SEI PERSPECTIVES

Tail-risk, Market Turbulence and Surviving the Perfect Storm

For pension scheme trustees and sponsors the global economic turmoil of the past few years has placed risk management firmly in the spotlight.

Drawing on this theme, this edition of SEI Perspectives examines one of the most currently talked about subjects, tail-risk. We explore its background and causes, its potential impact on pension schemes, and the options available to hedge against it. Furthermore, we explain why in our view, hybrid options could offer the most sensible form of tail-risk mitigation.
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What is tail-risk?

There is no widely agreed definition of tail-risk. However, the term has come to denote significant downward moves in a pension scheme’s financial position over a short space of time; those caused, for instance by high impact, so-called ‘black swan’ events that are unforeseeable and potentially catastrophic.

What is a typical UK pension scheme’s primary exposure to risk?

Most UK pension schemes hold equities in their portfolio as part of their assets. However, the liabilities (i.e. the future pension payment obligations) are reasonably predictable future outflows and therefore resemble long-dated bonds. Often, the scheme’s asset portfolio matures sooner than the liabilities and consequently does not contain enough bond price sensitivity (also known as duration). This can lead to fluctuations between the value of the liabilities and assets. The scheme is exposed to interest rate risk; primarily the risk that falling interest rates lead to a higher value for the liabilities relative to the assets and consequently greater deficits. In addition, the assets are exposed to the risk of downward equity market movements, known as equity risk.

The experience of a UK pension scheme

In times of economic anxiety, markets often experience a so-called ‘flight to safety’ with investors, particularly those with shorter-term horizons, shying away from equities and more risky securities, in favour of defensive assets such as bonds.

• Sales of equities en masse cause a devaluation of equity holdings.
• Bond prices rise and yields decrease as demand for these safer assets increases.

When both happen over a short space of time, the experience for a typical UK pension scheme is a rapidly deteriorating financial picture.

• The scheme’s liabilities are linked to bond yields and falling yields leads to an increase in the scheme’s liabilities.
• If equity prices drop, this generally leads to a decline in asset values.
• Collectively, if assets are down and liabilities are up, deficit levels increase.

The cumulative effect for pension schemes is therefore a ‘double whammy’.

This predicament was realised on a large scale in the ‘perfect storm’ of the 2008 economic crisis. UK defined benefit (final salary) pension schemes showed a deficit of nearly £200bn at the end of December 2008\(^1\). Those same pension schemes had a surplus of £130bn in mid-2007. The impact of tail-risk on pension scheme funding can evidently be severe.

What can be done to mitigate tail-risk?

SELL EQUITIES
The simplest idea would be to sell equities (or other growth assets) and buy enough long-dated bonds to fully match liabilities. But pension schemes which are in deficit still usually need market growth in the assets to clear the deficit and that precludes selling equities today.

USE DERIVATIVES
To increase bond holdings without reducing equities, the scheme could buy interest rate swaps. Essentially it would enter into an agreement to buy exposure to fixed rate bonds at zero upfront cost. Positives – this reduces interest rate risk, keeps potential for growth in the assets and is a credible approach. Negatives – if long term interest rates rise, then the pension scheme loses out on funding level improvement as a result of ‘locking in’ to today’s interest rates.

VANILLA OPTIONS
A further idea would be to keep equities and use (vanilla) market options to mitigate some equity and interest rate risk. Equity market falls could be mitigated by purchasing a put option that provides a payoff beyond falls in the market below a certain level. Similarly, declining interest rates, (which can lead to rising liabilities) could be mitigated by taking out an interest rate swaption that provides the option to receive a certain fixed rate of interest in exchange for a floating rate for a given period of time. The maximum loss associated with buying a swaption is the premium paid and the value of the swaption to the pension scheme will be positive in scenarios where long term interest rates fall (precisely those situations where liabilities are also rising). Positives – the pension scheme has access to funding level gains if equity markets and/or interest rates rise. Negatives – the options can be expensive if both are purchased together and the pension scheme needs to take on some downside equity and interest rate risk in order to keep the premium tolerable.

A HYBRID APPROACH?
An alternative and in our view, more sensible approach, would be to keep equities and use hybrid options. These can be structured to more closely protect against movements in a funding level. They tend to be cheaper to execute than vanilla options and can be tailored more closely to a pension scheme’s specific needs.
The benefits of hybrid options

Hybrid options allow the scheme to tailor its risk mitigation to focus only on the events that would typically hurt the funding level. Equity markets and bond yields falling together is likely to be painful to the pension scheme but equity markets falling and bond yields rising might not be. A hybrid option which protects based on the difference between equity and bond returns can be used in this instance. This better reflects painful scenarios as they relate to the funding level.

The example below illustrates an option that is set up to pay off to the scheme if equities underperform long-dated bonds in a year by at least 15% and is applied to a number of scenarios with varying bond and equity returns. If the option expires ‘out-of-the-money’, i.e. without a profit, it is worthless at the end of the year and the buyer loses nothing apart from the original option premium, hence the ‘Not Paid’ red squares. On the other hand, if equity markets underperform bonds by 15% or more, the option expires ‘in-the-money’.

Various shades of green demonstrate the varying amount of profit the option would pay out given the annual returns on bonds and equities. The darker the shade, the more extreme the scenario and the larger the profit generated by the hybrid option. 2

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<th>Paid if Equities – Bonds &lt; -15%</th>
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For illustrative purposes only

2 Source: SEI
Tail-risk hedging in practice

We back-tested the hybrid option on a sample UK Pension Scheme with a 60/40 equity/fixed income asset allocation with the funding level tracked annually from 1999 (including sensible assumptions about liability size and structure). As illustrated in the diagram below, the results showed a 17% higher funding level in 2011 inclusive of the costs of running the option strategy.

Looking back, we arguably had two major tail-risk events in that time period (the 2001/2002 ‘dot com bubble burst’ and the 2008/2009 economic crisis). The funding level of the 60/40 scheme without option investing was hugely impacted in these periods whereas the hybrid ‘funding level options’ provided a large amount of value to support the assets when the funding level was in danger.

Impact on funding level – hybrid option strategy

Source: SEI. Portfolio is a hypothetical portfolio of 60% equities and 40% UK Gilts using broad market index data. Hybrid Options payoff based on the price of the FTSE Allshare Index versus UK gilts. Hybrid option prices are based on an SEI option pricing model calibrated to the prevailing market conditions. Results do not reflect any actual client experience nor do they reflect the impact material economic and market factors may have had on SEI’s decision making if a specific mandate was being managed.

3 Incorporated into this were allowances for systematic annual purchases of hybrid funding level options paying off only if equities underperformed bonds by at least 15% and expiring worthless at the end of the year if not. The back-test allowed for estimated movements in hybrid option prices in accordance with market conditions then prevailing.
Conclusion

• Tail-risk can have a substantial impact on pension scheme funding levels.

• Combination of vanilla options can offer effective mitigation but tend to be expensive since they may protect the scheme against events that do not necessarily require protection.

We believe that hybrid options have the potential to offer a superior solution to hedge against tail-risk for the following reasons:

• They can be customised to align directly to any UK pension scheme’s specific needs and focus only on mitigating events that are harmful to funding levels.

• Use of these options allows the scheme to benefit in funding level upside scenarios.

• Hybrid funding level options are likely to be cheaper than a combination of vanilla put options and swaptions.

Ultimately, hybrid options could play a vital role in journey planning and dynamic de-risking. By mitigating the risk of severe downside scenarios, a scheme could experience a smoother journey towards full funding.

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