multiple periods.

The first complexity hurdle at which many of today's practices fall is the recognition of endogenous risks.⁸ Decision-making processes and models like **exogenous risk**; that is risk that comes from the outside: it is all about factors, inputs and economic scenarios. Single period measures and mark-to-market accounting work for exogenous risk. Unfortunately investors do not operate on risk islands. As well as exogenous risk, there is also **endogenous risk** from the inside of the system. Our own decisions, actions and reactions themselves introduce risk and opportunity, as do the reactions of other investors as they consider new conditions. The concept of reflexivity is outlined in **Figure 05**. The success of a fund's mission is inherently sensitive to how well it adapts to changing conditions with a change of strategy.

Figure 05. Reflexivity

<p>Definition</p>	<p>Reflexivity refers to circular relationships between cause and effect. A reflexive relationship is bi-directional, with both the cause and the effect influencing one another. Originally the term came from sociology, and described an act of self-reference where examination or action 'bends back on', refers to, and affects the entity instigating the action or examination.</p>
<p>Reflexivity as explained by Soros⁹</p>	<p>Reflexivity is observed where investor beliefs change and these new beliefs impact investor behaviours, which affect investment conditions producing further feedback and iterations.</p> <p>Investor beliefs may change by recognising new realities in the operating model of a company (say, worse).</p> <p>This changes the beliefs about appropriate pricing (a cognitive process in Soros' description, in this example, lower).</p> <p>These beliefs affect investor buying behaviours and company cost of capital (driven higher, a manipulative process in the Soros' descriptions).</p> <p>Investors' observation of capital markets (the cognitive function) and participation in the capital markets (the manipulative function) influence both valuations and fundamental conditions and outcomes.</p>

This is why, in describing the multi-faceted nature of risk, we include significance (capturing endogenous factors) alongside impact (which is based on exogenous factors). What an investor decides to do in response to a poor outcome introduces risk and opportunity alongside the impact of that original outcome. For example, market bubbles are formed by investors reacting to rising prices by increasing their expectations of returns and therefore seeking to buy more, driving prices yet higher (and conversely for market crashes). To understand endogenous risk we need to look beyond single periods of time. Decisions in response to today's events affect the risks of tomorrow.

This calls for a broadening of the framework within which most funds operate. It has to assess the risks inherent in any decision where the decision maker is not 100% aligned to the mission. This is described as agency risk. Following the 2007-09 global financial crisis there is growing awareness that the investment system is full of agents who do not have perfect alignment. While the obvious agents are outside investment firms, clearly in-house executives have agency pressures too. Even trustees or board members do. Knowing that participants' actions themselves are a source of (endogenous) risk, the existence of conflicts of interest raises the need for asset owners as fiduciaries to have improved risk awareness (and hence risk management) that allows for those conflicts. This again speaks to the need for significance indicators in risk rather than just impact statistics.

How well is risk managed?

It is difficult to provide a rounded response to the question of how effective asset owners are in managing risk. We know from our surveys that asset owners mark themselves moderately well on this question. We also know that expert opinion looking from the outside in on asset owners is more critical in its assessment.

Risk management is inherently difficult and some of the general limitations of the governance of asset owners (see Clark and Urwin¹⁰) are obvious in this area. Funds struggle to mobilise the considerable resources needed for the challenge and rarely have information in a form that promotes good decision making.

But this is emphatically a glass half full subject. Asset owners have opportunities to develop both their thinking and their practices. These opportunities range from short-term quick wins to long-term incremental remedies and start with the critical factor of balancing the needs of helpful risk measurement with effective risk management.

Measurement or

management?

We need to be careful not to mistake measurement for understanding. To some extent we measure what we can, because we can. The driver losing his car keys on a dark night will always be tempted to look where the street lights are brightest.

There is, of course, a place for risk measurement as part of a rigorous evaluation and in forming reasonable expectations about the future. The strongest motivation for measurement is in support of better management. A good feedback loop between risk measures and decision making ought to be a key element of good risk management. However, we recognise this is difficult to achieve in practice as risk management is to guide decisions over actions in the future, about which we are largely in the dark. The rest of this publication focuses on ways in which asset owners can improve decision making by progressing from risk measurement to a deeper risk understanding.



We characterise this as risk intelligence which can come from better measures, feedback loops linking the measurement to the management and a real-time bias to action in response to developments. The three elements of this ideal practice form a risk management triangle of needs – the framework, governance and tools (see **Figure 06**).

Figure 06. The risk management triangle



Which risk measures?

To refocus measurement, we need to choose measures judiciously. There are many different risk measures to choose from. We would argue for some selectivity, but as risk is multi-faceted there will be a number to consider, with no single figure giving a complete picture. Think of the analogy of the aircraft cockpit, with its multiple warnings for possible risk events and its instruments measuring progress towards achieving mission success.

Alongside quantifiable risk measures, we need to recognise that uncertainty is better highlighted by codification (for example traffic lights or simple one to five scales). Whilst returns can be measured with great precision, risk measures are inherently nebulous. Features of a good risk measure are shown in **Figure 07**. Many widely used risk measures do not do well against this list. For example, volatility measures score only two out of five (transparency and probabilities).

Figure 07. Features of a good risk measure

1	Transparent and anchored in sound theory
2	Focused on downside outcomes
3	Linked to time horizons that are important
4	Incorporates probabilities
5	Assesses impact on the fund (considering solvency, and so on)

Continuous Value at Risk

Value at Risk (VaR) type measures are better at capturing impact and are focused on the downside. So not surprisingly, they do most of the heavy lifting in risk measurement, but not without some criticism.

$VaR_{(95)}$ is the downside outcome that is exceeded in 5% of outcomes given the probability distribution assumed. Its critics point to the lack of any insight into the attributes of the distribution deeper in the tail. The average downside outcome in those 5% of more extreme cases is the Conditional Value at Risk. On balance this scores better because it looks at the outcomes in the tail.

VaR addresses impact and downside outcomes where volatility fails to, but is still a short-horizon (usually one year) measure.

We would argue that most asset owners need to focus on longer-term risks. Continuous VaR (also known as Intra-horizon VaR) is one measure which attempts to introduce a longer horizon by linking shorter period VaRs into one measure.

Continuous VaR measures the worst outcome at a chosen probability level from inception to any point in time during the investment horizon.¹¹ Continuous VaR is always greater than VaR, given reasonable assumptions.

The risk dashboard

With multiple measures and risk assessments, the natural way of presenting data is in the form of a risk 'dashboard'.

The ideal risk dashboard would combine the following features:

- Multiple measures that have relevance for different decision makers. We think first and foremost of the board and the investment executive, but some data is needed for communication with the wider stakeholders, including beneficiaries.
- Creative and expert presentation that supports judgements and decisions. With so much information competing for space, good presentation that provides expert perspectives is critical. These include simple high/medium/low statistics and graphical alerts to higher risk exposures and to changes in risk exposures.
- Real-time feeds of data and measures. Given changing conditions and working with a philosophy that risks and opportunities are always shifting, there is a critical need to capture current conditions and to be ready to adapt.

Many funds are progressing in this direction, but risk dashboards in current use typically lack many of these features. In our view, this gap is an opportunity that funds can exploit. There is considerable scope for better measurement, better presentation and more real-time responsiveness to change. Having these in the hands of decision makers would lay the foundations for better performance. Without this information, decisions are handicapped and, by extension, so is performance.

The context of mission

Ultimately risk is concerned with the chance that mission goals or expectations will not be met. Mission in this context is the multi-period and multi-stakeholder value creation proposition.

Mission success depends on a certain amount of wealth being created over time.

The route by which funds intend to progress to mission success is commonly called the journey plan or even a flight plan.

This journey plan can be constructed as a function of time, policies and risk decisions. The journey plan for a fund maps out a current risk budget and describes how that risk will change, contingent on new circumstances. It also covers the financing commitments involved, both present and future, and how these would adapt to new circumstances. The subtle aspect of the journey plan is that it must reflect the adaptive opportunities that the decision makers will face in the future.

Risk as mission impairment

The risk event (or, more likely, series of inter-related events and decisions given the endogenous nature of the problem) that we should be most concerned with in risk management is the one that leads to a permanent impairment in the fund's mission. This is why both significance and impact are important. Risk can be seen as a continuum of outcomes with different levels of mission impairment.

Through the journey plan there are both within-horizon risks (where poor outcomes compared to expectations along the journey plan lead to a requirement to adapt) and end-of-horizon risks¹² (where shortfalls indicate mission failure).

We have already noted that wealth creation (and hence mission success) requires investment risk to be taken – with exposure to economically justified risk factors.



Taking this investment risk however, introduces the possibility of mission impairment – that assets are insufficient to meet actual or projected liabilities or wealth targets. To cover these periods the fund and its stakeholders need access to what we term ‘adaptive buffers’ to see them through a poor period.

Adaptive buffers have both financial and non-financial aspects so measurement needs to be both quantitative and qualitative. Most of these adaptive buffers can be termed ‘capital’. To an economist, capital is defined as one of the factors required for production. Financial capital is an obvious adaptive buffer. Financial capital is clearly critical for an asset owner to produce results for an institutional fund and ultimately secure a mission success. Most funds operate with certain financing expectations. The issue is how the financial inputs can be increased, given poor outcomes.

Wider definitions of capital consider non-financial forms, such as human capital, governance capital, political capital and emotional capital. These are all factors in the production of the results and mission of a fund and are also important as adaptive buffers.

Examples of adaptive buffers in pensions contexts are given in **Figure 08**. These buffers can come from the investor themselves (this is particularly important in defined contribution (DC) investment) or from another organisation. The sponsor is the most important provider of adaptive capital in DB pensions via the covenant, but the trustee will provide governance and political capital. We need to remember that, like other forms of capital, adaptive buffers are scarce, need to be bargained for, and will have (implicit) required rates of return.

Figure 08. Adaptive buffer examples

Context	Source of adaptive buffer	Description of adaptive buffer
DB pension	Sponsor	Financial capital called upon either on a contingent basis when shortfall is projected, or a realised basis when the journey plan fails to deliver agreed pensions.
	Trustee	Governance capital called upon to assess the shortfall situation and commit to an appropriate response.
	Trustee	Political capital of board members in drawing from the sponsor covenant an increased willingness to provide financial support.
	Industry safety fund (US PBGC, UK PPF and so on)	Financial and governance capital from external institution deployed where shortfall accompanies insolvency of a corporate sponsor.
DC pension	Member (self)	Human capital deployed to flex the covenant with self that makes up the DC journey plan. This could be in the form of delaying retirement, making higher contributions or accepting lower current or future consumption in the light of shortfall compared to pension expectations.
	Member	Emotional capital to be able to deal with temporarily poor investment results.
	Scheme provider	Governance capital to deal with poor outcomes with appropriate responses sufficient to support the member through the adverse times.

The risk ‘sweet-spot’

At present, investment journey plans are generally described and assessed without reference to either the availability or usage of adaptive buffers. If these are scarce, that cannot be right.

Good risk management will give consideration to how available and effective the various buffers would be in various future scenarios. We believe that adaptive buffers should be budgeted for and part of the journey plan. Measurements of mission success (both progress intra-horizon and end-horizon) should include wealth targets within a certain adaptive buffer budget.

Where two different investment strategies produce the same wealth outcome, but one either uses or requires the availability of a less adaptive buffer, then that less capital-intensive strategy should be viewed as superior in a world of scarce adaptive buffers. Furthermore, an investment journey that calls upon an adaptive buffer at some stage should be marked down relative to one that merely relies on its existence. Conversely, an investment journey plan that does not acknowledge the existence of some available adaptive buffer might be thought of as unduly conservative.

We return to the principle that the taking of some risk in pursuit of a value-creation mission is good but there is a limit, with too much risk being bad. The Goldilocks principle is at work. The concepts we advance find the financial equivalent of the perfect temperature of porridge in the ‘risk sweet-spot’.

These notions of how to compare investment journey plans, of scarcity of adaptive buffers or the possibility of being too conservative raises the question of how much risk is the right amount to take. The essence of this thinking is to seek out the ideal risk amount or risk budget to commit to the mission such that value creation is optimised, allowing for the risks and the potential draw-downs of the adaptive buffers.

Taking risk where it is economically justified is necessary to produce wealth creation, but too much risk may lead to mission impairment. Asset owners and other stakeholders are searching for the optimal amount of risk to take. This amount will facilitate wealth accumulation for the long-term investor and optimises the chances for mission success. This incorporates balancing the needs and security of different stakeholders and of different generations of beneficiaries.

The right amount of risk is a function of the availability of adaptive buffers. Permanent mission impairment is reached when the ability to adapt runs out and risk crystallises.

The concept can be formalised but it is difficult to avoid complexity (see **Figure 09**) and there are intriguing challenges with inter-generational fairness.

“Taking risk where it is economically justified is necessary to produce wealth creation, but too much risk may lead to mission impairment.”

Figure 09. The development of ‘just right’ risk

Adaptive capital mapped to journey plan	Investment strategies optimised for risk in this framework will be those whose potential requirements for adaptive capital match the capital available through the journey plan – which is a function of timeline, policies and norms.
Adaptability ratio concept	<p>The potential capital required can be thought of as a Continuous Value at Risk (CVaR) type measure. Just-right risk can be assessed through the ‘adaptability ratio’.</p> $\text{Adaptability ratio} = \frac{\text{Amount of adaptive capital available}}{\text{Capital the strategy may require}}$ <p>where the denominator is a CVaR.</p> <ul style="list-style-type: none"> • Adaptability ratio equals 1 if the investment strategy is optimised for available adaptive capital. • Ratios less than 1 suggest the strategy may require more capital than is actually available – that is, it is too aggressive. • Ratios above 1 mean that available adaptive capital is not being utilised – that is, the strategy is too conservative. <p>Adaptive capital has both hard and soft elements. This means that it will be hard to turn the adaptability ratio into a pure quantitative exercise in many cases where there is non-financial adaptive capital. It is more likely that investors will be able to use the ratio as a gauge of risk, given some deliberation of potential loss outcomes and the adaptations that would be necessary. This implies a need for scenario analysis accompanied by stress testing of fund solvency to assess the right amount of risk.</p> <p>Given the broad definition of adaptive capital, it will be necessary for investors to think laterally about different risk sources and the range of potential decisions, responses and adaptations that would ensue as the mission progresses.</p> <p>Mission success/failure (or progress/impairment) emerges over time more with wealth and cash than with value and funding status, and varies by segment.</p> <p>Mission outcome progress for some segments where mission is complete (for example, the pension is paid).</p> <p>Mission within-horizon progress where mission is incomplete (for example, the pension is in deferment).</p>

Inter-generational fairness

The challenging reality is that many institutional funds have taken on responsibilities for multiple generations of beneficiaries in their mission, often far into the future. How do the fiduciaries of such funds make sure that they deal fairly with the entitlements of different generations? Most funds struggle with this, because the interests of current beneficiaries tend to get more attention than those that relate to the distant future.

The issues are most stark in DB pensions. With many funds in deficit, there is a rather optimistic journey plan being implemented which depends critically on good outcomes for returns and for future contributions to cover distant liabilities. To be provocative, is it fair that some deeply underfunded pension plans which face a realistic likelihood of future default are paying

current pensions in full? There are all sorts of legal issues with bringing some fairness to this mission. We see considerable grounds to be alarmed about the state of many underfunded and weakly covenanted corporate plans. Some public funds appear to be relying on a future generation of taxpayers to support their commitments, which is unsustainable. So how should this be addressed? The concept of fiduciary duty captured in various jurisdictions includes the duty of loyalty to all members. To act appropriately in the face of this duty requires the consideration of certain measures focused on analysing impacts on the different member segments, some of which are many years apart. With relevant measures of the inter-generational progress towards mission success in place, there is more chance that fiduciaries will address the building pressures before it is too late.

Which benchmarks?

Benchmarks are tools that are critical to effective risk management. But which benchmarks?

We have to be sensitive to the influence of benchmarks as an anchor to decisions, not simply a performance standard. Effective risk management appears to support the use of benchmarks to serve two purposes – performance comparison and risk profiling.

Previously, we described asset-owner decisions on the optimal risk profile for a fund. Here the asset owner is setting the context in which strategic and tactical decisions will be made. This can be done through a benchmark which we call the reference portfolio. This is an investible benchmark which acts as a representation of the risk profile decision taken by the asset owner. This decision best resides with the governing board of the asset owner as it is so central and strategic in the mission. Most boards would prefer to keep the reference portfolio simple, with just a small number of components. Historically the components have been asset classes (perhaps three or four incorporating equities, bonds and real estate) but they could be risk factors (see below).

This plays simultaneously to the board's strengths and weaknesses; the strengths in inferring the risk sweet-spot given all the nuances in the mission; the weaknesses in not having the domain knowledge to address the complexities of multiple asset classes or risk factors. In the latter areas, the investment executive will likely have the most to offer.

The reference portfolio is not the place where the fund needs to express much diversification, but instead focus on codifying a risk profile in terms of broad exposures in a way that is consistent with board members' investment values and beliefs. Setting this reference portfolio will require assessment of the right amount of risk using scenario analysis. This is followed by the translation to asset classes/risk factors which

require agreement on beliefs about expected returns and risks, some quantitative modelling of the different components with respect to potential poor outcomes and some qualitative overlay.

As well as a codification of risk profile, the reference portfolio serves the board in its evaluation of the decisions further down the value chain. It benchmarks the actions of the fund's investment executive team and outside managers. These actions will include both strategic and tactical decisions.

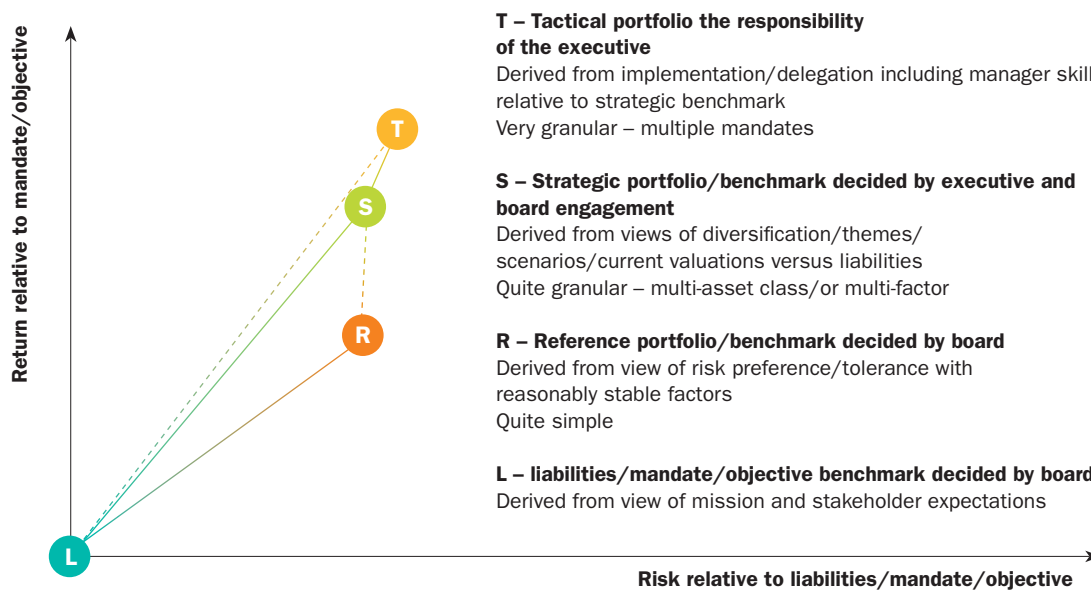
In addition to the reference portfolio, we suggest funds adopt a further level of benchmark through a strategic portfolio. The strategic portfolio, which usually sits best in the decision-making responsibilities of the fund's executive, will vary more frequently than the reference portfolio. It will also include exposure to different risk factors necessary to build diversity into the fund's asset allocation. The strategic portfolio is a benchmark allocation that reflects the executive's up-to-date views on economic themes, scenarios, diversification and current asset-class valuations.

The actual or tactical portfolio is derived from actual investment implementation by investment managers appointed by the fund and the delegated actions of agents of the executive. This will be the combination of a number of investment mandates. It is only at the level of this portfolio that it is appropriate to start measuring risk as tracking error (probably relative to the appropriate element of the strategic portfolio for each mandate).

Whenever tracking error is used in risk management, there is a likelihood that the risk that is measured is not true mission risk.

Figure 10 sets out the considerations in this benchmark framework.

Figure 10. Generalised benchmark framework



In a historical context the reference portfolio was often the 60:40 portfolio, comprising 60% equities and 40% bonds, as this was generally accepted to be a good proxy for the market portfolio postulated by modern portfolio theory. The 60:40 reference portfolio was adopted by pension fund boards relative to a liability portfolio of nominal bonds (which now includes inflation-linked bonds in some countries), and by endowments relative to a liability portfolio that would have looked more like inflation-linked bonds. The investment executive would have introduced more granularity by specifying the mix of equities between domestic, overseas and emerging, and whether to include alternatives (real estate, private equity and hedge funds) in the strategic portfolio. The goal was to exploit diversification.

In our current context the focus is shifting more towards risk factors (or, more importantly, risk-return factors). Part of the reason for this shift is that asset classes are increasingly seen as relatively blunt tools for allocating risk. In other words, adding more asset classes does not necessarily improve the portfolio’s diversification. For example, how we assess how much extra diversification we gain by allocating our bonds across sovereigns, corporates and alternative credit (high yield, distressed, asset-backed and mortgage-backed securities) rather than just holding sovereigns? Using asset classes as the components we must rely on historical relationships (their variability and correlations), and assume that these relationships will be stable into the future. We could instead use risk factors as the components.

For bonds we would use term risk, inflation risk, credit risk and illiquidity risk (see **Figure 04** for descriptions). The advantage is that we can be more confident about how these risk factors will behave in different future environments, and so we do not need to assume that the past relationships between the bond asset classes will continue to hold. It is true that we must make different assumptions – which risk factors, in which proportion, account for the performance of different types of bonds (and assume this mix stays constant in the future) – but the current consensus is that this approach is superior in terms of building better diversified portfolios.

We are confident that much more work will be done on developing risk factors and allocating portfolios on that basis. As examples, in addition to the four risk factors for bonds we noted previously, it would be possible to consider the steepness of the yield curve, or the level of yield relative to dividend yields. For equities, rather than allocate by country (or sector), investors could use the Fama-French three factors (market beta, size and value)¹³, add in Carhart’s fourth factor, momentum¹⁴, or expand to an even longer list of BARRA-type factors¹⁵. While greater numbers of risk factors offer the potential for greater diversification, we must bear in mind that the factors need to be distinct (independent from each other), which becomes increasingly hard as the number increases.

Risk-based asset allocation

Whether using asset classes or risk factors as the primary building blocks, the vast majority of investors have, to date, undertaken capital-based asset allocation.

In other words the question has been 'what proportion of my assets (capital) do I want in each component?', and the historic answer was often '60% in equities and 40% in bonds'. The answer, of course, was dependent on the forward-looking assumptions for the returns and risks of the asset classes, and the correlations between them. Consequently the more capital allocated to the higher return/higher risk asset class, the higher the expected return from the portfolio, but also the more volatile it was likely to be.

In recent years the alternative approach of risk-based asset allocation has emerged. So far products are only available from a few asset managers¹⁶ and the technique is only being used by a small number of asset owners, but the concept is appealing. We illustrate the approach with the simplified example in **Figure 11**. We assume we have two assets, equities and bonds, which have the same risk-adjusted

return (information ratio) equities have the higher expected return and higher risk. If we need our portfolio to produce an expected return of 6.4% pa then we allocate 60% of our assets to equities and 40% to bonds. However, because we have the majority of our portfolio in the asset with significantly higher volatility it turns out that equities account for 86% of total portfolio risk. We are very exposed to equity risk.

Figure 11. Risk-based allocation example

Asset	Expected return (% pa)	Expected volatility (%)	Information ratio (return/volatility)
Equities	8	20	0.4
Bonds	4	10	0.4
Leveraged bonds	8	20	0.4

Correlation between equities and bonds assumed to be 0.2

Capital allocation		Risk allocation (1)		Risk allocation (2)	
Portfolio		Portfolio		Portfolio	
Equities	60%	Equities	34%	Equities	43%
Bonds	40%	Bonds	66%	Leveraged bonds	43%
Cash	0%	Cash	0%	Cash	14%
Expected return	6.4%	Expected return	5.3%	Expected return	6.9%
Expected volatility	13.4%	Expected volatility	10.3%	Expected volatility	13.4%
Information ratio	0.48	Information ratio	0.52	Information ratio	0.52
Proportion of total risk		Proportion of total risk		Proportion of total risk	
Equities	86%	Equities	50%	Equities	50%
Bonds	14%	Bonds	50%	Bonds	50%

To solve this over-exposure we decide that we will allocate by risk instead, and to maximise diversification equities will account for 50% of total risk (Risk allocation (1)). To achieve this we calculate that we need to allocate 34% of the assets to equities, but now our expected return drops to 5.3%, although the volatility falls faster and efficiency goes up. Nevertheless we will fail to achieve our required expected return. We can address this new problem by leveraging the bonds so that they have a higher expected return and higher volatility. In our simplified example (Risk allocation (2)) we have made the volatility numbers the same as the original, so in this case risk-based allocation looks to be equivalent to equal-capital allocation.

If the volatilities of the equities and leveraged bonds were slightly different, equal risk weights would imply different capital weights. Now we can exceed our required expected return, in fact by a large margin. Consequently we have introduced an allocation to cash (0% expected return and zero volatility) in order to bring down the portfolio's expected volatility so that it equals the volatility we were willing to tolerate when allocating by capital. Even with an allocation to cash we have a higher expected return and more efficient portfolio. In addition, the cash would be expected to offset some of the effect of large equity market falls, so downside risk statistics could be improved as well, although we are more exposed to bond market falls.

We believe this example conveys the attraction of risk-based asset allocation but it also appears to have an element of 'conjuring trick' about it. How is it possible to create so much extra expected return for no more risk, simply by waving a magic wand and leveraging the bonds? As with most things the devil lies in the detail, and not everyone is convinced it is possible to create value in this way. We refer the interested reader to the Risk based asset allocation section below for a more technical discussion of the subject. For the less-interested reader it essentially comes down to whether you believe different assets are priced so as to give approximately

the same risk-adjusted return, or you believe they are priced according to their correlations and risk, so all assets have the same impact on a portfolio. For our part we believe more strongly in the first and so we do think that more value can be created from risk-based allocation. Of course, it is worth noting that when this approach is followed by enough investors, then asset pricing will tend to reflect correlations to a greater extent, at which point the additional value will start to disappear. However, this is normal for the world of investment. Success attracts more money, changing prices and reducing future success.

Risk-based asset allocation

Anybody who adheres to modern portfolio theory will struggle to accept risk-based asset allocation. Consider a core belief in the assumption that we live in a stationary world where equilibrium is the normal state of affairs. There can be shocks to the system, but long-run history is our best guide to expected future returns, risks and correlations. Further, modern portfolio theory and the capital asset pricing model (CAPM) is the best model of reality, and therefore the market portfolio is king (super efficient – the highest possible Sharpe ratio). The risk-free rate is also key, defining the capital market line along with the market portfolio. Given historical returns, the capital market line is relatively flat, the point of tangency with the efficient frontier is quite far to the right (say 60% equities), and the gap between the capital market line and efficient frontier for high risk levels is small. In other words there is little benefit to leveraging the market portfolio. In this world Sharpe ratios differ between asset classes, but Treynor ratios (return above risk-free rate, divided by the beta to the market portfolio) are equal for all asset classes (this defines the security market line). This implies that securities are priced according to their Treynor ratios (we are not sure actual investors behave this way), and that correlations are efficiently priced by the market (this has not been true historically, but could be true).

As for leverage, the (unequal) Sharpe ratios are unaffected by leverage, so no magic is possible at the asset class level or portfolio level. You can leverage up and down the capital market line if you want to, but with consensus/equilibrium assumptions there is very little to be gained from leveraging the market portfolio, and could you live with the higher risk? The gains to leverage would be highest (according to the CAPM model) with a low risk-free rate/high-return spread for bonds, and low-return spread between bonds and equities (the point of tangency is at the left end of the efficient frontier).

The conclusion from this belief set would be that straying from historical data anchors constitutes active management and introduces risk. Consequently, long-term investors should stick with a 60:40 portfolio and ride out the shocks (there is an implicit or explicit belief that equities have a superior Sharpe ratio). For a good exposition of this worldview see *Leverage and the limits of the possible*, Fred Dopfel, BGI Investment Insights Issue: 10.05.

Not everyone is happy to retain the assumptions underlying modern portfolio theory. An alternative belief to hold would be that all asset classes have about the same long-term expected return on a risk-adjusted basis. In this world Sharpe ratios are the same between asset classes (securities are priced according to their Sharpe ratios to give the same risk-adjusted return), and correlations are not efficiently priced. The (equal) Sharpe ratios are unaffected by leverage, but once leveraged the investor becomes indifferent between equal absolute returns – and so attention can now be focused on relative risks and correlations. Much greater diversity (diversification) is possible as the (equally efficient but) low volatility asset classes have an equal voice in the portfolio.

As noted in the main text, it would be sensible to monitor whether correlations were becoming priced in, as this would indicate that the opportunity from risk-based asset allocation was diminishing. Historically, inflation-linked sovereign bonds have been strongly diversifying assets, so watching this asset class for a zero or negative return premia would be sensible risk management. The UK presents an interesting case where the low real yield on index-linked gilts would suggest that correlation has been priced in. However, it is generally thought that the low level of real yield is due to legislative restrictions leading to a greater demand for hedging assets, rather than the weight of money pursuing risk-based allocation strategies.

Building a strong risk framework

We can now pull together these ideas of risk in the context of mission, assessment of available adaptive buffers, appropriate risk measures and benchmarks which incorporate economically justifiable risk factors, into a risk framework.

Much of the framework is concerned with clear thinking on the issues. The checklist for assessing the clarity of thinking would be:

- Has risk been considered in the context of the mission?
- Have the risk measures identified as important been derived from the mission?
- Have models been used that help assess these measures?
- Have the limitations of these models been understood?

If this clarity is in place, funds can progress to a framework document which would typically cover a risk register, risk budget and risk scenarios.

The risk register

The framework begins with the identification of risks. For each risk source there should be consideration of potential adverse outcomes, with a focus on significance to the fund as well as on impact. This needs to be much more than a ‘tick-box’ exercise. The risk register can be a useful tool for recording the multitude of risk sources to consider. The features that need to be captured are a comprehensive listing of risk moving from the assessment of impact to significance. An example register can be found in **Figure 12**.

Figure 12. The risk register

Prime risk areas	Size	Overall significance	Relative to peers		
Return drivers	VaR is assessed at around x% loss but with some ‘fat tail’ properties	Management of return drivers is critical to meeting the mission	3 High		Similar
Manager skill	VaR is assessed at around x% loss but with some fat tail properties	Management of active manager risk not likely to be critical to meeting the mission	1 Low		Lower
Covenant	VaR is assessed as small but with some extreme risk properties	Management of covenant remains critical to meeting the mission	3 High		Higher
Mortality risk	VaR is assessed at around x% loss	Management of longevity remains influential in meeting the mission	2 Moderate		Similar
Interest rate risk	VaR is assessed at around x%	Management of interest rate risk influential to meeting the mission	2 Moderate		Similar
Inflation risk	VaR is assessed at around x% loss	Management of inflation risk influential to meeting the mission	2 Moderate		Similar
Counterparty risk	VaR is assessed as small but with extreme risk properties	Management of counterparty risk not likely to be influential in meeting the mission	1 Low		Similar
Reputational risk	VaR is assessed as small but with extreme risk properties	Management of reputation risk not likely to be critical to meeting the mission	1 Low		Lower
Liquidity risk	VaR is assessed as small but with extreme risk properties	Management of liquidity risk not likely to be critical to meeting the mission	1 Low		Lower
Implementation risk	VaR is assessed as small but with extreme risk properties	Management of implementation risk not likely to be critical to meeting the mission	2 Moderate		Lower

Note that the register starts with the risk associated with return drivers. In the context of wealth creation through the journey plan, the risk framework should be thought of as a risk-return framework. The framework should also consider long-term risks. This is partly because mission is a long-term endeavour and partly because too much short termism is a weakness in much of today's investment landscape. One thing that can contribute to short termism is risk measurement. Many measures are inherently short term. Therefore the risk framework needs to focus more on management than measurement. Hence the register's incorporation of significance and an assessment of whether various risk types are on the rise.

The risk budget

The concept of the risk budget has gained considerable support among practitioners without becoming academically rigorous. The risk budget is the combination of three facets:

- Individual asset classes and mandates where ex ante expectations (beliefs) can be estimated by asset owners.
- Combinations of asset classes and mandates producing diversification benefits which similarly can be estimated after allowing for correlations.
- Portfolios which can be analysed and compared for their return-per-risk features.

While risk budgets seem to point to the combinations of asset classes and mandates that have most merit, asset owners have gradually weaned themselves off undue reliance of this tool as an optimiser with its implied model reliance. The value of the risk budget as the first-line summary of expectations for any strategy is clear.

The risk scenarios

The third part of the risk framework is presentation of the risk scenarios which take styles of 'what if' thinking and turn it into 'now what' thinking.

Effective risk management is as much a thinking and preparation process as an action process and scenarios play a particular part in developing this thinking.

There is a big difference between anticipating risks and predicting risks. Anticipation is a more realistic goal with investment risks than prediction. Most risks that investment funds experience can be anticipated in broad categories but they may be difficult to predict in ways that funds can precisely protect themselves from. Thinking about risks before they arise (pro-active thinking) prepares the fund for situations where risk seems to be rising. Anticipation of a problem may be able to suggest some protective action or at least accelerate the actions needed to deal with the aftermath of a risk event. Scenarios help disciplined thinking with a 'pre-mortem' of what might go wrong.

Scenarios come in three main groups: stress tests of various components of investment conditions, replays of past history and replays of alternative futures. They can be prepared on a regular basis and put the fund's current strategy through a series of 'what ifs' structured around changes in some of the key drivers. Simple scenarios are organised around single dimensions of change (interest rates, inflation rates, mortality, market corrections). The scenarios that involve more complex combinations of change tend to test prior periods of market stress: the October 1987 crash; the Russian default and LTCM in 1998; the TMT bubble through 2000; the global financial crisis through March 2009. Or periods of economic stress can be used, such as the US Great Depression (1930s), UK stagflation (1970s) or Japan's stagnation (1990s and 2000s).

Alternatively, plausible scenarios for the future can be prepared around evolving conditions such as growth, leverage at work in the economy, inflation, overheating and sovereign default.

Scenarios have, to date, been more single period in character. In view of the endogenous sources of risks they should include multi-period examples.



Building strong risk governance

We turn to the second part of the risk management triangle, governance.

We consider the practical issue of how asset owners organise themselves to take decisions, incorporating best practice in risk management. The key question in this area is how good measurement can lead to better management.

We would argue that most of the principles required for good risk management are already contained in normal principles of good governance.

The Clark and Urwin governance research provides a 12 point best practice list for governance.¹⁷ These are covered in **Figure 13**. Those which resonate particularly with better risk management are mission clarity, investment beliefs and the risk budget.¹⁸

Figure 13. Global best-practice governance

Core best-practice factors	
Mission clarity	Clarity of the mission and the commitment of stakeholders to the mission statement
Effective focusing of time	Resourcing each element in the investment process with an appropriate budget considering impact and required capabilities
Leadership	Leadership, being evident at the board/Investment Committee level, with the key role being the Investment Committee Chairman
Strong beliefs	Strong investment beliefs commanding fund-wide support that align with goals and informs all investment decision making
Risk budget framework	Frame the investment process by reference to a risk budget aligned to goals and incorporates an accurate view of alpha and beta
Fit-for-purpose manager line-up	The effective use of external managers, governed by clear mandates, aligned to goals, selected on fit-for-purpose criteria
Exceptional best-practice factors	
Highly competent investment executive	The use of a highly competent investment function tasked with clearly specified responsibilities and accountabilities to Investment Committee
High level board competencies	Selection to the board and senior staff guided by numeric skills, capacity for logical thinking, ability to think about risk and probability
Supportive compensation	Effective compensation practices used to build, attract and retain appropriate talent align actions to the mission
Competitive positioning	Frame the investment philosophy and process by reference to the institution's comparative advantages and disadvantages
Real-time decision making	Utilise decision-making systems that function in real time not calendar time
Learning organisation	A learning culture which deliberately encourages change and challenges the commonplace assumptions of the industry

Mission clarity and the commitment of all stakeholders to a strong mission statement – which can be captured in certain strongly held values – has strong implications for risk management when the risk framework sees risk being associated with mission success. Clear expectations for the future of a fund and the investment landscape are expressed as beliefs. The use of the risk budget to capture beliefs in actionable form is key to the practical areas of thinking that the best funds excel at.

Values and beliefs are challenging concepts. First, they are subjective and require considerable thought. Second, they may well differ across the members of a board, but for effective practice it is critical to develop shared values and beliefs. Third, the process of codifying values and beliefs involves considering something inherently abstract ('soft') and codifying it in a clear and more tangible form ('hard'). Fourth, using them in practice requires some discipline. But, a sound belief structure supports more coherent and logical decisions.

The importance of values and beliefs, and their links to effective policies and norms are discussed in **Figure 14**.

Figure 14. Values and beliefs of asset owners

Beliefs best practice	A key governance best practice conclusion is that investment decisions are best developed if there is particular attention paid to the values and investment beliefs of the fund's fiduciary board and CIO and the expression of decision-making policies and norms consistent with them.
Values	Values in this framework are convictions about what matters to the fund's fiduciaries and its stakeholders, often expressed as views about desirable behaviours and outcomes for the fund and its beneficiaries and captured in a mission statement.
Beliefs/expectations	Beliefs are working assumptions about the investment world that underlie investment practices and decisions which, when developed and shared, help make goal setting and decision making more effective. The most helpful beliefs accurately describe future outcomes, get organisation-wide traction and are detailed.
Policies and norms	Policies and norms are guidelines about how the fund should operate under various conditions in the future, which should be designed to be consistent with the values and beliefs.
Engagement on beliefs	With board and CIO separately (and correctly) producing belief statements there is the potential for overlap or confusion. It is critical: <ul style="list-style-type: none"> • For the board to have a set of beliefs which the CIO is aligned to. • For the CIO to have a set that are consistent with the board's, are supported by the board, but which drill deeper.
Good use of values	Funds have an edge where the board and CIO are aligned on motivations and purpose, in particular their priorities.
Good use of beliefs	Views of the board and the CIO about the present and future landscape of the domain of the enterprise are opportunities for differentiation – a matter of clarity.
Good integration	The successful joining-up of values and beliefs and norms is critical (given their multiplicity) – a matter of coherence.

However, even with these underpinnings, understanding risk is not easy. Three more best-practice factors are linked to excellence in risk management practice: resourcing, real-time decision making and culture.

Appropriate resource and time allocations need to be devoted to risk. The danger is that focus stays on returns and on the short term because they are easier. This difficulty level combined with the qualitative nature of many of the assessments that are needed means that the capabilities of the board (and training is a big factor here of course) will be a key determinant of success in risk management. The fast-changing nature of both risk sources and their significance speaks to the desire for real-time decision making in risk management.

The overlay required in addition to these best-practice governance criteria is the ability of the board to establish and nurture a suitable risk governance culture. This cultural element would include the placement of risk discussions and decisions on board and investment committee agendas, the type of language and measures used in the organisation as well as a greater adaptability to reposition the fund as a result of new learning.

Strong risk culture depends on the quality of the dialogue on risk and the processes that accompany it. This dialogue should take place throughout the organisation. A critical element is a sense of shared responsibility for risk in its entirety rather than delegation to someone or some team that will only sectionalise its interest.

We envisage the role of the board incorporating setting the risk profile (and hence owning the reference portfolio), being a catalyst on key risk decisions and offering a sounding board, challenge or oversight function to the executive as necessary. The executive will support decision-making processes through regular reports: the risk register, risk budget and scenario analyses. These will include both measures and commentary – measures are incomplete without the commentary that goes with them. That commentary should also incorporate information on the real-time decision making taken by the executive between committee meetings. It is helpful if that reporting continues to use the reference-strategic-tactical/actual benchmark framework detailed above.

This reporting, and the decision-making norms, including the agreed delegation framework, will be captured in a risk management policy which the board should formally adopt and review periodically.

“Strong risk culture depends on the quality of the dialogue on risk and the processes that accompany it.”

What tools are needed?

The third part of the risk management triangle relates to risk tools. Risk needs to be assessed at a total fund level in the context of the mission.

Dashboard

The core requirement is a model of the current portfolio that integrates the holdings in the context of the liabilities. The risk model needs to be current (as near to real-time as is practicable). There are merits in having it relatively independent from the decision-making process. The danger with risks being communicated by the same model as decisions are taken with is that biases can take hold.

The risk model alone is not a sufficient tool. The critical tool is a risk dashboard because the ability to present much, complex information in a clear, concise and accessible format significantly increases the chance of good and timely decision making.

The risk dashboard is a measurement to management tool. To aid decision making, the dashboard needs to be more than a top 20 of risk statistics. A holistic view of the risk landscape should be presented with measurements, concise commentary, risk significance codes, trends and calls for decision. This is not a one-size-fits-all exercise as boards and investment committees will want to agree their own format with information that speaks to their own mission, beliefs and skill set. To be holistic (and effective), there are three dimensions in which the dashboard needs to stretch further: expected returns, horizon and viewpoint.

Expected returns

Any dashboard that misses the valuation dimension to strategy misses a significant piece of medium-term risk. It is axiomatic that in a world of assets reverting to mean values¹⁹, high valuation may be unremarkable in terms of short-term risk but dangerous in terms of medium-term risk. The timing of a move from trending to mean reversion is highly uncertain. The dashboard must also encompass the risk driver elements.

Horizon

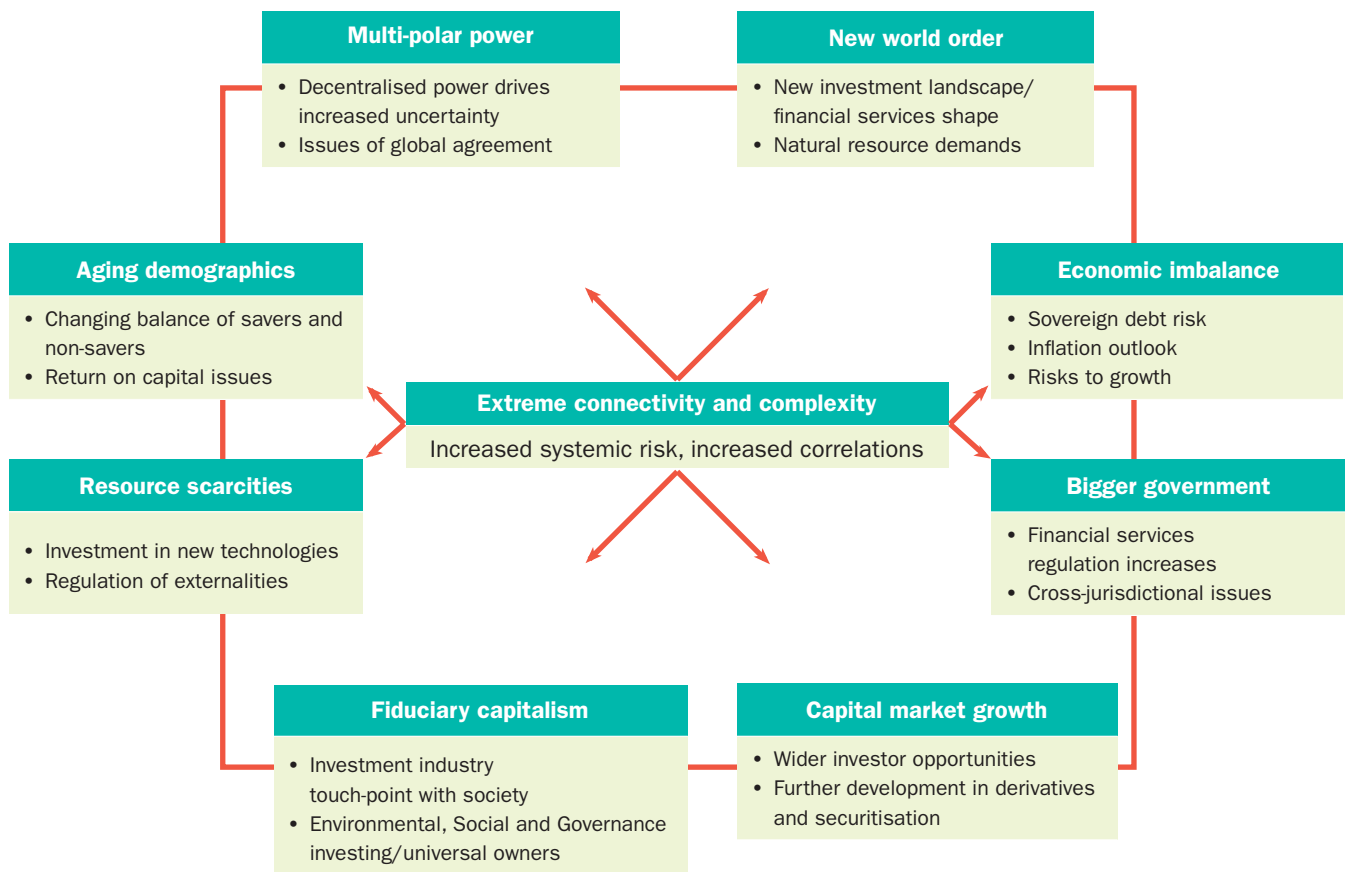
When considering risk in the context of mission, we need measures and understanding of both within-horizon risk and end-of-horizon risk.

Measurements that are tied to time horizons of one year or less should not constitute a large part of the dashboard. Solvency or accumulated wealth needs to be predicted over the remaining length of the journey plan. A number of macro-economic and public policy scenarios should be considered. Measures that can help include Continuous Value at Risk type measures attached to each scenario for within-horizon assessment plus probabilities of mission success and terminal wealth distributions for end-of-horizon.

Viewpoint

Asset owners have tended to spend the majority of their time on portfolio risks. Whilst this is important and understandable, in a world of endogenous risk it is also important to seek to understand systemic risk. The global financial crisis has highlighted the importance of this area and how we can be taken by surprise by tightly coupled events. The board will need to have antennae trained on the financial, economic, political and social world; on big picture trends and changes. Large systemic risk typically occurs at inflexion points in these factors which are, by definition, hard to predict accurately. The best governed funds though will be drawing upon a diverse field of experience. Capturing important systemic developments in a dashboard format is not straightforward, but at the very least a board with strong risk governance culture will demonstrate this wider view with some socio-economic commentary and risk significance estimates. In **Figure 15** we have outlined the considerations we would expect a board to have in its current agenda.

Figure 15. Macro risk framework





Extreme risk hedging

As well as building a dashboard to better monitor unfolding conditions, we suggest that improved risk management requires a second important tool – an improved hedging capability. We are not claiming that hedging is any way new, but we do believe that thinking in this area can be moved forward somewhat. We have made the claim that risk is really about the possible permanent impairment to mission. In this context, should an investor's asset allocation include an asset class or strategy or derivative which aims to counter the occurrence of extreme risks – unlikely, but potentially high-impact events? We would argue yes, at the right price.

If we choose to do nothing and leave the asset allocation unchanged we are effectively self-insuring – no annual outlay on insurance premia but a big potential threat to our mission if the extreme event happens. The alternative action is to take out insurance in some form, but this will cost and hence impact returns. So we will have to give up some expected return if we wish to make our portfolio more robust.

As we are dealing with hedging in this section we will ignore for the moment the possibility of managing risk through dynamic asset allocation. That said, based on the observation that insurance premia tend to rise when many people want to insure, we would advocate a dynamic, preferably contrarian, hedge overlay.

Hedging comes with its own set of problems. One is that not all extreme risks can be hedged. Another is that any hedge used is likely to involve a degree of imprecision. A third is cost. A fourth is whether we are clear about what hedging success looks like. To explain, imagine that the bad event is about to happen and that most assets, except the hedging asset, will become worthless. Does the investor want to be fully insulated against the market falls (suffer no drop in portfolio value), or would they be happy if they had 10% of their assets left? The second option is much easier to achieve than the first, as the investor would simply move, say, 10% of the portfolio into the hedging asset.

Protecting the whole portfolio value increases the complexity in a number of ways.

First the carrying cost of the hedge is likely to be higher. Second, it is almost certain to require the use of derivatives and therefore thought needs to be given to whether the counterparty would be willing and able to pay out if the bad event happened. Finally, as Keynes warned, it is often better to fail conventionally than to succeed unconventionally. If a few, institutional investors become super rich relative to others through successful hedging there would be a danger that they would be targets for special levies, taxation or confiscation. On the positive side, derivatives provide much greater flexibility and the more precise targeting of risks. They also do not require much capital, therefore leaving the bulk of the portfolio untouched.



To summarise on hedging, there are three strategies available:

- **Hold cash.** To quote James Montier, cash is ‘perhaps the oldest, easiest, and most underrated source of tail risk protection’²⁰. Over long historical periods cash has held its real value through both episodes of deflation and inflation but there is no guarantee that this will be the case in the future. If an investor currently views holding cash as too high an opportunity cost, especially in real terms in Western markets, then this will be a difficult option. However, it is possible to view cash as having a very high option value, as some sovereign wealth funds do, with that value increasing non-linearly with the degree of market stress experienced.
- **Derivatives.** It is worth mentioning that cost and usefulness are often in opposition. The cost of derivatives protection can often be reduced by specifying more precise conditions – but the more precise the conditions, the greater the chance that they are not exactly met and hence the insurance does not pay out.
- **Hold a negatively-correlated asset.** For quite a few extreme risks it is possible to predict in broad terms their effects on asset markets and therefore we can identify assets that would hedge these effects. However, there is no single asset that will work against all possible bad outcomes and so we would need to devote a large amount of the portfolio’s capital to holding a variety of asset hedges. Further, there is no guarantee that the expected performance of the hedge asset will actually transpire in the event.

In the light of these difficulties we would suggest a prioritisation exercise: first, focus on the events that can permanently impair the mission.

Using house insurance as an example, many, if not most, home owners are voluntary purchasers despite the negative expected return, on the basis that an uninsured fire would be an event they could not financially recover from. This should identify which extreme risks can be ignored, and which matter. For the latter the right thing to do is to pay up for the insurance, given that the exercise just undertaken has shown the investor cannot afford to self-insure. Second, an investor should do the simple things. These would include:

- Ensuring the asset allocation is as diversified across as many return drivers as possible (many institutional portfolios are heavily concentrated in equity (growth) risk).
- Diversifying within asset classes (most pension funds are heavily exposed to domestic sovereign bonds for liability-matching purposes – extreme risk thinking would suggest reducing the quality of the match to reduce the risk concentration).
- Consider creating a strategic allocation to cash, along the lines suggested above.

Finally, greater complexity can be added over time, assuming it passes a considered cost/benefit analysis. This is likely to involve adding long-dated derivative contracts in a contrarian manner, that is when they are cheap rather than popular.



Long Termism

We have already asserted that there is too much short termism in current risk management practice, leading to inappropriate use of measures which may well underestimate long-term risk.

There is another problem with focusing on short-term risk which goes to the heart of long-term funds – issues of inter-generational equity (see page 17, the context of mission). This is a complex area – itself another reason why many shy away from long-term risk – but one which investors will need to grapple with if they are to act sustainably. In a multi-period, mission-centric risk management framework, future generations of stakeholders need to be taken into account. Indeed many sources of adaptive capital such as sponsor covenants and contingent assets implicitly draw upon the adaptability of future generations. A short-term covenant would not suffice for taking investment risk in DB pension arrangements. Many sovereign wealth funds (SWFs) are established to smooth the benefit of shorter-term exploitation of scarce natural resources across a number of future generations relying on adaptive political capital to take investment risk. Hence, inter-generational considerations are important for most institutional investors. However, there are some barriers to effective operation.

The first is a governance barrier, in that future generations are always going to be under-represented in decision-making bodies. To the extent that adaptive buffers are scarce and need to be bargained for, the present generation is likely to favour itself over future generations in that bargaining process. This will act as a limit on long termism.

The second barrier relates to the actions of corporations in which the fund invests. Management of those corporations generally comes with short-term incentives. Hence equity and bond holders from long-term funds are obliged to invest in corporations with short-term incentive arrangements. To date, this tension has tended to be balanced out by funds focusing shorter term rather than corporations adopting longer-term incentives.

There is, however, a class of investor that may help to resolve this conundrum in favour of the longer-term perspective. Universal owners are long-term asset owners that are committed to inter-generational equity and recognise the issues of sustainability in that challenge.

If they are large enough to exert material economic and political influence and have investments that are broad enough to represent a slice of the world's markets and economies, then they will necessarily be faced with the risks of negative externalities (such as damages arising from tobacco, asbestos and pollution). These investors (few in number but large and influential) may pursue a rational interest in promoting longer-term thinking in corporations through active shareholder engagement. The definitions and strategies of the universal owner are captured in **Figure 16**.

Smaller funds that are owners of the same companies are fortunate 'free-riders' in this exercise of fiduciary capitalism. But this circumstance does not present any reason for universal owners not to play to their strengths in their strategy.

Figure 16. Universal owner principles

<p>Recognise their context</p>	<p>They recognise that both individually and in aggregation through the connections in their holdings they own a significant slice of externalities which risk being internalised to their fund's net cost, now or in the future:</p> <ul style="list-style-type: none"> • Directly through individual stocks. • Indirectly through other holdings. • Obliquely – socialised externalities (social costs to others).
<p>Develop and act on beliefs</p>	<p>They believe they can successfully protect/grow the value of their holdings – directed by pure financial criteria in the maximisation of return adjusted for risks and costs – by seeking to manage their risk exposure to externalities through:</p> <ul style="list-style-type: none"> • Ownership strategy; active ownership, collaboration in public policy efforts. • Allocation strategy; integration of Environmental, Social and Governance (ESG) factors, investment in targeted ESG related mandates like clean tech.
<p>Produce ancillary benefits</p>	<p>They recognise that their actions effect system-wide change of net benefit to society more broadly and other investors (who gain free-rider effects); this is secondary to their financial purpose.</p>

Proposals for doing risk better

This publication has laid out a view of what risk is and how asset owners might start to engage with it in the context of mission. While it has highlighted ideas for improvement, we conclude with some explicit descriptions of where risk management might be done better.

Our concern is to move from measurement to management based on understanding rather than statistics; to move longer term in line with mission considering both the journey plan and the likely destination; and to allocate according to the ability to adapt financially, politically and through good decision making.

Our aim is also one of integrity to sound principles, which requires simultaneously aligning the risk framework and governance with the risk tools used.

Figure 18. Better risk framework

The framework emphasises a deliberate approach to risk management. **Figure 18** suggests where frameworks could be improved, many as shorter-term projects.

	Scope of possible changes	Explicit examples
Mission clarity	Mission statements. To view risk in the context of mission, clear statements and wide stakeholder engagement in mission is a key starting point.	Mission drafting to include a memorandum of understanding.
	Journey plans. Many funds have journey plans – for DB pension funds these are usually de-risking plans. Strengthening these plans is a natural next step.	Journey plans drafted with understanding of risk factors and incorporating adaptive buffer concepts.
	Key performance indicators (KPIs). Funds rely heavily on performance measures versus benchmarks, whereas capturing and measuring KPIs as inputs would add to measurement depth.	Multiple KPIs recorded on the risk dashboard.
Beliefs	Expansion of beliefs to cover risk factors, the dangers of mission impairment from excessive exposure to risk, access to adaptive capital, dealing with the complexity of the risk landscape and endogenous risk.	Investment beliefs to be re-examined and strengthened, and translated into positive decision-making norms.
Risk budgets	Risk budgets based on a thorough understanding of risks, their impact plus significance and the fund's ability to adapt.	Risk budgets expanded and made more real-time.
Long termism	Funds address the misuse of measures, incentive structures and agency issues to align with mission and sustainability.	Revisions to mandates, targets and compensation structure.

Figure 19. Better risk governance

The mission, organisation and long-term challenges in risk point to the need for better risk governance. Improvements fall into three categories. These will usually be tough challenges and best pursued over a longer period.

	Scope of possible changes	Explicit examples
Organisational design	Best practice would include a board engaged with risk profile and deepening its experience of complexity, an empowered executive making real-time decisions and a benchmark framework that recognises different responsibilities.	Revisions to the decision rights and responsibilities matrix to reflect more informed and streamlined decision making.
Culture	Organisational design, processes and decision-making norms flow from a risk governance culture. This stems from the quality of the dialogue on risk inside the organisation and the place risk occupies on agendas and in incentive structures.	Action plan for change management.
Compensation	Rewards tied to attainment of risk outcomes within parameters may reinforce appropriate behaviours.	Revised compensation structures of the executive team.

Figure 20. Better risk tools

Incorporating risk tools can be undertaken with out-sourced systems and so can be delivered in the shorter term.

	Scope of possible changes	Explicit examples
Benchmark framework	Evolving benchmarks to meet the dual purposes of risk profiling and performance assessment.	Introduce the Reverse Stress Testing framework.
Risk models	The specification involves modelling which can be consolidated to a portfolio level view.	Consider internal or external risk management solutions including off-the-shelf versions.
Risk dashboards	Structure the feeds from various risk and valuation sources to produce a combined measurement and management tool.	Consider internal or external risk management solutions; requires customisation.

In conclusion

The incentive to improve risk management is rooted in a belief that the best risk managers with the deepest understanding will gain competitive advantage in the increasingly complex and inter-connected investment world. This transition is to both a better framework and better governance.

The additional resources required may be secured in part by internal and additional external people and technologies. In governance terms it is encouraging that asset owners have been prepared to directly hire more high calibre people from CIOs (chief investment officers) through to CROs (chief risk officers). On the other hand, the challenges managing internal capabilities and the specialised nature of the competencies required suggest increased reliance on outsourced consulting and risk modelling services.

Are asset owners comfortable spending more on risk management? It varies widely. But it seems strange that funds pay considerably more for external portfolio management mandates that produce bottom-up impacts but pay less to address the top-down impacts, including the risk management dimension. It is difficult to be clear

about exactly where fund spending goes but it is usually above 50 basis points for external portfolio management and under five basis points for the fund's asset allocation and risk management activities.

The landscape of risk management painted here reflects the complexity of the world in which funds operate. Closing the gap between current and best practice will be hard work. The good news is that this change is founded on the areas of mission, beliefs, governance and implementation practice where high performing funds will already have focus. The prize is a deepened understanding of risk that will translate into 'just right' risk taking aimed at mission success. This prize is synonymous with better overall performance.

- ¹ Graham Greene (1969), *Travels with My Aunt*, The Bodley Head, ISBN 0140185011.
- ² Andrew Lo and Mark Mueller (2010), *Warning: Physics envy may be hazardous to your wealth!*, MIT working paper series, available at web.mit.edu/alo/www/Papers/physics8.pdf.
- ³ The statement was made by Rumsfeld on 12 February 2002 at a press briefing where he addressed the absence of evidence linking the government of Iraq with the supply of weapons of mass destruction to terrorist groups. The Transcript is available at www.defense.gov/transcripts/transcript.aspx?transcriptid=2636.
- ⁴ Harry Markowitz (1952), *Portfolio Selection*, *Journal of Finance* 7(1):77-91.
- ⁵ The term 'nowcasting' is a contraction of 'now' and 'forecasting'. The term is used in both economics and meteorology. These models are used where official economic data is only available with a time lag.
- ⁶ Lisa Goldberg, Michael Hayes, Jose Menchero & Indrajit Mitra (2009), *Extreme Risk Management*, MSCI Barra research paper No. 2009-4.
- ⁷ Nicolas Taleb (2010), *The Black Swan* (2nd edition), Penguin.
- ⁸ See for example H Woody Brock (2009), *The End Game Draws Nigh*, SED Profile 92.
- ⁹ Soros, George (2008). *The New Paradigm for Financial Markets*. Public Affairs.
- ¹⁰ Gordon Clark & Roger Urwin (2008), *Best practice pension fund governance*, *Journal of Asset Management*, 9(1): 12-21.
- ¹¹ For a detailed explanation of Continuous VaR see John Campbell, George Chacko, Jorge Rodriguez and Luis Viceira (2004), *Strategic asset allocation in a continuous-time VaR model*, *Journal of Economics Dynamics and Control*, 28 (11).
- ¹² Mark Kritzman and Don Rich (2002), *The Measurement of Risk*, *Financial Analysts Journal*, 58(3).
- ¹³ Eugene Fama & Kenneth French (1993), *Common Risk Factors in the Returns on Stocks and Bonds*, *Journal of Financial Economics* 33 (1): 3-56.
- ¹⁴ Mark Carhart (1997), *On persistence in mutual fund performance*, *Journal of Finance*, March 1997: 57-81.
- ¹⁵ For explanation of these factors see www.msccibarra.com.
- ¹⁶ We are referring to risk-based asset allocation and in this area only a few asset managers have offerings. Risk-weighting in general is becoming increasingly common. There are various risk-weighted equity products that seek to outperform capitalisation-weighted indices, and there are constant-volatility products and minimum-volatility products available too.
- ¹⁷ *ibid* Clark & Urwin.
- ¹⁸ *ibid* Clark & Urwin.
- ¹⁹ Mean reversion is an example of an investment belief, and requires a deeper belief regarding the mechanism that causes the mean reversion. An alternative belief in market returns following a random walk would mean that current valuation gives no insight into medium-term risk.
- ²⁰ James Montier (2011) *A value investor's perspective on tail risk protection: an ode to the joy of cash*, GMO white paper June 2011.

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