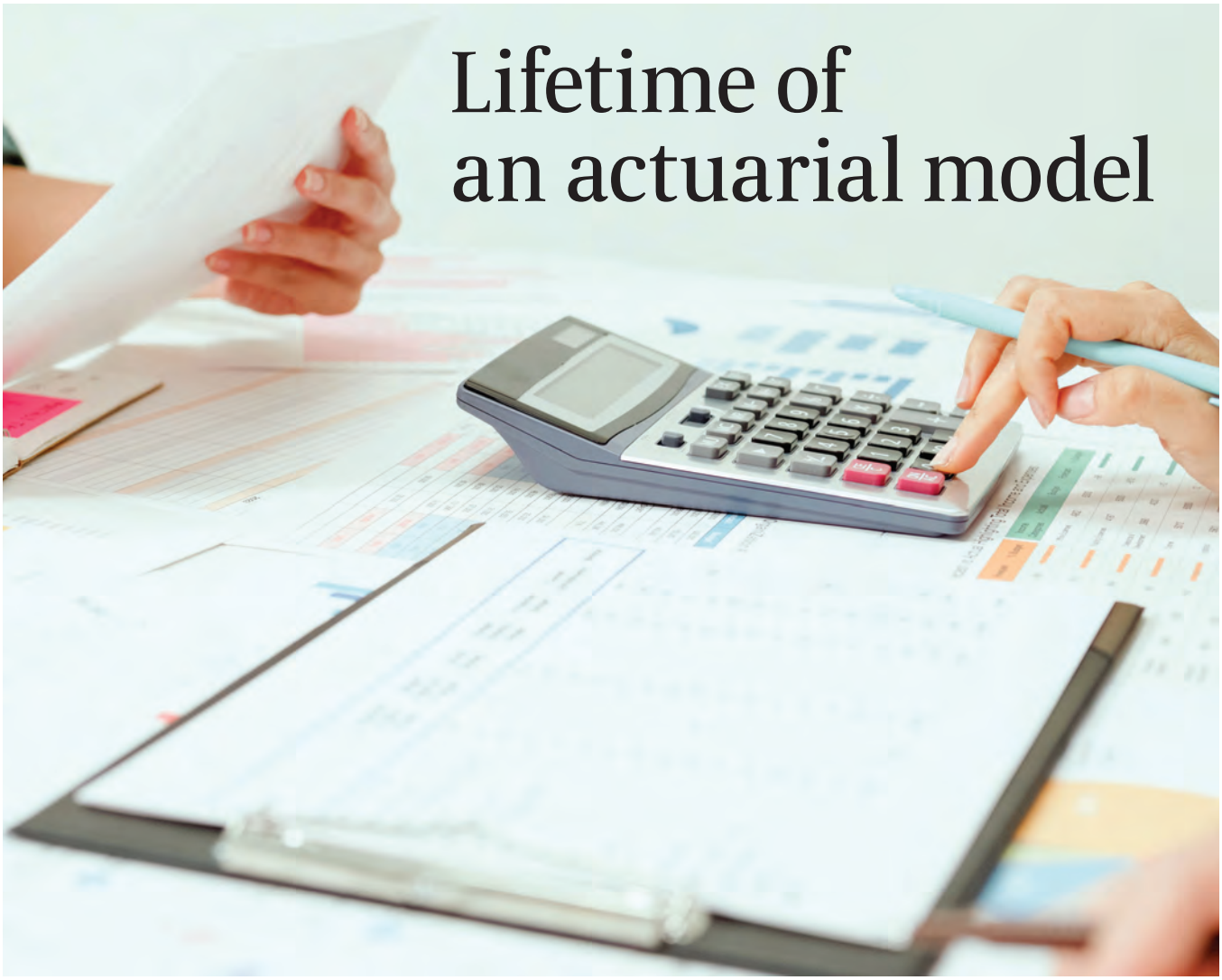
ACTUARIAL

Lifetime of an actuarial model



Actuarial models are the backbone of any life insurance company. The output from actuarial models is used for regulatory valuations, capital calculations, financial reporting, risk management and many other strategic purposes. **Milliman**'s **Messrs Rohit Malhotra** and **Subhash Khanna** discuss the dwindling longevity of actuarial models.

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Over the last few years, the models of most life insurance companies have undergone changes at a phenomenal pace due to the addition of new product designs, implementation of new regulations or reporting standards and various other factors. While we do see many successful examples of model implementations, the success criteria set by insurers to judge the success of these implementations is restricted by the accuracy of the results produced and reduction in the runtime to meet current requirements.

The structural design of a model is often neglected, which means that models are not designed with a long-term view in mind. In addition, as the people who manage the model are replaced over time, with newcomers often bringing in their own design language/preferences, models can deviate even further from best practice. Over time, as the models deviate from an optimal design, the risk of errors and maintenance overheads greatly increases. Sub-optimal models may then lead to increased runtime or unreliable results or both in the long term.

To develop an appreciation for good structural design, it is useful to understand the lifetime of an actuarial model and the phases a model goes through over its lifetime. Each phase requires a different approach to ensure a high-quality model is maintained and that it is able produce reliable outputs.

Based on our experience, companies with strong model governance, controls and review and optimisation policies have been successful in maintaining the quality of their actuarial models.

Typical lifetime of an actuarial model

The lifetime of an actuarial model refers to the duration from the model's initial design to when it becomes obsolete due to it becoming inefficient, or due to changes in regulation, business environment or technological advancements. It encompasses various phases, including design, implementation, operational use and maintenance, upgrades and replacement.

Phase 1: Inception and design

The model comes to life during the implementation phase, but it is the design phase which determines the success of any model implementation. It is critical for a model's success to have a well-documented model specification which covers the technical requirements and coding standards.

It is also crucial to conduct thorough research and analysis to understand the specific needs and requirements of all stakeholders involved and agree on a model structure which can meet those requirements in the long run. This phase sets the foundation for the entire life of the actuarial model, shaping its functionality, scalability and adaptability to future changes. Some best practices include:

- Documenting the model design principles and the coding conventions
- Evaluate the trade-offs between simplicity and complexity in the model design. While it is important to capture the new requirements accurately, overly complex models can be difficult to understand, maintain and validate
- Documenting the testing approach and acceptance criteria
- Setting up a framework to measure the success of model implementation
- Developing a proof of concept before committing to any specific design
- Documenting the project management approach to be followed for model releases

Phase 2: Implementation

In the implementation phase, meticulous attention to detail, technical expertise and strong organisational skills are required to translate the design specifications into a working model. This involves selecting appropriate actuarial software, establishing robust data pipelines, building the model functionality and rigorously testing the model for accuracy and performance.

While the important factor during implementation is to stay as close as possible to the technical specifications and to have an approval process in place to accept any deviations from the technical specifications, the following areas need special consideration:

- The policy data transformation process, which generates data in a format which can be read into the model in an efficient manner, should be viewed as an integral part of the model implementation
- The structure of assumption tables should be implemented in such a way that updating assumptions requires as little manual intervention as possible
- All inputs should have an easy-to-follow audit trail
- Keeping the model's original design and purpose intact, instead of chasing the never-ending desire to cover all real-world complexities, should drive model implementation decisions
- Results templates should be viewed as part of the implementation - downstream impact on results templates should be tested

Phase 3: Operational use and maintenance

Once the model is deployed, continuous monitoring and maintenance are essential to ensure its ongoing reliability and relevance. Establishing a robust governance framework and quality assurance process, together with training to appreciate model risk management practices, helps maintain model quality. Measuring model quality at regular intervals helps assess the current state of the model.

Phase 4: Upgrades

As reporting requirements and business needs evolve, periodic upgrades to the actuarial model are often necessary to enhance its functionality. The following should be considered when planning an upgrade:

- **Analysis of new requirements and overall design approach**: When considering a new requirement which may require major changes to an existing model, it may be useful to also consider a new design approach for the entire model, instead of simply trying to fit the new requirement into the model. Using a new design, in some cases, may lead to a lower number of changes and better quality of the model
- **Future-proofing**: The upgrade could also be an opportunity to re-design the model to accommodate future changes in data, business requirements and infrastructure
- **Continuous monitoring**: The upgrade could also be used to establish or improve processes for ongoing monitoring, testing and maintenance of the model to ensure it stays relevant

Phase 5: Replacement

Despite efforts to maintain and upgrade the actuarial model, there may come a time when it becomes obsolete. Proactively identifying signs of obsolescence, such as declining performance or inability to meet new requirements or increasing risk of errors, is critical. The best practice is to not delay when it is time to replace a model, as such delays could be costly compared to the price of a new implementation.

Regularly benchmarking the current model and proactively monitoring indicators of model quality, with the goal to replace the model when the indicators fall below a threshold, can help mitigate models' risks and ensure the integrity of actuarial analyses.

One way to monitor model quality is by scoring the model against the design principles documented in Phase 1 and replacing the model when the model score degrades and shows no signs of improvement after taking corrective actions.

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