



BENCHMARKING SERIES



**Correlations Study
Executive Summary**

Introduction

In March 2015, ORIC International conducted a survey on operational risk dependencies. The survey consisted of 55 questions split into 3 sections:

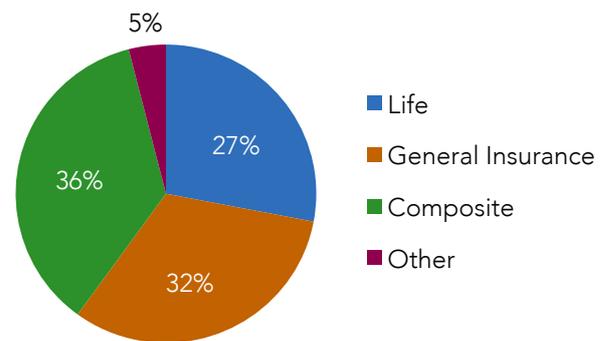
1. Operational risk dependencies with other risk types
2. Dependencies within operational risk
3. Scenario causal relationships

Participants only answered the questions in the sections that were relevant to their internal processes. For example, if a firm doesn't consider correlations within operational risk then none of the other questions in that section were made available. The questions were drafted and reviewed by the Scenario Analysis Working Group and approved by the Internal Model Discussion Group lead.

The objective of the survey was to understand current practices within member firms for applying dependencies to and within operational risk along with what effect dependencies have on the percentage of capital held for operational risk.

The survey was completed by 22 member firms from across the globe. Of the firms who took part in the survey 36% were composite insurers, 32% were general insurers, 27% were pure life insurers and 5% were classified as 'other'. 16 firms did not participate in the survey, 8 of whom were firms subject to Solvency II and running an internal model for

% of respondents by firm type



operational risk but chose not to participate, 5 are based in locations not subject to Solvency II regulations, and 2 are using the standard formula.

A mix of different sized firms participated in the survey. In this report we define:

- 'small' insurers as those with annual gross written premiums (GWP) in 2014 of less than £1bn for all firm types (32%/7 participants),
- 'medium' where GWP is £1 to 2bn for general insurers and £1bn to £5bn for life or composite insurers (41%/9 participants)
- 'large' where GWP is above £2bn for general insurers and above £5bn for life or composite insurers (27%/6 participants).

Of the 22 participants, 64% completed the survey in relation to the Group entity and 36% completed the survey on behalf of their individual business entity.

This report summarises our findings from the study.

A more detailed version of the report has been made available exclusively to the firms that participated in the study. We hope that you have found this executive summary useful and please contact Jenna Andrews at ORIC International to register your interest in participating in future benchmarking studies or to discuss this report.

Executive Summary

Key Findings

Operational Risk Dependencies with Other Risk Types

Methodology

- The majority of firms assessing operational risk dependencies with other risk types are using or developing an internal model.
- Most firms who apply dependencies between operational risk and other risk types apply them with insurance (94%), market (88%) and credit risk (82%).
- The business levels at which firms apply dependencies between operational risk and other risk types varied from Group to business unit and is dependent on the level of granularity that the firms use to quantify operational risk and the methodology (if any) used to aggregate results for the purposes of modelling.
- The vast majority (94%) of firms use a 1 year time horizon for assessment.
- The majority of firms have a good level of documentation with some development required for the documentation of dependency rationales.

Input

- The majority of firms are using percentage assumptions for assessing correlation co-efficients.
- Little consideration is given to the dependencies 'to ultimate'.
- Two thirds of firms are using internal data inputs, over ½ of which are also using external data inputs.
- The majority of firms (13 out of 14) allow for tail dependency within their methodology are internal model firms.

Output

- The percentage effect range was a reduction in capital held for operational risk from 20% - 75% in comparison to standalone capital.
- Average percentage reduction of 45% and median reduction of 45%.

Disclaimer: All answers stating 0% were removed for the purposes of this study.

Dependencies within Operational Risk

Methodology

- The majority of firms applying intra operational risk dependencies are internal model firms.
- The business level at which intra operational risk dependencies are applied was again varied and is more than likely reflective of the way the risk quantification process and modelling works in each firm.
- There was a good level of documentation present for firms applying these types of dependencies with some evidence that those developing an internal model have documented the process, assumptions and rationales slightly better than those applying the standard formula.

Inputs

- Correlation co-efficient assumptions used ranged from 0% (no correlation) to 100% (fully correlated).
- Other assessment parameters included risk dependency, event dependency, common causation, environmental factors and combined severity and frequency.

- The correlation co-efficient averages show that the risks with the highest correlations co-efficients were duplicate pairs which is unsurprising given that correlation coefficient matrices are symmetrical in nature and often used with a Gaussian copula or t-copula.
- The average correlation co-efficients show no 0% correlations across all risk categories meaning that all co-efficients had been assessed as at least somewhat related.
- More firms are using external data inputs when considering intra operational risk dependencies than dependencies with other risk types. This may be because the firms who participated in this survey are ORIC International members who have access to external operational risk data but not external data from other risk types. ORIC International has the concept of boundary risk events in which a risk event may have more than one related risk type. Currently the boundary event field is optional in the consortium database however this is an area of future focus and data development for ORIC International.

Executive Summary

Outputs

- The percentage effect range was a reduction in capital held for operational risk between 16.2% and 85% meaning that the aggregate operational risk capital requirement on a standalone basis is 16.2% - 85% lower than the sum of the individual scenarios.
- Average reduction of 55% and median reduction of 36.5%.

- A third of firms stated that they use intra operational risk correlations to enhance risk management in the business, effectively creating great 'value add' benefit as a result.

The approaches for enhancing the risk management processes included:

- Informing the ORSA
- Informing stress and scenario testing
- Control improvement activity
- Insights into the firms risk profile

Scenario Causal Relationships

Methodology

- Circa 50% of firms stated that they did consider the causal effect of one scenario on another and the majority (7 out of 10) of those firms were developing/using an internal model.
- The way in which these causal effects are considered was varied. The majority assess causation as part of existing processes such as stress and scenario testing, reverse stress testing or scenario thematic reviews.
- 4 in 10 undertake an independent causal link exercise.
- The documentation of the process and the outputs seemed less formal with only half confirming that they fully documented the process and two thirds stating that they fully documented the outputs.

Assessment

- 2 in 10 firms stated that they considered vicarious scenario causality in which scenario A vicariously causes scenario C though strong mutual causality with scenario B.
- 50% of firms considering causal links assess both frequency and severity whereas 25% are assessing neither/or "other". The "other" 25% are assessing either frequency or severity, but not both.

Outputs

- 50% of the firms assessing scenario causal relationships take the assessments into consideration when calculating operational risk capital.

Key areas of development identified

1. Value add

Overall, the survey demonstrated that for many firms the dependency process has two material focuses:

- i) The calculation of diversification benefit and resultant reduction in the amount of capital held for operational risk
- ii) The qualitative value that this process can provide to the business. Those firms using expert judgment in the assessment of dependencies could further consider how the knowledge of risk dependencies is used elsewhere to strengthen a holistic risk management framework.

2. Documentation of rationales

The documentation of the process and the assumptions were well developed however many firms felt they could better develop the documentation of the rationale behind the assessment results. Dependency assessments based on expert judgement may face enhanced scrutiny by a regulator and therefore the documentation of rationale is particularly important as well as justification that the expert is credible and qualified to make the assessment.

3. Consideration of correlations over more than a 1 year horizon and to ultimate

The consideration of dependencies over more than 1 year will depend on the firm's choice of model and the purposes the firm is using this model for, for example in assessing economic capital a firm may well want to examine a longer time period. The results of this study show that many firms who do consider dependencies to ultimate but don't see any material difference in the impact on the standalone capital figure as a result of dependencies to ultimate.

Firms could further consider whether it's appropriate to use a single dependency structure for both one-year and to ultimate views.

4. Use of external data

Firms could further consider using external data to inform the correlation process. To aid member firms in doing this, ORIC International and Oliver Wyman will be shortly undertaking a correlations study with the aim of examining operational risk correlations, as well as correlations between operational risks and market risks (eg. equity risk, interest rate risk) using ORIC International data and publicly available market data.

Internal Model v Standard Formula

77% of the survey participants are developing an internal model for the calculation of operational risk capital requirements and 23% are using the standard formula.

The stated range of percentage difference in pre-diversified operational risk capital between the internal model and standard formula is between 9 – 300% with an average difference of 98% and median difference of 70%.

The range of percentage difference in diversified operational risk capital between the internal model and standard formula is between 0.5 – 200% with an average difference of 65% and median difference of 48%.

The standard formula prescribed by the Prudential Regulation (PRA) in the UK and EIOPA in the EU, sets out the dependencies structure and parameters. Therefore, any work undertaken on applying dependencies for operational risk will either be; to help develop an internal model not currently used to assess regulatory capital requirements or as a purely qualitative process to provide the business with further information regarding the risk dependency profile.

It should be noted that any difference in methodological approach for firms running the standard formula should be consistent with the Standard Formula methodology as set out by EIOPA¹. This methodology does not allow for any dependencies between operational risks.

¹ CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: SCR Standard Formula, Article 111(d) Correlations.

Conclusion

These survey results indicate that the participating firms have developed processes for assessing the dependencies between operational risk and other risk types as well as looking within operational risk at the varying levels of divergence/convergence and complexity.

In relation to inter risk dependencies, the key areas of divergence identified were:

- The business level at which dependencies are applied
- Documentation of assumption rationales
- Use of internal data and external data to inform the assessment
- Aggregation of dependencies across business units
- Average correlation coefficient range

In relation to inter risk dependencies, many of the key areas of divergence and convergence in approach identified were the same as those identified for inter risk dependencies. Additional areas of divergence that were identified were:

- Risk category level at which dependencies are applied
- Use of dependencies to enhance risk management practices

The key convergent practices identified were the same across both type of dependency assessment (inter and intra) and these included:

- Firms are assessing dependencies between operational risk and insurance, market and credit risk.
- Firms are assessing dependencies over a 1 year time period
- Firms have a good level of process and assumption documentation
- Most firms are not considering dependencies to ultimate

In relation to scenario causal relationships, there were varying degrees of documentation of the process and results and the majority of firms assess both frequency and severity. 50% of the firms use the results during the calculation of operational risk capital requirements and the effect of these relationships on the capital requirement again varied.

Next Steps

In order to help our members further understand the extent of operational risk dependencies within the industry, ORIC International is scoping a project with Oliver Wyman. This will use ORIC member loss data to estimate correlations between different types of operational risk and potentially also between operational risk losses and market risks (e.g. equity, interest rate, credit spreads).

We look forward to being able to provide you with further thought leadership on this topic once this study has been undertaken.



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