Converting a typical South African funeral model to Milliman Mind

Converting an existing funeral model to Milliman Mind required minimal changes to the original Excel logic, unlocked improved performance, revealed hidden errors in the legacy version, and delivered enterprise-grade audit trails without sacrificing the familiar spreadsheet interface.

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What is Milliman Mind?

Milliman Mind (Mind) is a web-based modelling platform designed to streamline and accelerate complex actuarial workflows. Mind converts normal Excel spreadsheets into robust, auditable models, offering the transparency and control of enterprise systems without sacrificing ease of use.

Mind places particular emphasis on automation and intuitive user experience. It supports actuaries in managing calculations, data processing, and regulatory reporting more efficiently. By reducing the need for manual intervention, Mind helps minimise the risk of errors and allows actuarial teams to shift their focus from model maintenance to strategic analysis and decision making.

Through utilising cloud computing and its web-based architecture, Mind allows real-time collaboration among multiple users within an organisation. Robust oversight and model security are maintained through features such as access controls and configurable user roles.

Funeral valuation model case study

We converted a typical funeral valuation model originally built in proprietary actuarial software (referred to here as the 'legacy platform') into the Mind platform. The primary goal of this case study was to verify that Mind can accurately replicate the logic and results of the legacy platform, while also enabling a comparison of model performance across the platforms.

FUNERAL VALUATION MODEL FEATURES

The model used in this case study was a typical funeral valuation model, modelled on a per-life basis.

At a high level, some of the key features of the model included:

- Monthly projection of expected premiums, death outgo, lapses, and expenses. Projections capped to 120 years of age.
- Incorporation of waiting periods.
- Inclusion of reinsurance arrangements.
- Aggregation of results across the entire book of lives.
- Discounting applied using yield curve as input.
- Decrements applied using duration-based lapse curve and age-based mortality curve.
- Calculation of best estimate liability only.

CONVERSION AND DEPLOYMENT IN MIND

The conversion process consisted of three main phases (which is very similar to other Mind conversion projects):

1. Model conversion to align with Mind's requirements and good practice
2. Performance testing and optimisation
3. Model reconciliation

Model conversion to align with Mind best practices

The conversion process began with an existing Excel model designed to replicate the original model built on the legacy platform. This Excel model included VBA code to loop through all required model points and scenarios. To ensure alignment with Mind's best practices and enhance model flexibility, some standard Excel formulae needed to be replaced.

Mind introduces several new Excel formulae that extend the standard Excel toolkit, bridging the gap between conventional spreadsheets and production-grade models. These new formulae were used selectively in specific situations, while core calculations continued to rely on familiar Excel functions.

VBA code is not supported within the Mind environment, necessitating the conversion of existing VBA logic. We used Mind's extended Excel formulae to replicate the original VBA looping functionality.

Conversion of Excel models into Mind generally requires other common conversion work, as mentioned below:

- Grouping tables into 'grids.' These grids are grouped for display and calculation purposes in the Mind system.
- Adding table headers to allow easy identification in Mind's web interface.
- Enriching grid properties, such as adding input properties that allow users to import CSV files containing data to push into the model.

We did not record the exact time taken for the initial model conversion. We estimate a conversion will take approximately two days for a developer who's familiar with Excel and has had Mind training.

PERFORMANCE TESTING AND OPTIMISATION

Once converted, the Mind model can be imported into the Mind interface by dragging and dropping the files into the web application.

Mind includes an integrated profiler, debugger, and automation tools. The profiler enables users to analyse the model's calculation speed down to a cell-by-cell level, providing quick access to performance summaries and helping to pinpoint areas of focus for optimisation.

Best practices for efficient and easy-to-follow models are generally straightforward to learn and apply. These typically also apply for general Excel modelling. However, given that we run larger models in Mind compared to Excel, the calculation performance is more pronounced in Mind compared to smaller Excel models.

The time required for performance testing and optimisation can vary, depending on the model's complexity and size. We estimate a developer experienced with Mind to be able to complete optimisation within two to three days. It will be more difficult for a new developer to know all the good practices. However, with assistance from a Mind expert, we expect them to take around three to five days to get a desirable model.

MODEL RECONCILIATION

After converting the model to Mind, the results were reconciled against the original model. This can typically be time-consuming, given that discrepancies need to be followed down into the detail of the calculations.

You might wonder why reconciliation differences occur if we are converting Excel models without adjusting large parts of the original formulae. These most commonly arise from errors identified in the original models, for example:

- The new Mind model picks up errors where complex conversions took place. For example, where calculations are split from input grids as part of the conversion process.
- The new dynamic nature of Mind automatically addresses spreadsheet issues in the original Excel models. For example, Mind ensures that cell references are dynamically resized to capture all data. Often through comparison of results, we uncover that the original Excel had reference issues where Mind now uses correct references.

The Mind platform makes debugging easy as the interface is like Excel. Formulae can be viewed in a spreadsheet-like format. Furthermore, there are various features that aid debugging, such as following cell calculation links, partial calculations, and formulae evaluation.

An experienced developer could take as little as one full day, while investigating and resolving discrepancies may require additional time. An inexperienced developer may require one to three days to correct any differences between the models—but very much a function of the quality of the original model.

ADDITIONAL FEATURES OF THE MIND MODEL

The Mind platform naturally adds several other features to your modelling environment. These enhancements include, but are not limited to:

- **Comprehensive audit trail:** Mind includes a detailed audit trail system that automatically records the time, user, and specifics of each modification made to a model. This feature addresses a key concern when using Excel in production environments, supporting strong governance and transparency.
- **User roles and permissions:** Set permissions on who can do what within the system by assigning roles to users. This allows better governance over your modelling process.
- **Powerful application programming interface (API) integration:** Mind offers a flexible API that enables full automation of model runs and related tasks. This allows users to integrate Mind seamlessly into their end-to-end workflows, eliminating the need for manual intervention (e.g., automating data ETL, automatic multiple model runs, export of results, and scheduling of these processes).
- **Stress testing and analysis of change:** Mind has built-in functionality to allow users to trivially run models under multiple scenarios and stresses, ensuring that sensitivity and scenario analysis options are easily maintained. Additionally, Mind natively supports analysis of change runs, which is particularly valuable for reporting requirements such as those under IFRS17.

- **High-performance computing (HPC):** Mind incorporates a new HPC feature, enabling users to distribute model workloads across multiple parallel sessions in the cloud. This is an optional included feature available to those who would like to unlock more cloud computing power over and above the already efficient platform.

RUNS PERFORMED

We performed several runs of the model across the legacy platform, Excel, and Mind, focusing exclusively on base scenario model runs for each platform. The runs carried out were as follows:

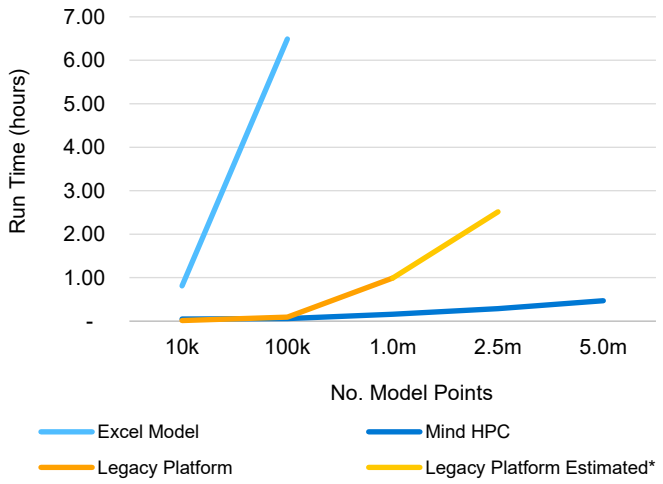
- **Legacy platform:** An older actuarial software solution still commonly used for life valuations, executed on a local server with no cloud computing involved.
- **Excel platform:** The Microsoft Excel model, utilising VBA code to iterate through the respective model points.
- **Mind platform:** Runs were performed using Mind's HPC functionality in the cloud.

Due to the nature of the two software packages (Mind and the legacy platform), it wasn't possible to perform the runs on identical servers. Nevertheless, the results are presented to provide a comparative illustration of performance, particularly as many insurers use similar local server setups.

MODEL RUN TIME PERFORMANCE

Figure 1 illustrates the run times recorded for each modelling platform and the respective number of model points of each.

FIGURE 1: RUN TIMES RECORDED FOR EACH PLATFORM



*Due to complexity with handling large model point files in the legacy platform, we have estimated the run time using the average of the run times per policy available to us.

The run times are difficult to compare directly due to the difference in architectures of the model runs. The legacy platform and Excel don't have the benefit of scaling in the cloud that Mind benefits from. Furthermore, both the legacy platform and Mind can still yield different run times through changing the underlying hardware.

For the Excel model runs, we turned off screen updating and ensured calculations were switched to manual. While the model was capable of managing smaller model point numbers, run times soon become unmanageable with an increase in the number of model points. Furthermore, we are limited to around 1 million lives in Excel, which is difficult to overcome in an efficient way.

Mind offers HPC functionality as standard, with users paying only for the additional cloud computing costs. Users still have the option to perform non-HPC runs on their Mind-allocated server, which won't accrue additional costs.

Other alternative platforms might not have this functionality readily available. Furthermore, where it is available, it often requires licensing a more expensive version/expansion of the product suite. Therefore, it's common for insurers to relate with the experience seen for the legacy platform.

In terms of cloud costs, the runs we performed in Mind accrued costs of around USD0.30 for the smaller runs to USD21.18 for the 5 million model point run. This amount will vary depending on the server configuration that the user opts for.

Dedicated support and continuous innovation

Milliman Mind is supported by a dedicated team focused on ongoing infrastructure development, helping to ensure that the platform remains at the forefront of actuarial technology. Regular updates and enhancements are designed to address evolving industry requirements, with clear communication of any changes to users.

In addition to technical development, Milliman consultants are available to assist with the initial conversion of existing models to the Mind platform as teams quickly get up to speed with the software. This combination of continuous innovation and expert guidance enables users to make effective use of Mind's capabilities and supports a smooth transition to the platform.

Conclusion

The conversion process proved straightforward: Five days from start to finish with minimal Excel logic changes. More importantly, the reconciliation phase delivered additional value by exposing calculation errors that had gone unnoticed in the original model. The result: familiar Excel-based workflows now backed by enterprise audit capabilities and cloud scalability, outperforming legacy and Excel-VBA performance at large number of model points.

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Milliman leverages deep expertise, actuarial rigor, and advanced technology to develop solutions for a world at risk. We help clients in the public and private sectors navigate urgent, complex challenges—from extreme weather and market volatility to financial insecurity and rising health costs—so they can meet their business, financial, and social objectives. Our solutions encompass insurance, financial services, healthcare, life sciences, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

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