

Investing for Self Sufficiency - Objectives and Strategies



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Agenda and speakers

Many pension schemes now have very low levels of investment risk. As a result, longevity risk (or risks) is becoming more important in the context of the total level of risk being run. If these risks are not hedged, there are implications for the most appropriate investment strategy in terms of optimising risk/return trade-offs. In this session, we describe the different risks faced, how they can be measured and the implications for optimal investment strategies.



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Paul is responsible for leading global research in investment strategy, outcome-oriented investing, risk management and asset-liability modelling. He works closely with teams not just at LGIM but also across the Legal & General Group. Paul joined LGIM in 2015 from J.P. Morgan Asset Management where he was European Head of the Strategy Group. Prior to that, he was a Professor of Actuarial Science at the University of Kent, where he continues to hold a chair. As well as holding a PhD in Economics from the University of Bristol, Paul is a Fellow of the Institute and Faculty of Actuaries, of the Chartered Institute for Securities and Investment, and of the Royal Statistical Society. He is also a chartered enterprise risk actuary and a CFA charterholder.



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Graham was appointed Head of Matching Solutions in March 2015. He has particular expertise in risk management, derivatives, insurance investment and project management. His main focus is on the management of a range of pooled funds and bespoke client portfolios for DB and DC pension scheme clients. Graham joined LGIM in 2007, originally working in the Derivative Trade Support team and moving to the Solutions Group in 2009. He is a graduate of the University of Southampton where he obtained an honours degree in management and accounting.

Key points

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Executive summary

This paper examines how uncertainty regarding future mortality and life expectancy outcomes, i.e. longevity risk, affects defined benefit pension schemes. The purpose of this paper is to set out a framework for measuring and understanding longevity risk, and to explore its potential impact on investment strategy, particularly for schemes aiming for self-sufficiency. The key points are:

► **First**, pension schemes are maturing and there is an increasing focus on the endgame. As schemes approach their endgame, longevity risk is an increasingly significant component of overall scheme risk.

► **Second**, properly understanding longevity risk requires use of stochastic models. These should integrate with models of the other risks that a pension scheme faces.

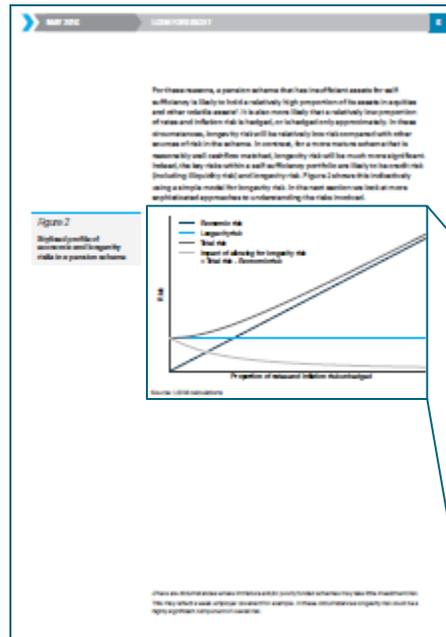
► **Third**, consideration of longevity risk impacts investment strategy. For those schemes in run-off, the main conclusion is that schemes should likely maintain some investment risk, predominantly via credit but also from diversified growth assets at high funding levels, unless they are fully funded on particularly prudent longevity assumptions.

John Southall
Senior Investment Strategist

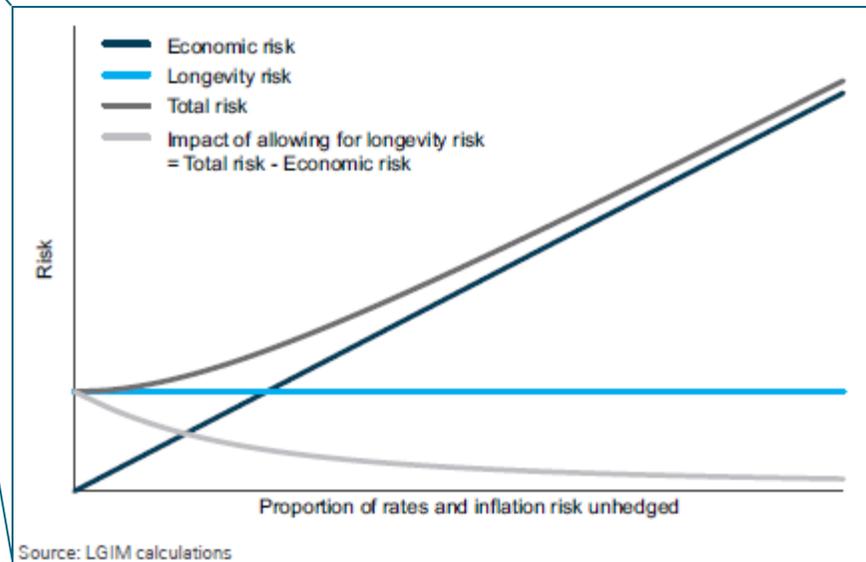
Paul Swearing
Head of Research

- As pensions schemes approach their endgame, longevity risk is an increasingly significant component of overall scheme risk
- Understanding longevity risk needs stochastic models which should be used together with stochastic investment models
- Schemes in run-off should diversify longevity risk with some investment risk unless they are fully funded on particularly prudent longevity assumptions

Stylised profile of economic and longevity risk



- As economic risk falls, longevity risk becomes significant – it is no longer diversified



Drivers of longevity risk

Drivers for continued longevity improvements	Drivers for reduced improvement rates
Reduced infectious disease rates	Complex illnesses such as dementia may be harder to tackle
Reduced occupational stress	Global warming
Improved healthcare	Pollution
Rising living standards	Obesity
Lifestyle changes	Biological limits of ageing
Increasing understanding of genetics and personalised medicine	Antibiotics lose effectiveness
Further advancements in medical technology	Overcrowding

Components of longevity risk modelled

Components of longevity risk

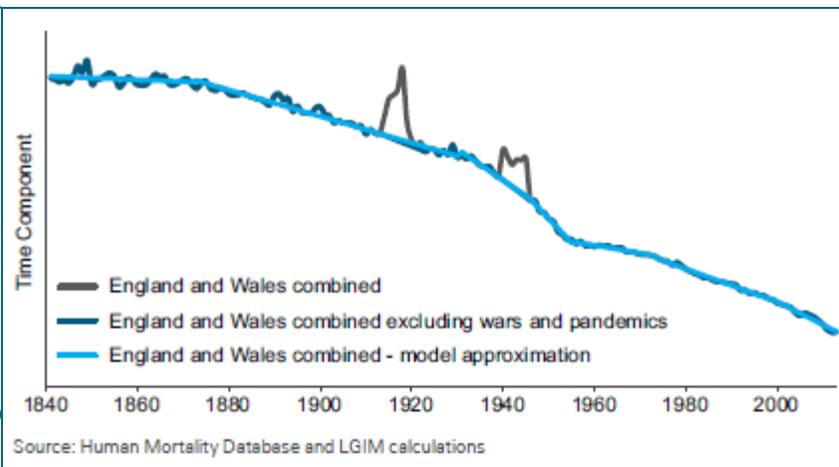
Level risk	✘
Volatility risk	✓
Trend risk	✓

- Level risk is ignored – though there is a risk that the initial rates are wrong, it is not a diversifiable risk
- Volatility risk can be important for small schemes
- Trend risk is the most obvious risk...
- ...though we also consider trend *change* risk
- Starting point is Lee-Carter...
- ...with a trend-change variation

Lee-Carter trend parameter



- Clear changes in trend can be seen...



The impact of trend-change risk

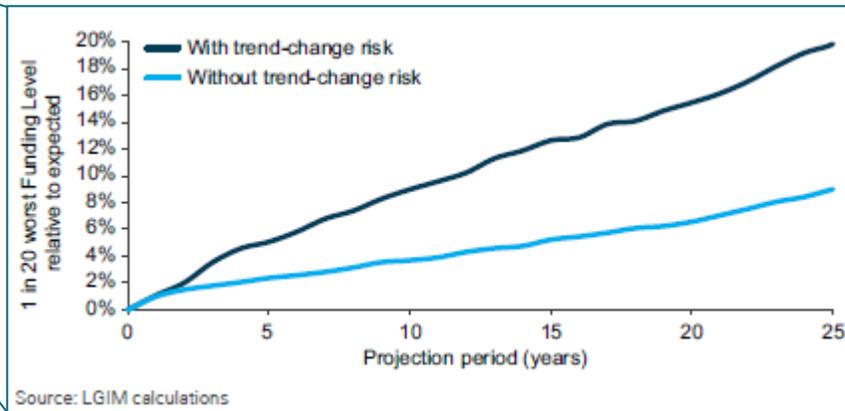
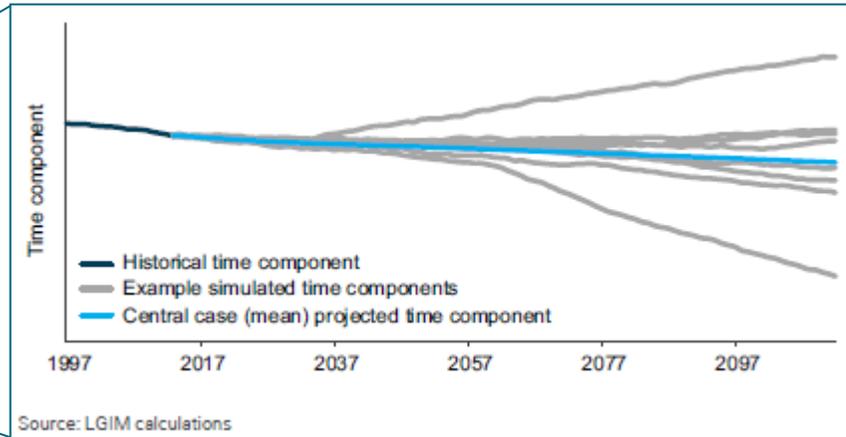
Figure 5
Example simulated projections of the time component of mortality rates

Figure 6
Longevity risk and the impact of allowing for trend-change risk

Figure 7
Longevity risk and the impact of allowing for trend-change risk

As can be seen, allowing for trend change risk leads to a much greater degree of uncertainty than that implied by a random walk with drift alone. Indeed, longevity risk is approximately doubled at every projection period.

Although it is a large rise in risk in terms of volatility when studying risk, it can be helpful in getting an conceptual grip on the approximate magnitude of uncertainty involved. Broadly speaking, longevity risk appears to have a standard deviation of around 2% per annum in this example. The actual figure can vary with the specific profile, initial funding level of the scheme and the time horizon involved. Indeed this is partly why a probabilistic approach to modelling longevity risk is helpful.



- Including trend-change risk makes a significant difference

The impact of scheme size

Small Scheme risk

One of the key benefits of our models is that it can separate always-needed risk from a relatively small scheme membership. Your response to the number of members is a scheme's terms of the degree of longevity risk that is experienced. For the same scheme as in Figure 2, we have calculated small scheme risk, which risk and small longevity risk is 10 years in excess of the response to the funding level of the scheme. Table risk is essentially longevity risk in excess of an infinite number of members, so that the probability of death risk for you from any people actually die. The calculations have been repeated assuming the same membership size from a variety of different assumed membership.

Figure 7
Impact of small scheme risk

Source: LGIM calculations

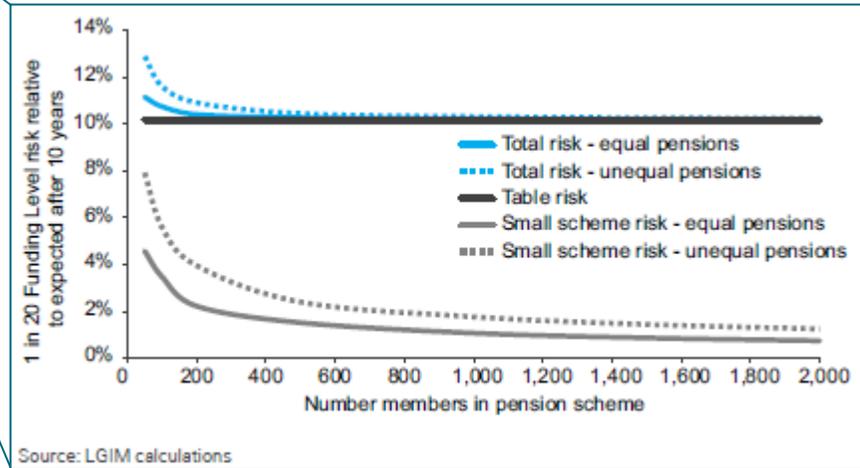
In the case of 'equal pensions' the chart assumes that all members have the same rate of pension payments (regardless of age). For 'unequal pensions' we have assumed that the top 10% of annual pension payments to 50% of all scheme members. In practice it is difficult to ascertain the level of pension inequality within a scheme without detailed membership information.

As can be seen, small scheme risk can have a significant impact on total longevity risk, but only if the scheme has around 500 or fewer members. Larger schemes can also suffer longevity risk but this is because the majority of benefits to be highly concentrated, for example in a small and very generous executive section.

Impact on small scheme risk

A small funded scheme with a well diversified strategy of 10% equity, 60% bonds and 30% gilts, 2.5% allowance to gift to be expected to have above average funding level volatility of around 3.4% per annum. If we only allow for investment risk, roughly speaking, the total risk would increase to around 5.0% or 5.5% per annum once longevity risk of 1.0% per annum is accounted for (assuming no small scheme risk). At higher levels of investment risk, the marginal impact of longevity risk is likely to decrease over as Figure 3 in section 2 above.

- Small scheme risk not generally an issue...
- ...unless well under 1,000 members



The Chance of Ultimate Excess (CUE)

- Key concept – solvency is about the chance of ultimate excess rather than present values

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The ability of assets to outlast liabilities can be determined without resorting to discounting liabilities.

The fundamental question for such a scheme is: will my assets outlast my liabilities? Consider a scheme with a profile of liabilities as shown in Figure 2. The profile of the assets will be uncertain, as will the period for which they will last. In essence, the question can be answered by

- Projecting the assets forward using randomly simulated investment returns
- Using the projected assets to pay the liability cashflows as they fall due
- Calculating the proportion of scenarios for which the assets outlast the liability cashflows

We call this proportion the CUE, or 'chance of ultimate excess'. In the right-hand panel in Figure 2, this is represented by the proportion of results above the horizontal line, and is defined as follows:

$$CUE = \frac{\text{Number of scenarios of ultimate excess}}{\text{Total number of scenarios}}$$

This metric can be used to answer a number of questions, key ones being:

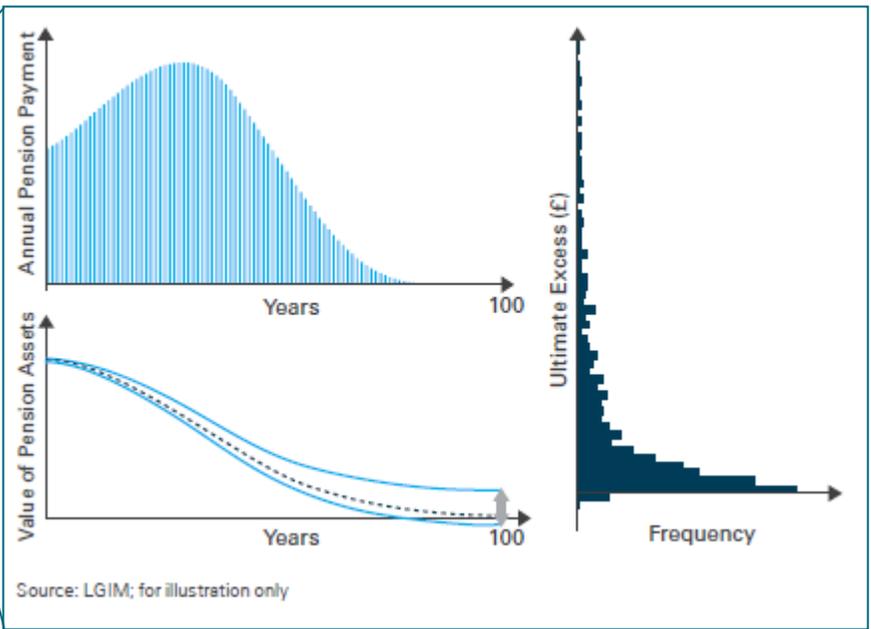
- What is the CUE for a given asset allocation and asset value?
- What is the asset allocation that can maximise the CUE for a given asset value?
- What is the minimum level of assets and asset allocation that can be used to reach a target level of CUE?

This highlights an important difference between the CUE approach and traditional methods of asset allocation, in that the CUE can be used to propose an optimal asset allocation. Traditional methods of asset allocation instead give a range of optional portfolios: the efficient frontier.

This is the first key priority: success for a self-sufficient pension scheme is the assets outlasting the liability cashflows. The CUE provides us with a measure that we can use to assess this, by focusing on the cashflows generated by the assets held and the extent to which they can meet the liabilities.

Figure 2
Stylised profile of assets and liabilities

Source: LGIM, for illustration only



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The impact of longevity risk on asset allocation

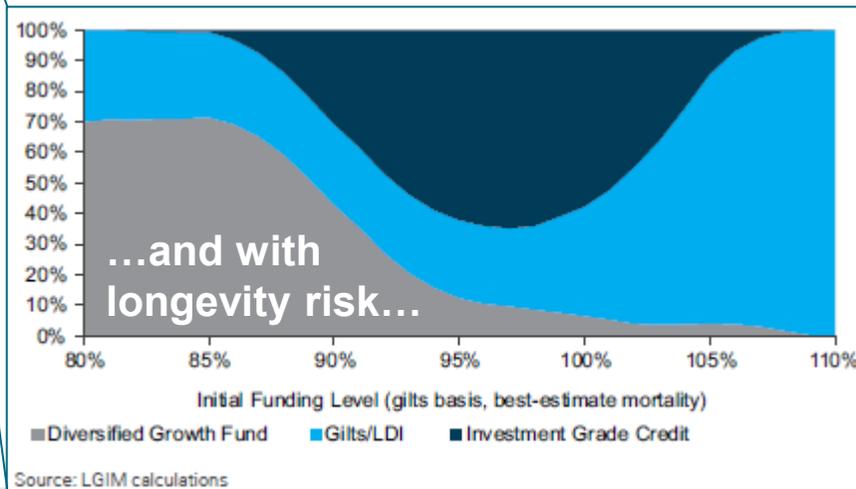
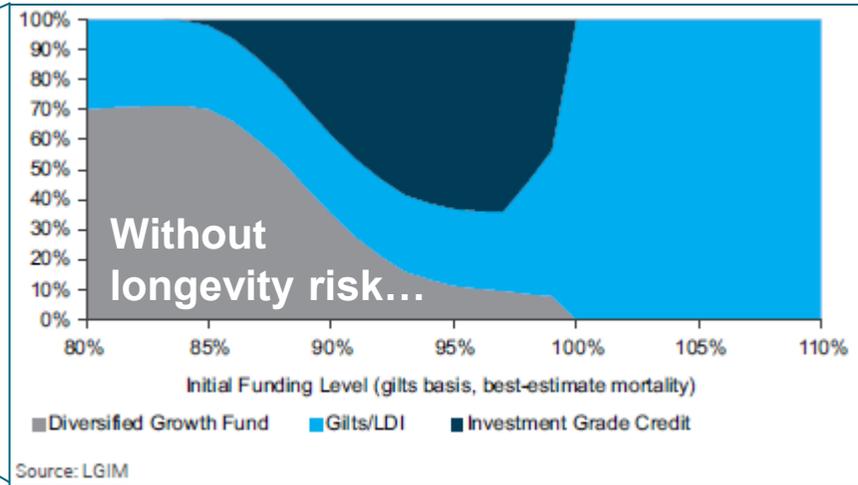
Figure 10
Strategies that condition the probability of meeting future liabilities if there is no longevity risk.

Figure 11
Strategies that condition the probability of meeting future liabilities allowing for longevity risk.

The key difference between the two charts occurs at high funding levels. Without longevity risk, no investment that should be taken over the extreme 100% funded. But with longevity risk, one should consider taking investment that will vary high funding levels around 100% funded using best estimate mortality rates. A typical prudent mortality assumption might be around 9% higher liabilities than best estimate, corresponding to broadly 100% funding using a prudent mortality table.

In practice, determination of the strategic asset allocation is likely to involve looking at a broad range of mortality, not just CIE. Nevertheless such models may help to assess determine the investment strategy that best helps them meet their objectives.

Source: LGIM



The background of the slide features several white papers scattered on a light-colored surface. Each paper has a large, bold, black question mark printed on it. The papers are slightly overlapping and angled, creating a sense of depth and focus on the question marks.

Q & A

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