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Current issues

The impact of COVID on new data risk

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The COVID pandemic has given companies a lot to think about over the past two years, with the heavy experience changing the way firms set best estimate mortality assumptions. An area which has had less attention is the impact on the calibration approach within Longevity Risk models. Within this article, we consider the potential impact of the COVID pandemic on these models, with a particular focus on **new data risk**.

What is new data risk?

Under Solvency II regulations, many firms use an Internal Model to calculate their Solvency Capital Requirements ("SCR"). The SCR is a Value at Risk metric and is set to ensure that firms can meet their customer obligations over the next 12 months with a 99.5% probability. Internal Model firms therefore need to hold sufficient capital to withstand a "1 in 200 year" event for all the risks they are currently subject to, including longevity risk.

Longevity risk is typically broken down into two broader groups - longevity level (the uncertainty in current mortality rates) and longevity trend (the uncertainty in future mortality rates). These groups can be further sub-divided into different components, to measure the various risks underlying level and trend. A common sub-risk of longevity trend risk is "new data risk".

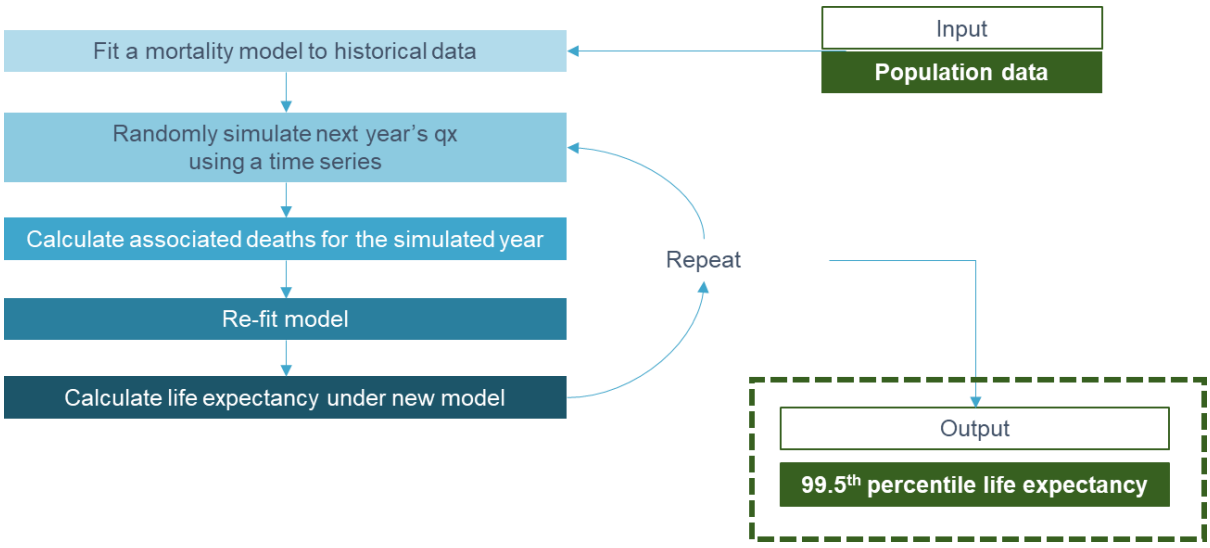
New data risk reflects the risk that new data could emerge which changes an insurer's view of mortality improvements

In a normal year, insurers and reinsurers will update their best estimate mortality improvement assumptions to reflect the most recent population data available. This is typically carried out by moving to the latest version of the CMI mortality projections model. Every year, the impact that the new data will have on the projection is unknown. This uncertainty, known as "new data risk", is one of the many risks which need to be captured within a longevity risk Internal Model. New data risk is modelled by considering two components; parameter risk and volatility risk. Parameter risk reflects the uncertainty around the general direction of mortality improvements, whereas volatility risk reflects the fluctuation around this trend.

How can new data risk be quantified?

To understand the statistical uncertainty of new data risk, firms use the volatility of past data to inform their view. A typical approach for capturing this volatility is to use **structured stochastic mortality models**. There are a range of structured stochastic models available, including Lee Carter, variants of the Cairns-Blake-Dowd ("CBD") model and the Age-Period-Cohort-Improvements ("APCI") model, which underlies the calibration of the CMI model. Firms typically consider a range of models and select one to use based on specific criteria, such as goodness of fit to historical data and how stable the model is to changes in the data.

These models are fit to historical data and have parameters which aim to explain the features of mortality rates (e.g. they increase with age, reduce with time etc). When combined with a time series model, they can be used to randomly simulate mortality rates for future years. To meet Solvency II requirements, firms need to determine the "1 in 200" new data risk event over a 1-year period. The stochastic models are therefore used to simulate next year's data many times (e.g. 5,000 times), illustrating the range of possible rates expected based on the past data, and the models are re-fit using each additional simulated year of data. From these projections, a distribution of life expectancies can be produced, from which the 99.5th percentile value can be determined. The diagram below provides more detail around the process.



What is the impact of 2020 data?

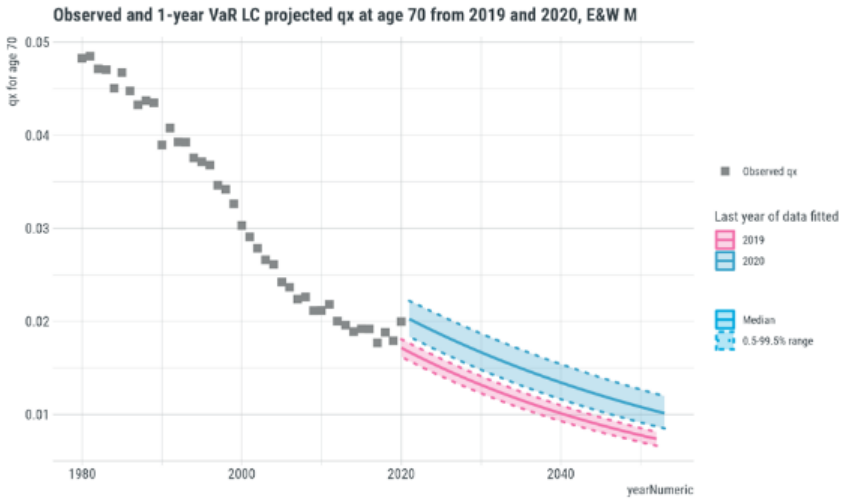
Putting the above approach into practice, we have used the Lee Carter model with a random-walk time series to understand how adding 2020 data changes the size of the new data risk. We have used population data from England & Wales and calibrated the model to two different periods of the data:

- The first is based on historical data from 1980-2019, and therefore simulates values in 2020.
- The second is based on historical data from 1980-2020, and therefore includes the volatile 2020 experience and simulates values in 2021.

The results[1] can be seen in the chart and table below for a male aged 70. These show that including 2020 in the calibration data:

(i) significantly increases the central (i.e., best estimate) projection of mortality rates. This can be seen by comparing the pink and blue solid lines on the chart. This corresponds to a fall in life expectancy of 1 year (at the 50th percentile).

(ii) increases the funnel of uncertainty around future mortality projections, due to the additional volatility, which would increase the new data risk stress. This can be seen by comparing the pink and blue dotted lines on the chart, and it increases the 99.5th percentile stress from 2% to nearly 4%.



	Cohort LE male aged 70		
Data	**50th**	**99.5th**	**Stress**
1980-2019	16.3	16.6	**2.0%**
1980-2020	15.3	15.9	**3.8%**

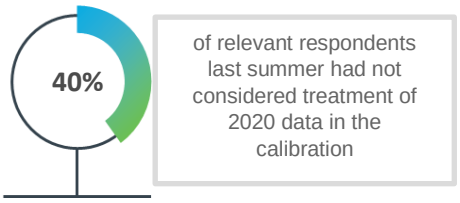
Inclusion of 2020 data could therefore significantly impact mortality projections and the capital requirements associated with new data risk if results from the model are the only consideration. Companies will need to consider whether it is reasonable to exclude or include the volatile 2020 data.

[1] Note, as part of our simulation we did not make any allowance for parameter uncertainty. Only the volatility component of the model was stressed. Other simulations may output different results.

Should the data be included in calibrations?

The central projection from adding 2020 data (which resulted in a 1 year fall in life expectancy for a male aged 70) is generally considered to be an unrealistic reflection of mortality rates going forwards. We know from our 2021 longevity benchmarking survey that few firms are using the 2020 data point to inform their best estimate trend assumption. All respondents who planned to adopt CMI_2020 for their year-end 2021 reporting intended to give 0% weight to 2020 data.

In the context of this change in approach for best estimate assumptions, it is possible that firms will introduce an expert judgement to also exclude 2020 data from their calibrations. Last summer, as part of our benchmarking survey, we asked firms how they would be treating 2020 data in their longevity risk calibrations. At the time, 40% of respondents hadn't considered this, 7% of respondents were making no change, and the other 53% of respondents were either not re-calibrating the stress or were re-calibrating but excluding 2020 data.



Exclusion of 2020 data may be considered reasonable if new data risk is defined as the risk that data emerges which *changes* your view of mortality improvements. Since no firms changed their view as a result of the 2020 data, perhaps it shouldn't be used to inform the volatility of assumptions. However, if firms do decide to exclude 2020 (and 2021) data, the following points should be considered:

1. **Risk of cherry-picking data**. When justifying the expert judgement, a clear rationale should be set out as to why this data should be excluded versus other volatile years in the past – after all, the very purpose of the "1 in 200 stress" is that it is an extreme event. Placing a 'threshold' on when the approach would change would artificially limit the volatility (and therefore the uncertainty) of the distribution. Having clear sight to the best estimate approach will help independent validators get comfortable with this change in approach.

2. **Approach in the long-term**. Some firms may wish to hold off on re-calibrating their new data risk component until more reliable data emerges. However, it is important to remember that, even if future experience were to return to the pre-pandemic projection, inclusion of the 2020 (and 2021) data in the calibration period would continue to increase the volatility within the data. In other words, the capital stress will not automatically reduce when the projection "normalises".

3. **Modelling practicalities**. Although it may seem simple in theory to just exclude the extreme years of data, the practical challenges of how this would be implemented should be considered. For example, the tools being used to make the projections may not be straightforward to modify. Crudely removing a few years of data may also cause issues, for example it could disrupt any cohort effects being modelled.

Treatment of the data therefore requires a lot of care. We will ask for an update in this year's benchmarking survey to understand any progress in approaches taken.

Next steps and other considerations

With the pandemic continuing and with uncertainty around future experience, new data risk remains an important element for companies to consider. This article aims to highlight some key points for consideration, but the most suitable approach may vary by firm.

We also note that new data risk is just one part of the longevity risk Internal Model calibration. Expert judgements in other components of the model, such as model risk or new information risk, will also require a review in the context of the COVID pandemic.

Our team of longevity consultants has supported 5 Internal Model firms with the calibration or validation of their longevity risk model over the past 18 months. If new data risk, or any area of longevity capital modelling, is an area that you would like support in, we would be very happy to discuss this further. Please also keep an eye out for our longevity benchmarking survey that will be produced later in the year and let us know if you would like to participate in this.

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