



WHITE PAPER

INSURANCE RISK MANAGEMENT

ESTABLISHING A SOUND FOOTING: DELIVERING BEST PRACTICES IN MODEL IMPLEMENTATION, OPTIMIZATION AND VALIDATION

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Introduction

The pressure continues to pile onto insurance actuaries and risk managers. Regulators demand more, as do insurers' own management to help their business decisions. They want insightful results, in greater detail, and more frequently, often necessitating the processing of complex model analyses involving huge data volumes.

An effective risk management framework, well-defined Internal Model governance processes, and effective modelling systems can help meet these demands. But when this framework is incomplete, and moreover when Internal Models and processes are not properly implemented and validated, problems can arise. Costly enhancement projects, board-level scepticism over Internal Model results, and risks related to the reliability of chained spreadsheets are best avoided, as indeed is any impact on the risk of regulatory non-approval.

This white paper describes FIS' views on how insurers can construct a solid framework that actuaries, risk managers and the business as a whole can rely on. The focus is in core quality-related issues – model implementation, optimization and validation, and a number of considerations for each.

Model architecture and implementation

Model implementation, optimization and validation are best seen as linked processes subject to the right governance and menu of approaches and roles. These help achieve an optimum model architecture with robust risk challenge, and enable companies to use models to drive risk appetite, risk tolerance and stress testing for FLAOR/ORSA ("Forward Looking Assessment of Risk"/"Own Risk Self Assessment") and core regulatory purposes, such as for Solvency II. Getting the model architecture and implementation right from the onset is an important consideration. This can avoid costly model rationalization and streamlining projects in the future.

Good model implementation requirements are needed to meet the needs of best-in-class risk management, to capture management actions, to meet FLAOR/ORSA best practice, and to embed risk appetite analysis. Nested stochastic modelling approaches can help in this process, supported by scalable model analysis to create order where structures of risk neutral and real world scenarios are used.

Cloud implementation

As the need for on-demand capacity rises, insurers are increasingly considering the use of cloud computing infrastructure for model implementation. An effective model architecture requires the right choice of environment and scalability of resource – related to both IT and people. Best-in-class model architecture may utilize a cloud structure. If such a structure is adopted then the business needs to understand the cost of data upload/download and core costs. The question of which models operate best in the cloud also needs to be addressed.

Actuarial-risk-IT collaboration

Tight model implementation plans demand that IT integration and planning are done in a spirit of close co-operation between IT and actuarial/risk teams. This needs a high quality integration and IT project plan, especially when more complex models are involved, for example when Nested Stochastic/ Structures need to be placed in a cloud environment.

Model optimization

Today's model validation is tomorrow's model optimization - there is still a gap to true model optimization. This involves good model implementation, validation, checking of the model, or having pass/fail criteria to establish and validate it.

One requirement for model optimization is substantiated evidence for conclusions and a link back to a company's Profit and Loss account (P&L) through the P&L attribution test. For example, when using external models, e.g. asset Economic Scenario Generator (ESGs), it is critical to get boards comfortable with what is going on in the black box. There are two schools of thought here - some boards appear to believe that they only need to review a model closely if it is a bespoke/non-standard model, while others believe that all models, even generally accepted market leading Economic Scenario Generators (ESGs), need challenge by the Board.

It is clear that black box models are increasingly hard to accept. From the board's point of view, engagement in model use is engagement in model validation. Boards and independent model validators should be looking to invalidate the model - rather than validate it.

The delays in the Solvency II program to expressly led to insurers focusing on eliminating manual processes redundant code/routines and steps. This focus on streamlining model processes was aimed at achieving business benefit from Solvency II.

The main challenges that remain are those of validating dependencies, adequate time and resource, defining adequate pass/fail criteria and defining/measuring expert judgement.

Key model optimization and validation topics	Business needs and likely actions
Drawing business benefits from solvency II internal modelling	Delivering quality robust processes for the chief actuary and chief risk officer <ul style="list-style-type: none"> • Business planning • ORSA/FLAOR • Capital management
Streamlining model frameworks	<ul style="list-style-type: none"> • Dedicated project team • Process re-engineering and system enhancements • Focus on creating automated end-to-end actuarial models, ESGs and data flows • Elimination of redundant processes
Building efficient risk models	<ul style="list-style-type: none"> • Project should improve quality/run times/data processes with the operations and IT teams • Examples include the elimination of spreadsheets and manual processes
Embedding Internal Models in business processes	<ul style="list-style-type: none"> • Quarterly hard timetable and processes • Governance processes and streamlined board reporting
Use test in practice	Use embedded modelling processes to produce <ul style="list-style-type: none"> • Business plans/forecasts • Risk appetite/tolerances • Clear Return on Equity targets/risk budgets for pricing
Meeting the validation test	UNeed to build out levels of validation, quality and expert judgement control. Possibly using a dedicated Internal Model validator

Dependencies

When implementing and validating dependencies, it is essential to understand and trace the underwriting cycle through shock factors to claims inflation/claims frequency to the overall modelling of insurance risk. Increasingly, scenario generators are being used to test and validate copulas and other dependency structures. However, it is important to get the right balance of quantitative and qualitative judgements of dependencies. The quantitative approach runs the risk of 'over-fitting' through ever-increasing degrees of freedom as the data set expands. The qualitative approach highlights the importance of expert judgement.

Expert judgement

Expert judgement is becoming business as usual. Underwriting or investment losses typically highlight the level of personal involvement in the game for the expert. Getting the right balance between the data-based judgement, which can be viewed as disinterested and unbiased, and schools of thought based on limited human memory and past views, is a challenge. Expert judgement is typically dependent on views that are biased but based on an individual's recollection of data to which others do not have access. This shows an asymmetry in views, and highlights the need to maintain a good record or inventory of 'expert judgement' to allow proper business monitoring and risk governance.

Market risk/ESGs

These are often tacked onto non-life models and can be hard to manage and validate as black boxes. Annual recalibration exercises often lead to shifts in calibration and model results which can confuse boards/management and lead to accusations that the actuary has failed to keep the board informed, or that he or she has failed to avoid a 'no surprises' approach.

Parameter uncertainty

Parameter uncertainty is a major topic. One school of thought believes that any parameter already includes an element of bias or judgement. In other words, an element of model uncertainty arises from expert judgement (e.g. over choice of method), and another from statistical variation and statistical analysis. An analysis of 'best guesses' overlaid with a diagram or graphical representation of outcomes can be used to successfully spot outliers.



Model validation

Validation is an important aspect of Internal Models, not only for supporting the model approval application process with the regulator, but also for providing management with the necessary understanding and assurance of the model and its results. The model validation exercise should methodically review and leave no stone unturned in the Internal Model framework. Such validation should challenge the models' theoretical and practical foundations, as well as its use within the regulatory context of the Solvency II Directive and within the wider Enterprise Risk Management (ERM) framework.

Model validation should be straight forward enough if approached in the right way. However, such model validation requires a clear validation framework and process. Proxy models are important in this space and validation of complex nested stochastic models remain problematic. This is despite the warnings from some insurance regulators against the over-use of proxy modelling as a replacement for a full empirical granular capital model.

Profit & Loss (P&L) attribution

A central tool within the model validation and business planning armoury is the P&L attribution framework and report. However, P&L attribution is often one of the least well-developed aspects of company's IMAF programs. Attempts to carry out P&L attribution based on a simple analysis of variants from the capital model omit a key source of P&L attribution arising from prior period development or assumption/data changes in respect of claim reserves/claims provisions against prior exposure periods. In such cases it is clear that the capital modelling function has limited or indeed any interaction with the reserving function, and hence a central aspect of the Use Test is missed.

Independent model validation

An Independent model validator can co-ordinate validation activities and report back to a company's audit committee or board on the robustness of the Internal Model. Such an Independent model validator should be independent from the actuarial function and work as a second-line function on behalf of the chief risk officer (CRO). Such an individual should have sufficient experience and standing within the company to carry out his or her role through a framework typically outlined in the model validation governance policy.

The Independent model validation should seek to establish tiers of model validation from proof-of- conceptual validation, through to detailed post implementation validation which is typically owned by an internal audit function. Working within this framework, the independent model validator can work to provide risk challenge to each step in the validation pathway and provide best-in-class tools, board reporting metrics and frameworks for boards and non-executive directors to challenge the Internal Model and exercise effective model oversight.

The aim is to make risk management more than just a compliance issue, and for it to be integral to how the organization manages its capital and develops its business strategy.

Meeting the use test

Validation should benefit the Use Test and in essence the business. If such a model can be used and embedded to produce a base business plan (at the 50th percentile) rather than produce only extreme percentiles and catastrophes for risk-based capital, then such an approach goes a long way towards meeting the Use Test.

As noted, in order to meet the Use Test the model should typically validate at the mean, median or 50th percentile to a company’s business plan over, for example, one, three and five years. In fact, such a model should be used to produce a company’s business plan and hence meet the Use Test. It becomes a requirement to take business planning out of the hands of a spreadsheets community, and place it in the hands of an actuarial or risk modelling system and subject to the right Solvency II governance framework of model vision/ scope, model validation and model change control. If this can be achieved then such a model will again go a long way towards meeting the ‘Use Test’ and also provide genuine business benefits through acceptance (by the finance and commercial functions) for the purposes of business planning. If a validated Internal Model is used for base business planning at the 50th percentile, then such a model can more readily be adapted to give insights into risk appetite at the level of the 90th percentile or of a 1-in-10 year event.

Efficient model design should embrace the challenges of embedding the model and meeting the Use Test up front. As we approach Solvency II ‘go live’ in January 2016, some important successes factors and development needs can now be identified from Solvency II programs:

Meeting the board back test

Meeting the exacting requirements of the Board Back Test also demands an appropriate structure, good communication, results visualization, fast processes and predictive capacity.

Key questions to focus on include answering ‘what-if’ questions such as:

- ‘Did your model predict the outcomes of the 2008 -10 recession and following growth phase?’
- A common CEO level question: ‘Did your model predict X’ or ‘can your model explain what went wrong last year?’
- CRO/chief actuary questions such as ‘Does your model meet the needs of the Board?’ and ‘Can this model withstand the challenges of the Independent Model Validator?’

Another consideration is that, as we emerge out of recession, companies are increasingly interested in model capacity to model growth, customer differentiation, economic differentiation and customer attitudes/dynamics. To achieve this, next generation models are increasingly required to link pricing/DFA capacity through to reserve/capital modelling in a model that represents salesforce dynamics and training needs.

Successes	Development needs
Project management skills (PMO)	Validation/Expert judgement
Risk governance framework for models	Poor processes
Risk appetite	Cost
Use test	Scope
Technical skill level/knowledge	Regulatory engagement
Model build/Data scorecards	Lack of fixed timetable

Summary and conclusions

Validation and optimization are key aspects of Internal Models. This is the case not only for supporting the model approval and application process with the regulator, but also for providing management with the necessary understanding and assurance of the company's Internal Model.

A sound model validation and optimization process is essential as the pressure from regulators and management continues to pile onto insurance actuaries and risk managers. As noted, regulators demand more, as do insurers' own management. These demands are for insightful results, greater detail, and more frequently reporting. This in itself often generates complex model analyses and huge data volumes which demand process streamlining, validation, optimization and efficient end-to-end processes.

An effective risk management framework therefore requires embedded validation and optimization processes. These are about methodically turning over every building block of the Internal Model framework and challenging its theoretical and practical foundations, and its use within the regulatory context of the solvency II framework and also of wider ERM. Such an approach will move the linked disciplines of model implementation, validation and optimization beyond complex regulatory compliance and make them integral to business as usual. This will help companies to move beyond a costly obsession with optimizing risk/actuarial infrastructure and governance. If this can be achieved then the internal model will truly become a foundational business management system that allows boards and management teams to make optimal business decisions, and not an end in itself.

About the author

Director of the general insurance business practice within FIS' insurance business. William Diffey is a senior actuary with Board and audit committee level experience within both general insurance and life businesses. He is a Fellow of the Institute of Actuaries and is a regular speaker at industry conferences focused on model validation/optimisation, risk management, ERM and CRO advisory topics.

Prior to FIS, William was vice president and finance actuary at Genworth Lifestyle Protection Insurance, leading the actuarial function for general insurance and life protection businesses for over 20 countries. Before this, William worked at Tillinghast-Towers Perrin (now Towers Watson) for a wide range of life and non-life clients, and played a key role in developing intellectual capital in the areas of risk management, ERM, Individual Capital Adequacy Standards (ICAS) and economic capital.

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About FIS

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