

QIS5 results: Internal Models



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EIOPA has published the results of the fifth Quantitative Impact Study conducted across reinsurance and insurance undertakings throughout Europe in 2010. While the report demonstrates increased participation in the study it also highlights significant work which needs to be done in order to reduce complexity in the guidance and to ensure consistency across territories.

INTRODUCTION

On 14 March 2011 EIOPA issued its report on QIS5. Milliman has produced this detailed summary of the Internal Models section of the EIOPA report. Additional summaries are available from Milliman relating to the other sections of the QIS5 report. This is part of a series of Milliman summaries covering the key areas of QIS5.

A short Milliman summary is available giving an overview of the whole QIS5 report. The full report is available on eiopa.europa.eu.

The sections of this summary are listed below with some of the key findings from each section:

- **Disclaimer** – No firm conclusions can be drawn from the use of internal models in QIS5 due to the small number of models used (and the even smaller number of those which would be approved).
- **Internal models on solo level** – Many undertakings indicated that they were going to use internal models to calculate SCR under the Solvency II regime but did not submit any QIS5 results
- **Status of internal models** – This section includes undertakings' comments on: the reasons for using an internal model, the correlations used, criteria for distinguishing between major and minor changes, external models used, probably distribution forecasts, future management actions, calibration, validation tools and documentation.

- **Internal model results** – Surprisingly, for solo SCRs, the SCR calculated using the standard formula was found to be consistent with that using an internal model. However, significant differences were seen for group SCRs where capital requirements calculated using internal models were, on average, 80% of those calculated under the standard formula.
- **Partial internal models** – The modules that most participants plan to replace with a partial internal model are non-life underwriting risk (natural catastrophe risk and premium and reserve risk), market risk and life underwriting risk. EIOPA notes a degree of confusion over the scope of internal models, either between full and partial models or the differences between developing an internal model and merely using undertaking-specific parameters. Also some undertakings reported that they plan to use the standard formula correlation matrix, replacing the standard formula parameters with their own. EIOPA's view is that would not be allowed.

DISCLAIMER

Due to the fact that undertakings' internal models have not yet been finalised and because of the small sample provided, no exact conclusions can be drawn as to the size of the capital requirements calculated by internal models compared to the capital requirements calculated by the standard formula.

Furthermore some undertakings mentioned using internal model techniques which in EIOPA's opinion

were not in accordance with the Level 1 text and the QIS5 Technical Specifications.

INTERNAL MODELS ON SOLO LEVEL

Solo undertakings which were part of groups for the most part declared that they would be using internal models developed at group level. Local undertakings that are currently implementing internal models (in many cases they are only in the early stages) presented very detailed group answers without giving much information on the local level.

Several supervisors reported that many undertakings indicated that they were going to use internal models to calculate SCR under the Solvency II regime (in many cases they had already entered into the pre-application phase) but did not submit any QIS5 results regarding internal models.

STATUS OF INTERNAL MODELS

Participants reported the following main reasons for using internal models instead of the standard formula:

- internal models better reflect the undertakings' specific risk profiles,
- additional risks are covered by the internal model beyond those covered by the standard formula;
- the internal model applies a more granular aggregation method;
- the standard formula does not take into account volatility.

Undertakings provided the following insights into the various aspects of their models:

- The parameters used in their correlation matrices (these varied from the standard formula in most cases from $\pm 25\%$ to $\pm 50\%$).
- Criteria which could be applied to distinguish between major and minor changes.
- External models likely to be used (mainly natural catastrophe risk models, Economic Scenarios Generators and tools for the calculation of the best estimate).
- Probability distribution forecasts

- Some undertakings indicated that their internal models predicted the full distribution forecast and others that only key points were used to fit the distribution forecast.
- The most common method for producing the probability distribution forecast was Monte Carlo simulation.
- Reports of the number of simulations used varied widely from 10,000 to 100,000 (the median was 25,000 simulations).

- Future management actions taken into account were:
 - changes in asset allocation;
 - changes in future bonus rates;
 - changes in product charges or expense charges;
 - changes in their reinsurance programme;
 - dynamic hedging; and
 - run-off decisions.
- Calibration – most undertakings used the Solvency II risk measure of 99.5% VaR over one year. In some cases undertakings used a combination of risk measures.
- Validation tools mentioned include:
 - back testing;
 - sensitivity testing;
 - stress and scenario testing;
 - profit and loss attribution;
 - benchmarking; and
 - analysis of change.
- The majority of undertakings were still in the process of developing certain aspects of the internal model documentation. Most of the documentation concerning, for example, description of the internal model, the methodology used in the internal model or assumptions, was completed or partly completed. The documentation for the validation process or for the model change policy is mostly not yet commenced.

INTERNAL MODEL RESULTS

In QIS5 234 undertakings (about 10% of all participating undertakings) provided overall SCR results calculated by internal models.

A comparison of the internal model SCR and the standard formula SCR (based on the small sample) for solo SCR calculations is shown below.

Table 19: Ratio of internal model SCR to standard formula SCR

	10 th percentile	25 th percentile	50 th percentile	75 th percentile	90 th percentile	Weighted average	Standard deviation	Sample size
SCR internal model to SCR standard formula	66%	83%	91%	107%	121%	99%	0.38	236

On average the internal model results were very close to those derived by the standard formula; however, there was variation at individual level.

Groups which used full or partial internal models were also asked to provide the capital requirements coming from these internal models.

Table 21: Ratio of group internal model SCR to group standard formula SCR

	10 th percentile	25 th percentile	50 th percentile	75 th percentile	90 th percentile	Weighted average	Standard deviation	Sample size
Group SCR internal model to group SCR standard formula	50%	60%	80%	90%	100%	80%	0.3	29

As shown in the table the median of the group SCR calculated via internal model is about 80% of the one deriving from the standard formula.

Analysis of groups whose internal model SCR was higher than their standard formula SCR suggests that these groups are not well diversified and are characterised by a risk profile dominated by one type of risk.

For the groups which had the lowest ratios of internal model SCR to standard formula SCR, it was found that in the standard formula calculation one type of risk always dominated.

PARTIAL INTERNAL MODELS

In QIS5 99 undertakings (about 42% of all undertakings which provided internal model results) provided SCR results calculated by the partial internal models.

Table 22: Ratio of partial internal model SCR to full standard formula SCR

	10 th percentile	25 th percentile	50 th percentile	75 th percentile	90 th percentile	Weighted average	Standard deviation	Sample size
SCR partial internal model to overall SCR	51%	80%	86%	99%	110%	82%	0.37	100

The median of the partial internal model SCR ratio was 86% across all undertakings with a weighted average of 82%.

The most common risk modules that undertakings plan to model are non-life underwriting risk, market risk and life underwriting risk.

Undertakings predominantly intended to replace the natural catastrophe risk and premium and reserve risk in the non-life underwriting risk module with their partial internal model.

Most undertakings which plan to use partial internal models indicated that they would use the standard formula for operational risk. Some of them will also

use the standard formula for counterparty default risk.

One interesting point is that those undertakings which plan to calculate only operational risk with standard formula treat their models as full internal models, when in fact they should be considered partial internal models.

It was mentioned by several groups that they were intending to use the standard formula for operational risk due to a lack of data and in the awareness that this standard formula module lacks risk-sensitivity.

Undertakings also mentioned using different (internal) parameters to the standard formula in order to take into account the specific risk profile of the undertaking. But there is a restricted and closely-defined area where undertaking-specific parameters can be used. EIOPA's view is that changing the parameters of the standard formula themselves should not be considered as internal modelling and does not comply with the Solvency II requirements regarding internal models.

Undertakings which intend to use partial internal models under Solvency II mainly reported that they plan to use the standard formula correlation matrix, some stating they would replace the standard formula parameters with their own. EIOPA's view is that this latter approach would not be allowed. Undertakings also reported the following methodologies for integrating partial internal models with the standard formula:

- a variance-covariance matrix, for example for the risks not covered by the standard formula;
- using one large correlation matrix to aggregate all risks;
- some sub-modules will be stochastically modelled all together; and
- using copulas to aggregate partial internal models with the standard formula.

SUMMARY

EIOPA comments that there is still work to be done, particularly with regards to internal models. The scope of application of both partial and full internal models is still subject to some misinterpretations. Most internal models have not been finalised yet. Furthermore, some undertakings are using internal model techniques which in EIOPA's opinion would not yet be in accordance with the Directive.

Various participants indicated that they would be applying to their supervisory authority to use an internal model to calculate the Solvency II SCR. In many cases they indicated that they have already entered into the pre-application phase. However, at the same time, many of these undertakings have not submitted any qualitative nor quantitative data regarding their internal model.

QIS5 is expected to be the last in the series of impact studies, and as such any further improvements to the Solvency II regime will be through *ad hoc* work and tests leading to the finalisation of the Level 2 Implementing Measures later this year and the subsequent consultation on the Level 3 guidance. Companies are encouraged to engage fully in these further consultations to ensure that the final Solvency II guidance provides a solution that is both sound and workable.

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