



Optimising life reinsurance strategy under risk-based capital measures

Summary Report

**Tatyana Egoshina
Sandra Haas
Chris Lewis
Scott Mitchell
Jillian Wood**

December 2013

TABLE OF CONTENTS

1. Introduction	3
Background and objectives	3
Structure of report	3
2. Typical types of life reinsurance coverage	5
Proportional reinsurance	5
Non-proportional reinsurance	6
Combined structures	7
Alternative structures	7
3. The context of reinsurance decision-making	8
The broad environment	8
Other factors influencing reinsurance strategy	12
4. Aligning strategy with risk appetite	13
5. Optimising the reinsurance strategy	14
Measuring the interaction of risk, capital and value	14
Optimisation problem: A simple theoretical view	15
Practical constraints	15
A practical framework for testing reinsurance structures	16
6. Further Detail	18

1. Introduction

Background and objectives

The recent introduction of new economic- and risk-based reporting and solvency frameworks across the insurance industry is increasingly encouraging life insurers to focus much more than previously on risk, value, and capital management of their portfolios. These new frameworks include the European Insurance CFO Forum Market Consistent Embedded Value Principles¹ (MCEV Principles), Solvency II, the Swiss Solvency Test (SST), and internal economic capital and rating agency capital measures.

Risk-based frameworks offer more incentive to develop risk management strategies that align with risk tolerance and optimise economic value on a risk-adjusted basis. Such frameworks can lead to a significant shift in perspective for many insurers, often challenging the conclusions of traditional management decisions.

As life insurers adapt their business models to modern risk management frameworks, reinsurers must also adapt their offerings to meet the evolving needs of their life insurance clients. Typical proportional and non-proportional life reinsurance coverage, such as quota share or excess-of-loss, are not tailor-made for modern-day capital frameworks and are therefore not necessarily optimal for life insurers. For example, quota share treaties can, in some markets, eliminate significant potential profit generated by smaller claim sizes, thus reducing balance sheet value and solvency ratios under economic-based frameworks.² However, such structures remain the norm across much of the life industry.

In this summary research report, we explore the possible impact of risk-based economic frameworks on a life insurer's reinsurance strategy.

We have also produced a fuller version of this report which includes a detailed numerical case study, and in which we also investigate potential improvements in reinsurance structures to meet the modern-day requirements of life insurers, whilst still offering an attractive business proposition for reinsurers.

Note that this report focuses on traditional reinsurance structures and does not explicitly cover financial reinsurance, such as value-in-force (VIF) monetisation or surplus relief, offered by reinsurers. For specific coverage of these types of solutions, we refer readers to another Milliman publication, 'VIF monetisation for European life insurers: A re-emerging trend.'

Structure of report

In Section 2, we provide a brief overview of various types of typical life reinsurance coverage currently available.

In Section 3, we describe the broad context in which reinsurance decisions are made, including key decision factors and the implications for risk, capital, and value management.

In Section 4, we highlight the importance of aligning reinsurance decisions with risk appetite.

In Section 5, we describe an economic perspective for optimising the reinsurance strategy.³ We formulate a simple theoretical optimisation problem for assessing alternative reinsurance strategies, as well as considering how to manage the real-world practical constraints.

¹ Copyright© Stichting CFO Forum Foundation 2008.

² We note however that, in some markets, reinsurance is sometimes priced more aggressively than the direct insurer's own assessment of the risk rates and can therefore enhance the value of the insurer's portfolio.

³ Reinsurance strategy here refers to the type of cover and appropriate parameters of this cover, e.g., a mixture of common forms of reinsurance (quota share and excess-of-loss).

The full version of the report includes additional material and can be ordered at www.milliman.com/oplifereport. In particular, it provides a case study which illustrates how a framework might be applied in practice and introduces new ideas from recent academic research, with the objective of combining new research with a pragmatic approach to structuring reinsurance programs.

2. Typical types of life reinsurance coverage

To provide further context, we provide a high-level overview of common types of traditional life reinsurance coverage. Note, however, that the intention of this paper is not to provide a comprehensive description of reinsurance available to life insurers. We have assumed that most readers are generally familiar with typically available reinsurance structures.

Proportional reinsurance

Under proportional reinsurance treaties, the reinsurer accepts a defined percentage of each policy written. The reinsurer will receive the defined portion of premiums and pay the defined portion of claims.

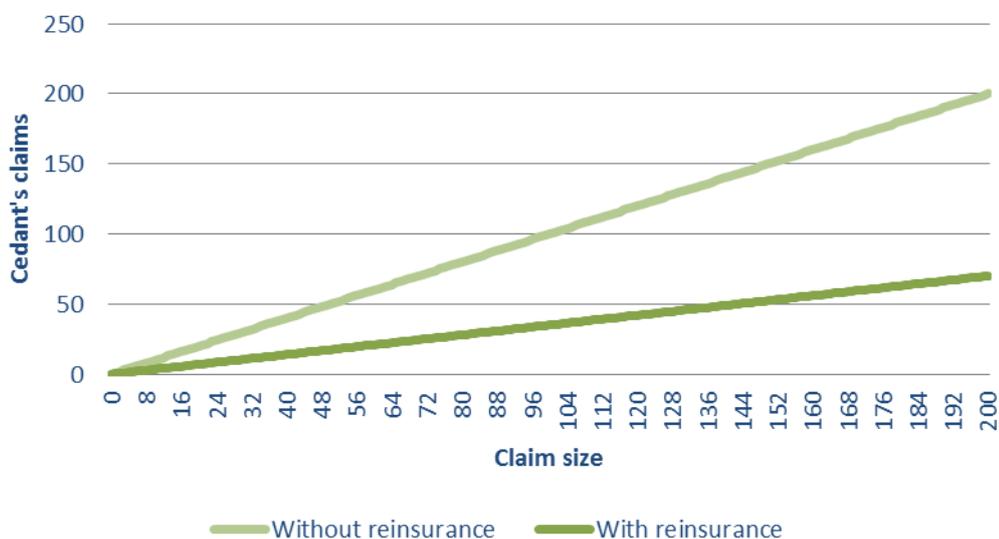
Additionally, a reinsurance commission may be paid to the cedant, which can help to reduce the insurer's new business strain, for example relating to underwriting, administration, reserving, marketing, commission and other costs associated with writing business.

Quota share

A typical proportional reinsurance structure is quota share. Under quota share, the reinsurer accepts the same percentage of all policies written by the cedant. In the context of life insurance, quota share contracts can often have a quota of up to 90% or more of the risk being ceded to the reinsurer.

Figure 1 illustrates the cedant's claim profile with and without quota share cover.

Figure 1: Cedant's Claim Profile Under Quota Share



Surplus reinsurance

Another type of proportional reinsurance coverage is surplus reinsurance. Under these arrangements, the cedant retains the full amount of each policy up to a defined exposure retention limit, with the risk above this limit fully reinsured.

Non-proportional reinsurance

Under non-proportional coverage, the reinsurer meets the cost of claims above a defined claim retention limit.

Excess-of-loss

Under an excess-of-loss treaty, coverage is often defined on a per-policy basis. However, treaties can be written on a 'per-event' basis, such as a pandemic event or a group life contract which is exposed to concentration risk under a particular risk event, such as an earthquake.

Stop-loss

Stop-loss coverage applies to the aggregate claim amount of a portfolio within a defined time period. It is often referred to as aggregate excess-of-loss.

Figure 2 illustrates the cedant's claim profile with and without stop-loss cover.

Figure 2: Cedant's Claim Profile Under Stop-Loss



A standard stop-loss contract covers the full tail risk of the ceded portfolio, thus exposing the reinsurer to extreme events. Reinsurers often introduce upper limits in order to avoid excessive tail risk exposure, as illustrated in Figure 3.

Figure 3: Cedant's Claim Profile Under Stop-Loss With Upper Limit

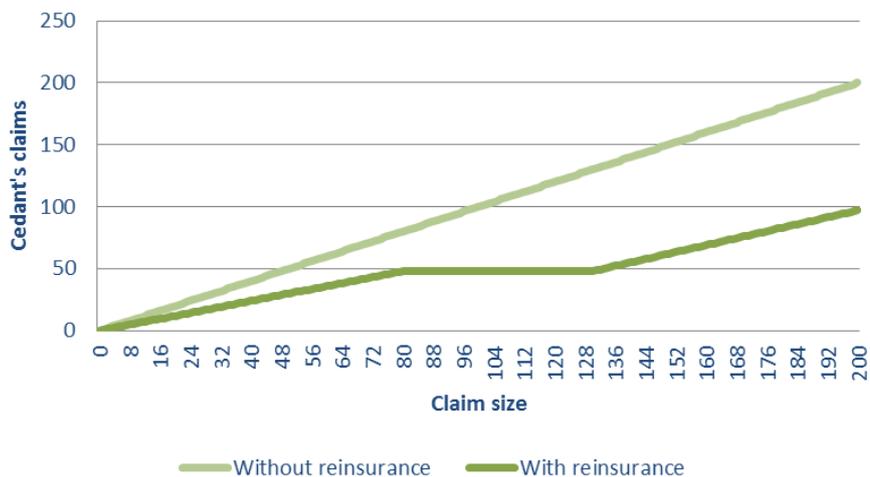


Combined structures

Classical proportional and non-proportional reinsurance structures are not always adequate to meet certain risk profiles and may not take into account the value perspective under a certain risk aversion.

Alternative reinsurance forms can be achieved via a combination of proportional and non-proportional coverage, for example combined quota share and stop-loss contracts, as illustrated in Figure 4. However, increased complexity in structure can introduce administration and pricing challenges.

Figure 4: Cedant's Claim Profile Under Combined Quota Share and Stop-Loss With Upper Limit



Alternative structures

In the full report we explore an alternative reinsurance structure that aims to match risk profiles for both insurer and reinsurer without introducing too much complexity.

3. The context of reinsurance decision-making

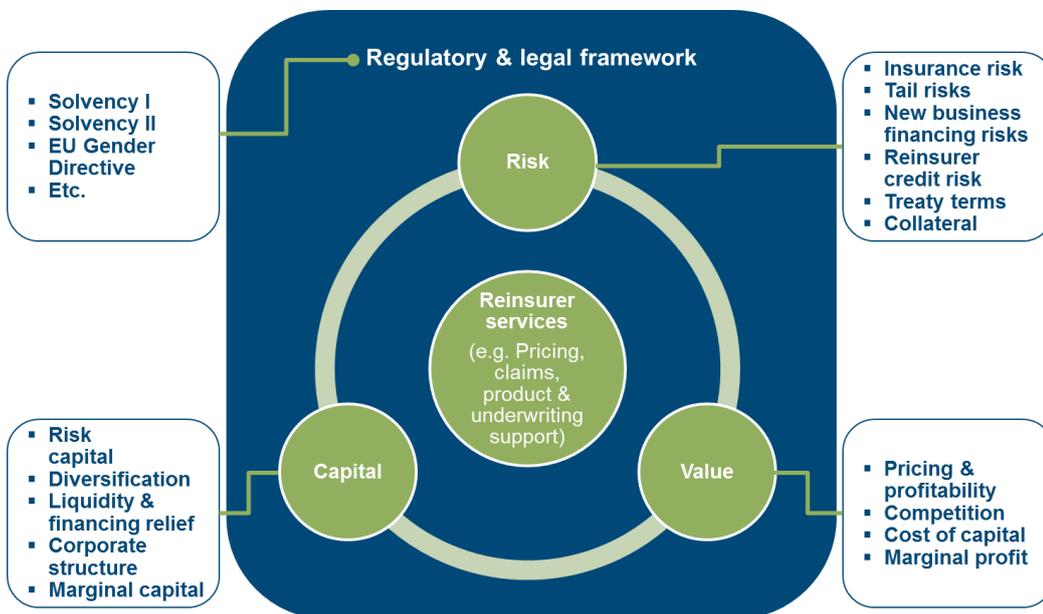
The broad environment

Life insurers' reinsurance strategies are typically considered within a broad economic, operating, and regulatory environment, such as that illustrated in Figure 5.

Reinsurance has clear implications for risk, capital, and value management, all of which are themselves closely interrelated in an economic context. Additionally, other services offered by the reinsurer are an important consideration when making reinsurance decisions.

In the following subsection, we elaborate on certain key aspects of each of these main areas.

Figure 5: Economic and Operating Environment Supporting Reinsurance Decisions



Risk management

Below we describe key aspects of a risk management framework which are impacted by reinsurance decision-making:

Insurance risk	<p>Reinsurance is a primary tool for managing the insurance risk of a life insurer. This might include protection against:</p> <ul style="list-style-type: none"> ▪ Individual claims above a certain size. ▪ Aggregate claims above a certain level, including the effects of: <ul style="list-style-type: none"> – Extreme insurance events such as epidemic/pandemic events or deaths from natural catastrophe events (e.g. earthquakes) or terrorist events. – Concentration risk, for example if many policyholders are located in the same location and/or are exposed to similar risks. ▪ Claims volatility, especially from a smaller portfolio.
-----------------------	--

New business risks	<p>Reinsurance is effective for managing certain financial risks associated with writing new business. In particular, an appropriate reinsurance commission structure can relieve the insurer's financing strain associated with the costs of underwriting, sales and initial administration. Additionally, the reinsurance commission provides relief from the reserving strain associated with statutory regimes which do not recognise the full economic value of the insurance contract on the balance sheet.</p>
---------------------------	---

Credit risk	<p>While reinsurance typically reduces certain risks on the insurer's balance sheet, it does introduce additional credit risk. The insurer must therefore assess the default risk and credit ratings of alternative reinsurers.</p>
--------------------	---

Treaty terms	<p>The terms and conditions of the reinsurance treaty should be designed to provide the appropriate legal and financial protection, as intended by the objectives of the insurer when deciding to take reinsurance coverage.</p>
---------------------	--

Collateral	<p>Collateral arrangements can play an important role in reducing counterparty risk and protecting policyholders. A wide range of options are available for structuring these arrangements, and it is important to understand their impact as they can influence the economics of a reinsurance transaction.</p>
-------------------	--

Capital management

Below we describe key aspects of a capital management framework which are impacted by reinsurance decision-making:

Liquidity and financing management	<p>As mentioned above, an appropriately designed treaty can help to manage the liquidity and financing demands associated with writing new business.</p>
---	--

Corporate structure The corporate structure of the insurer is an important consideration, especially when the insurer consists of multiple entities.

Corporate structure is often driven by capital optimisation. Reinsurance can act as a mechanism to support an enhanced capital structure, for example by transferring risk capital from one entity to another and allowing improved diversification within a group of companies.

It is also important to make allowance for any implications of the corporate structure when assessing alternative reinsurance options. For example, considering the impact of reinsurance at a local entity level may offer different conclusions to the impact at group level.

Diversification profile Insurers can gain advantages through a diversified mix of risk types and an appropriate corporate structure. For example, multinational insurers will often benefit from geographical diversification and a balanced portfolio. In contrast, monoline domestic insurers might be limited in the diversification they can achieve, although this will often be offset by a competitive advantage through a specialised offering.

When reinsurance is used to reduce certain risk exposures (e.g., mortality risk), it can also reduce the level of the diversification benefit, thus at least partly offsetting financial benefit of the risk transfer. In some circumstances, the reduction in diversification benefit can be greater than the reduction in mortality risk capital. This can be observed for certain relative levels of longevity and mortality exposures, which are negatively correlated under the Solvency II standard formula framework.

A holistic view across all risk categories should therefore be adopted in order to achieve the desired risk and capital objectives.

Credit risk capital We discussed earlier the need to consider the reinsurer’s counterparty risk. This naturally has implications for risk capital that must be held to reflect the additional credit risk.

Marginal capital A key metric when assessing the alternative reinsurance structures is the marginal capital impact, as measured on either an economic or regulatory basis.

Value management

Below we describe key aspects of a value management framework which are impacted by reinsurance decision-making:

Pricing and profitability The profitability of an insurer’s portfolio, in particular the relative pricing level between the insurer and reinsurer, can influence the relative attractiveness of certain types of reinsurance.

Competition The market for life reinsurance is not an efficient one. There are relatively few providers and market share is dominated by a few larger life reinsurers. Additionally, the default risk varies by reinsurer. As with any inefficient market, the level of pricing can vary widely and some types of coverage can be difficult to obtain at a reasonable price, or at all.

Price is not the only competitive factor - levels of service, expertise, or knowledge support are also key decision drivers.

Cost of capital	<p>An insurer requires capital to write insurance business, in order to support minimum (and target) capital requirements, and to meet up-front costs such as underwriting, acquisition of business, and initial administration efforts. Capital comes at a cost, which will vary by insurer depending on specific circumstances.</p> <p>The cost of capital will influence the economic impact of an insurer's risk profile. For example, if an insurer increases its risk exposure to certain risks, its capital requirements under a risk-based regime will increase and the cost of that capital will impact profitability.</p> <p>An insurer's capital costs can therefore influence the attractiveness of reinsurance and other risk management strategies. There may be a 'tipping point' at which a certain level of reinsurance coverage is not worth the cost, for example if the insurer is instead willing to accept the risk and hold the associated risk capital on its own balance sheet.</p> <p>An insurer's capital costs will depend on a number of factors. These might include capital structure, credit rating, size of company, financial position, market conditions, and market perception.</p>
------------------------	---

Marginal profit	<p>A key metric when assessing the alternative reinsurance structures is the marginal profitability impact, as measured on either an economic or accounting basis. Combined with the marginal capital impact, the marginal return on capital can be assessed.</p>
------------------------	---

Reinsurer services

In addition to providing reinsurance coverage, reinsurers offer valuable services such as knowledge support, underwriting, pricing, and product and claims management. They are a key offering to life insurers and can be a major driver behind taking reinsurance coverage. It is therefore unlikely in the current environment that insurers will make reinsurance decisions based purely on financial and risk factors.

Regulatory and legal framework

In this paper we focus on the economic- and risk-related factors which support reinsurance decisions. However, other regulatory and legal considerations must also be considered, especially as they may restrict decisions based purely on economic principles. For example, the Solvency I regime may enforce more stringent requirements than Solvency II (e.g., by restricting the reinsurance credit within the solvency calculations), and this may restrict capital transfers and lead to additional capital costs.

Other factors influencing reinsurance strategy

In addition to the aspects mentioned above, reinsurance decisions can be influenced by a wide range of other factors, including:

Product mix The product mix of an insurer’s portfolio determines the relative focus on various types of risk.

The biggest challenge facing many life insurers often relates to market risk, or more specifically asset-liability management (ALM). ALM is typically addressed through hedging or investment strategy, rather than reinsurance, and is therefore outside the scope of this report.

However, for insurers with a significant exposure to risk⁴ or annuity products, managing insurance risks is a major focus, as they are a key driver of risk and value.

For insurers with more focus on savings-type products, the management of persistency risk is a major challenge.

Potential diversification benefits are also a key consideration. Well diversified insurers may have the ability to offset different types of risk before considering the need for external reinsurance. Indeed, some large insurance groups have an internal reinsurance department which seeks to aggregate risks across the group in order to optimise diversification, subject to capital fungibility constraints.⁵ Any excess risk above the company’s risk appetite is then transferred, either via reinsurance or capital markets.

Size of insurer and financial position Smaller insurers, or insurers with limited financial resources, will typically have less ability and/or less appetite to absorb claims fluctuations. In contrast, larger insurers may focus more on retaining profits and diversification benefits associated with insurance risks.

Some insurers may have limited excess solvency or liquidity to absorb new business strain, resulting in a greater need for financing arrangements (e.g. reinsurance commission or financial reinsurance).

Reinsurance can also offer solvency relief, although this varies by solvency regime.

Risk appetite Different insurers will have different appetites for different types and levels of risk, often related to the above factors. Excess risk above risk appetite should be considered for external risk transfer, for example via reinsurance. The counterparty default risk of the reinsurer is also a key consideration, as well as the associated impact on risk-based capital. We discuss the importance of risk appetite in Section 4.

⁴ For example, risk products (also referred to as protection products) can encompass term assurance, disability, critical illness, credit life products, etc.

⁵ Capital fungibility refers to the extent to which capital can flow freely around a group structure, given constraints of such aspects as corporate structure, solvency requirements of local subsidiaries, dividend restrictions, tax impacts of capital transfers, etc..

4. Aligning strategy with risk appetite

With the introduction of Solvency II, European insurance companies are increasingly focusing efforts on understanding and defining risk appetite and aligning risk limits with that appetite. This includes risks that are typically mitigated through reinsurance.

Historically, however, life insurers have not always aligned reinsurance decisions with their internal risk appetites. For example, risk business such as life or disability term assurance might often be ceded on a quota share basis. This means that profit and risk from the 'first dollar' of risk coverage is being ceded to the reinsurer, despite the fact that most, if not all, life insurers have the available capital resources to retain an initial risk layer.

The first challenge here is for the management of an insurance company to define risk appetite in an objective and quantifiable way. Consider a life insurer with the risk appetite to withstand a 1-in-200-year event (i.e., the Solvency II risk tolerance level)⁶, unless reinsurance pricing justifies otherwise. Under this view, non-proportional coverage, such as excess-of-loss or stop-loss, might be more suitable than proportional coverage, such as quota share.

In this simple example, it is theoretically rational for the insurer to cede only excess risk at or above the 1-in-200-year event. Otherwise we potentially observe either of the following scenarios:

- The insurer retains less risk than it has appetite for, potentially sacrificing the associated profit and resulting in sub-optimal management of economic capital.
- The insurer is exposed to a higher level of risk than it can tolerate, thus risking the future financial health of the company to an unacceptable level.

In practice, however, there may be barriers which prevent an ideal alignment of reinsurance coverage with risk appetite, for example:

- Defining with any level of accuracy the events which correspond to the risk appetite is not always easy, especially for extreme risk events that occur, by their very nature, rarely (e.g., pandemic events).
- It may not be possible to define the risk tolerance limit for an entire portfolio across multiple risk exposures, allowing for diversification effects, and then formulate that into a practical reinsurance structure.
- Reinsurance pricing may justify ceding a higher portion than risk tolerance alone might suggest.
- There might be other drivers for taking reinsurance coverage which are less easy to quantify, such as underwriting or pricing support.
- There will be limitations in the availability of certain types of coverage, or possibly not at an acceptable price.

In Section 5 we consider further the role of risk appetite in a broad optimisation framework.

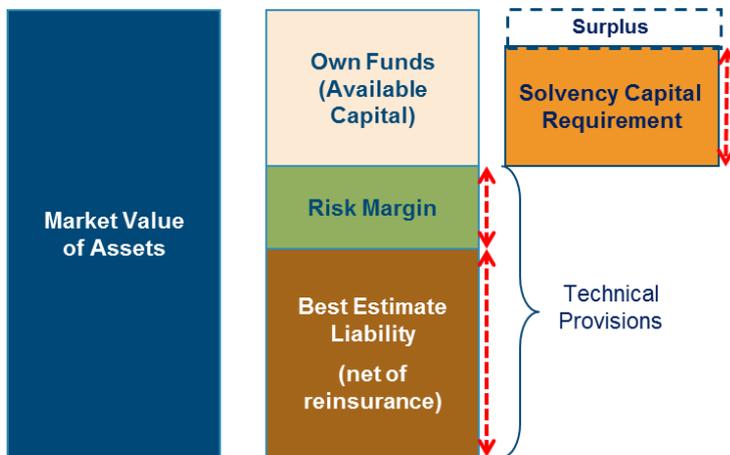
⁶ We note that insurers may hold capital to withstand an event which is more remote than the 1 in 200 year event, for example 1 in 1,000, in order to meet internal target capital or rating agency requirements.

5. Optimising the reinsurance strategy

Measuring the interaction of risk, capital and value

As indicated in Section 3, the concepts of risk, capital and value are closely interrelated. This is well demonstrated by an economic capital framework, such as Solvency II. Under such frameworks, the economic balance sheet represents economic- and risk-adjusted value; while the risk-based target capital⁷ reflects the risk profile of the insurer. Figure 6 illustrates the basic structure of an economic capital framework.

Figure 6: Economic Balance Sheet and Risk-Based Target Capital⁸



A key prerequisite for life insurers to quantify alternative reinsurance structures within an economic capital framework is a reliable and robust cash flow projection model. Model results can then be used to support objective decision-making.

Insurers based in the European Union are required to implement a market-consistent approach for the valuation of assets and liabilities. The standard formula methodology under Solvency II, which is a stress-based regime for assessing solvency capital, offers an effective and adequate platform for many insurers to assess reinsurance decisions.

Some insurers have chosen to implement an internal capital model to gain a more sophisticated view of the risk, often adopting a distribution-based approach. When the internal model is used for regulatory risk capital purposes, such as Solvency II or the SST, the internal model must satisfy 'Use Test' requirements. This requires insurers to demonstrate that management decisions are supported by the results of the internal model.

⁷ We use the term 'target capital' to highlight that the context is broader than Solvency II. Under Solvency II, target capital is referred to as the solvency capital requirement (SCR).

⁸ Note that, for presentational purposes, we illustrate the Technical Provisions net of reinsurance. Under the Solvency II technical specifications, the reinsurance asset is presented separately on the asset side of the balance sheet. However, the net effect on balance sheet value is the same.

Insurance groups can also adopt a group model to assess the relative advantages of introducing capital and risk transfer instruments across the group.⁹ A well-developed group model can support a holistic assessment of intragroup transactions and internal diversification before consideration of external transfer of residual risk to reinsurers or capital markets.

Optimisation problem: A simple theoretical view

At a conceptual level, reinsurance strategy can be formulated as a mathematical optimisation problem under Solvency II or an economic capital framework.

Consider the following optimisation problem, subject to constraints of risk tolerance and availability of certain types of reinsurance coverage:

1. Maximise balance sheet value.
2. Minimise technical provisions¹⁰ (net of reinsurance).
3. Minimise the solvency capital requirement ("SCR").

Alternative formulations of the problem might also consider other factors, such as earnings volatility or constraints.

Figure 6 above illustrates the components of the economic capital framework that are influenced by a change in reinsurance structure:

- Changing the retention levels and reinsurance structure will change the risk profile and risk-based SCR.
- This subsequently changes the risk margin component of the economic balance sheet.
- Changing the reinsurance structure will also change the reinsurance asset (illustrated in Figure 6 as a component of Technical Provisions).

While this construction is an elegant framework within which to consider the reinsurance strategy, numerous complexities arise in applying the numerical calculation in practice, as described in the following section.

Practical constraints

In the real world, insurers face a complex operating environment. The basic formulation described above is complicated by numerous factors, including:

- Knowledge of reinsurance pricing for every type of coverage is not generally available.
- Certain reinsurance coverage may not be available.
- Corporate structures can introduce complexity, such as tax issues or restrictions on risk and capital transfer, as well as offering the possibility to diversify risks internally before ceding excess risks to an external reinsurer.
- Local regulatory capital regimes, such as Solvency I, may apply and restrict the optimal capital structure implied by a pure economic framework.
- Other regulatory requirements may restrict certain structural features of the treaty.
- Ancillary services from a reinsurer (e.g., underwriting or pricing) have a clear value which is not captured by the quantitative framework described.

⁹ The SST requires insurance groups to adopt a group model which explicitly models the intra-group transactions. Solvency II offers insurers a number of options on how to capture the intra-group interactions, some more complex than others, which are outside the scope of this paper.

¹⁰ Technical provisions under Solvency II, or alternatively reserve liabilities or provisions under other regimes.

-
- Estimating claim distribution may not always be reliable, which is an important assumption when risk capital and economic value are being assessed on a distribution basis¹¹.

In short, the 'closed-form' formulation of the reinsurance optimisation problem is normally not practically feasible. Below we describe a practical approach to the problem.

A practical framework for testing reinsurance structures

There is not a 'one-size-fits-all' reinsurance structure that would be optimal for all life insurers. Every insurer is faced with different circumstances, as determined by factors discussed above.

In practice, a trial-and-error approach is typically adopted for testing the impact of alternative reinsurance structures. However, for such an approach to be effective, some structure must be introduced into the decision process to maintain as much objectivity as possible. Such a process might follow the following framework:

Step 1: Define the objectives Understanding the main objectives is critical to the design of the reinsurance structure and a successful outcome. Areas of focus when setting objectives may include financial reporting implications, capital release, maximum acceptable loss, transfer of risks and rewards, volatility management, and/or liquidity enhancements.

Step 2: Identify the candidate portfolio(s) For a diversified insurer with a varied and segmented portfolio, the possibilities for implementing reinsurance solutions will be broad, including the use of internal reinsurance structures to optimise risk diversification and capital.

As an early step in the process, insurers might perform an assessment of their portfolios to identify which are strong candidates to meet key strategic objectives set by management.

An initial assessment of business units or portfolios can offer insights into key target measures, such as value, projected profits, cash flow and capital requirements. Considering the degree of variability in these key measures, at a high level, gives an initial indication of the degree to which actions might yield a suitably rewarding improvement. For example, a portfolio with relatively low value or encumbered capital which is not sensitive to changes in reinsurance coverage will have limited options for performance enhancements through reinsurance. Portfolios which combine large economic values or encumbered capital with large sensitivity might represent the most interesting potential to enhance balance sheet and capital performance.

For each candidate portfolio, more detailed assessment can be made of the scale of benefit which might be obtained from particular reinsurance options and the effort or cost associated with each.

At the same time, the nature and risk profile of the portfolio can influence the availability and perceived value of reinsurance coverage because the appetite of different reinsurers towards different risk types can vary significantly.

¹¹ Risk capital is typically assessed on either a 'scenario basis' (e.g., Solvency II standard formula), where the scenarios represent the risk event at the designated tolerance level; or a 'distribution basis' (e.g., an internal capital model based on distributions) where the risk capital reflects a risk measure, such as the Value at Risk or Tail Value at Risk associated with the designated risk tolerance.

Step 3: Identify and understand the constraints

As described above, there will likely be a number of constraints which will influence the outcome of a particular structure. It is important to understand these constraints and their implications when assessing alternative structures.

In some cases, for example when considering financial reinsurance solutions, it will be important to understand the regulator's view at an early stage in the process to ensure that the desired balance sheet or capital objectives are feasible under the current structure and regulation. It may also be important to understand the auditor's opinion on the accounting implications of a particular structure.

Step 4: Short-list the candidate structures

As mentioned above, candidate structures should be considered in the context of the main objectives. Structures can be as simple or complex as the situation requires and will be tailored to the specific circumstances and needs.

Certain structures should be short-listed for consideration in a detailed quantitative assessment. This requires a good working knowledge of the available solutions and their costs.

At this stage, the insurer will typically approach a reinsurance broker or reinsurers directly and request tenders for the structures being considered. This may or may not involve a competitive bidding process involving a number of reinsurers.

To aid this step, some insurers will have dedicated reinsurance managers who liaise directly with reinsurers on a regular basis. Equally, the reinsurers can advise on possible structures to fit the objectives and the costs of those structures.

Step 5: Quantitative and risk analysis

As mentioned earlier, a key prerequisite for life insurers to quantify alternative reinsurance structures is to have a reliable and robust cash flow projection model that can support objective decision-making, including for new business.

For the candidate structures identified in the previous step, the insurer might evaluate a variety of retention levels, consistent with risk appetite. The actuarial model should offer an impact assessment on the key metrics, e.g., value, capital, cash flows, etc.

Scenario testing, volatility analysis and risk analysis are also key to ensure the robustness of a proposed structure and to avoid certain unintended consequences.

The underlying risks associated with the defined portfolio, such as mortality, persistency or market-related risks, will be a feature of any analysis to some extent. Other risks will also arise, such as counterparty, legal or tax risks. Each structure considered should be subject to a risk analysis, including identification of appropriate mitigation options, if available.

Step 6: Sign-off and approval

On successful completion of the above steps, internal approvals and sign-off will be obtained, thus allowing the insurer to proceed with implementing a new reinsurance structure.

6. Further Detail

This summary report sets out the high-level framework for optimising life reinsurance under economic capital measures.

Our full version of the report can be ordered at www.milliman.com/oplifereport, and includes additional material on the following aspects:

- A detailed numerical case study showing how this approach can be applied to an illustrative portfolio of group life business
- An introduction to new ideas from recent academic research, with the objective of combining new research with a pragmatic approach to structuring reinsurance programs.

ABOUT MILLIMAN

Milliman is among the world's largest independent actuarial and consulting firms. Founded in 1947, the company currently has 56 offices in key locations worldwide employing more than 2,500 people.

Milliman maintains a strong and growing presence in Europe with 250 professional consultants serving clients from offices in Amsterdam, Brussels, Bucharest, Dublin, Dusseldorf, London, Madrid, Milan, Munich, Paris, Stockholm, Warsaw, and Zurich.

milliman.com



CONTACT

For more information, please contact your local Milliman representative, or the authors:

Tatyana Egoshina
tatyana.egoshina@milliman.com
+44 20 7847 1527

Sandra Haas
sandra.haas@milliman.com
+41 44 287 9078

Chris Lewis
christopher.lewis@milliman.com
+44 20 7 847 1536

Scott Mitchell
scott.mitchell@milliman.com
+44 20 7847 1604

Jillian Wood
jillian.wood@milliman.com
+44 121 632 2801

This paper only presents information of a general nature. It is not intended to guide or determine any specific individual situation and persons should consult qualified professionals before taking specific actions. Neither the author, nor the author's employer, shall have any responsibility or liability to any person or entity with respect to damages alleged to have been caused directly or indirectly by the content of this paper.

This paper and any information contained therein are protected by Milliman's copyrights and must not be modified or reproduced without the express consent of Milliman. Copyright © 2013 Milliman.