

QUANTIFYING OPERATIONAL RISK IN LIFE INSURANCE COMPANIES

DEVELOPED BY THE LIFE OPERATIONAL RISK WORKING PARTY

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Abstract

This paper overviews a practical approach to the assessment of operational risk in life insurance companies. It considers how actuaries working in conjunction with risk management professionals and senior management, can develop a framework to assess the capital requirements relating to operational risk, taking into account the capital requirements of other risks and their interaction.

This paper recognises that we do not live in an ideal world and a lot of the data that one might want for operational risk assessment are not, and in some cases never will be, available. Consequently, the approach outlined in this paper takes into account the fact that management and assessment of operational risk is at an early stage of development in the life industry. In addition it outlines some of the areas where development is necessary or desirable in the coming years.

There is a section on what operational risks it is appropriate to hold capital against. As this is a new area for insurance companies, and given the governance requirements for Individual Capital Assessments, it is important to explain the results effectively to senior management. Therefore a brief review of techniques for reporting the results of the assessment is provided.

The paper concludes with some thoughts on how operational risk management can be embedded more in the business, and then considers what future work will help develop the framework. To echo the thoughts of the authors of the General Insurance paper on this topic, we hope the paper will sow seeds for the development of best practice in dealing with operational risk and raise the awareness and increase the interest of actuaries in this emerging topic.

This paper represents the views of the individuals in the working party, and not necessarily the views of their employers or the actuarial profession

Keywords

Operational risk, risk management, life insurance, quantification of risk, financial services, individual capital assessment, capital management, people process and systems, curve fitting, regulations and risk, regulatory capital, risk categorisation, key risk indicators, loss distributions, stress tests, scenario analysis, aggregation, correlation, risk reporting, professional guidance.

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1 Introduction

1.1 Overview

The Financial Services Authority, "FSA", has introduced an Individual Capital Adequacy Standard for insurance companies in the Prudential Sourcebook, "PSB". The Individual Capital Assessment, "ICA", covered in PRU 1.2 and 2.3, requires a firm to:

... identify and assess risks to its being able to meet its liabilities as they fall due, to assess how it intends to deal with those risks and to quantify the financial resources it considers necessary to mitigate those risks. To meet these requirements, a firm should consider the extent to which capital is an appropriate mitigant for the risks identified and assess the amount and quality of capital required.

Operational Risk, "OR", is one of the six risk categories in the PSB, along with credit risk, market risk, liquidity risk, group risk and insurance risk. It is described as "the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events".

As well as being a regulatory requirement, there are considerable business benefits from assessing, monitoring and controlling a firm's OR exposures. Management can make conscious decisions about what risks they want to accept, what risks they want to eliminate or reduce and what risks they wish to transfer. By measuring the risks, the benefits of their actions can be monitored. By analysing the OR losses, trends can be identified, lessons can be learned and appropriate action can be taken. Management controls can be enhanced to reduce the possibility of losses.

The risks involved, and their individual circumstances and loss amounts, are potentially extremely varied and relatively infrequent in occurrence. Consequently, operational risks are typically long-tailed and model results can be highly sensitive to assumptions.

A further issue is defining what an OR loss is. An OR event can impact many aspects of an insurance company's operations, particularly claims and expense experience. It is not easy to separate out how much of the experience variations are as a result of OR events. Conversely, once an OR event has been identified it is not always easy to identify what the impact is or has been.

Hence we do not live in an ideal world and much of the data that one might want for rigorous statistical analysis and modelling of OR is not currently available and in some cases never will be. Applying quantitative approaches, therefore, can be highly spurious, and one needs to evaluate the results accordingly. One should also guard against affording full credibility to any one approach.

In this context, actuaries need to be wary of over-engineering the model before gaining a good understanding of OR and the potential impacts. The scenario-based approach set out in this paper facilitates improved understanding of OR, through detailed consideration of causes, effects and impacts, as well as providing a pragmatic transparent basis for capital assessment.

In practice OR may be assessed outside the Actuarial function. However, Risk Management professionals will typically work in conjunction with the Actuarial function to quantify OR. Actuaries should be well placed to support the assessment. There will be some allowance for OR events within the data informing the actuarial models used

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to assess the capital requirements for insurance and other risks and it is important to understand the dependencies.

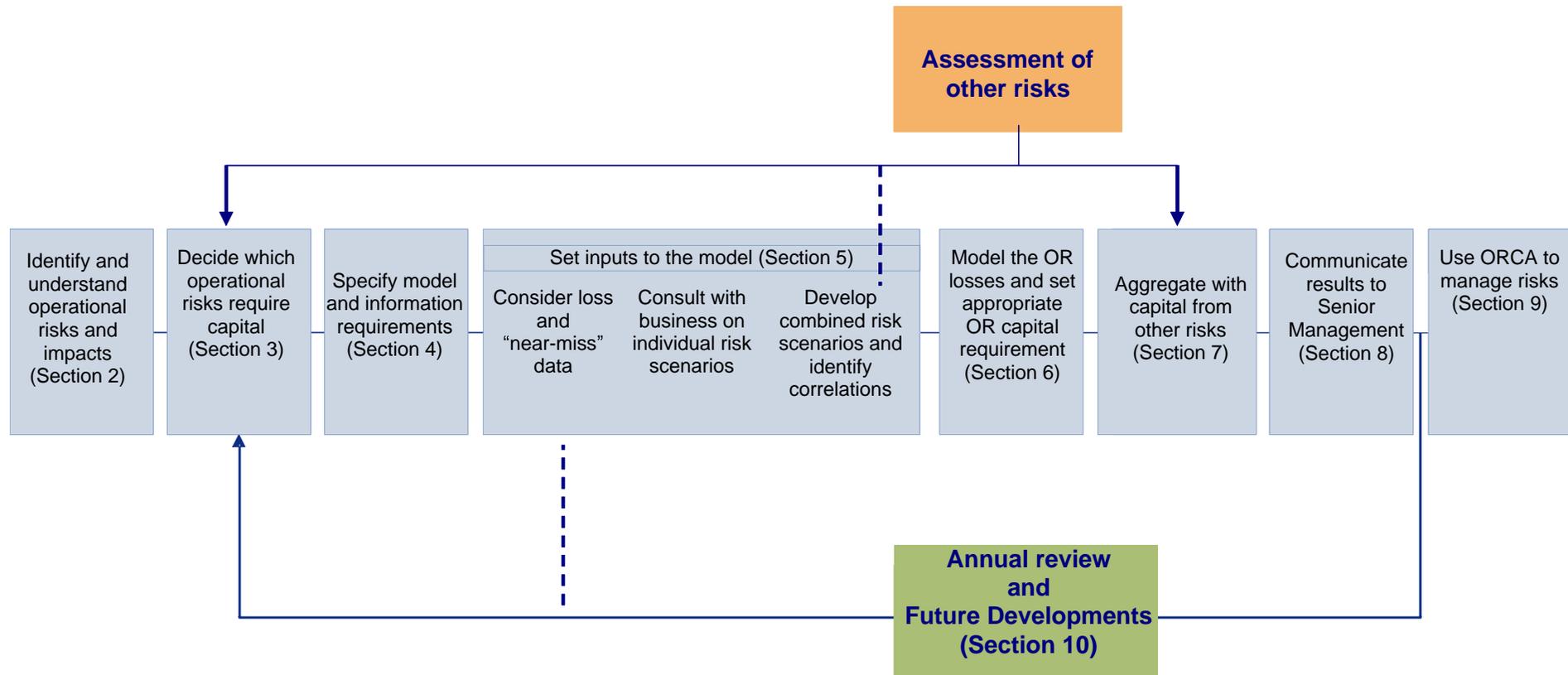
This paper focuses on the methodology to be followed in assessing OR Capital, the "ORCA", and the specific risks mentioned have been included for illustrative purposes only.

We have in places borrowed from the earlier work of the GIRO Working Party by Tripp et al, which looked at OR in General Insurance Companies. Their paper "Quantifying Operational Risk in General Insurance Companies" explored more of the theory of the subject and we would encourage readers to look at that paper as many of the issues are similar for life and general insurance companies.

1.2 The ORCA process

Figure 1.2 sets out the methodology described in this paper. The detail on each step is covered in the relevant sections. An example is given in Appendix 4.

Figure 1.2: ORCA Process



2 Identify and Understand OR affecting life companies

2.1 Identifying OR

A robust and comprehensive risk identification process is fundamental to the capital assessment. The identification of ORs may start with high-level risk categories in the definition of OR, namely people, processes, systems and external events. The firm should then identify levels of sub-risks which reflect its individual circumstances, history, culture and organisational structure. The sub-risk definitions will vary by type of company – for example a pure reinsurer will have very different risks compared with a with-profit office. There will also be different risks where the company outsources some of its activities. Table 2.1 shows example sub-risks using this approach.

Table 2.1: OR based on People, Process, Systems and External Events

High-level Risk	Sub-Risk	High-level Risk	Sub-Risk
People	<ul style="list-style-type: none"> • Internal Fraud/ Collusion • Key Person Risk • Skills/ People adequacy/ Training 	Systems	<ul style="list-style-type: none"> • Software risk • Hardware risk
Process	<ul style="list-style-type: none"> • Client service and interaction • Contract and documentation • Data input risk • External Data adequacy • Financial & Strategic Management • Methodology, Modelling, Interpretation • Internal management information • Mis-selling • Outsourcing / Offshoring 	External Events	<ul style="list-style-type: none"> • Legislative/ Regulatory risk • Physical asset risk • Third Party liability • External fraud

There are several ways in which OR may be categorised:

- by people, process, systems and external events (as above);
- by business division;
- by key process or function;
- by stakeholder; and so on.

The important point is that, as far as possible, all the firm's risks are included and that the categorisation fits conveniently with the way in which the firm's business is managed. To illustrate, Appendix A1.1 shows detailed sample OR descriptions based on the definitions used by one insurance company. There are five risk categories used:

operations; customer treatment; governance, people and organisation; legal and regulatory; and change.

Basel II OR categorisation and ABI ORIC examples

As a useful check on completeness, the list of OR identified may be compared with industry-wide categorisations of OR. There is currently no universally adopted categorisation across the financial services industry. The Basel Committee on Banking Supervision has devised a three-level categorisation of OR and this provides a useful start-point for insurance companies. However, insurance companies should consider whether there are insurance specific ORs that are not covered or specific banking risks that are not relevant to insurers.

The ABI has followed the Basel II categories for ORIC – an OR loss database for the insurance industry – and has provided examples of insurance activity for each risk event category as shown in Appendix A1.2.

2.2 Possible future mis-selling or ‘treating customers fairly’ (TCF) issues

One risk area worth covering in more detail at this point is the risk that existing products are deemed to be mis-sold or unfair at some point in the future, for example due to sales process failures, mal-administration or due to misleading or insufficient documentation. A number of insurance companies regard this as a significant potential OR given the complexity and long-term nature of several insurance products and also if current regulatory standards are applied to old books of business.

Appendix A1.3 gives examples of product issues which could give rise to mis-selling problems in the future, in the worst case requiring a review along the lines of the pension review (1994 – 2002). It also seeks to outline developments to date.

Please note the Working Party is not expressing an opinion on whether mis-selling did actually occur in these cases. We are merely logging regulatory and other activity noted in these areas.

2.3 Understanding OR Impacts and Losses

Before any detailed capital assessment the firm first needs to understand fully the impacts and losses arising from OR events. A single risk event may have many consequences, some of which will require capital to be held. A particular consequence may result from a number of OR events which in turn may be driven by many causes. The appropriate risk management response should deal effectively with the root causes rather than the consequences.

Figure 2.3 illustrates the distinction between causes, events and consequences. Consider a poor customer service event such a serious processing error adversely affecting many policyholders. One consequence might be an increase in lapses. Damage to the firm’s reputation might lead advisors to place less new business with the firm. The firm may have to invest in major process improvement activity increasing project expense spend.

An investigation into complaints reveals that the main root causes of this particular error were partly people-related - inadequate training and low morale among call centre staff - and partly system-related.

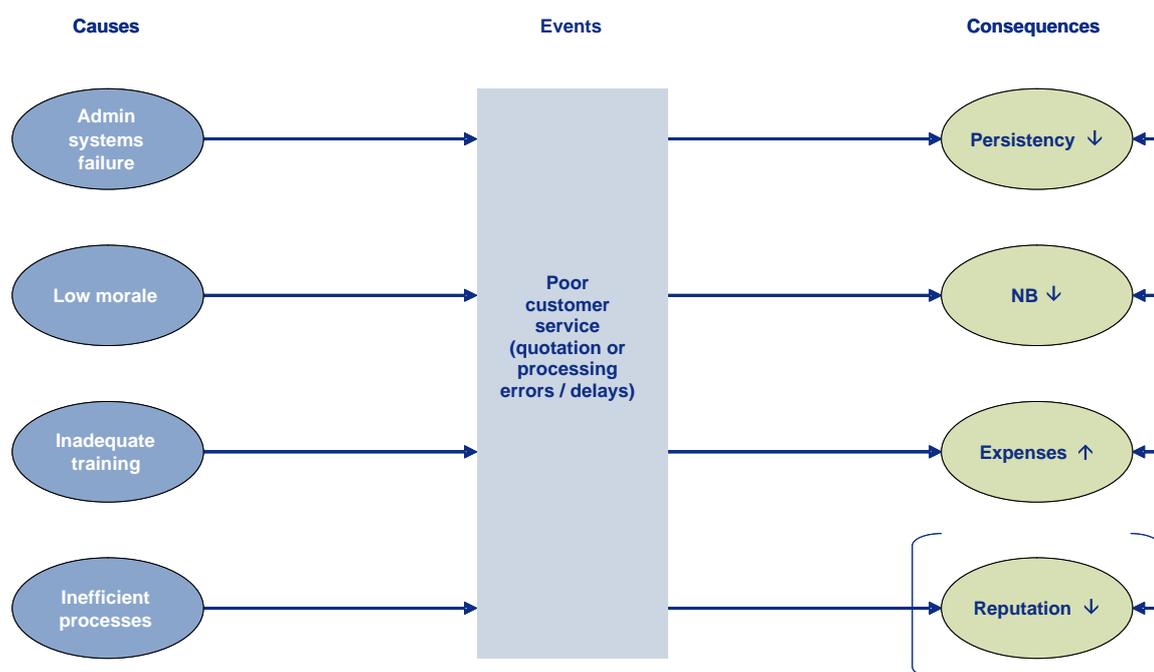


Fig 2.3: Causes, Events and Consequences

There are many possible impacts on the firm from OR events. These include:

- Legal fees and other costs in contesting litigation (including FOS fees);
- Regulatory fines and other regulatory costs (e.g.s166 reports);
- System costs in fixing problems;
- Compensation payable to customers including amounts written off;
- Market and other losses resulting from the operational event, e.g. box losses due to process failures, unwitting guarantees arising from poor policy wording;
- Increased capital requirements and associated costs;
- Impairment in the value of in-force business (VIF);and
- Brand / Reputation damage, leading to worsening persistency and new business.

Considerable overlap may exist between these types of losses, for example, an adverse ruling under the Unfair Terms in Consumer Contracts Directive against a charge levied may require customers to be compensated for past charges, but will also result in a reduction in VIF in respect of future charges of that type. Similarly a market exposure arising due to poor policy wording may increase capital requirements on top of the actual losses incurred from such exposure.

2.3.1 Example: Equitable Life

By way of an example of an OR event, consider the case of Equitable Life. Even if they had they won their Guaranteed Annuity Rate (GAR) case at the House of Lords they would have incurred considerable litigation expense. As it was, they had to change their systems to reflect the ruling, compensation had to be paid and they ended up with an increased exposure to annuity rates and hence market and longevity risk.

Aside from the economic cost of the increased exposure, there would have been a capital cost as reserves would have had to be set aside to cover this. These reserves would be based on prudent assumptions (e.g. GAR take-up rates) which would have exacerbated this cost.

The increased exposure reduced the VIF of existing business but the reputation damage gave rise to a surge in surrenders which also damaged VIF. Following the loss of their GAR court case, the Equitable's life portfolio contracted by 46% and pensions portfolio by 28% by the end of 2003, with mass paid-ups on the latter leading pension premiums in force to fall by more than 80% over the same period.

While the increased capital cost forced the closure to new business, even had the Equitable been able to remain open, or if it had won the case, it is likely that the reputation damage suffered would have led to significant reduction in sales and a consequent reduction in the goodwill of the business.

2.3.2 Further examples

Reviewable premiums

The FSA has recently issued advice on the reviewability of critical illness premiums and flexible whole-of-life policies¹. The impact of this is as yet uncertain, but consider the possibility of an office that cannot review critical illness premiums, nor adjust flexible whole-of-life benefits due to the wording of its marketing literature being at odds with the FSA's guidance.

In this case past premium and benefit reviews may have to be reversed and premiums refunded. There will need to be system changes to affect these and to ensure future reviews are stopped. There will be a VIF impact for flexible whole-of-life as the calculation can no longer assume premium increases / benefit decreases, and for both increased capital charges will arise due to previously reviewable benefits now being guaranteed.

Adverse coverage of the ruling may deter future sales, particularly from IFAs who would be more aware of such developments – the impact on direct sales to the public will depend on the press coverage and how newsworthy the media judge the event.

Surrender penalties

Another scenario would be a ruling against surrender penalties which are judged to be inconsistent with Treating Customers Fairly (TCF). As before there may be compensation issues, but the VIF impact will be worth noting. Not only will this reduce due to the removal of a charge, but the surrender rate may increase as investors previously deterred by the charge take advantage of its removal. Such a ruling would

¹ http://www.fsa.gov.uk/pubs/other/good_practice.pdf – FSA, 19/5/2005

also affect regulatory reserves – in particular any negative sterling reserves would have to be removed following the ruling.

Market Value Adjusters (MVAs)

A similar effect would be experienced on With-Profit Bonds were MVAs to be ruled out, perhaps because their presence was not properly explained². Again surrenders are likely to rise with consequent impact on VIF, but there would be also be a significant economic cost from the increased market risk exposure (effectively now offering an American option on the asset share), compounded by heavy regulatory capital required to back what are now guaranteed surrender values.

Underwriting

Poor recruitment and training may lead to poor standards of underwriting. This would lead to lives who should be loaded or refused being passed at normal rates. Aside from the loss of extra premium and higher claims experience (and hence lower VIF), a reinsurer may refuse a claim on grounds that their standards were not followed, exacerbating the cost of claims. They may also terminate a treaty or only accept new business at much higher rates damaging new business profitability.

A related example is non-disclosure, wilful on the part of the policyholder or the seller. If detective controls are inadequate, higher claims experience and lower VIF will result. Again the reinsurer may reject claims, and terminate a treaty. Claims rejected for non-disclosure may be challenged at FOS, resulting in regulatory costs associated with FOS adjudications. The extent that this occurs regularly will be reflected in claims experience and hence in reserves. One would need to be clear on whether this is picked up in the insurance or OR assessments.

System errors

A system error may lead to over-charging of clients. On top of the cost of fixing the system and compensating clients, negative press coverage could adversely affect sales.

2.4 Initial Frequency-Severity Assessment

OR events have very different frequencies and potential sizes of impacts (severity) reflecting the variety of potential causes and impacts discussed above. It is common practice to categorise risks into four or more broad categories using a simple frequency-severity matrix as shown in figure 2.4. This is an initial quantification to assist in prioritisation and will be enhanced in the modelling methodology.

It may be possible for the impact of a risk to manifest itself in different forms. An apparently high impact, low frequency event may be a compounding of a number of undetected low impact, high frequency events and there is a systemic risk underpinning the event. An example is a unit pricing error caused by incorrect charging which is too small to detect on a daily basis, but over a period of months or years generates significant errors. Another example is fraud, where there can be both low impact, high frequency small-scale fraud events and high impact, low frequency events (e.g. Enron, the Nick Leeson case etc.). It will aid understanding and clarity to keep separate the analysis of these distinct types of fraud and model as separate risks.

² <http://www.financial-ombudsman.org.uk/publications/ombudsman-news/47/47.pdf> (& issue 38)

Gross and net risk assessment

The categorisation will usually be performed net of any controls in place to mitigate the risk (“net risk” or “residual risk”). However the firm should also consider the risk before the operation of any controls (“gross risk” or “inherent risk”). OR losses are affected by variations in both the inherent risk and in the effectiveness of the controls and this is an important part of the modelling methodology discussed in Section 4.4. A gross and net assessment will help the firm understand the potential impact of risks if controls are ineffective and also help prioritise control assurance work. Firms should be wary of low net risks where the gross risk is high as there is considerable reliance on effective controls.

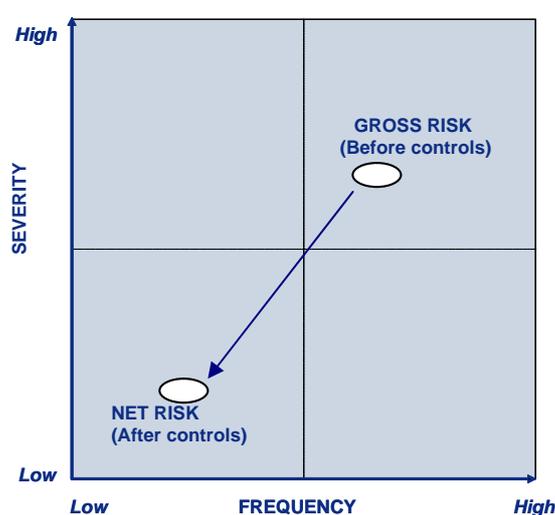


Fig 2.4: Frequency / Severity Matrix

Monitoring and Key Risk Indicators

Probabilities and sizes of risks will alter over time as management actions are put into place to control risks and as external events unfold. Key Risk Indicators (KRIs) may be used to monitor whether there is an increasing likelihood of the event happening or whether, given the event, the impact could be higher.

2.5 Risk Assessment Matrix

All the information gained in identifying and understanding the OR may be summarised in a risk assessment matrix. Table 2.5 shows an example entry in an Assessment Matrix.

High-level Risk	Sub Risk	Frequency	Severity	What could go wrong (Scenario Definition)	Impact on the Firm	Controls / Actions	Feedback/KRI
		(Net of controls)					
People	Fraud/ Collusion	H L	L H	Misappropriation of funds	Unrecoverable financial loss	Succession planning	Number of single controls in certain area
	Key Person Risk	L	L	Death of CEO	Business disruption		
	Skills/People adequacy/ Training	H	H	Unapproved advice given by salespeople	Possible fines and compensation Reputation damage		Training Sales monitoring

Table 2.5: Risk Assessment Matrix (extract)

3 Which operational risks require capital assessment?

Having identified and understood the ORs, the next stage is to determine whether capital is appropriate for each risk.

Possible reasons for **not** holding capital as a response to a risk include:

- the risk does not impact the solvency balance sheet; or
- there are more appropriate mitigating actions in response to the risk; or
- the impact is covered elsewhere in the ICA; or
- the impact is not material for ICA purposes.

3.1 Impacts on ICA balance sheet

The ICA is typically based on a realistic assessment of the assets and liabilities. Capital should be held for risks that impact on the cashflows underlying this base realistic balance sheet.

Types of Risk not impacting ICA balance sheet

The following types of risk would **not** require capital under this principle:

- Strategic opportunity risks

The risk of failing to exploit an opportunity to increase profits or to reduce the expense base does not require the provision of capital, unless some future benefit has already been anticipated in the balance sheet.

- New business risks

Some OR impact on the willingness of existing and prospective policyholders to place new business with the firm. This goodwill is an important part of an office's valuation, and limiting such damage is an important part of risk management. However, it is unlikely that goodwill will be allowed for as an asset in the ICA balance sheet, and so it would be inappropriate to hold capital against its impairment through operational or any other category.

A similar case for exclusion from OR capital can be made for other impacts which affect the volume and profitability of future new business, for example a reinsurer pulling out of treaty or increasing their rates for new business.

However, firms will need to cover the secondary impact of falling business volumes on the spreading of current expense base over a reducing book for a period until it can realign its cost base.

At any point in time it is reasonable for a firm to hold enough capital to fund its requirements for writing new business. It is not immediately apparent over what period it should be looking to fund new business. From an audit perspective, the auditors will want to be assured that the company has enough capital to the next audit date, i.e. for one year, after allowing for any agreed funding or support from an adequately capitalised parent. Where a firm has realistic and achievable plans for raising further capital in the future then it would be feasible to hold enough capital to fund new business for a prudent assessment for the time that would take. In any case the firm may take into account any management actions that would be possible to limit the flow of new business.

- Risks to other corporate objectives

Some risks affect a corporate objective, but not the ability to pay existing policyholders or to meet expenses. For example, the risk of changes to certain accounting standards may impact share price, but not solvency.

Types of Risk affecting ICA balance sheet

There should be allowance for litigation and regulatory costs, the costs of fixing systems, policyholder compensation, and the cost of any additional market, credit and/or insurance risk exposure arising from operational failures. These are expected to impact on the realistic assets and liabilities. The only question is whether they are already covered implicitly elsewhere in the ICA.

A firm's realistic balance sheet often includes credit for the value of the in-force business, "VIF". If this is the case, a risk that impacts on the VIF in stress scenarios will need capital in the ICA. Realistic liabilities are likely to take credit for certain future income streams. For example, future annual management charges on linked business, and therefore the loss of, or reduction in, those anticipated streams, *does* require capital in stress scenarios.

Note that while including VIF in a balance sheet is normal in life insurance, in many other institutions such as banks this will be rare. As such their OR capital will not include VIF impacts.

Regulatory Capital

An OR event may give rise to a regulatory capital requirement greater than the true economic cost of the event. ICA is primarily concerned with the firm's own assessment of its risks, and hence the true economic cost of risks arising, but the cost of regulatory capital is arguably an economic cost to consider.

If there is not much difference between the regulatory impact and the economic impact, it may be that the regulatory impact is used as a proxy for economic cost. However, in the example where surrender penalties are invalidated, the regulatory capital requirement (loss of negative sterling reserves) is likely to be significantly greater than the economic cost. In this circumstance, the VIF may be recalculated allowing for the higher reserving cost and the OR capital should reflect this VIF impact.

3.2 Capital is not the most appropriate mitigating action

This principle is described in GN46, paragraph 3.5:

"Whilst holding capital might be an appropriate response to mitigate the impact of most risks to the firm's ability to meet its liabilities, PRU 1.2.34G makes clear that some risks, such as those relating to control weaknesses, including liquidity risks, may more appropriately be dealt with by rectifying the weaknesses. It may therefore not be necessary to hold capital in respect of such risks, provided that the rectification measures intended are adequate. Consideration should also be given to the necessary capital while the rectification measures are implemented."

For some risks rather than holding capital it may be better to:

- Tighten controls to reduce or eliminate the residual risk, for example by installing a sprinkler system or setting up a new monitoring process (although the possible of controls failure needs to be considered);

- Transfer through insurance or outsourcing (although the cost of the transfer needs to be allowed for, and the potential for non-recovery due to counter-party failure or limits being exceeded); or
- Have a contingency plan other than capital, such as access to external funding.

It may be that actions have been identified to reduce a risk, but they have not been completed. In such cases, the firm should consider if capital is needed to absorb losses in the period until actions are completed and risk is reduced.

The firm should carefully document its rationale for excluding risks on this basis, including reasons why the controls or mitigating actions are believed to be adequate.

3.3 Impact covered elsewhere in ICA

There is significant scope to double-count OR impacts in the ICA. An OR event can lead to consequences covered by stress and scenario tests for other PSB risk categories, particularly any tests for persistency and expense risk. There may be implicit margins in assumptions, methods and calculations of assets and liabilities that cover some OR impacts. Such OR impacts should be excluded from further capital assessment to avoid double counting, provided that the covering stress test or margin adequately covers the impact.

3.3.1 Brand / Reputation damage

Many OR events have an adverse impact on the reputation of the firm. Damage to brand has two main effects: on the trust placed in the office by existing policyholders and on prospective policyholders. With regard to the former, the loss of confidence will impact on lapse and paid-up rates and, as this affects VIF, the effect should be allowed for in assessing capital. However this is likely to be covered at least partially in the insurance risk capital.

The other impact on existing policyholders, and on prospective policyholders, is their willingness to place new business with the office. This was discussed in Section 3.1.

3.3.2 Capital held for other PSB risk categories

Market and credit risk capital is likely to only reflect current exposure, not any additional exposure arising from OR. However, the insurance risk capital assessment is likely to have significant overlaps with OR. For example:

- mortality and morbidity capital may allow for the higher than expected claims experience that may arise from operational failings in underwriting;
- expense risk capital may allow for the additional costs that may arise from flawed operational processes (e.g. errors leading to re-work); and
- lapse risk capital may allow for the increased lapses that may arise from an operational event damaging the office's reputation.

Two important caveats apply.

- Firstly the size of, say, a shock used to calculate mortality capital may be smaller than the impact of flawed underwriting while it is unlikely that lapse shocks would be so severe as to mimic the contraction of the portfolio witnessed in Equitable, as noted above. A parameter shock of 10-20% may be typical in calculating mortality

capital, but much higher shocks may be experienced in the absence of adequate underwriting, as was experienced on MIRAS no-underwriting campaigns in the mid-1980s.

- Secondly, diversification benefits will be assumed between operational and other risks. It would be inappropriate to exclude an impact from OR capital on the grounds that it is included in insurance risk, if the latter only gives rise to a marginal figure due to diversification benefits assumed with OR. Therefore careful consideration of correlation factors between operational and other risks is required, and aggregate capital tested against combined risk scenarios.

3.3.3 Implicit allowances for Operational Risks

Implicit allowance for ORs may be made in expense reserves if operational losses, such as ex-gratia payments, are included in the renewal and claim expense data on which the valuation expense loadings are based.

However, this cannot be taken for granted as accounting treatment may vary e.g. the losses may be classed as exceptional items and excluded from the base data and hence the expense reserves. It is unlikely that low frequency, high impact losses would be included in this way, as they are generally viewed as exceptional items.

There is a need to identify the extent to which these operational losses are allowed for in expense reserves to test whether the allowances are adequate.

Implicit allowances may exist elsewhere in non-operational reserves:

- Offices may be unwittingly paying out to annuitants who have died – annuity reserves will be held for such cases (part of the operational loss of such “dead annuitants” is the effect of this over-reserving);
- Mortality and morbidity assumptions will be based on experience which will implicitly reflect operational losses from policyholder dishonesty, e.g. false PHI claims. This implicit allowance should be tested against the current control framework as it is based on the weaknesses of historic controls;
- Valuations frequently do not allow for flexible whole-of-life / PHI / critical illness premiums to be reviewed or for mortality and morbidity charges to be increased. Therefore they implicitly allow for the impact if such reviews and increases are challenged successfully under TCF;
- Unit reserves may include an addition for premiums received but not yet allocated due to processing delays – any margin for prudence in this addition may be viewed as partial provision for the box-losses that could arise once these are allocated;
- Reserves may not allow for favourable tax arrangements, and so would be unaffected by any Inland Revenue challenge of these.

In all cases it is important to quantify the extent of the implicit allowance and judge whether this is adequate.

If explicit provisions exist for operational events (e.g. mis-selling) are already allowed for in the capital calculation, then these should not be included again. That said, consideration should be given to the adequacy of these provisions and OR capital may still be necessary to cover any shortfall in stress conditions.

While implicit allowances may be made for ORs in the values of assets and liabilities, there may also be errors in the calculations of these. Such errors are an OR in

themselves and consideration should be given to the strength of controls around the calculations. Where these are felt to be inadequate, capital should be set aside to cover possible undervaluation.

3.4 Materiality

Any OR that clearly will not materially affect the capital result may be excluded from the assessment. The initial frequency-severity assessment is useful in identifying the most significant risks affecting capital requirements as follows.

High Frequency / High Severity

It is unlikely to be acceptable to run with a risk in this category and merely hold the capital required. Strong controls should be put in place in order to combat these risks. The risk would then fall in one of the other three categories on a *net* of control and mitigating actions basis. The potential for control failure will need to be considered.

Low Frequency / High Severity

It is the high impact events that are likely to give rise to the greatest requirement for capital. At the extreme levels of probability that are considered to define the capital required, say the 99.5th percentile, even the lowest probability events may happen.

These events also have the greatest uncertainty about the impact amount, and give rise to the greatest uncertainty about the level of capital needed. For these reasons the most time and effort should be invested in assessing the nature of the high impact risks and the controls around them.

High Frequency / Low Severity

In contrast the high probability, low impact events are likely to have less variability in outcome across scenarios. They are unlikely to have a very significant impact on the scenarios that are 'extreme', or contribute a large part of the capital requirement.

Another characteristic of some high probability, low impact events is that some of the impact may already be captured in the company's annual expenses, and hence should not count as an operational loss.

Low Frequency / Low Severity

These are unlikely to make a significant contribution to the calculation of capital required and it may be appropriate to exclude these subject to consideration of control effectiveness where the inherent risk is high.

In summary, many of the risks to be modelled will fall into either the high frequency low severity or the low frequency high severity categories. Most time and effort should be spent considering the low frequency, high severity risks for ICA purposes.

Low Frequency Thresholds

It should be noted that risks assessed with a frequency of less than the confidence level for the ICA should not automatically be excluded. GN46 states

"It is not appropriate to ignore material risks which, in isolation have probabilities of occurrence lower than the confidence level for the ICA. This is because they still contribute to the overall distribution of the capital required."

To illustrate this point, consider a firm faced with just five independent 1 in 250 year risks. The aggregate loss distribution will have one of those five loss events at or

around its 98th percentile (probability is slightly less than 1 in 50), well within the firms 99.5% confidence level.

In practice it is difficult to estimate with any certainty whether a low frequency risk is a 1 in 150 year event rather than a 1 in 250 year event. Judgement will be required as to whether or not a risk is too remote to be material for inclusion in the ICA, but clearly that threshold must be significantly above the confidence level for the ICA.

3.5 OR events considered in practice

Table 3.6 show the results of an internal review by KPMG of ten firms' ICAs, showing the OR events that were considered in the capital assessment.

Table 3.6: OR considered in ten firms' ICAs

OR event	Number of Companies	OR event	Number of Companies
Administration	2	Mis-selling	5
Business continuity	4	Outsourcing	3
Claims mishandling	4	Pension scheme	4
Client retention	1	People (key persons, training etc)	4
Company Specific risks	2	Project failures	1
Credit rating drop	1	Regulatory	6
Fraud	3	Reinsurance	2
Incomplete data	2	Reputation risk	1
Incomplete documentation	2	Tangible asset damage	1
Investment mishandling/management	2	TCF (mis-pricing)	3
IT (systems and control)	7	Unforeseen tax costs	1
Legal	6		

4 Specifying the OR model

4.1 Possible modelling techniques

It is assumed that firms will model OR capital in a separate stand-alone model and then aggregate with the capital assessed for the other PSB risk categories.

There are many techniques that may be suitable for modelling OR. However, the working party restricted consideration to two approaches that could be adopted in the short timescales imposed for the first few ICA submissions:

- The frequency-severity model; and
- Risk event scenarios.

The working party also considered how control effectiveness might be built into the approach.

The GIRO paper by Tripp et al considered possible techniques in more detail, including Bayesian networks and causal risk maps. These are not repeated here, however we recommend that some of the techniques are fully explored as future developments in OR assessment.

4.2 The Frequency-Severity model

A common method used to model OR for ICAs submitted to date is Monte Carlo simulation of a frequency-severity model. The mathematical formulation is as follows.

Let N_i denote the number of loss events arising from the i -th OR in a given time period.

Let X_{ij} denote the amount of the loss arising from the j -th loss event arising by the i -th OR.

There are K ORs requiring capital, identified through the steps set out in section 3.

Then $S = \sum_{i=1}^K \sum_{j=1}^{N_i} X_{ij}$ represents the aggregate loss from the selected ORs in the given time period.

For the i -th OR, the number of loss events, N_i is a random variable relating to the frequency of losses. The individual loss amounts X_{i1}, X_{i2}, \dots are random variables relating to the severity of losses.

The OR capital (ORCA) is given by:

ORCA = the relevant percentile loss from the tail of the simulated distribution of S , for example, the 99.5th percentile over a one-year period.

In order to carry out the simulation, one first needs to fit distributions for N_i and X_i for each of the K ORs. Then random numbers are used for statistical sampling of the loss distributions of different ORs. A large number of simulations are carried out to obtain the possible outcomes of the different risks in combination.

The model needs to allow for correlations where appropriate and these can have a significant impact on the total OR capital. Most software packages allow correlations to be set between the frequency and/or severity distributions of the various OR. These

correlations will then be reflected in the distribution of S and hence the aggregate capital result.

Excluding impacts for which capital is not required

As covered in Section 3, a single OR event can give rise to a number of impacts, but some of these will not require capital, for example because the impact is already covered elsewhere in the ICA. Only those impacts identified as requiring capital should be included in the model.

Similarly only the proportion of the capital impact that is not provisioned for, for example as expenses, should count towards the ICA component of OR. The provisioned amount may represent the "expected" level of impact, probably based on recent years' experience of the actual costs incurred.

The company must identify this provisioned loss, and exclude it from the capital calculation in order to avoid double counting between expenses and the capital requirement. Ideally, this is modelled out by only considering the unexpected component of the risk when setting the frequency and severity parameters. Alternatively, one may subtract the amount already provisioned from the modelled loss in each simulation.

4.3 Risk event scenarios

For some OR impacts, the data may be so limited or uncertain that it would not be worthwhile to fit distributions and run simulations. As an alternative one can derive capital direct from a specific adverse risk event scenario. A scenario-based approach provides a more pragmatic, transparent basis for capital assessment as the capital required is directly driven from the scenario rather than from the complex interaction of frequency and severity distributions.

Even when frequency-severity simulation is considered to be worthwhile, a number of scenarios can be used to inform the fitting of distributions.

Scenarios may also be used to identify interactions between risks to validate aggregations between risks.

4.3.1 Using scenario losses directly to set capital

For each OR an extreme adverse scenario is defined and the impacts in that scenario quantified. The scenario should be consistent with the desired ICA confidence level, e.g. a 1 in 200 year event. In practice considerable judgement is needed.

The capital requirement for that OR is simply the quantified loss in the adverse scenario (for those impacts identified as requiring capital).

Let L_i be the scenario loss for i -th OR \approx required percentile from the tail of $\sum_{j=1}^{N_i} X_{ij}$.

It is then necessary to aggregate across the K scenario losses to estimate the percentile loss from the tail of the aggregate loss distribution.

<p>ORCA = Agg($\{L_i\}, \{\rho_{ij}\}$) where $i, j = 1, 2, \dots, K$ and ρ_{ij} is the correlation between OR i and j</p>
--

This aggregation may be performed using an aggregation formula, such as root sum of squares allowing for correlations. This approach requires a K by K matrix of pair-wise correlation estimates. The correlation estimates must be for the relationship between total losses, rather than the frequency or severity of loss events for each risk.

4.3.2 Other uses of scenarios

Scenarios may also be used to

- Inform distributions in the frequency-severity model by considering a range of scenarios at different points of the distribution curve. Section 5.3 suggests a pragmatic approach where actual loss data is insufficient;
- Test the OR capital by considering potential combined OR scenarios where combinations of risk coincide and interact (see Section 4.6).

4.4 Building in Control Effectiveness

A fundamental objective of OR capital is to drive appropriate behaviour within an organisation. One of the key behaviours that should be driven is cost-efficient improvement in the effectiveness of the control environment. The control environment is defined here as the management controls undertaken to respond to a risk.

In order to achieve this drive in behaviour, it is necessary to include control effectiveness in the OR capital model explicitly. Therefore, if control effectiveness increases, then the capital requirement decreases and vice-versa. Also, once control effectiveness is included, it is possible to carry out cost benefit analysis of the different controls comparing their cost to their effect on capital.

One approach to ensure that control effectiveness is captured in the model is to understand clearly the movement of loss from gross to net caused by the introduction of key controls for that risk.

Gross can be defined as the loss if all controls fail. Net can be defined as the loss if all controls operate as designed. In practice it is neither of these losses that will be suffered by an organisation if the risk occurs. Instead it will be a loss somewhere between the two because not all controls are likely to 100% fail or 100% operate as designed.

The approach to understand this movement of loss from gross to net will vary depending on the method used to parameterise the model (i.e. loss data or scenarios).

A method that can be used for scenarios is described below.

When developing a loss scenario to take into account control effectiveness these five steps can be followed:

Step 1: Undertake a detailed costing of the gross and net loss of a scenario

Step 2: Identify the key controls that take this gross costing to a net costing

Step 3: Develop rules and data that allow for more objective measurement of the effectiveness of these key controls

Step 4: Calculate a weighted average effectiveness of these key controls

Step 5: Calculate the scenario loss taking into account the gross and net costings and the weighted average control effectiveness

This is illustrated in the table 4.4.

Table 4.4: Scenario loss allowing for control effectiveness assessment

Gross Loss (100% control failure)	Key Control Name	Control Weight	Control Effectiveness	Weighted Average Control Effectiveness	Net Loss (100% control operation)	Actual Loss
£G	C ₁	CW ₁	CE ₁	WACE%	£N	£L
	C ₂	CW ₂	CE ₂			
			
	C _n	CW _n	CE _n			

Therefore the actual loss is calculated as follows:

$$L = N + (G-N) \cdot (1 - WACE)$$

$$\text{where } WACE = \frac{\sum(CW_n \cdot CE_n)}{\sum CW_n}$$

Once this scenario loss that takes into account the effectiveness of the control environment has been calculated, other risk responses can be mapped to it to take into account their effect, e.g. the corporate insurance programme.

The following simplified example should help to illustrate this approach:

Assume that the risk being measured in detail is business interruption. Before the steps described above are undertaken, the scenario being measured needs to be clearly defined. There are several methods to identify the adverse scenario that are not described here.

Let us assume that the adverse scenario chosen is Fire at Location X. The gross and net definitions of this adverse scenario need to be clearly established.

For example, the gross definition states that the fire starts on the fourth floor, all the key controls identified fail and the building burns to the ground. The definition should also include the management strategy, e.g. move to another location nearby and rebuild. The net definition states that all key controls and management actions work as designed so that the fourth floor suffers some fire damage with water damage to two floors below and all Business Continuity Plans operate as intended to minimise disruption to operations.

STEP 1: These detailed descriptions of the gross and net adverse scenario can now clearly be costed taking into account all the different types of expense that would be incurred. In our example, let us assume that Gross (G) = £20m and Net (N) = £10m.

STEP 2: The key controls that take the scenario from gross to net should be clearly defined. Note, in practice it is helpful to identify controls as part of Step 1. For simplicity, in this example, say there is one key control, namely (C₁) Business Continuity Plans (BCPs).

STEP 3: The cost effectiveness rules then need to be defined. The OR policies in place can be used to drive these rules. For example, there may be ten BCPs in place at location X and company policy states that these need to be updated every six months. Therefore, in order to link the policy to capital and to use capital to drive management behaviour, the control effectiveness figure can be derived as a percentage of plans outside policy. Let us assume that two of the

ten BCPs have not been updated within 6 months. Hence, Control Effectiveness (CE_1) = 80%. The Control Weight (CW_1) is 1.

STEP 4: Step 3 is carried out for all key controls and the WACE is calculated. In our simplified example, WACE = 80%.

STEP 5: Therefore, using the data and rules established above, the Actual Loss (L), taking into account control effectiveness is £12m.

See section 8.5 for an example dashboard relating to the monitoring of this scenario.

4.5 Time Horizon

There are two main methods for setting the appropriate level of capital.

- **One-year approach:** Hold enough capital to ensure, with an appropriate degree of confidence that the company can cover its risks over a one-year period.
- **Run-off approach:** Hold sufficient capital to ensure, with an appropriately reduced degree of confidence, that all liabilities can be met as they fall due.

A one-year approach is often used to model extreme losses arising, but it may be appropriate to make an additional allowance against recurring, typically low-value, OR events beyond the coming year. In essence these can be viewed as an additional recurring expense.

It may also be appropriate to allow for operational losses on new policies written over the coming year, and possibly beyond. While the value of these may not be explicitly allowed for in ICA, consideration should be given to the possibility that operational losses may exceed the expected value of these policies and that some OR capital may be required to cover the balance. One factor that one would take into account would be how long in practice it would take to turn off the flow of new business.

Finally, it is worth noting that operational loss has a substantial IBNR element – it may take many years for errors in policy wording, systems and in the sale to crystallise so any capital assessment should have regard to the possibility of losses arising from such historic events.

4.6 Combined OR Scenarios

The models described so far are “bottom up” in that the OR capital is built up to cover a number of individual OR events. It is also necessary to consider how these individual events might be linked into a wider scenario, and how the consequences of the interactions in these scenarios may lead to a greater or lesser OR capital requirement.

Section 5.5 describes a consultative approach to identifying and assessing comprehensive combined risk scenarios for this purpose.

5 Quantifying and parameterising the key ORs

5.1 Internal loss data

When building models of the future, the start point should be consideration of the events that have happened in the past. The data representing losses experienced by the firm, with allowance for internal control enhancements, should provide at least some indication of the likely future experience.

However building and maintaining a loss database internally may be costly and difficult. This needs to be weighed up against the potential benefits of having data readily available to inform modelling and provide a more robust capital assessment. In addition, there is a more general risk management benefit through lessons learned from the company's own past mistakes or errors so that similar losses may be avoided in the future.

Common reservations on collating internal loss data are:

- The usefulness of historic losses as a guide to the future. For instance, data may be available on past unit pricing errors, but having moved to a completely different system with tighter controls, will future losses bear any resemblance to past? When considering mis-selling, are costs of pensions and endowment reviews relevant to potential future mis-selling?
- How easy is it to obtain the split of payments between reserve releases, settlement costs and ex gratia payments?
- the events that need to be measured to assess OR capital are rare and often insufficient to model the tail of the distribution with accuracy. 1 in 200 year events probably have not occurred.
- Difficulties with embedding and overcoming non-reporting, e.g. due to a perceived "fear and blame" culture.

5.2 External loss data

An alternative or supplement to collecting data internally is to use an external data source. Even if some internal data is available, external data can be used in a variety of ways to assist in the assessment of risks that a company may face. Even if the data cannot be used to quantify risks explicitly, it can often form a useful basis for generating scenarios that the company should think through. In particular, external data may help to:

- identify "near-miss" events – to consider the external event, assess its impact and likelihood for the company in accordance with the established OR framework and investigate the controls to prevent occurrence at the company. If the controls are in place and operational this will give assurance to the risk committee that similar events are controlled at the company. If not, then action can be taken to close off this risk;
- consider the impact of an operational loss event on other risk categories, e.g. if customer withdrawals increase suddenly and significantly because of an event which reduces confidence in the industry, this could have an impact on liquidity risk;

- input to modelling scenarios to identify the potential amounts of capital which could be held to give assurance that the company could withstand a similar loss event;

When considering external loss data in a loss database the following issues need to be addressed:

- The recovery amount associated with the loss. If the loss is insurable, whether the amount reported is the gross amount or the amount net of the insurance recovery.
- The size of the loss relative to a company's size in terms of assets or revenue. Unless the amount of the loss is set in some context of overall costs / percentage of revenue/ or percentage of net assets, there is limited use in trying to analyse common types of events. Even if it is in percentage terms, is that percentage scalable / comparable to different sized companies?
- The date that the loss occurred. Did other companies also experience similar losses around this time? If the loss is not public knowledge, a company may not wish the loss event to be posted to an external database if it is a one-off event and would lead to immediate identification of the company.
- The delay between the time of the actual event and the detection of the loss/reporting on the database. If a company wants to make sure the issue is fixed before reporting it, or doesn't want to draw attention to itself by adding a well-known event to an "anonymous" database, this may mean a delay in reporting the event until the risk has passed.
- The relevance of the loss event. If the database has a particular business line classification, this may not be completely applicable to another company's own business lines. If this is the case, the event may be less useful in terms of recognition or modelling.
- The completeness of the database. There will be some events where the loss will be non-monetary such as a loss of reputation. These types of events cannot be ignored when considering the potential capital charge. These will not be collected on a loss event database, unless some potential indirect loss amount can be given.

Table 5.2 summarises some of the key databases currently available. To date, they may have focused on bank data, but this should be changing. It should be noted that this data might be useful for insurers even though it relates to a banking environment.

The ABI has launched a loss database for UK insurance companies. The outline is given in Appendix 2.

Table 5.2: External Databases

Supplier	Type of Data
SAS OpRisk Global Data	10,000 publicly reported operational loss events of \$1m or more.
Op Risk Analysis	Op Risk Global Data – information on operational losses exceeding \$1m.
Op Vantage (incorporating IC2's F1rst database - Zurich)	Op Var Database – 8000 public loss events; Data from public sources such as news reports, court filings, SEC filings
Net Risk	Database of 3000+ publicly disclosed operational risk loss events, specific to financial institutions
Operational Risk exchange association (ORX)	Inter-bank operational risk loss database
GOLD (Global Operational Loss Database)	British Bankers' Association (BBA)
Aon Op Base	Database of 12,000 operational risk events on over 2000 financial institutions.

5.3 Quantifying OR without historic loss data

Due to scarcity of data on actual losses in the life industry at the present time, many insurers have to quantify OR with little relevant historic loss data available.

In the case of low frequency risks, it is unlikely that sufficient data will be available to enable sophisticated loss distribution modelling for some years. However, as databases on life industry losses grow it should be feasible to apply loss distributions to high probability low impact losses within the next couple of years.

An alternative to using actual loss data is to consult with the senior managers responsible for day-to-day management of the processes that could lead to the operational losses to obtain expert opinion.

Typically the managers will not be statistical experts and therefore the information requests needs to be easily understood by non-statisticians.

For the frequency a simple categorisation that could be requested from managers is:

- Likely;
- Possible;
- Unlikely; and.
- Extremely remote.

The modelling team would then assign probabilities to each category to feed into the frequency distribution part of the model.

Alternatively the managers could be asked to specify probabilities of loss events directly. It is often helpful to turn these probabilities into a frequency, for example, there could be a threshold probability above which it could be considered that an event occurs annually. The risk can then be compared against historical experience for that risk or other past events.

A practical approach for the loss amount distribution is to request a small number of possible points, or scenarios, on the loss distribution for example:

- Optimistic loss;
- Median loss;
- Pessimistic loss; and
- Worst case loss

The modelling team will then assign probabilities to these losses to feed into the severity distribution part of the model.

The managers should estimate the points on the loss distribution allowing for variation in both the underlying inherent risk and in the effectiveness of the controls. Ideally this should be performed by assessing scenarios on both a gross and net of controls basis as discussed in Section 4.4 so that control effectiveness can be built in explicitly to the calculation.

Alternatively variation in effectiveness of controls may be built into the loss scenarios definition, for example:

- Median loss scenario assumes controls work as expected;
- Optimistic loss scenario assumes controls happen to work well e.g. due to luck / coincidence of event to control checks; and
- Pessimistic loss scenario assumes some controls fail to work as expected and so losses carry on unmitigated for a longer period.
- Worst case loss scenario assumes several controls fail to work as expected and so losses carry on unmitigated for a longer period.

The loss amounts should include only those components for which it is necessary to hold capital, as discussed in sections 2 and 3. Indirect costs, such as lost business through reputational damage should be identified, but excluded from the model if these are allowed for elsewhere in the ICA, for example in a persistency stress test.

Note that, although the optimistic, median, pessimistic and worst case categorisation has been discussed in terms of the loss amount (severity), it could also be used to specific a range of frequency estimates to inform fitting frequency distributions if considered to be a worthwhile enhancement.

5.4 Practical issues and how actuaries can help

There are practical issues to overcome in setting the parameters and actuaries are well placed to help or facilitate.

Subjectivity

Inevitably, given the lack of loss history, there will be large elements of judgement involved in setting the estimates. Managers can, inadvertently or otherwise, overstate the severity and probability of the risks for which they are responsible to emphasise their importance. On the other hand there may be a temptation to play down some risks in the hope of bringing down the economic equity requirement, and hence improve their risk adjusted return on capital, "RAROC".

A workshop can help to make the estimation process more robust and to obtain a consensus view rather than relying on one individual's view.

As well as the senior manager responsible for the risks in question and subject matter experts from the relevant area of the business, the attendees could be selected from:

- the central risk function, to bring cross-business view of risk and controls;
- actuarial, to provide expertise on quantification;
- internal and/or external audit, for their knowledge on control issues (subject to maintaining independence); and
- external advisers, to bring industry wide knowledge.

The 'Delphi' method³, which was developed by the RAND Corporation, is a useful technique to reduce subjectivity. This involves seeking the views of each attendee individually, summarising the views, replaying them back, letting the experts refine their views in the light of the comments of others and then drawing estimates from the refined views.

Actuaries are well placed to help the business quantify its ORs. They can help define the framework for quantification by identifying the key drivers and explicit assumptions needed to assess a loss. They should also have a good feel for variability, impacts, present values of key revenue account items and simple exposure measures such as number of policies by type.

As an example of where Actuarial expertise can add value, consider a life company that sells a low-risk, yet non-guaranteed, money market fund. A mis-selling scenario may have this pitched as guaranteed and for clients to then suffer loss when a holding of the fund defaults. An Actuary would be well placed to judge the likelihood of default occurring, and thus advise on the likely probability of such an event, as well as the likely loss.

Misunderstanding the methodology

Compound distributions or conditional distributions can be difficult to understand and parameterise. The business may be used to expressing risk as a single impact and a probability as this is often the approach used for risk reporting. Splitting the risk into a frequency and conditional loss given event makes it difficult to understand the overall likelihood of, for example, the pessimistic scenario. The frequency parameter relates to any loss occurring, not a specific loss amount.

Actuaries have a key role to play here in explaining the parameters and should not underestimate the communication and effort needed to do this. The robustness of the estimates relies on a good understanding of the capital implications.

Expressing a well-known risk into the frequency-severity framework can help understanding and bring the methodology to life. For example looking at the last 100 years' 1 year equity market changes one might get a fall every 3 years, with a median fall of 8%, a pessimistic fall of 20% and a worst case of 50%.

The example does not have to be life insurance related, for example using topical natural disasters such as hurricanes in the USA may also help managers relate to the probabilities. The key point is tailor the explanation to the knowledge and experience of those involved.

³ See "Risk Quantification Techniques" by Mark Chaplin in "The Actuary" magazine, June 2003.

Another area that is difficult to understand without statistical training is the capital implications for different parameters and how the frequency interacts with the conditional loss distribution to give the compound loss distribution. For example, a 1 in 200 year loss might be equal to the pessimistic loss amount for a 1 in 20 year event frequency or nearer the worst case loss amount for a 1 in 5 year event frequency. In the equity example a 1 in 200 year fall of around 40% is broadly consistent with the parameters mentioned.

It is important to playback what the agreed parameters mean in plain English to the workshop attendees to ensure good understanding. Sensitivities of the capital requirement to changes in the parameters can also help.

Alternatively, a simpler, more transparent methodology is to set capital directly from a 1 in 200 year scenarios rather than using multiple scenarios to populate a frequency-severity model.

Getting buy-in

The estimation process described above involves considerable time and effort across the business and therefore it is important to 'sell' the approach to all involved.

In particular one needs to explain the benefits of the frequency-severity approach compared with the traditional risk reporting approach of a single impact and probability, including why three or four scenarios and a frequency are requested rather than just the 1 in 200 year scenario.

This should cover:

- the suitability of the model to the nature of ORs,
- the need to allow for variability to aggregate across different risks and allow for significant diversification benefits and
- the general benefits of stress testing and working through scenarios to improve understanding of risks and effectiveness of controls and mitigating actions.

Sensitivities can demonstrate the significance of this work to the capital requirement.

Governance and sign-off process

The senior managers for each OR being assessed should sign-off the loss estimates set in the workshop.

Once all the data has been collected it is important to look at all the risks together to assess whether the relative sizes and probabilities of risks are consistent given the company's current view. Frequencies can help in challenging assessments as they give a framework for comparing expected losses to those that the company has incurred in the past.

As well as a review by the centralised risk function, if there is one, or other risk professionals, some form of challenge panel can give added perspective to help ensure that the data is consistent and reasonable across the whole organisation. This might be a sub-group of the OR committee and should consist of senior managers from across the business as well as actuarial, risk and audit professionals and possibly, some external or Group representation.

Actuaries have a key role in this governance process in advising and challenging on quantification and capital implications and ensuring that these are proportionate.

5.5 Generating Combined Scenarios

Business managers' input is also needed to design combined risk scenarios to inform correlations and the appropriate level of aggregate capital to hold for OR and also for ICA as a whole. An approach to identifying and assessing a comprehensive set of combined OR scenarios are as follows.

Step 1: Decide on base risk event

The first stage is to identify the base risk event of the scenario, perhaps by choosing from the categories of OR in the risk assessment matrix. For example, the scenario could be constructed around a Business Continuity issue, a Fraud issue, a Regulatory or Legal issue.

Step 2: Brainstorm all potential causes and impacts

Consider all of the potential causes of the base risk, e.g. could the risk event be caused by any, or some, or all of, a breakdown in people, process, systems or by external events.

This also allows overlaps between scenarios to be identified so that the final number of scenarios is the optimum number; it is more effective to have a small number of wide-ranging scenarios, than a larger number of scenarios which are not comprehensive.

Similarly, it is then important to identify all of the widest range of potential effects and outcomes of the scenario. Certain of these may seem unrealistic or extremely unlikely, but this again allows the widest possible implications of the scenario to be considered. During this consideration, it is important to identify the effects beyond the immediate operational effects, e.g. consider the effects on the financial market (local and international), financial services industry, reputation of the firm, and overall customer confidence etc. As with the process to capture causes, this allows the most extreme scenarios to be considered.

Step 3: Select Plausible Adverse Scenarios

Having identified the most extreme causes of a scenario, and the widest possible effects of the scenario, it is then necessary to establish some plausible scenarios from this overall potential population. It is extremely unlikely that all of the causes of an event will happen at the same time; equally, it is extremely unlikely that all of the identified effects will happen at the same time.

This plausible scenario identification is best achieved through a facilitated discussion. Senior managers with relevant expertise should use their experience and knowledge of systems and controls to consider what is a plausible scenario, given all of the potential causes and effects of the scenario. It is likely that there will be several logical permutations to be extracted from the potential worst case. Following the initial discussion, the plausible scenarios should be agreed by all the senior managers involved in the workshop, and the assessment process can begin to consider the potential financial impact and likelihood of these scenarios.

Appendix 3 contains two examples: a Business continuity event and Pandemic Flu. The results of this scenario assessment can then be used to determine the OR capital alongside the model results as discussed in Section 6.4.

6 Setting the OR capital requirement

6.1 Fitting appropriate distributions to each OR

The scenario estimates provided by the business may be used to set OR capital directly or as inputs to a frequency-severity model if considered a worthwhile exercise.

Assuming that the frequency-severity model is to be used, suitable distributions should be fitted to the incidences and the sizes of the different risks, taking into account the incidence probability and some, or all, of the median, optimistic, pessimistic and worst case values of loss size input statistics supplied by the business experts for respective risks.

Frequency

Table 6.1.1 describes some of the potential frequency distributions that could be used.

Table 6.1.1: Possible Frequency Distributions

Bernoulli	This is the simplest distribution, and assumes that a risk either happens once or not at all. Thus all we need to parameterise is the probability of occurrence.
Poisson	The Poisson distribution is often used for modelling incidences of low frequency events. It requires only one parameter.
Negative Binomial	A possible disadvantageous property of the Poisson distribution is that the mean and variance are equal. On an intuitive level, this seems like a very narrow range for higher frequency distributions, and one may want to model the frequency via a distribution permitting more variability than the Poisson. One such distribution is the Negative Binomial, which is a commonly used generalisation of the Poisson.

Severity

Ideally, one would fit the loss amount distribution using observed loss data, but in practice one needs to rely on the scenario estimates because of the scarcity of experience data. Table 6.1.2 describes some of the potential severity distributions that could be used.

An initial fit can be attempted by treating the median and the pessimistic as say the 50th and 90th percentiles of a distribution. One may argue that fitting of specific distributions is somewhat spurious, and one needs to bear this in mind when considering the results.

Table 6.1.2: Possible Severity Distributions

Lognormal	In general the Lognormal distribution should represent a suitable distribution for loss sizes, as it takes on positive values only, it is significantly positively skewed, and allows generously for positive outliers. The Lognormal needs two parameters only, so that one can input the 10 th and the 90 th percentile as parameters for this distribution. However, one would still want to consider the impact of using alternative distributions, and sets of parameters.
Generalised Pareto Distribution - GPD	This is a more sophisticated distribution compared to the Lognormal, and is particularly useful for modelling tail ends. However, it is important to understand that one needs to first select a threshold before fitting the GPD to the tail of the distribution. ⁴
Weibull, Beta	These are other theoretically attractive options. However, given the scarcity of the data available to fit the distributions, they need to be used with caution as they may lead to spurious results.

⁴ For more details on how the GPD is used for the modelling of extreme events, please refer to sections 3.19 to 3.28 of 'The Modelling of Extreme Events' by D.E.A Sanders

6.2 Setting correlations between ORs

Even where data is available, it is hard to establish reliable correlations between ORs, especially where loss events are very infrequent. Given that data is likely to be limited, a pragmatic approach is necessary to setting correlation assumptions. The scenario analyses and/or other activity behind the risk assessment matrix in Section 2.5 may provide a guide to the correlations of OR types with other risks, operational or otherwise by identifying common root causes or drivers.

A base assumption of zero correlation between ORs is reasonable where there is no clear common driver.

It may be reasonable to group together ORs prior to modelling to reduce the number of correlation estimates required, especially where strong correlation is suspected between a few risks, but others are thought to be unrelated. For example, the risks may be allocated into one or more functional, geographic or Basel categories. A standard correlation (likely to be 1) can be assumed within the group.

6.3 Running the model

6.3.1 Preparation

It is good practice to have and record a random number seed when carrying out Monte Carlo simulation. In addition to ensuring that one can exactly reproduce past results, it ensures that when one tests sensitivities, the change in results is due to the change in parameters, rather than just a by-product of random innovation terms.

One needs to use a large enough number of simulations such that the standard error of the results is sufficiently small. This only needs to be checked once – by calculating the standard error of the output for a large enough number of simulations for the Central Limit Theorem to hold.

6.3.2 Output statistics

Useful output statistics that help analyse and understand the results include:

- The mean and standard deviation
- Percentiles for various different levels of risk appetite. These are a useful feedback to the business experts for high level reasonability checks.
- Cumulative distribution functions for each risk, and the aggregate amount
- The effect of each input risk on the size and variation in the projected total loss for our required percentile. This is useful for determining the significance of each risk.

6.4 Deriving the appropriate level of capital

The OR capital requirement should be derived from the tail of the aggregate distribution as described in Section 4.2.

However it is also necessary to consider how the combined OR scenario fits with this model result. It may be that many of the individual OR capital amounts can be replaced by the overall amounts for two or three “killer” scenarios, as the events are now encompassed in a single scenario. Alternatively, it may seem that this overall

scenario-based amount is so significant, and so remote from how an incident would be managed locally, that a firm may prefer to maintain the aggregated individual OR approach as a capital management tool.

The combined OR scenario approach allows much clearer links to other categories of risk to be made. Both of the example scenarios in Appendix 3 could potentially have an effect on a firm's approach to calculating its market or insurance risk capital charge.

In setting the capital requirement for the scenario one may want to recognise the potential operational impact in isolation. It is challenging to separate this specific amount from the overall capital charge for the whole scenario. However, if there is no recognition that the scenario contains some correlation with market and/or insurance risk, there is a danger that the total charge may be included in the OR capital charge, and there may be double counting as a result.

Linked to the above, it is also important to note that correlations vary depending on the scenario. Whilst it may ordinarily be assumed that OR and mortality risk are independent, using the scenario approach shows that these may be potentially closely related in some circumstances. For example, one of the effects of the "bird flu" example scenario noted in Appendix 3 could be that mortality rises as a consequence of the pandemic. Therefore, it is important to recognise that the scenario approach has implications beyond the calculation of the OR capital charge only.

Sensitivities of the final capital result to correlation assumptions should be tested. Analysis of combined OR scenarios can be used to add comfort that the diversification benefit claimed between different OR is not unreasonable.

6.5 Sensitivity testing

Given the subjective nature of the input parameters, it is important to test the sensitivities in the main output statistics to changes in the input variables.

Examples of the tests that could be used are:

- Test 1: Investigating the effect of a small change in the pessimistic values for the frequencies and severities. This test considers the effect of increasing the pessimistic values of the frequencies and severities by 10%, while keeping the median values constant.
- Test 2: Investigating the impact of a small change in the percentiles for the pessimistic severities. This test considers the effect of incorrectly estimating the pessimistic percentiles of the frequencies. For example, suppose one had estimated the 'pessimistic' severity to be 1 in 100 event, when it was actually a 1 in 50 event.
- Test 3: Given the subjective nature of the distributions, it is important test the impact on the results of fitting a number of different distributions for frequency and severity. The sensitivity is taken to be the maximum capital given by the various combinations of distributions.
- Other tests would be specific to a certain model and may involve changing the values of parameters concerning insurance, threshold values, truncation values, etc...

Note it is important to test the sensitivities of the tail values of the inputs, as those are much harder to estimate correctly compared to the medians, and should have a larger impact on the stand-alone capital for each scenario.

7 Aggregation with other risk categories

7.1 Correlation matrix approach

The correlation matrix method is currently the most widely used approach for the aggregation of capital between different risk types. This requires a pair-wise correlation to be set between each of the risks modelled, including OR.

The correlation estimates should reflect the relationship of total losses for OR to each of the other risks. Where a small number of ORs are modelled, it might be practical to treat each as a separate risk, and enlarge the whole matrix. This would reduce the uncertainty caused by having to make estimates based on a diverse mix of risks grouped together as OR.

In the future, fully stochastic models may be developed to combine operational and other risk types. This might overcome some of the limitations of the correlation matrix method. Firstly, the correlation assumptions may not hold in all parts of the distributions being combined. Secondly, the correlation matrix approach requires an assumption that the aggregate distribution is a multivariate normal, and this may not be an appropriate assumption.

7.2 Setting correlation assumptions

A considerable degree of time and effort has been expended across the industry to establish reasonable ranges for correlations between different risks. There is no one-size-fits-all solution because the exact nature and relationship of risk differs between firms. Correlation assumptions for OR are likely to be even more diverse because OR is very specific to each firm. The categorisation of risks will also vary between firms; for example, a firm might consider the effects of adverse persistency experience as wholly an insurance risk, or partly OR.

Scenario analyses can provide a guide to the correlations of OR types with other risks, by identifying common root causes, drivers and knock-on effects.

A reasonable approach to setting correlation assumptions is to establish the ORs that have the greatest influence on the OR capital, and set the assumptions accordingly. Many ORs may be considered to be uncorrelated to other types of risk, and this should be taken into account. Equally, where there are implied relationships between risks, such as between some ORs and lapse risk, this must be reflected. It is clear that depending on the significant ORs, the most appropriate correlation assumptions will vary from firm to firm.

To determine the most significant ORs, the capital for each of the risks taken in isolation can be compared. A more sophisticated approach is to examine the simulations where losses are at the capital requirement or greater, and take the mean losses for each risk across these simulations. The correlation estimates for OR as a whole can be taken as a weighted average of those for the individual risks, although it may be just as suitable to make a pragmatic estimate.

Assumptions should be reviewed in the light of business-wide stress scenarios encompassing different risk types. Such analysis might be based on historic events or hypothecated scenarios.

Sensitivity to correlation assumptions can be tested by comparing:

- The capital requirement for OR
- The change in the combined capital requirement for all risks when OR is excluded

The rationale and review process behind the final assumptions should be recorded.

7.3 Example

For a typical life company, operational losses due to mis-selling and market risk are highly correlated. This is because both the frequency and severity of loss events are dependent on the performance of the potentially mis-sold products. There are, however, other factors such as the effectiveness of controls around the selling process to consider.

In calculating the ICA, the life company might estimate that historic events indicated a correlation between market and mis-selling risk of around 0.75. Analysis of the OR model indicated that mis-selling was by far the most significant OR. However, the other ORs in the model were judged to be highly unlikely to be correlated to market risk. The life company tested several alternatives for its correlation assumption between operational and market risks. Considering the sensitivity of the total ICA to this assumption, it judged that 0.5 was appropriate. It also developed a number of scenarios involving simultaneous stresses in several risks, and these did not provide evidence that the assumption was unreasonable.

Appendix 5 contains example correlations taken from the results of a survey presented at the 7th Ernst and Young ICA Forum.

7.4 Comparison between firms

Comparison of capital for OR between firms will not be straightforward, for a number of reasons:

- Firms will have different categorisations of risk and different assumptions of implicit coverage in other risks
- Firms are different sizes and sell different products
- The control environment will be different for each firm
- The back-book of each firm has a different profile of products
- Even generic risks will vary significantly between firms

OR capital expressed as a percentage of pre- or post-diversification ICA might be examined to compare the capital held by firms for OR. However, changes in capital for other risks, potentially unrelated to OR, will affect this measure. In particular changes in correlation assumptions between other risks would affect OR as a percentage of post-diversification ICA. An alternative comparison approach might be to consider key risk indicators, but it is unlikely that suitable data would be available to form meaningful comparisons.

8 Presenting the results

Senior management will find it easier to understand the OR assessment, and trends in exposures and losses if diagrams and charts are used to explain the assessment.

8.1 OR reporting

A reporting framework for the ORCA process might include:

- an annual report for the Group Risk Committee (on behalf of the Board) and senior management summarising the key aspects impacting their business. The report is likely to include:

- an Executive Summary;
- the scope of the report, including regulatory background;
- a summary of the key risks being faced;
- a description of the organisation's risk appetite or ability to withstand risk, including any soft issues or qualitative aspects, and how it has been determined;
- an assessment of the key ORs (size, volatility, importance);
- a description of the approach, work completed, methods and data - including any gaps and key assumptions;
- an explanation of the ORCA and implications for the Group ICA and any FSA discussions or reviews by third parties;
- the approach to managing, mitigating and generally coping with the risks, including commentary on potential management actions;
- commentary on how the risks will be kept under review (monitored), how the risk process will be refreshed and reviewed (for example proposed Key Risk Indicators);
- recommendations on the way forward, for example future process improvements or data collection;
- The overall results and conclusions.

- a more regular (monthly or quarterly) report for the Group Risk Committee / Board, comprising:

- OR "dashboard" of key components (see section 8.5 below);
- Review of OR profile from self-assessments / scenarios;
- Reported losses / near misses – aggregate numbers plus full details of those over a defined threshold, including actions to address;
- Analysis of external losses relevant to the firm;
- Material OR issues reported by the business;
- Other Key Risk Indicators;

- Capital numbers under the ORCA, broken down by business line / risk type;
- A Business Area profile report, outlining the results of self-assessments / scenarios plus reported incidents;
- A Head of Business report, comprising details of all the items contained in the Risk Committee report noted above, but for one specific business function, e.g. Operations.

It is likely that members of the Group Risk Committee will be familiar with many, if not most, of the issues being covered here. What is new is the way that the regulations in PRU and governance best practice are making more explicit the need not only to undertake the ORCA but to use it to manage the business more effectively.

8.2 Loss Distribution

It is essential to explain how the OR losses might be distributed and this can be done for many of the risks through producing charts of the distribution such as Figure 8.2. These can show the relationship of what losses are covered by which element of the provisions and which by capital, and the aggregate losses which are too infrequent to be covered.

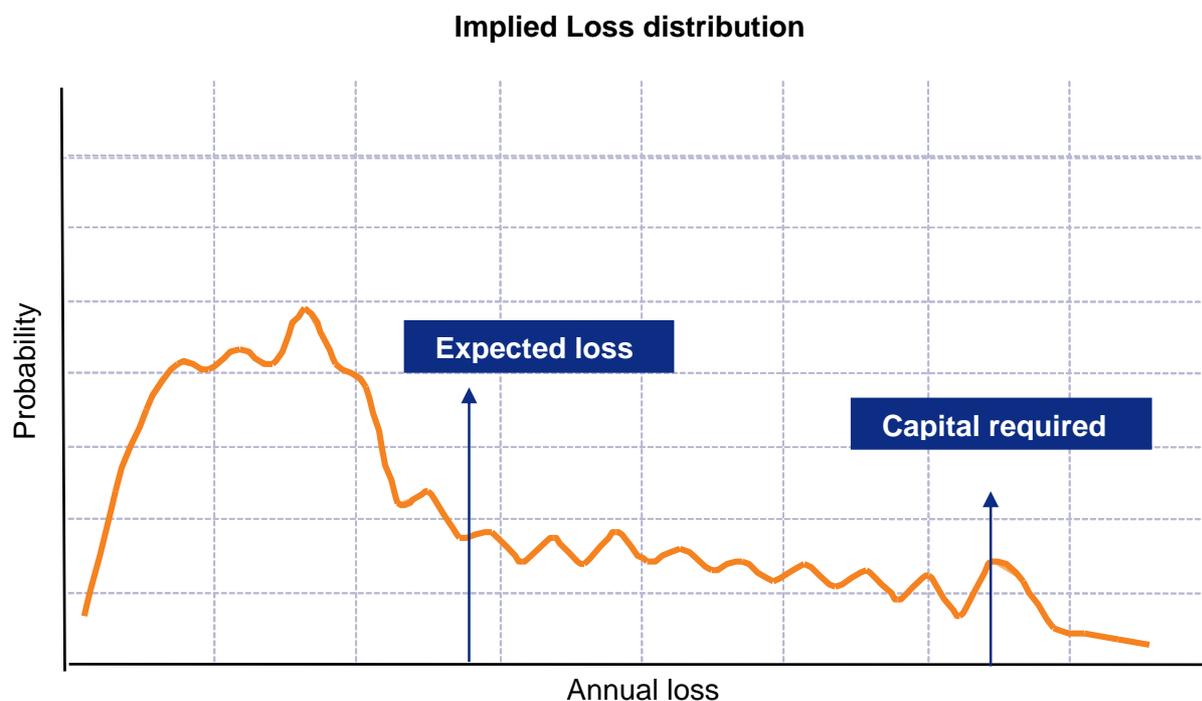


Fig 8.2: Loss Distribution

Care must be taken to explain how the curve has been fitted – or at least what alternative distributions might look like.

8.3 Risk Assessment

There are various ways of portraying the results of an impact assessment. The most common tool is a “heat map” of some kind, plotting impact against likelihood – with the priorities for action shaded red. Examples are shown in Figure 8.3.1 and 8.3.2.

This can be used to summarise the overall assessments of the most significant risks:

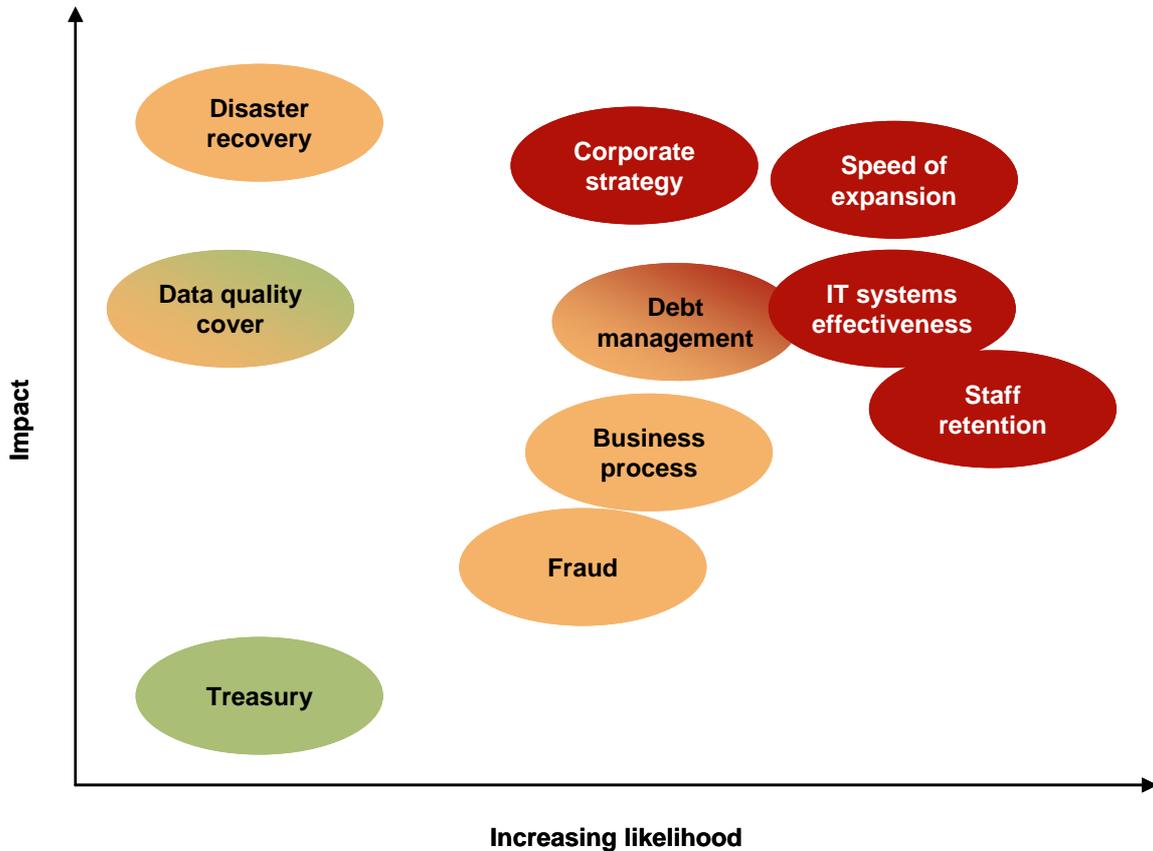


Fig 8.3.1: Risk Heat Map

Or to categorise the current assessment into zones:

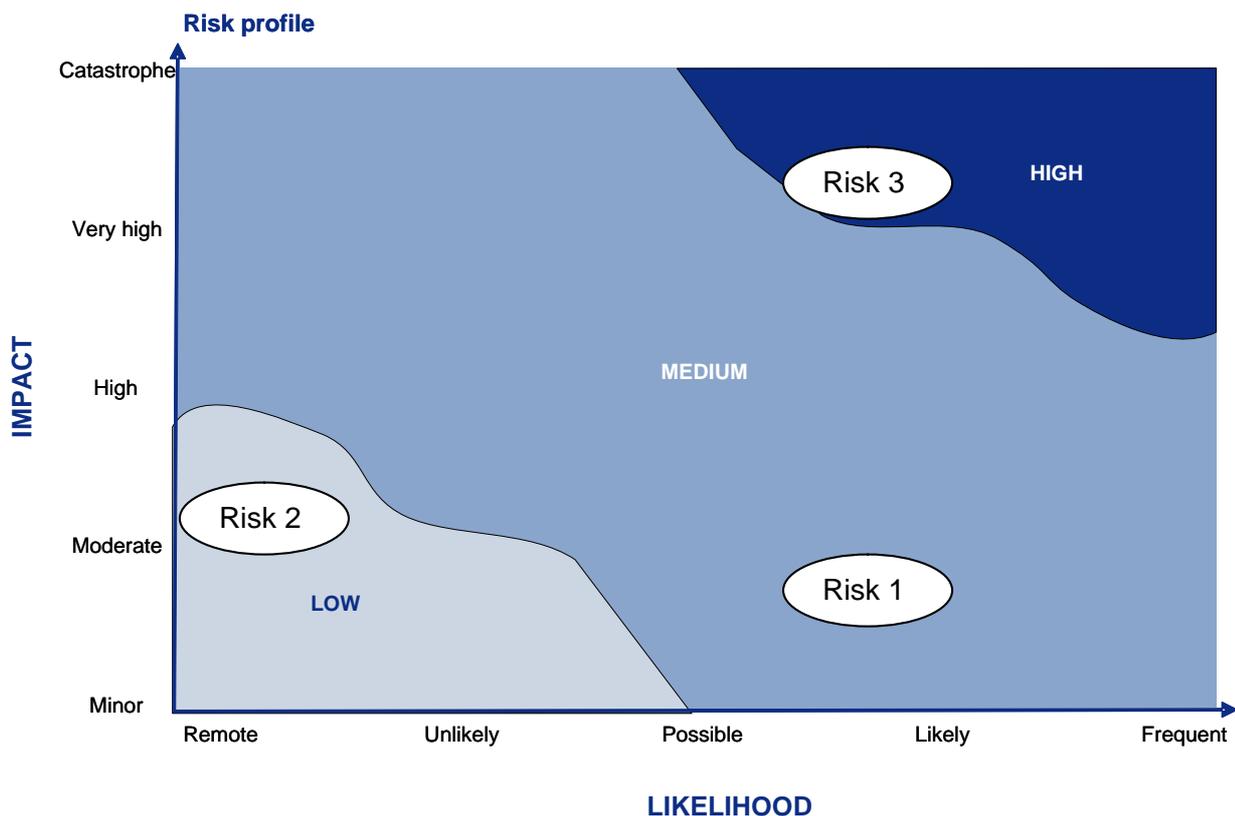


Fig 8.3.2: Risk Map with High/Medium/Low Zones

Whilst this is a good way of showing the assessment at a particular time, it is important that the Group Risk Committee is made aware of trends and how these trends have been assessed.

8.4 Key Risk Indicators

A method is needed to indicate how exposures are being managed, or external factors are influencing a company's exposure to those risks. There are many aspects of the business that may be monitored and it is easy to reach "information overload" preventing a clear view of business trends. It is, therefore, best practice to decide on what the key risk indicators, or KRIs, are for the business.

Sometimes there is confusion with Key Performance Indicators in respect of OR. KRIs should reflect risk areas with the greatest potential impact on capital – not necessarily the greatest exposures as they might have a low likelihood of happening. KPIs reflect management of the business but might reflect operational issues such as days taken to process items but don't actually reflect OR exposure.

A scorecard approach can assist in the assessment of various risks and how they are changing over time. KPMG have used charts such as the one shown in Figure 8.4 below in this approach:

Jan				Feb				Etc			
FINANCIAL				CUSTOMER							
	Business unit target	Movement	Status		Business unit target	Movement	Status				
Total cost of risk				Service level agreement performance							
Cost of losses				Customer satisfaction							
Exposure											
PEOPLE				PROCESS							
	Business unit target	Movement	Status		Business unit target	Movement	Status				
OpRisk management performance				General audit findings							
Staff turnover / vacancies				OpRisk framework audit findings							
Overall OpRisk awareness				Sharing best practice							
Fraud incidents involving staff / ex staff				Action plan progress							
OpRisk satisfaction surveys				Temporary risk control measures							

Indicates immediate action required
 Indicates close monitoring needed
 Indicates no action required

Fig 8.4: KRI Scorecard

Clearly such a report is only a snapshot and there would need to be additional commentary to explain why the view was that a particular KRI had moved in the direction indicated. Currently most companies rely on the subject view of management and/or the risk department for deciding on the level or movement in many of their KRIs. Over time it is important that data is produced for as many of the KRIs as possible to enable objective assessments.

This concept can be developed further to give a summary of a number of reporting in what is often called an MI dashboard.

8.5 MI Dashboard

Assume the approach for developing a particular scenario outlined in section 4.4 has been undertaken then a summary of the key information, or “dashboard”, as shown in Figure 8.5 can be used to monitor the scenario on an ongoing basis.

The key drivers of the scenario costing (Gross (G) and Net (N)) must be identified and data collected on a regular basis. This is referred to as Scenario Costing Monitoring in the dashboard below. Limits to these metrics should be established so that if the metric moves outside a defined limit, then the OR capital is recalculated. A practical use is as follows: an offshoring or outsourcing programme could significantly reduce headcount at a location. The affect this has on the OR capital can now be estimated and included in the business plan of that programme.

In addition, for each key control identified (C_i), the actual data and control effectiveness percentage (CE_i) can be collected on a regular basis. This is referred to as Key Control Monitoring in the dashboard below. Again, limits to these metrics should be

established so that breaches lead to an OR capital re-calculation and, more importantly, a timely and appropriate management response. A practical use is as follows: a programme can be established to improve a particular key control at all locations. The affect this has on OR capital can now be estimated and included in the business plan of that programme.

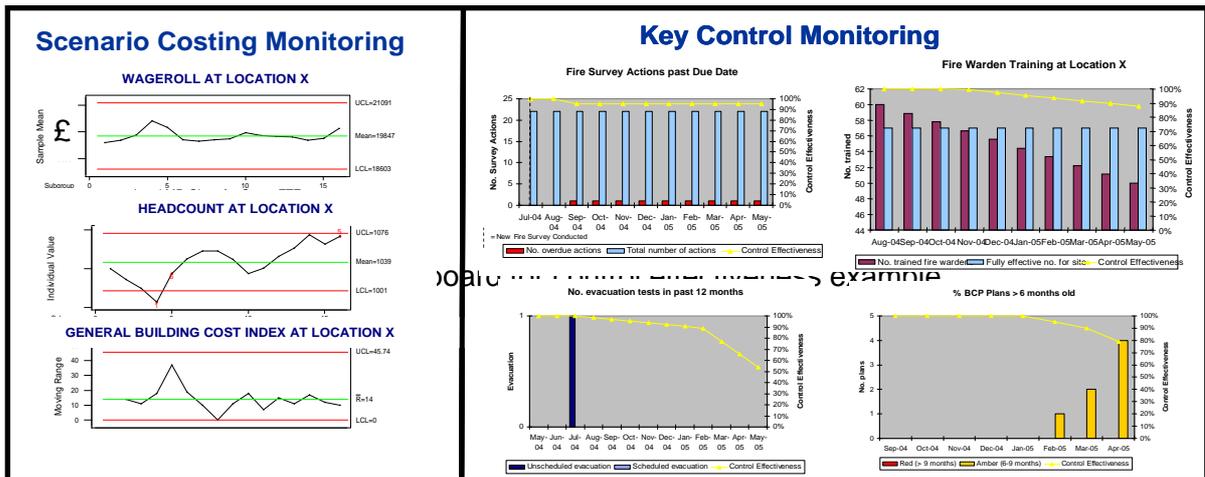


Fig 8.5: MI Dashboard for control effectiveness example

9 Using the ORCA in the business

In many ways, the real value in developing and implementing an ORCA assessment comes with the increased risk awareness, and sophistication of risk identification and analysis techniques that this brings to the business. From senior management down to grass roots business personnel, those involved in decision-making and process implementation can help to ensure a more robust control environment if the ORCA assessment is properly used. Some thoughts on “Building a framework for operational risk” were given by the FSA in PS142.

The output and ‘by-products’ of an effective ORCA process will include:

- Establishment of a loss (and near miss) database
- Analysis of the drivers/ causes of losses
- Suite of key risk indicators (KRIs)
- Identification of the controls over ORs, and their weaknesses
- Identification and consideration of the impact of scenarios which could significantly impact the company
- Assessment of the potential impact of control failures
- Regular reporting to senior management and business MI
- Alignment of control to the risks in the business

To ensure the optimum level of involvement and buy-in to any ORCA process, the business should be involved right from its beginnings. By being involved in the identification and analysis of potential material risks, highlighting potential control failures and walking through scenarios that may affect the business, as well as being charged with the responsibility of reporting any events that have led (or may have led) to financial loss, business areas can help to build an accurate representation of potential capital requirements. Through this involvement, and feedback of resulting capital numbers, the business is much more likely to engage in the process and look for ways to help influence those numbers downwards through improved control.

However, it can be difficult in practice to implement a business-centric ORCA process, and it may well take something of a culture shift to help embed the methodology into the business. Noted below are some examples of practices used in various insurance firms to aid in this process.

9.1 Risk identification and assessment

By obtaining business involvement in risk assessments, scenario generation and analysis, firms ensure that the business is bought into the process at every stage, meaning that they are far more familiar and comfortable with the final capital figure. There are a number of techniques used to facilitate initial risk and scenario identification, including

- Presentations on the end-to-end process
- One-to-one meetings
- Brainstorming sessions

- Workshops

It is important that an introductory presentation is given, which can be tailored to either a granular business unit audience or to senior management (e.g. board members). The presentation should give the context for the risk/scenario assessment and the ICA, and outline the business areas' role at all stages.

To reflect a direct relationship between the risks facing the business and the capital required to protect against the impact of those risks crystallising, some firms make direct use of self-assessed risks with impacts and frequencies to drive the capital calculation. By focussing on the higher impact risks identified, for example by excluding those with potential impact under an agreed financial threshold, the business' own assessments of risk exposure can be factored directly into the ICA calculations. This means that a key building block in satisfying the ICA 'use test' (i.e. is the ICA being used to manage the business more effectively in line with PRU and governance best practice) is put in place. Appropriate challenge and oversight should be given by an independent risk function.

Alternatively, many firms use business expertise to build OR scenarios from root cause through to outcomes. By analysing the output from the OR framework, such as risk self-assessment, events and KRIs, a number of key risk scenarios may be suggested, refined and finalised, which accurately reflect the most material and applicable risk events faced by the firm. Again, by utilising a broad base of business expertise at all stages of this process, the 'use test' is partly satisfied and business buy-in is improved.

9.2 Reporting frameworks

Regular reporting of ORCA results and the outputs from the various OR framework components form a second important use of the process in the business.

A possible reporting framework is described in Section 8.1. In order to collate accurate MI for the reports noted, and indeed to provide accurate ORCA numbers, the input of the business is required. In particular, complete and accurate reporting of events that have led to loss or potential loss relies heavily on business areas' honesty and openness in reporting, and this can mean a change in culture for many businesses. To help to support this change, there is a case for altering appraisal and remuneration frameworks to reflect the requirement – at least to make non-reporting a reason for not awarding bonuses, rather than penalising for the loss itself (assuming that negligence is not present).

To further shorten communication lines and encourage reporting, firms often use a 'hub and spoke' model in risk management, embedding risk personnel within business lines to facilitate OR identification, assessment and management. This structure allows central risk personnel to dedicate time to analysing and reporting trends and firm-wide patterns of risk while ensuring a close oversight is kept of varied business lines.

The reward for the business as the measures bed down and trends emerge is to identify the drivers and root causes for losses, enabling management action to be taken to prevent loss (and as a by-product, reducing capital requirements). Similarly, by studying and analysing losses reported by other organisations, management can amend processes and controls to minimise the chance of the same event impacting their company.

9.3 Review and capital allocation

In order to preserve the contemporary nature of the ORCA results, regular reviews should be carried out (firms undertake such reviews on anything from a quarterly to an annual basis). These reviews will serve to demonstrate how the risk profile of the firm is altering over time, and ensure that any actions identified to remedy control weaknesses identified via the process are tracked and reported sufficiently frequently. Firms utilise a combination of desktop reviews and facilitated sessions to produce the requisite quality of output from such reviews.

By feeding back the effects that changes to risk, control and scenario assessments have on final ORCA numbers, business lines can understand the implications of their own risks on the firm's capital profile, and be incentivised to implement improved controls where appropriate. This may include implementation of KRI measures that objectively measure the control effectiveness of documented controls. Therefore if, for example, a BCP risk contributes a certain amount of capital, one or more objective measures such as percentage of BCP plans that are overdue for testing may be used to measure the effectiveness of mitigation of this risk, and thus the capital contribution it makes.

Many firms aspire to develop further such feedback, and allocate the ORCA capital to business lines as operating or economic risk-based capital, linking the performance of the business unit to its capital base. There also exists the opportunity to embed capital planning into business plans, for example by including the capital reduction effects of improved operational controls in business cases for change initiatives and projects.

Development of risk appetite for OR may also be linked to capital review and allocation. Many techniques for defining risk appetite exist, ranging from the use of external proxies such as returns on equity etc. to much more granular internal measures. Firms may derive their OR appetite from the aggregated results of the ORCA, while others are aiming to obtain 'target' impact figures for individual risks and scenarios as part of the regular review of risk assessments, using these figures to build overall appetite from each individual business area's inputs. The derivation of risk appetite figures is worthy of further debate and documentation outside of this paper.

To improve efficiencies over regulatory reporting, firms have tied in their review of numbers for ORCA with a more qualitative certification of controls and exceptions that demonstrate full compliance with the text of PRU.

In one example, a firm has produced 'sign-off' packs for a number of key senior management personnel to certify that their area has been adequately controlled for the period under review, with supporting control documentation and evidence, backed up by the OR qualitative and financial self-assessment. Where exceptions have occurred, these have been fully documented along with action plans to remedy. These packs in turn allow the directors of the firm to certify PSB compliance. (Further, as a bancassurer, the firm has also tied in its Sarbanes-Oxley certification and testing to the same review timetable and process to provide a 'one stop shop' for material regulatory requirements.

9.4 Governance

Used as part of the firm's governance framework, the ORCA can be a primary tool in maintaining senior management oversight and control. For example, regular and comprehensive reporting to Risk Committee or Board as outlined in Section 8.1 helps greatly in allowing the Board to discharge its ultimate responsibility for risk management, as does regular update and tracking of ORCA results and, for some, the resulting capital allocation. The results and methodology may also be reported to a Financial Results Committee or Audit Committee, to allow the scrutiny of non-executive directors. These committees may also perform an 'up-front role in the sign-off of assumptions and models used in the ORCA.

By contributing an overview perspective to scenarios, the Board or Risk Committee can also become actively involved in scenario development and analysis, further reinforcing both the integrity of the assessment itself and senior management's discharge of its responsibilities.

Many firms have also convened specific OR committees within the firm's governance framework, often as sub-committees of either a main Risk Committee or of the Board itself. These committees receive regular reports from the risk function and business lines on material risk issues, events, KRIs etc. and help to guide actions to address identified weaknesses. Where such committees do not exist, other firms have documented within their governance frameworks that functional senior management team meetings must have as a standing agenda item the regular review of OR profiles, events and actions.

The outputs from the ORCA and the OR framework can also help internal audit to effectively perform their role as the 'third line of defence' in the governance framework, by highlighting risk issues across the business and aiding in the allocation of potentially scarce audit resource in the audit planning cycle. Furthermore, internal audit also has a role to play in reviewing the overall OR methodology and the ORCA, to give an independent opinion on its applicability, accuracy and effectiveness. This review is often augmented by external independent review from external auditors and/or consultancy practices.

These efforts should help to embed further the ORCA process as an integral part of the organisation, both structurally and culturally.

10 Future Developments

For life insurers the measurement of OR is still in its infancy. This paper sets out an approach for the practical measurement of OR in the short-term. There are many areas where further advances are expected to take place in the future. The GI paper, "Quantifying Operational Risk in General Insurance Companies" by Tripp et al, listed a number of future developments and many of these are also relevant to life insurance.

Many offices will be seeking to improve their models over the coming years, particularly following feedback from the FSA as part of their Individual Capital Guidance. However, there are some generic issues the working party has identified in the course of writing this paper that the working party believes all offices will face in the medium term and these are set out below.

10.1 Loss data

Some areas of OR have well established data collection procedures. For example, ex-gratia payments may be captured as part of the general accounting process. However, there are many areas of OR which will not have had data captured regularly. For most companies, accruing sufficient data on which to build reliable models will be an important area of research. Initiatives such as the ABI database will help to build this pool of data, but it may take many years to acquire sufficient data to be credible, particularly for the extreme events that the calculation of the ICA considers.

10.2 Depth of Scenario analyses

Perhaps the main area to develop in the shorter term is the quality and depth of analysis of risk event scenarios to enhance understanding of the gross risk, effectiveness of controls and mitigating actions. This can be built upon simple questions such as "what exactly could go wrong?", "how would we respond?" and "what would be the impacts across the business?" Probing at a sufficient level of detail can greatly enhance understanding and improve capital assessments, and the management of risks generally.

10.3 Governance

For many companies the reporting of OR is still in its infancy. Many different ways of presenting OR metrics are being tried to facilitate the proper monitoring of these risks. Developing an understanding of the key drivers of OR within an organisation plays an important part in establishing what these metrics should be and this takes time. However, the embedding of these metrics into regular reporting and monitoring cycles offers considerable benefits since a full understanding of operational risks faced by the company by senior management will enable better risk control overall.

10.4 Modelling techniques

Several companies have used the frequency-severity model described in this paper for their first OR capital assessment. The GIRO paper by Tripp et al describes a number of alternative techniques, such as causal risk maps and Bayesian networks that could be considered in future to support an improved understanding of cause, effect and consequence.

10.5 Generic ICA issues

Correlation and aggregation methodology

A great deal of time has been expended in companies to arrive at correlation coefficients to use when considering diversification benefits. For many of these coefficients there is little data available on which to base them. Further work is required in this area, perhaps with the use of scenarios to justify the correlations chosen.

A commonly cited weakness of the use of correlation matrices is that there is an assumption that the distributions of the quantities being aggregated are Normal. Ultimately there may be a move to more advanced methods of aggregation that do not require this assumption and reflect the distribution of the underlying risks more accurately.

Run-off approach

The current practice adopted by most firms is to calculate the amount of capital required to meet all liabilities falling within a one year time horizon. The alternative approach is to hold an amount of capital that will meet all ORs until the business has run off. At the moment it is difficult to establish the confidence level to use in this calculation that is equivalent to the 99.5% confidence level over one year. As more data becomes available and as models become more flexible this alternative approach may be implemented.

10.6 Further research

Quantifying OR is a new area that we expect to develop considerably. Actuaries should be well placed to help life companies on this journey to improve their assessment and management of OR. We hope that this paper will stimulate development of best practice in dealing with OR and identify areas of further research. We encourage readers to feedback comments and share their own experiences and insights.

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Global Association of Risk Professionals: <http://www.garp.com>

The Operational Risk magazine: www.operationalriskonline.com

Risk Management Maturity Level Development:

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Appendix 1: OR affecting Life Companies

A1.1 Sample OR definitions for a Life Insurance Company

Risk Category	Description
Operations Risk	
➤ Documentation	<ul style="list-style-type: none"> ➤ Failure in completion / maintenance of documentation including: <ul style="list-style-type: none"> ➤ Flaws in legal agreements including (but not exclusively): <ul style="list-style-type: none"> ➤ reinsurance treaties; ➤ investment mandates; ➤ distribution agreements; and ➤ contracts with suppliers.⁵ ➤ Flaws in marketing & promotional literature incl.: <ul style="list-style-type: none"> ➤ unauthorised promotional literature; ➤ errors in (the systems used to provide) illustrations & quotes⁶; and ➤ any literature that creates misleading / unreasonable expectations. ➤ Errors in policy documentation including: <ul style="list-style-type: none"> ➤ poor wording of provisions that creates unreasonable expectation or other changes the nature of the product from that priced; ➤ errors in policy schedules (& systems used to produce these); ➤ Flaws in legal documents services provided (under Final Salary schemes) ➤ Failure to retain proper records, not only to meet FSA requirements but also the requirements of the business (e.g. to deal with subsequent disputes with clients etc.) ➤ Failure to have documented processes in place for administrative procedures ➤

⁵ referring here to errors in drafting as opposed to an ill-conceived contract which doesn't meet the company's requirements / lock the company in on unfavourable terms

⁶ including flawed specification, development, testing and implementation of software & systems

-
- Damage To Physical Assets
 - Product flaws
 - Theft of Assets
 - External Fraud
 - Internal Fraud
 - IT Systems Failure
 - External Communication & Reporting
- High impact low frequency events, resulting in damage to / loss of physical assets, incl. buildings, systems & other infrastructure. Often external events outside of the life office's control, such as terrorist attacks, fires, flooding or 'Acts of God'.
 - Defective products & / or unauthorised product design including (but not limited to):
 - Errors in the pricing models;
 - flawed process for setting assumptions⁷;
 - unauthorised product concessions; and
 - products which generate unacceptable losses for policyholders⁸.
 - Theft of property / assets by external parties, and other criminal acts which would also include acts such as sabotage and/or vandalism etc
 - Fraud committed by third parties
 - Fraud or theft committed by individuals employed by the life company, either acting alone or as a result of collusion with or coercion by other employees or external parties.
 - Also includes rogue trader and other similar types of unauthorised activities such as insider dealing ;
 - IT systems failure and business disruption for all aspects of IT infrastructure, operating systems and networks. This includes systems based data corruption.⁹
 - Mis-communication in any aspect of external communication and reporting, released into the public domain by issuing factually incorrect or misleading information. This includes
 - errors in published financial results
 - flaws in extraction of policy data
 - other valuation data errors
 - flaws in valuation method
 - incorrect specification, coding, testing & implementation of reporting systems
 - flawed valuation assumptions
 - incorrect reporting of results
 - other flaws in financial reporting & disclosure
 - disclosure of price sensitive or otherwise confidential information.
-

⁷ e.g. assumptions which do not properly take account of experience, nor adjust for the target market and sales process ; use of overly simplistic assumptions

⁸ though the key issue is how the potential for losses are explained in the sales process.

⁹ disruption to IT Systems as a result of physical damage to either hardware or a building or operating centre housing such hardware, may be more properly considered under the risk event 'Damage to Physical Assets'.

-
- Outsourcing and Third Party Failures
 - The failure of outsourced partners or 3rd party suppliers external to the life company to provide the service required including¹⁰
 - ill conceived agreements which do not meet the life company's needs¹¹ ;
 - organisational failure / default of the outsourcer¹² ;
 - outsourcer's system failure ;
 - ...or simply substandard performance / failure to meet SLAs;
 - Transaction and Payment Processing
 - Mistakes, errors and/ or process failures related to the management and execution of all transactions and/or payments, including
 - 'manual data entry' errors.
 - errors in the design, specification, coding, testing and implementation of agency, sales, administration and other systems

Customer Treatment Risk

- Customer Service
 - Poor and unacceptable customer service¹³, as a result of, but not limited to :
 - failure to execute / deliver on time and/or in accordance with instructions ;
 - not treating customers reasonably or fairly ;
 - inability to satisfy agreed levels of service (including customer complaints handling) ;
 - acting outside of customer instructions ;
 - failing to observe customer confidentiality ;
 - poor service resulting from flawed design, specification, coding, testing & implementation of customer service systems (incl. Internet sites)
 - Best advice/ Sales Practice
 - Mis-selling and/or negligent advisory practices that result in negative impact on our customer's financial position. This includes tax, legal and/ or other professional advisory work (e.g. for Final Salary business). See Appendix 3.
-

¹⁰ in this context, suppliers should be understood to include (but not limited to) utility suppliers, for water, electricity, phone lines etc. in addition to traditional service suppliers.

¹¹ as distinct from errors in drafting of the legal agreements (Documentation risk) or an inappropriate strategic alliance which is more strategy than operational risk

¹² aside from the business disruption, any replacement provider may charge more which will impact on VIF. Note overlap with Credit Risk.

¹³ typical impacts for this type of loss event include compensatory / ex gratia payments, or penalty payments resultant from breaching customer instructions for investments etc.

Governance, People and Organisation Risk

- Employee Relations and Health & Safety
 - Human Resources
- Any breakdown in the management of workforce and/ or workplace conditions, to include breaches of Health & Safety and Employment Legislation, the relationship with employees, trade unions and other related parties. This category includes accidents to staff or customers, discrimination, harassment or unfair dismissal cases, as well as strikes and 'working to rule' type actions by the workforce.
 - The ability of the life company to attract, retain, train, reward and incentivise appropriately skilled staff and managers, the failure to take appropriate action as a result of inappropriate behaviour or underperformance. This does not include 'human error'.

Legal & Regulatory Risk

- Financial Crime
 - Regulatory Requirements
 - Legislative Requirements
 - Tax risk
- Failure to comply with Financial Crime Legislation resulting in an inability to manage criminal activity related to Money Laundering, Terrorism Acts etc.
 - Failure to comply with life industry regulations including PSB and non-UK based financial regulators ;
 - May also include liabilities under the FSCS which relates to mis-selling by other parties ; in the worst case these may include a liability to compensate policyholders of a failed competitor ;
 - May also include actions under Unfair Contract Terms Directive here (though position is blurred with Legislative requirements while UCTD is not industry specific, the FSA are involved in UCTD actions) ;
 - Failure to comply with any other legislative requirements such as breaches of the Data Protection Act, OFT guidelines, CCA requirements, Environmental and Corporate Responsibility requirements.
 - Risk relating to changes in tax legislation, either general taxation, VAT or life company specific, and any HMRC challenge to tax arrangements and calculations of the life office;

Change Risk

- Impact of Change
- The impact of a significant change initiative, or a number of change initiatives running at the same time, creating an adverse effect on business conditions and/or customers.
 - Examples include changes to processes, development and implementation of new IT systems and/ or delivery channels, the development of new products, and the failure of change initiatives and/ or new strategies to meet with the desired business case.
 - This also includes write-offs/ costs inherent in delays, or indeed failure, to deliver benefits.
-

A1.2 Basel II Categories of Loss Event

The Basel Committee breaks down OR loss events into seven general categories at level 1, twenty sub-categories at level 2 and provides examples of activity at level 3. The ABI has followed the Basel II categories for ORIC - an operational risk loss database for the insurance industry – and has provided examples of insurance activity for each category as illustrated in the table below.

Event Type Category (Basel Level 1)	Sub-Categories (Basel Level 2)	Activity Examples (Basel Level 3)	Insurance Activity Examples (provided in ABI data template)
Internal Fraud <i>Losses due to acts of a type intended to defraud, misappropriate property or circumvent regulations, the law or company policy, excluding diversity/discrimination events, which involves at least one internal party</i>	Unauthorised Activity	<ul style="list-style-type: none"> Unauthorised use of computer systems Unauthorised transactions Unreported transactions 	<ul style="list-style-type: none"> Non disclosure of investment losses Intentionally circumventing underwriting limits Intentionally circumventing claims payment limits Inappropriate use of a system username and password to circumvent application controls, resulting in an inappropriately authorised payment
	Theft and Fraud	<ul style="list-style-type: none"> Fraudulent activity Theft of assets Misappropriation of assets Deliberate destruction of assets Forgery, impersonation Deliberate disclosure of price sensitive information Teaming and lading 	<ul style="list-style-type: none"> An employee colluding with an individual making a fraudulent claim An employee impersonating a client, in order to perpetrate a fraudulent claim
External Fraud <i>Losses due to acts of a type intended to defraud, misappropriate property or circumvent the law, by a third party</i>	Theft and Fraud	<ul style="list-style-type: none"> Theft of assets Forgery, impersonation Fraudulent billing by suppliers Fraudulent claims 	<ul style="list-style-type: none"> Assets stolen from an employee's car An office burglary A policyholder knowingly supplies incorrect policy data to obtain cover
	Systems Security	<ul style="list-style-type: none"> Hacking Theft of information Viruses 	

Event Type Category (Basel Level 1)	Sub-Categories (Basel Level 2)	Activity Examples (Basel Level 3)	Insurance Activity Examples (provided in ABI data template)
Employment Practices & Workplace Safety <i>Losses arising from acts inconsistent with employment, health or safety laws or agreements, from payment of personal injury claims, or from diversity / discrimination events</i>	Employee Relations	<ul style="list-style-type: none"> • Benefits • Harassment • Terminations, including tribunals • Industrial activity • Management/staff communications 	<ul style="list-style-type: none"> • Downtime costs associated with a general strike by staff • An individual wins a case for constructive dismissal
	Safe Environment	<ul style="list-style-type: none"> • Health and safety 	<ul style="list-style-type: none"> • Employee compensation claims due to negligence, or personal injury • Fines by the Health and Safety Executive
	Diversity and Discrimination	<ul style="list-style-type: none"> • Equal opportunities 	<ul style="list-style-type: none"> • Discrimination – religious, sex, ethnicity etc
Clients, Products & Business Practices <i>Losses arising from a failure to meet a professional obligation to specific clients (including fiduciary and suitability requirements), or from the nature or design of a product.</i>	Suitability, Disclosure and Fiduciary	<ul style="list-style-type: none"> • Regulatory breach • Data Protection Act • Mis-selling reviews • Regulatory compliance of appointed representatives 	<ul style="list-style-type: none"> • Contractual policyholder breaches e.g. advice given around cost of rebuild for home insurance, or guarantees about cover, not honoured in the future • Fines under the Data Protection rules because the Marketing department sell a database of customer's details to another Insurance firm
	Improper business or Market Practices	<ul style="list-style-type: none"> • Money laundering • Fines • Improper market price 	<ul style="list-style-type: none"> • FSA fine as a consequence of a non-qualified individual who sells and gives advice after Jan 05 • Fines due to other regulatory or tax breaches
	Product Flaws	<ul style="list-style-type: none"> • Product defects (unauthorised, etc) • Product literature defects • Model errors/assumptions misinterpreted 	<ul style="list-style-type: none"> • Product related complaints • Costs associated with an under researched product going to market, requiring further unplanned development
	Selection, Sponsorship and Exposure	<ul style="list-style-type: none"> • Inappropriate underwriting • Inappropriate reinsurance 	<ul style="list-style-type: none"> • Exceeding underwriting limit (unintentional) • Costs associated with contractual breaches from partnerships and third parties
	Advisory Activities		

Event Type Category (Basel Level 1)	Sub-Categories (Basel Level 2)	Activity Examples (Basel Level 3)	Insurance Activity Examples (provided in ABI data template)
Damage to Physical Assets <i>Losses arising from loss or damage to physical assets from natural disaster or other events</i>	Disasters and other events	<ul style="list-style-type: none"> • Natural disaster losses • Losses from external sources (terrorism, vandalism) • Physical asset failure (not system) 	<ul style="list-style-type: none"> • Claims to replace or repair assets and buildings
Business Disruption & Systems Failures <i>Losses arising from disruption of business or system failures</i>	Systems	<ul style="list-style-type: none"> • Hardware • Software • IT Network • Telecommunications • Utility outage/disruptions • External interference 	<ul style="list-style-type: none"> • IT Systems and telecommunications failure and downtime • Viruses and security breaches

Event Type Category (Basel Level 1)	Sub-Categories (Basel Level 2)	Activity Examples (Basel Level 3)	Insurance Activity Examples (provided in ABI data template)
Execution, Delivery & Process Management <i>Losses from failed transaction processing or process management, from relations with trade counterparties and vendors</i>	Transaction Capture, Execution and Maintenance	<ul style="list-style-type: none"> • Delivery failure • Poor service (incl timelines and content) • Not meet customer expectations • Not appreciate changing customer service needs/ expectations • Internal customer service failure (external impact) • Data error, incomplete or not timely • Management information error • Incorrect unit pricing • Failure to document of processes • Loss key personnel 	<ul style="list-style-type: none"> • Service related complaint • Cases requiring re-work or correction • Pricing errors or backdating adjustments • Projects initiated, then cancelled • Interest on late payments
	Monitoring and Reporting	<ul style="list-style-type: none"> • Failed mandatory reporting • Inaccurate external reporting • Shareholder reporting 	<ul style="list-style-type: none"> • Regulatory, legal or taxation fines associated with mandatory reporting requirements
	Customer Intake and Documentation	<ul style="list-style-type: none"> • Incomplete/ incorrect application documents • Customer policy wordings • Contract documents ineffective 	<ul style="list-style-type: none"> • Re-drafting or mislaid or incorrect legal documentation
	Customer or Client Account Management	<ul style="list-style-type: none"> • Incorrect customer records • Information to incorrect customer • Payment to incorrect customer 	
	Trade Counterparties	<ul style="list-style-type: none"> • Third Party actions (eg Poor publicity) • Ethical and environmental failures 	
	Vendors and Suppliers	<ul style="list-style-type: none"> • Outsourcing management • Outsourcing delivery failure • Outsourcer failure • Vendor delivery failure • Vendor disputes 	<ul style="list-style-type: none"> • Legal Expenses • Bad debts, write off

A1.3 Examples of possible future mis-selling or TCF issues

This appendix gives examples of product issues which could give rise to mis-selling problems in the future.

Contracted-out pensions

Issue: those contracted-out are effectively giving up a defined benefit promised by the State for a money-purchase pension. While rebates were considered generous at the time when these were sold, particularly for the young, investors may have suffered through recent market falls and improvements in life expectancy.

Recent events:

- July 2004 – in what is described as a landmark ruling, Financial Ombudsman Service (FOS) upheld a complaint against Prudential in the case of Mr Ford. Whilst he was advised to contract-out at an age above Prudential's own maximum, it would appear the FOS decision had as much to do with the explanation given
- H2, 2004 – early 2005 – adverse comment on contracting-out pension sales arises in the press, with the Consumer's Association / Which? making comparison with Mortgage Endowments and calling for Government action;
- 18th March 2005 – FSA write to life offices looking for information on contracting-out sales, with a focus on post-1997 sales (also looking for information on contracting back in);
- August 2005 – FSA publishes OAC report into contracting-out. Among its key findings is that the median shortfall for those contracted-out throughout is estimated to be £3,900 while that for those contacted out for 5 years is £1,950. With this report, the FSA summarised work and findings to date, including:

the exercise in March above highlighted that, generally, there was a considerable degree of commonality of approach within the industry¹⁴;

they are continuing to look carefully at the evolving regulatory requirements that were in place during the relevant period, "...against which the behaviour of firms at the time has to be judged";

they discussed with the Financial Ombudsman Service complaints about contracting out raised by individuals. To date, there have been only a small number of complaints, with the Financial Ombudsman Service recording fewer than 100 cases;

complaints levels at individual firms are also generally low.

Reviewable Premiums

Issue: concerns about whether clauses allowing insurers to increase critical illness premiums are fair; coupled with contractual reviews on flexible whole-of-life policies where generally premiums increase / benefit decrease as part of the contract design. Also relates to ability to vary risk charges under linked contracts

¹⁴ e.g. until 1997 most firms used age and salary criteria as the basis for recommending whether a consumer should be contracted in or out, although some individual firms had different practices.

Recent events:

- August 2004 – FOS addresses investment whole-of-life in Issue 39 of “Ombudsman News”. Warn they may uphold complaints where effects of plan reviews were not made sufficiently clear;
- January 2005 – in their “Financial Risk Outlook”, FSA states it is to consider the fairness of review clauses under Unfair Contract Terms Directive, with the ABI ;19th May 2005 – FSA issues “good practice” note on reviewable premiums, with the ABI also issuing guidance at the same time;
- October 2005 – FSA challenges Prudential International on its application of reviewable charges under the Unfair Contract Terms Directive and obtains an undertaking from Prudential International in this regard.

Guaranteed Equity Bonds (GEBs)

Issue: can be viewed as “Precipice Bonds” with income re-invested. Many GEBs currently maturing are simply returning capital with the investor having lost out on any interest they would have received had they been in a bank.

Recent events:

- February 2005 – in “Financial Promotions : taking stock and moving forward” the FSA highlights GEBs and other capital secure structured products as an area of possible concern, with promotions often not covering access to capital nor explaining product features;
- March 2005 – on a positive note, in “Ombudsman News”, issue 44, FOS highlights a GEB case which it rejected thereby highlighting the point that not all claims against life insurers are successful.

Income Drawdown

Issue: investors may have lost out where they were invested in equities, as equity returns have recently failed to match those on bonds, let alone compensate for “mortality drag”.

Recent events:

- April 2005 – in “Identifying and responding to emerging retail risks”, the FSA outlines work being done on investigating the suitability of drawdown advice;
- May 2005 – referred to in FSA speech by Clive Briault on retail financial advice market – “consumers with relatively small pension pots (less than £100k) being advised to take out lump sums, and paying high charges without understanding fully the impact of this on their pensions”.
- .

With-Profit Bonds

Issue: investors aggrieved at the application of MVAs, with many complaining that risks were not adequately explained.

Recent events:

- July 2004 – “Ombudsman News”, issue 38 covers FOS attitude to MVA : will uphold complaints where a firm failed to give clear information on this. Also covered in issue 47 (July 2005), while their 2004/05 annual report highlights complaints regarding these;
- December 2004 – Bradford & Bingley fined £650,000 by the FSA, in part for mis-selling with-profit bonds;
- Early 2005 – following campaign by the Daily Mail, the FSA initiates a review of with-profit bond sales;
- June 2005 – in an update to “Identifying...emerging retail risks”, the FSA concludes that, with a complaint acceptance rate of roughly 1/3rd, a wide scale review is not appropriate though it does leave the door open to a future review and to action against individual firms.

Equity Release

Issue: whether these products are being sold appropriately to the elderly.

Recent events:

- 24th May 2005 – FSA warns advisers that its mystery shopping exercise has concluded that there is widespread mis-selling by advisers and this has to stop.

Group AVC mis-selling

Issue: while FSAVC investors have been reviewed, there is a possibility that similar complaints could arise on employer-sponsored Group AVC arrangements where the employer also offered an “added years” option.

Recent events:

- November 2004 – BBC “Money Box” report highlights plight of teachers advised by Prudential to take out a money-purchase AVC under the Group AVC it ran, where “added years “ was available. FOS quoted as having ca.100 similar complaints.

Protection issues

Issues surround the promotion of protection contracts and disputes regarding the settlement of claims, particularly for Critical Illness. Non-disclosure is a significant problem, particularly as if an insurers controls are inadequate in this regard, they may still have to pay the claim while the reinsurer will have grounds for not paying out on its share. Recent developments include:

- May / June 2005 : FOS addresses non-disclosure in issue 46 of “Ombudsman News”;
- August 2005: FSA points out issues it has encountered with critical illness promotion in “Financial Promotions Mortgage and General Insurance Bulletin.”

Other possible issues

Potential mis-selling Issues identified by David Addison in his in the July 2005 edition of “The Actuary” include:

- S2P rebate policies – related to review of past-contracted sales in 1. above ;
- Derivative-based replacement with-profits products – risk of poor returns due to the cost of providing the underlying guarantee ;
- Corporate bonds – risk of capital loss through spread widening, default and rise in bond yields. Could be exacerbated by any marketing focus on yield arising, blurring distinction with deposit accounts.

Financial Services Compensation Scheme (FSCS) / IFA mis-selling claims

Issue: while it is usually assumed that no mis-selling exposure arises on business sold through IFAs, the recent surge in IFA failures has led to a rise in FSCS levies. There is a risk that IFAs cannot (and/or will not) pay for further mis-selling claims arising through the FSCS and that life offices will have to bear a share of these¹⁵. The funding of the FSCS is the subject of a report by the consultancy firm Oxera for the FSA.

In general IFAs may seek to pass responsibility for mis-selling back to a life office, citing poor sales literature¹⁶, and it's worth noting recent FSA pronouncements on TCF which places responsibility on the provider in this regard.

In May 2005, an IFA being sued over the investment of a Zurich offshore bond was able in turn to successfully sue Zurich over information they provided on the bond. Zurich has had to meet 2/3rds of the resulting compensation aware of £1/2m.

In September 2005, John Tiner referred to this case and indicated that the producer / distributor interface would be a key area of TCF work for the FSA in 2006.

Legacy mis-selling issues

Possible future developments on mortgage endowments:

- surge in complaint volumes – the FSA have recently issued a survey which indicates that up to 400,000 mortgage endowment holders (15% of total) may complain in the following 6 months, with a similar number after that. If true this would cause a severe strain on complaint handling, not to say of its impact for the adequacy of provisions;
- complaint handling – following a “Dear CEO” letter in July 2005 from the FSA highlighting the need for proper complaint handling. Two months earlier, Abbey was recently fined for its failings in this regard. While its rejection rate of 90% was very high, others have been fined for having more modest rejection rates¹⁷. In January 2006, Guardian were fined for a surge in rejection rates from 29% to 77% in 2003 and 2004 following the introduction of new claims procedures. Apart from the fine, there will also be the cost of re-reviewing past cases;
- time-bars – while most companies have implemented these, where they have not been the result is an open-ended American option on the endowment fund, with an increasing floor typically converging with the shortfall at maturity . In addition there is the possibility of a legal challenge to the validity of a time-bar in certain situations;

¹⁵ as they did with Pensions Review (A16) costs, where over 85% of these costs were met by offices .

¹⁶ understand some IFAs have attempted to sue Standard Life with this purpose in mind.

¹⁷ for instance, Friends Provident were fined £650,000 for rejecting ca.6,500 out of 21,788 complaints (30%) whereas the FSA felt that 1,000 was more appropriate (< 5%).

- considerable volumes of complaints arise through 3rd parties (“ambulance chasers”). In October 2005 the ABI has recently called on life companies to pay compensation direct to the policyholder rather than through such companies. It is also noteworthy that these companies are branching out into other areas of complaint¹⁸.

For the Pension Review – residual claims could arise for Phase 1 “no loss” cases, FSAVC review cases and non-responders, while costs of reinstatement could be affected by increased life expectancy amongst other things.

¹⁸ e.g. the firm Endowment Investigations was involved in the Prudential contracting-out case in 1. above

Appendix 2: ABI Loss Database

During 2004, the ABI set up a working group to design an operational risk loss database for the insurance industry - ORIC. This is now being implemented within the UK, with plans to extend it internationally.

The following tables illustrate the ORIC Quarterly Data Submission Template.

Loss Event ID Code
Business Unit Code
Event Date (when recognised internally)
Event Date (when the event took place)
Event Type Category (Basel Level 1)
Event Type Category (Basel Level 2)
Activity Description and Comments
Gross Loss - Estimate of Actual (£'s)
Gross Loss - Estimate if a "Near Miss" (£'s)
Recovery Estimate (£'s) - (if any)
Impact Code
Soft Loss Code
Business Function
Geographical Region of Loss
Event Status

Insurance organisations that sign-up to the database will make quarterly submissions and be able to receive quarterly updates of loss data that has been submitted by their peers.

The data template above uses the categories taken from the Basel II regulation and provides insurance examples, as illustrated in the table in Appendix 1.

ABI Loss database initial submission reporting form

Initial Submission Reporting Form

Firm ID Code	Loss Event ID Code	Business ID Code	Event Date (1) (when recognised internally)	Event Date (2) (when the event took place)	Event Type Category (Basel Level 1)	Event Type Category (Basel Level 2)	Activity Description and Comments	Gross Loss – estimate of actual (GBP)	Gross Loss – estimate if a “near miss” (GBP)	Recovery	Impact (see table)	Soft Loss (see table)	Business Unit (see table)	Geographical Region of Loss (see table)
Issued by ABI	Firm to specify	General Life Reinsurance Fund Mgt Group Other	dd-mm-yy Date event recognised internally	dd-mm-yy Estimate of date the event took place	Internal Fraud External Fraud Employment Practices and Workplace Safety Clients, Products and Business Practices Damage to Physical Assets Business Disruption and System Failures Execution, Delivery and Process Management	See categories	Could include: A secondary risk factor A brief description of the loss.	Direct financial loss above £10,000	Estimated financial loss above £10,000		A subjective factor (0-5) expressing the impact of the loss on the firm	A subjective factor (0-5) expressing the relationship and reputational damage associated with the event	The Business Unit which suffered the loss	The geographical area where the loss was incurred

Revised Submission Reporting Form:

Firm ID Code	Event ID Code	Business Unit ID Code	Event Date (1) (when recognised internally)	Event Date (2) (when the event took place)	Event Type Category (Basel Level 1)	Event Type Category (Basel Level 2)	Initial Gross Loss (GBP)	Revised Loss (GBP)	Movement	Recovery	Reason for Revision
							Direct financial loss above £10,000	Firm figure	(+ / - GBP)		eg Negotiated New estimate Regulatory fine / penalty Professional fees

Event ID Code

A unique event number will be assigned to each loss event. This is for internal use only, and will not appear on the report-back form.

Date

The date is the date a loss event is recognised internally. A day, month and year (dd-mm-yy) will be recorded.

Event Type Category – Basel Level 1

There will be seven event type categories

Event Type Category – Basel Level 2

Details in ABI Categorisation document

Activity description

This will be a free-form field to describe the loss and/or detail one secondary risk factor. Please include as much detail as possible.

Gross Loss – actual and estimated (£)

Loss will be confined to the gross financial impact of an operational risk loss event above a minimum threshold. The minimum loss amount is £10,000.

Impact ('Effect')

The inclusion of a subjective factor (0-5) expressing damage to the firm from the operational risk loss event would provide valuable information

Grade	Defining factors – one or more of the below
0	No effect on business unit
1	Negligible effect on business unit
2	Negative effect on business unit but no negative effect on share price
3	Potential negative effect on share price, possible senior management involvement
4	Negative impact on share price, senior management involvement
5	Significant effect on share price, direct senior management/board involvement

Soft Loss

The inclusion of a subjective factor (0-5) expressing the relationship and reputational damage associated with the operational risk loss event would provide valuable information.

Grade	Defining factors – one or more of the below
0	No external effect
1	No media coverage, increase in customer complaints
2	Limited local or industry media coverage, increase in customer complaints, possible account closure, no negative effect on share price
3	Limited national media coverage, large scale customer complaints, some customer loss, informal regulatory enquiry, potential negative effect on share price, possible senior management involvement
4	Sustained national and limited international media coverage, serious customer loss, formal regulatory investigation or enquiry, negative impact on share price, senior management involvement
5	Sustained negative national and international media coverage, large scale customer loss, formal regulatory intervention and fines, significant effect on share price, direct senior management/board involvement

Business Unit

Sales and Distribution

Underwriting

Customer Service/Policy Administration

IT

Facilities

HR

Outwards RI

Actuarial- Reserving

Audit

Claims

Legal and Compliance

Marketing

Investment/Treasury

Accounting

Outsourcing

Actuarial- Pricing

Tax

Geographical Region of Loss

UK

North America

South and Central America

Europe - EU

Europe – Non EU

Asia (including Japan)

Middle East

Australasia

Africa (including South Africa)

Reason for Revision (in revised submission form)

Material changes only (generally, once)

Negotiated

Insurance

Recovery of loss

New estimate

Regulatory fine / penalty

Professional fees

Appendix 3: Example Combined Risk Scenarios

Two potential scenarios have been considered to illustrate the generation of a combined operational risk scenario.

Business Continuity

Scenario 1 – BCP				
Cause	Event	Effect	Internal Data	External Data
<p>People Staff sabotage.</p> <p>Process Security Policy not followed.</p> <p>System Faulty Building systems.</p> <p>External Event Direct terrorist Attack. Terrorist attack in city. Natural disaster. Disaffected customer base. Press reporting against individual/corporate actions.</p>	<p>Major incident occurs at any of the Company's buildings or where the Company's operations are concentrated, or at a major financial centre.</p>	<p>Disaster Recovery site is inaccessible; DR site has insufficient capacity; Customer contact lost; Payments not made; Premiums not collected; Staff unable to work; DIS costs; Systems unavailable and controls bypassed (fraudulent claims/ underwriting); New Business lost; Customers move business; Confidence in market undermined (<i>market risk</i>).</p>		

Pandemic Virus

Scenario 2 – Pandemic Virus				
Cause	Event	Effect	Internal Data	External Data
<p>People Staff sickness policy not followed; Staff travel policy not followed.</p> <p>Process BCP ineffective.</p> <p>System Faulty Building systems.</p> <p>External Event Pandemic outbreak of virus.</p>	<p>Virus attack (SARS, Bird Flu) affects specific Continents where the Company has operations, or worldwide.</p>	<p>Staff resource not available to sell or process business; Segregation of duties controls cannot be implemented; Backlogs rise; Complaints rise; Mortality rises/ Run on Claims; (<i>insurance risk</i>) Longevity assumptions inaccurate/ Early payouts; (<i>insurance risk</i>) Annuitant Book falls; (<i>insurance risk</i>) Economy slowdown; Loss of confidence in the Market (<i>market risk</i>).</p>		

Some of the questions which could then be asked in relation to the scenarios are:

1. What are the worst plausible scenarios from the above maximum potential combination?
2. How would the likelihood and impact of these plausible scenarios be assessed (using internal and/or external data as appropriate)?
3. What are the correlations with any other risk categories?
4. What would be the effects of a stress situation (i.e. will this be more likely and/or have a greater impact in a falling/rising market?)

As a result of considering the answers to these questions, one would assess what would be a reasonable amount of OR Capital to hold for each scenario, and hence in aggregate.

Appendix 4: Worked Example

The following example is fictitious and solely for illustration of the principles.

Let's say there are the following three ORs have been identified in the quarterly risk report (the actual report would typically contain many more):

- Mis-selling
- Inadequate service delivery
- Business interruption events

Working through the proposed steps described in the paper:

Understand the risks

The risks are discussed between Actuarial and Risk Management, and the business owners and a common understanding arrived at.

Mis-selling

For clarity, it was agreed to split the mis-selling risk into three main components:

- mis-selling in relation to future sales
- known issues in the existing book, such as mortgage endowment redress; and
- Undiscovered issues in the existing book, perhaps due to flawed sales processes,, poor policy wording, poor product design, or not treating customers fairly in administering products e.g. charges, options.

Inadequate service delivery

It was felt that this "risk" was not clearly reported, as inadequate service delivery is the high-level consequence rather than the root cause or driver. Further discussions with the customer service managers revealed the main underlying causes of poor service were system failures, poor training exacerbated by very high turnover in the call centre.

Business interruption

A recent internal audit of controls for UK processes was positive, giving the opinion that the current contingency plans for recovery of work areas, arrangements for temporary accommodation and business continuity plans for all business critical processes were robust. There was some exposure in the UK through self-insurance and additional costs of operating less efficient disaster recovery plans to maintain service standards. It was assumed that regulatory fines and compensation payments would be very unlikely in the circumstances of an external event, given good communication with policyholders and the FSA.

However, the same level of control was not in place for the recently offshored processes leaving some exposure in the short-term.

Which risks require capital?

The risks are filtered so that only risks where capital is appropriate remain.

The mis-selling risk in respect of future sales does not require capital, as the firm's ICA does not allow for future new business profits or losses in advance. The known compensation issues are already reserved for at a prudent level in the ICA balance sheet and so only the risk of these reserves being inadequate needs to be considered. Capital should be considered for the undiscovered product issues in the existing book.

The "risk" of inadequate service delivery is being addressed by a current project to improve administrative systems, processes and training. This project is fully budgeted for, on track and therefore it was agreed that no additional capital is needed in the ICA. The residual risk, including losses in the interim period until the re-engineered processes are in place, is covered by the stress tests for adverse persistency and increased expenses. This potential driver was considered as one of a number of drivers in setting the severity of the persistency stress test.

Capital is needed for the residual business interruption risks.

Scenario Analysis of potential losses

Mis-selling from existing business

Discussions around mis-selling risk for mortgage endowments identified the main reasonably foreseeable adverse scenario being an increase in the proportion of complaints from the current 40% to 50%. The complaints upheld rate and average compensation were felt to be relatively stable. Fines were considered to be unlikely based on open discussions with the FSA on complaints handling processes and standards.

The reserve in the base realistic balance sheet for ICA purposes already had a considerable margin that assumed a higher than 50% complaint rate. For simplicity it was decided to leave the full reserve in the unstressed balance sheet and have no additional risk capital.

A full-scale review of latent TCF issues had been recently completed. The top five product issues were considered and drivers identified. The view was that a material loss event in respect of these issues was a 1 in 10-year event, with a loss ranging from £20m to £170m depending on market conditions and the cohorts of policies affected. Based on this the loss given event distribution was assumed to be 85m median loss and 150m pessimistic loss.

Business Interruption

Potential events for scenario testing were fire, flood or explosion. Following discussion, the median loss event resulted in the main site being unusable for up to 10 working days with short-term failures in part of the IT/Telecomms infrastructure. This was judged to be a 1 in 20- year event.

The pessimistic scenario was a complete loss of a main site for 90 days and loss of a key supplier for the offshored processes. This scenario was worked through carefully to identify exactly how the firm would react, what would be insured and what unbudgeted expenses would be incurred. Insurance was assumed to be claimed in full, an assumption that was checked by a thorough review of policy wording.

The outcome is shown in the following table:

Area of Cost	Estimate	Basis
Overtime costs for recovery of normal work volumes	1.75	Headcount x Hours x rate
Temporary staff	1.00	Headcount x Hours x rate
Training and recruitment of replacement staff	0.25	
IT remediation costs	1.25	Allows for existing insurance
Telephony remediation costs	0.50	Allows for existing insurance
Costs to acquire/lease secondary properties	0.00	Robust contract in place for provision of 1000 seats deemed to be adequate. Non-critical processes could be delayed to make space for critical processes.
Premises remediation costs	2.25	Allows for existing insurance
Re-select / set-up new supplier	3.00	
Total	10.00	

Similar analysis on the median event gave a 4.5m loss. On playing the scenarios back to the business experts it became clear that they had meant that 1 in 20 years referred to the probability of the median event rather than the probability of any loss event. To ensure the model reflects this, the frequency parameter was amended to 1 in 10 years. This will then provide (approximately) a probability of the median loss of 1 in 20 years.

Model the aggregate operational risk capital

The three original risks can then be tabulated as follows, showing filtering decisions and loss scenarios for each risk:

Risk	Included/ Excluded	Reason for exclusion	Frequency of Occurrence	Loss Amount		
				Optimistic	Expected	Pessimistic
Mis-selling – future sales	Excluded	Future new business not on balance sheet				
Mis-selling/TCF – past sales	Included		1 in 10 years	50m	85m	150m
Business Interruption events	Included		1 in 10 years	2m	4.5m	10m
Inadequate Service Delivery (eg. due to poor processes and training)	Excluded	1) Capital not right response: process improvement project in progress as best response. 2) Covered in other tests: interim impact included in persistency / expense stress testing				

Appropriate distributions are then fitted to the data for the two included risks for the purposes of aggregating the capital requirement. (In practice, where one risk is so dominant a closed form solution might be used to extrapolate the loss for the dominant risk rather than running simulations).

Given the subjectivity around the inputs, discussions on appropriate distributions are somewhat spurious. Therefore it was decided to use the default poisson - lognormal and produce sensitivities.

For the probabilities of occurrence a Poisson with a mean of 0.1 (corresponding with the 1 in 10 year occurrence) was used.

For the Loss Amounts, the lognormal was used for both risks, taking the median and pessimistic loss amounts as 50th and 90th percentiles. This is shown in the graphs below.

Risk: Mis-selling – TCF risks in existing business

Incidence

Poisson distribution with parameters:

Rate 0.10

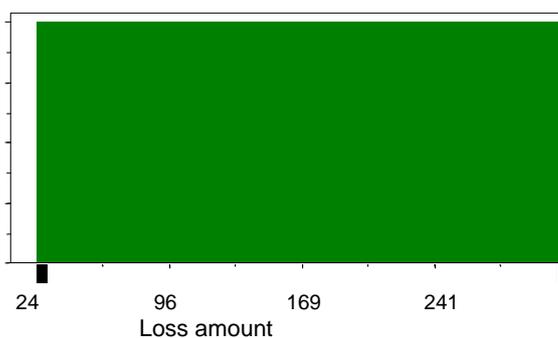
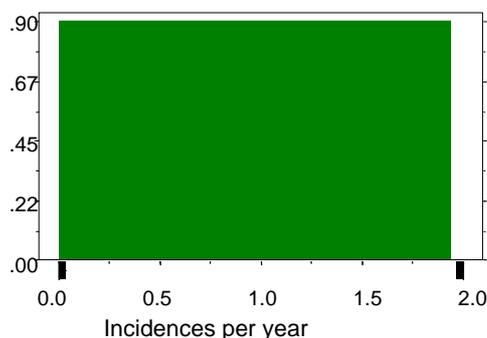
Loss size

Lognormal distribution with parameters:

10% - tile 85
90% - tile 150

Selected range is from 0.00 to +Infinity

Selected range is from 0 to +Infinity



Risk: Business interruption

Incidence

Poisson distribution with parameters:

Rate 0.10

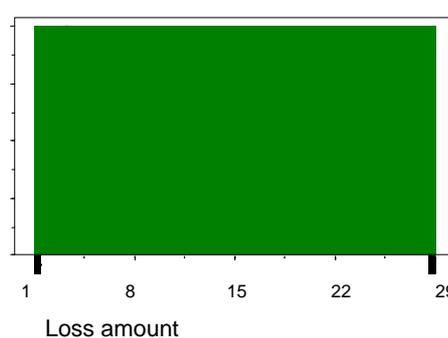
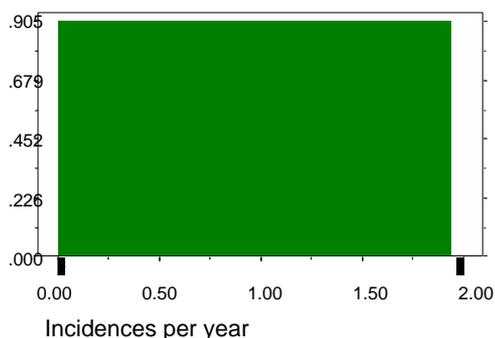
Loss size

Lognormal distribution with parameters:

10% - tile 4.5
90% - tile 10

Selected range is from 0.00 to +Infinity

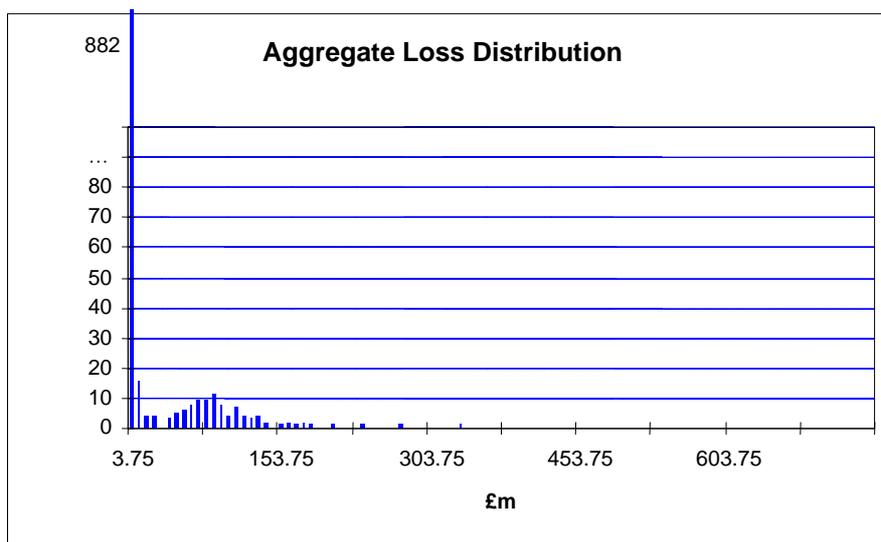
Selected range is from 0 to +Infinity



There is no reason to correlate these two risks and therefore the losses from them will be treated as independent in the simulations.

The 99.5th percentile is chosen for setting the ICA. For illustration, the model is performed using 1000 simulations (in practice a larger number will be run), and the results are set out below¹⁹:

The graph shows the frequencies of aggregate loss amount from different simulations. It can be seen that in 88% of the simulations no loss was suffered. The 99.5th percentile is **£178m**. This is the OR capital amount.



Simulation Output statistics

	Value
Number of trials	1000
Mean	9.95
Standard deviation	32.46
Percentiles of Aggregate loss:	
0%	0
5%	0
50%	0
95%	84.35
97.5%	111.85
99.5%	177.99
100%	336.15

One now needs to set the appropriate level of capital – in this simplified case, the 99.5th percentile was £178m. One can then aggregate OR Capital with the other risk capital making appropriate allowance for correlations.

¹⁹ The graphs and modelling illustrated in this example have been produced using "Crystal Ball" by Decisioneering (UK) Ltd, which is one of several proprietary statistical modelling packages available.

Appendix 5: Example Capital Stress Test Correlations

	Equity	Fixed Interest	Property	Credit	Mortality	Persistency	Expenses	Operational	Liquidity	Group
Equity	1	L	M	M	0	M	M	M	L	L
Fixed Interest		1	L	M	0	L	M	M	L	0
Property			1	M	0	M	M	M	L	L
Credit				1	0	L	L	M	0	0
Mortality					1	0	0	L	0	0
Persistency						1	L	M	L	M
Expenses							1	M	0	0
Operational								1	0	L
Liquidity									1	L
Group										1

1 = Perfect correlation, 0 = Zero correlation = typical range of 0 to 0.1

M = Medium correlation = typical range of 0.3 to 0.7,

L = Low correlation = typical range of 0.1 to 0.3,

Source: 7th Ernst & Young ICA Survey

Appendix 8: Future developments identified by GIRO working party

The GIRO working party paper by Tripp et al produced a preliminary list of potential future developments and asked for comments from the Profession to help strengthen and prioritise these topics:

- developing a deeper understanding of causal modelling techniques and their implication for risk modelling and analysis;
- a quantitative impact study, to help obtain industry based estimates on the quantum of operational risk;
- more detailed development of risk indicators and exposure to risk measures;
- development of a more consistent categorisation framework; while we understand the importance of defining risk tailored to a given organisation's needs, we think, ultimately, that this will slow down progress, as too much time will be taken in comparing categories which fundamentally have minimal difference;
- commencing a shared, confidential data collection service for the industry;
- developing new methods based on value at risk approaches, market measures (betas) and other techniques;
- deepening our understanding of systems, processes, controls and organisational design (roles and responsibilities); changing our own attitudes to 'soft issues' and building insights into the vital areas of culture and behaviours - we may not wish to become experts in all these fields, but our thinking should be good enough to ensure we can act sensibly as facilitators and integrators;
- considering new forms of risk management or mitigation, including use of insurance, cross sector aggregation, securitisation and other
- alternative forms of risk transfer - this might go as far as insurance product design to handle operational risk and subsequent rating; and
- ensuring that professional guidance and education are adapted to meet emerging needs