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Longevity Catalysts

By Khurram Khan

"Correct me if I'm wrong," said a fellow commuter as we pulled out of London Waterloo, "but most insurance takes care of mini-disasters, doesn't it? Bad outcomes, like your house burning down or your car being stolen." He went on: "By purchasing an annuity you are guarding against the eventuality that you remain healthy and live for a very long time, which is something *you wish* to happen, a good outcome!"

This made me think a little, and it soon became apparent that this is only one of a number of features that make longevity risk (the risk that policyholders live longer than expected) strangely unique amongst the basket of risks taken on by a typical U.K. insurance company.

Unlike other risks, longevity risk is not directly "observable" as such. The occurrence or non-occurrence of other risks is much clearer by comparison. An assortment of sensory stimuli faithfully reveal their presence: Spread widening, yields down, inflation up, lapses, earthquakes, hurricanes and car accidents—right there before our eyes, perhaps also on the news before making it to your local spreadsheet.

On the other hand, it is difficult to point to a "killer longevity scenario" without the benefit of prolonged hindsight following detailed data analysis, smoothing and noise elimination. The process has been neither instant nor particularly gratifying for annuity writers over recent times.

Most approaches to the measurement of future longevity trend risk are based upon the forward projection of historic death rates or mortality improvement patterns. This can be intuitively appealing and—once past data has been suitably smoothed using one of a number of available algorithms—visually attractive.

Past drivers of mortality improvements, however, are often unique or "one-off" in nature. There can never be another "birth of the NHS" or "introduction of screening breast cancer" or "breakthrough in surgical treat-

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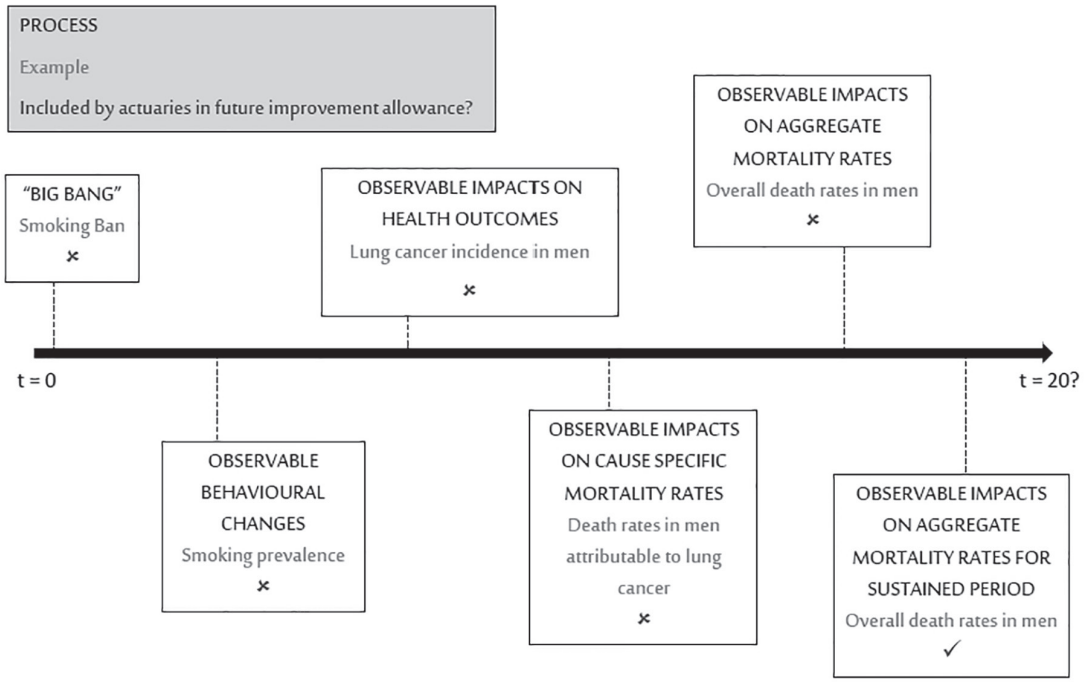
Figure 1: The Anatomy of a Mortality Improvement



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ment of coronary heart disease" or "advent of warnings on cigarette packets."

More importantly, perhaps, is the paradox that the latest, up-to-date death data merely represents the final signal emitted by longevity drivers at work decades earlier. In other words, it takes years for the forces behind improvements in mortality rates to finally reveal themselves in death data.

This "delayed recognition" is illustrated in Figure 1 on page 27.

That chart demonstrates that despite a number of "early warning indicators," it is not until sustained effects are observed in (national population) data that a corresponding allowance for mortality improvements is typically made in actuarial assumptions. The use of "all-cause death data" rather than classifying according to broad cause of death can in some cases add to the masking effect.

This fundamentally reactive approach is perhaps one of the component causes behind recurring "Actuaries revise life expectancy assessment again" type headlines that have been common in the U.K. over the last 15 years or so.

CAN WE DO BETTER?

The Longevity Catalysts Working Party has been set up by the U.K. Actuarial Profession (the Institute and Faculty of Actuaries) to answer one main, simple question:

"What future events are we aware of today whose occurrence is likely to be coupled with a significant impact on U.K. longevity?"

We refer to these as "Longevity Catalysts," listed and described at *www.longevitycatalysts.com.*

Examples range in classification from socio-political (*like the introduction of plain cigarette packaging in the U.K.*) to medical (*such as the development of a universal influenza vaccine*).

They also vary according to timing, with some not expected to occur for perhaps many years (*like mainstream use of stem cell therapy for a number of ailments such as Parkinson's disease*) to those that have occurred in the recent past (*such as NHS screening programs*).

The rationale for including recent, known events is founded on the principle (discussed earlier) that their effects may not be visible in death data for many years hence.

HOW CAN CATALYSTS HELP?

This initiative seeks to form the foundation of an approach that is more forward-looking in nature and can coexist alongside current practice.

Consider for a moment a scenario in which a well-defined schedule of Longevity Catalysts exists.

How exactly could one make use of this?

Longevity Catalysts are merely intended to represent the building blocks, and it is the ingenuity of end users that ultimately will govern wider use.

A few thumbnail sketches of possible uses are provided below with more detail on the website.

Assumption Setting

The setting of best-estimate trend assumptions can also benefit by consideration of what (if any) Longevity Catalysts are (already) implicitly allowed for within a given trend assumption.

This can then also be used to formulate a framework that sets out how best-estimate assumptions might react following the occurrence of one or more pre-specified Longevity Catalysts.

This then gives a best-estimate assumption "framework" or "policy" setting out anticipated responses to real-world events rather than a single, infrequently changed point estimate.

Cause of Death Modeling
Causal approaches have their advocates and opponents within the actuarial profession. To the extent that:

- They are used extensively by a number of practitioners (whilst acknowledging documented imperfections)
- They can be used to provide a wholly independent perspective (and thereby partially help to address the issue of "model risk"),

the Longevity Catalysts framework can help to directly inform projection pathways for deaths attributable to a given "cause."

Risk-Based Capital
One quirk of longevity risk-based capital (in the U.K., at least) is the requirement to assess the most adverse from a distribution of 200 possible outcomes over the following single *year*. Now, longevity trend risk plays out over a number of years, perhaps decades rather than 52 weeks. So, asking the "What's the worst that can happen next year?" question is something of a conundrum.

On the other hand, Longevity Catalysts can materialize in an instant. They might also have a profound effect on post-event trend assumptions if not already anticipated as discussed above.
By considering what Longevity Catalysts (or combination thereof) could unfold over the next year, this framework can help the user to formulate an extreme collection of longevity switches that could turn to "ON" over the next 12 months. The increase in liabilities at the end of the year stemming from the resultant overhaul of longevity expectations then contributes to the longevity risk-based capital assessed over one year.

Monitoring of Key Indicators
As shown in Figure 1, the transition from "Big Bang" to observable effects in the data is usually punctuated by a number of other signals. This can lead to "monitoring of key indicators" (*such as clear changes in smoking prevalence or early cancer diagnosis rates*) that can foreshadow associated effects in future emerging empirical data.

Hedging
Well-documented drawbacks of finite term longevity hedges (based on an exchange of liability value proxies at the end of the term) can include basis risk and "roll-forward" risk but also "event" risk (the risk that one or more events over the term of the contract cause universal increases to longevity expectations but have no impact on the hedge payoff, which is based only on experience over the term)

The existence of a well-defined, objective and widely agreed set of Longevity Catalysts can provide a platform for addressing the last of these.

For example, the final payoff from a 10-year hedge could be structured so that it is (at least in part) linked to the occurrence of one or more Longevity Catalysts. Objective definitions thereof should lend themselves to simple unadjusted inclusion within legal agreements.

WHAT ABOUT MORTALITY CATALYSTS?

The parallel but opposite concept of "Mortality Catalysts" also exists (*such as a political move to reform the NHS in the U.K., which ultimately leads to its demise*) and can be developed. One slight distinction is that the time lag between mortality catalyst trigger (*like the onset of an extreme pandemic*) and visibility in the data is likely to be smaller in magnitude than under the equivalent Longevity Catalysts paradigm.

CONCLUSION

It is clearly impossible to foresee all future catalyst events that will significantly impact human life span, so any schedule of Longevity Catalysts will not capture all such possibilities and is thus imperfect. Yet this serves to illustrate the even greater imperfection of ignoring any future catalyst events that are now known—which characterizes the present situation for most practitioners. Furthermore, this addition to the actuary's toolkit has a wide range of potential uses. ■