MILLIMAN BRIEFING NOTE

Case Study: Efficiency and control through Milliman Mind

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Effective model governance and process efficiency are critical issues for all model users and developers. In this case study, we look at how a slow Excel model with suboptimal model governance was migrated into Milliman Mind to significantly improve run speed and model risk management.

Milliman Mind

Milliman Mind is an agile modelling platform which leverages the user friendly language and interface of Excel with the performance you would expect of models created in C#, Python or other off-the-shelf modelling solutions. With Mind, you can create models in Excel and drop them into the Mind platform to set up a production process, optimise performance and improve governance and control.

Mind boasts calculation speeds up to 80 times faster than some Excel/VBA models, is fully cloud-hosted and API features allow full IT integration with existing systems. Finally, Milliman Mind has a dedicated help centre where users can access not only guides on using Mind features and formula but can also speak with the Milliman Mind team and ask questions on their model, fixing bugs and improving performance. Mind provides an excellent blend of Excel's familiarity and ease of use with the performance, user interface and range of tools you would expect from proprietary software.

Case Study

In calculating the technical provisions ("TPs") for a client's book of unit-linked business an assumption is needed for the performance fee that will be charged for each fund and product. The existing Excel/VBA model takes 1,000 scenarios for equity returns, bond return and discount rates from an economic scenario generator ("ESG") to project fund values based on the charges for that fund and the decrements for that product. The model carries out nested loops (over the scenarios and then funds) and the run time is around 25 minutes. In itself this is not a large run time but the model is then also run for shock scenarios. When carrying out an analysis of changes in the TPs each quarter the models are run again for any change to assumptions. In a given quarter the model may be run 12 times.

Aside from runtime, the model also suffers from the usual drawbacks of Excel models. Updating the model is a very manual process. The inputs are either pasted from the ESG or they are changed through editing the links to a number of other Excel files. This has the potential to create serious operational risk as the performance fee assumptions can have a significant impact on the TPs.

The Excel model is also not as fluid or dynamic as we would like it to be. For example, if a new fund is added or an existing fund is closed the structure of the model has to change slightly. The same problem exists if we wanted to run the model with 2,000 economic scenarios instead of 1,000.

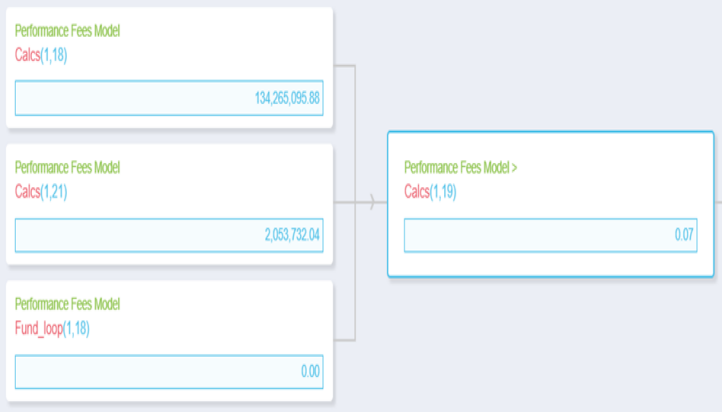
Version control and documentation is another very manual process with Excel models. Audit trails and version logs will only be as good as the person and process for updating them and because these are often static documents, they can quickly become outdated and inaccurate.

Outcome

The ultimate aim of the migration was to improve run time. Where the previous model took around 25 minutes to run, the Mind model takes just 2 minutes and 20 seconds to run. This 10 fold improvement in run time was achieved without any optimisation at all i.e. the model which existed in Excel was simply converted and run in Mind.

The model has retained its Excel architecture and changes to the model can be made in Mind or through exporting the model back to Excel. Cell formatting and notes in the old model have remained in the Mind model and Excel features such as freeze panes are still supported. Mind has also introduced insightful features to the model such as cell dependency trees which are not available in Excel.

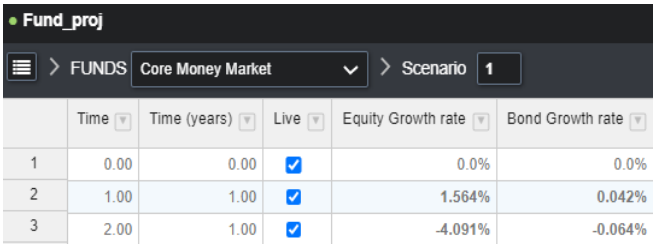
FIGURE 1: AN EXAMPLE OF THE CELL DEPENDENCY FEATURE



Milliman Mind has also made the model dynamic. The model now automatically adjusts to the numbers of scenarios and the number of funds in the inputs. The loop framework is also very intuitive and allows for easier access to granular results. In the Excel model, the fund value projection is only carried

out for one fund and one economic scenario at a time, as Excel is one dimensional, so looking through specific fund projections and scenarios is manual and time consuming. In Mind the results of every single loop are available at the click of a button. What's more, all of this has been achieved without the need to learn any programming languages.

FIGURE 2: LOOP SELECTION FUNCTIONALITY



	Time	Time (years)	Live	Equity Growth rate	Bond Growth rate
1	0.00	0.00	☑	0.0%	0.0%
2	1.00	1.00	☑	1.564%	0.042%
3	2.00	1.00	☑	-4.091%	-0.064%

Milliman Mind has allowed us to set up clear workflow processes that was previously contained in a static procedure document for the old Excel model. Mind's project management features allowed us to define clear steps in the production model from the economic scenario inputs and assumptions through to calculation and exporting results. Mind also supports team collaboration, enabling multiple team members to work on the model at one time allowing each to carry out their step in model workflow.

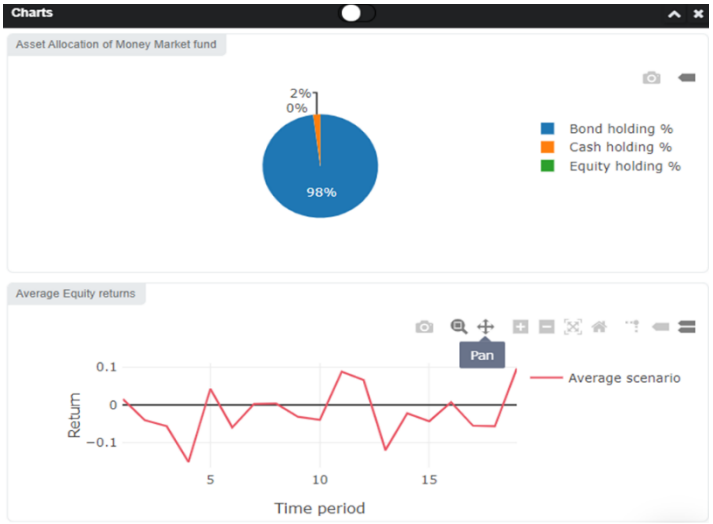
Finally, Mind has significantly improved the model's governance framework. Mind's automatic audit trail records every change made to even a single cell in the model as well as keeping a detailed log of every run carried out. Furthermore, the input manager reduces the operational risk from the pasting and linking to old Excel files as it stores the CSV inputs to the model and allows delegation of who is responsible for the inputs.

What's Next

Milliman Mind has greatly reduced the time taken to carry out model runs and reduced our model risk. Mind will also allow us to improve and fine tune this model further over time as we look at future development in these areas:

- Mind's performance profiler and debugger show the time taken to calculate any cell in the model. The model run time can be streamlined further through simplifying more complicated formulae.
- The current ESG model is also an Excel model and would be very well suited to being migrated into Milliman Mind. With some development the ESG and performance fee model could sit within the same workflow, removing the need to take the ESG output as an input to the current Mind model.
- A range of visualisation tools are also supported in Mind. Data visualisation can be integrated into the workflow as a validation step, containing checks and controls for the model. These can then be assigned owners in Mind for sign-off. An example of a preliminary dashboard currently being developed is shown below.

FIGURE 3: MILLIMAN MIND DATA VISUALISATION DASHBOARD



Mind has proven to be a quick and effective way to improve our calculation process and is well positioned to replace other models currently in use for this client and others in the near future.

How can Milliman help?

At Milliman, our consultants draw on years of modelling expertise to bring strategic insights and advice to clients who face ongoing modelling challenges.

Milliman can assist you with all aspects of your actuarial modelling needs, including:

- Training
- Model development and validation
- Model build
- Process development and validation
- Milliman Mind demonstrations and solutions

For further information, please contact your usual Milliman consultant or those below.

Milliman

Milliman is among the world's largest providers of actuarial and related products and services. The firm has consulting practices in life insurance and financial services, property & casualty insurance, healthcare, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

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