

MILLIMAN RESEARCH REPORT

# Reinsurance as a capital management tool for life insurers

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## Table of Contents

<b>INTRODUCTION.....</b>	<b>1</b>
<b>STRUCTURE OF THE PAPER.....</b>	<b>1</b>
<b>REINSURANCE UNDER SOLVENCY II .....</b>	<b>2</b>
<b>REINSURANCE AND IFRS .....</b>	<b>5</b>
<b>ASSESSING REINSURANCE FOR CAPITAL MANAGEMENT.....</b>	<b>6</b>
INTRODUCTION.....	6
DECISION PROCESS FOR REINSURANCE IMPLEMENTATION .....	6
EVALUATING REINSURANCE STRATEGIES .....	7
REGULATORY CONSIDERATIONS .....	8
COLLATERAL.....	10
CONCLUSION .....	11
<b>OVERVIEW OF REINSURANCE TYPES IN THE MARKET.....</b>	<b>12</b>
INTRODUCTION.....	12
LONGEVITY RISK REINSURANCE .....	12
MORTALITY AND CATASTROPHE RISK REINSURANCE .....	17
LAPSE RISK REINSURANCE .....	20
FINANCIAL RISK REINSURANCE .....	22
OTHER TYPES OF REINSURANCE .....	24
<b>CAPITAL MANAGEMENT STRATEGIES USING REINSURANCE .....</b>	<b>26</b>
INTRODUCTION.....	26
FICTIONAL INSURANCE COMPANY .....	26
CAPITAL MANAGEMENT STRATEGIES.....	28
CONCLUSION .....	35
<b>APPENDIX 1: OTHER CONSIDERATIONS WHEN IMPLEMENTING REINSURANCE .....</b>	<b>36</b>
<b>APPENDIX 2: CATASTROPHE BONDS .....</b>	<b>39</b>
<b>APPENDIX 3: CHARACTERISTICS PER REINSURANCE TYPE.....</b>	<b>40</b>

## Introduction

Life insurance companies face multiple risks that evolve over time and they must hold capital as a buffer against these risks. Capital management is an increasingly important topic for insurers as they look to find ways to manage their risks and the related capital requirements and to optimise their solvency balance sheets. Given the traditionally long-term nature of the insurer's liabilities, effective capital management can be complex. Insurers may face capital pressure due to their solvency coverage level, shareholder demands, regulatory concerns etc. Capital pressures have increased for many firms in recent years due to the continuing downward trend of interest rates to historic lows. Finally, the increasing presence of private equity in the life insurance market further pressures incumbents to create value themselves.

Reinsurance is one of the key capital management tools available to insurers. Several reinsurance structures are available, each with its own advantages and disadvantages and requiring experience and expertise to make optimal decisions. We have therefore prepared this research paper exploring a range of reinsurance strategies that could be utilised by life insurers for capital management purposes. In this paper we investigate more common reinsurance strategies, along with new developments and innovative strategies that could be implemented by companies.

Whilst we explored strategies used both inside and outside of Europe, we have given most of our focus in this paper to strategies of relevance within Europe and, therefore, that are subject to Solvency II capital considerations. Many other jurisdictions are subject to similar risk-based capital regimes, for instance Australia (Life and General Insurance Capital [LAGIC] framework), Hong Kong (Dynamic Solvency Test) and Switzerland (Swiss Solvency Test). Conclusions that hold for life insurers subject to Solvency II are therefore also broadly useful for insurers in other jurisdictions with risk-based capital regimes.

Apart from capital management, there are of course other benefits and consequences of reinsurance. Several considerations need to be made when implementing a reinsurance structure, and alternative capital management actions might sometimes prove to be more effective. As the main focus of this paper is on capital management, we only touch upon some of these considerations, with particular focus on the most important areas such as regulatory challenge, collateral and operational aspects of reinsurance.

We have used our own experience and expertise across Milliman, as well as holding discussions with a range of reinsurers, in order to determine the strategies to include and the considerations to focus on. We would like to thank these companies for their participation in our study.

We have written this paper from a life insurer's perspective.

## Structure of the paper

We begin the paper by giving an overview of the Solvency II requirements that need to be met for a reinsurance cover to be recognised as a risk-mitigating technique that effectively transfers risk, and therefore can be used as a capital management tool. Furthermore, we outline potential impacts of reinsurance on the balance sheet, profit and loss (P&L) account and capital requirements. These impacts are important when determining which reinsurance strategy to implement and what the impact on the insurer's business is.

Life insurers are not only subject to solvency regimes but also other financial reporting frameworks, such as International Financial Reporting Standards (IFRS). In practice, insurers will assess impacts on reporting profitability in addition to balance sheet optimisation when considering the implementation of reinsurance strategies. Although the focus of this paper is on capital management, we also give a brief overview of parts of the IFRS 17 Standard that affect reinsurance contracts and which insurers should consider.

We then discuss considerations for the insurer when opting for a reinsurance arrangement for capital management purposes. They not only cover financial impacts but also considerations such as regulatory approval, collateral management and other operational aspects of reinsurance.

Using these considerations, we then finally provide a detailed analysis of reinsurance arrangements an insurer could consider in its capital management plans, breaking this analysis down by risk type. We discuss various business strategies where reinsurance can be used, and their consequences. For the most common strategies, we do this by introducing a fictional life insurance company and showing the impact of reinsurance on its value. These sections form the bulk of the output from our research.

## Reinsurance under Solvency II

Reinsurance strategies considered in this paper are generally limited to strategies that effectively transfer risk. Previous solvency frameworks such as Solvency I allowed insurers, to a certain extent, to implement reinsurance structures that would materially lower capital requirements whilst minimising the risk transferred to the reinsurer. A minimum risk transfer implied a low reinsurance premium and, as a result, capital requirements were lowered under those frameworks with almost no impact on the P&L account.

Current solvency capital frameworks such as Solvency II do not typically allow for these artificial risk transactions. To be effective, and in order to lower its capital requirement or stabilise earnings, the insurer needs to transfer a sufficient amount of risk. The reinsurance cover should not be applied opportunistically but, instead, be part of a more sustainable reinsurance program.

Solvency II imposes several requirements for reinsurance treaties to be used as capital management tools, particularly for companies using the Standard Formula (SF). Below, we firstly provide a brief overview of the impact of reinsurance arrangements on the Solvency II balance sheet and P&L. We then highlight some important requirements for recognising reinsurance arrangements in the Solvency Capital Requirement (SCR) and look at other risks introduced.

### Reinsurance and the Solvency II balance sheet

#### Assets and liabilities

Reinsurance affects the insurer's Solvency II balance sheet on both the asset and liability side. It is important for the insurer to understand the dynamics between them before deciding on whether to implement reinsurance and how to use reinsurance as a capital management tool. The Technical Provisions under Solvency II for most liabilities<sup>1</sup> consist of a best estimate liability (BEL) and a risk margin. The BEL is calculated gross of any reinsurance arrangements.

The impact of the reinsurance cover on the best estimate cash flows is instead shown separately on the insurer's balance sheet as a reinsurance asset. This asset represents the present value of the recoverables less premiums from the reinsurance arrangement. These recoverables should be corrected for the timing of payments from the reinsurer to the insurer and for probability of default and loss given default in the event the reinsurer defaults at some point during the lifetime of the reinsurance contract.

The risk margin is calculated net of reinsurance, to the extent that particular reinsurance arrangements are eligible as risk mitigants in the SCR (as explained further below). Please note that the risk margin net of reinsurance does include counterparty default risk of the reinsurance agreement.

#### Capital requirements

The SCR is calculated net of reinsurance arrangements, subject to meeting the requirements noted in the next section. It is important to note that the overall SCR in Solvency II allows for diversification benefits between individual risks net of reinsurance. In general, it therefore holds that the more the insurer's portfolio is diversified, the less the impact a reinsurance arrangement will have on the overall SCR (as the reinsurance cover will reduce the SCR for one or more risks but also reduce the diversification benefit).

In addition, Solvency II allows for diversification benefits between counterparties. Splitting the reinsurance cover across multiple counterparties therefore lowers the capital requirement for counterparty default risk as a whole and potentially the overall SCR as well.

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<sup>1</sup> For some liabilities meeting specific criteria, 'Technical Provisions as a whole' can instead be calculated.

## Recognition and effectiveness of the reinsurance cover

For a reinsurance cover to be used as a capital management tool in Solvency II, the cover should be recognised as a risk-mitigating technique and, dependent on the use of the cover, should allow for effective risk transfer. Solvency II imposes several requirements for this to hold for SF companies, as outlined in Articles 208 to 215 of the Solvency II Delegated Regulations.<sup>2</sup> While these requirements do not technically apply to internal model firms, in practice many of the themes are expected to be broadly applicable.

### Domicile and jurisdiction of the insurer and reinsurer

The contractual arrangements between insurer and reinsurer must be legally effective and enforceable in all jurisdictions relevant to the contract (Article 209). Contracts cannot contain conditions outside the direct control of the insurer or reinsurer, or connected transactions related to the cover that could undermine the effective transfer of risk (Article 210).

The jurisdiction of the reinsurance company is important when closing a reinsurance deal for several reasons because reinsurers are only eligible for an effective reinsurance cover if they are:

- Situated in the European Union and comply with the SCR
- Third-country reinsurers situated in a country whose solvency regime is deemed equivalent or temporarily equivalent to Solvency II and which comply with the solvency requirements of that third country
- Third-country reinsurers, not situated in a country whose solvency regime is deemed equivalent or temporarily equivalent to Solvency II, with a credit quality of at least BBB-

If the reinsurer is situated in a country whose solvency regime is less onerous than Solvency II, the reinsurance premium it can charge might be lower compared to its European Union counterparts. On the other hand, counterparty default risk capital requirements may be higher. As such, there is a trade-off between reinsurance premium and capital requirements.

Supervisors may also only partially recognise the protection offered by reinsurance (Article 211). This is for instance the case when the reinsurer ceases to comply with the SCR after the insurer has entered the reinsurance contract. In this case, the protection offered by the contract may only be partially recognised for a period up to six months in case it is likely that the reinsurer shall restore compliance with the SCR within this period of time. The effectiveness of the reinsurance contract is reduced by the percentage by which the SCR is breached by the reinsurer.

### Duration of the cover

Solvency II uses a one-year time horizon to determine its capital requirements. Article 209 states that only reinsurance in force for at least the next 12 months can be fully used to obtain capital relief. Reinsurance that is in force for less than 12 months can only provide proportional relief unless it is replaced with a similar arrangement at expiry.

For this replacement arrangement it should hold that replacement does not take place more often than every three months in case a reinsurance contract is used for the risk transfer and one month in case of a financial instrument.

The replacement arrangement is not conditional on any future event which is outside of the control of the insurer or reinsurer, is realistic based on replacements undertaken previously, is consistent with the insurer's current business practice and business strategy, does not contradict future management actions and has no material risk of not being replaced due to an absence of liquidity in the market.

Finally, an adjustment or replacement to the arrangement can only take place more often than once per week if it prevents an event leading to a material adverse impact on the solvency position from happening.

### Other requirements

Besides the jurisdiction of the reinsurer and the duration of the cover, Solvency II imposes several other requirements for the reinsurance cover. They range from monitoring of risks related to the cover to transaction documentation. There should also not be any material basis risk arising from the arrangement.

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<sup>2</sup> Commission Delegated Regulation (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

## Basis risk and counterparty default risk

Although reinsurance covers can be used to mitigate risk, they also introduce new risks, the main ones being basis risk and counterparty default risk. For a reinsurance cover to be an effective capital management tool, these risks would ideally be kept to a minimum.

### Basis risk

Basis risk is the risk that remains when the reinsurance cover or risk-mitigating technique provides an imperfect hedge to the risk the insurer wants to transfer. If, for instance, an insurer has mortality risk in its portfolio and wants to hedge this risk using mortality bonds, basis risk arises from this hedge to the extent that the mortality index underlying the mortality bonds differs from the insurer's portfolio mortality. As a result of this difference, not all portfolio losses will be covered by these bonds and the remaining risk is called basis risk.

Regulators have put increased emphasis on this risk in their approval processes for reinsurance arrangements. Basis risk is considered material under Solvency II if it leads to a misstatement of the risk-mitigating effect on the insurer's Basic SCR that could influence decision-making or judgement, including that of the supervisory authorities (Article 211). The European Insurance and Occupational Pensions Authority (EIOPA) Q & As, although not legally binding, outlined an example of guidelines for basis risk. The relevant Q & A addressed whether basis risks should be reflected in the SF SCR. EIOPA concluded that the risk-mitigating effect on capital cannot be reduced to reflect basis risk. Therefore, a risk-mitigating technique should either be reflected fully in the SCR or not at all, depending on whether the criteria on material basis risk (and other criteria) is met. There is no scope for a middle ground of partial reflection in the case of basis risk.

### Counterparty default risk

Counterparty default risk is related to the possible default of the reinsurer and impacts the insurer in two ways under Solvency II. Firstly, there is the possibility that the insurer will not receive back all future reinsurance recoverables if the reinsurer were to default. Expected losses due to reinsurer default need to be allowed for by reducing the reinsurance recoverables on the balance sheet, thus impacting the own funds of the insurer. Second, the default risk can reduce the effectiveness of the reinsurance cover in the calculation of required capital and own funds (through the risk margin). Less risk may be transferred from the insurer's balance sheet overall, leading to higher capital requirements. Counterparty default risk can be partially offset by collateral arrangements and guarantees.

The capital to be held for counterparty default risk is also dependent on the credit rating of the reinsurer and the capital regime it is subject to. In general, the lower the credit rating of the reinsurer, the higher the capital requirement of the insurer under Solvency II.

In countries such as the United Kingdom (UK) and the Netherlands, the regulator has also placed a lot of emphasis on counterparty limits to assess how an insurer's solvency is impacted if the reinsurer fails and the insurer is forced to recapture the risk. Even if the insurer gets a full recovery, typically the SCR and risk margin then increase due to the recaptured risk. The UK regulator sees this as different from counterparty default risk capital.

### Standard Formula appropriateness

Solvency II allows insurers to use the SF to calculate the SCR. The SF aims to capture the risk that an average European (re)insurance company is exposed to. However, the SF is not appropriate for all (re)insurance companies. (Re)insurers are required to assess this appropriateness periodically if using the SF.

Implementing a reinsurance cover can have consequences for this appropriateness testing. If, for example, a substantial block of business is reinsured through one counterparty, one might argue whether the default stresses prescribed by the SF are still appropriate to reflect the insurer's risk profile. A more detailed description of the SF appropriateness testing—including counterparty default risk—can be found in a separate Milliman white paper.<sup>3</sup>

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<sup>3</sup> Clarke, S., Hoogewerff, S., & van der Kamp, R. (June 2017). Judging the Appropriateness of the Standard Formula Under Solvency II. Milliman White Paper. Retrieved 28 June 2020 from <https://www.milliman.com/en/insight/judging-the-appropriateness-of-the-standard-formula-under-solvency-ii>.

## Reinsurance and IFRS

The new IFRS accounting standard for insurance contracts, IFRS 17, is expected to have an effective date of 1 January 2023. This will change the accounting treatment of reinsurance contracts under IFRS reporting. IFRS 17 requires a reinsurance contract to be accounted for separately from the underlying insurance contract, which hasn't previously been the case under IFRS 4.

Both insurance contracts and reinsurance contracts held will have a separate Contractual Service Margin (CSM), which is a balance sheet item and a mechanism to spread profit over the lifetime of the contract.

The separate accounting treatment of reinsurance and insurance contracts will mean that there may be earnings volatility due to mismatches between the accounting treatment of insurance contracts and reinsurance contracts.

Accounting mismatches may occur in areas such as:

- The underlying insurance contracts and reinsurance contracts may have different terms which may lead to different measurement models being used to value insurance and reinsurance contracts. If the coverage period of a reinsurance contract is one year or less it may also be possible to model the reinsurance contract under the premium allocation approach. A mismatch will occur if the underlying insurance contracts are modelled using the general measurement model.
- Differences in contract boundaries between reinsurance contracts and the underlying insurance contracts. Reinsurance contracts often have cancellation clauses where contracts can be cancelled prematurely, leading to instability in financial results.
- Aggregation of contracts into units of accounts may also differ between insurance and reinsurance contracts. Insurance contracts may only be aggregated into cohorts that are inceptioned no more than one year apart whilst reinsurance contracts may cover many years of insurance contracts.
- Coverage units used to allocate the CSM over an accounting period may differ between the underlying insurance contracts and the reinsurance contracts, which may result in differences in the timing of profit and loss recognition.
- The CSM of the reinsurance contract can be both positive and negative but the CSM for an insurance contract must be positive or floored at zero. Losses from onerous groups of insurance contracts are recognised immediately in the P&L. Onerous reinsurance contracts can have a negative CSM which is spread over the lifetime of the reinsurance contract. This can lead to an accounting mismatch between the reinsurance contracts and the reinsured portfolio.
- Inception dates of reinsurance and reinsured portfolios often differ as reinsurance is taken out after insurance contracts have been written. This will lead to different locked-in rates being used to value contracts, leading to a mismatch in finance income and expenses.
- The separate presentation of insurance and reinsurance contracts can lead to balance sheet accounting challenges. The Risk Adjustment is the compensation that an entity requires for bearing the uncertainty about the amount and timing of nonfinancial risks. The Risk Adjustment of the reinsurance contract is not netted against the Risk Adjustment of the underlying insurance portfolio. This leads to the question of how to allocate diversification benefits to the reinsurance contract.

As a result of changes in financial reporting impacts, including possible additional earnings volatility, some insurers may require some elements of reinsurance treaties to be commuted or rewritten where possible to remove some of this earnings volatility. This will affect both internal and external reinsurance contracts and will depend on the reinsurance treaty terms.

As insurers develop familiarity with IFRS 17 reporting requirements, their appetite for reinsurance solutions will evolve.

Insurers taking out new reinsurance contracts for capital relief should also consider the impact on financial reporting in addition to capital optimisation.

## Assessing reinsurance for capital management

### Introduction

As mentioned in the introduction, reinsurance is one of the tools that can be used to deal with the current market challenges, such as low interest rates, decreasing profit margins and increasing capital requirements (due to interest rates). It is important though to realise that every capital management action comes with its trade-offs. Implementing a reinsurance cover not only mitigates risk but also impacts the P&L through reinsurance premiums, changes in net policyholder claims and, in some cases, reductions in asset returns.

One example is the implementation of a quota-share treaty on a block of in-force business. Such a cover can lead to a material reduction in capital requirements. However, the operating income can also take a hit as one loses the profits associated with ongoing management of the business.

Before discussing reinsurance types and strategies in the market, we therefore first provide an overview of areas to consider when assessing a reinsurance arrangement intended to be used as a capital management tool.

### Decision process for reinsurance implementation

Insurers can choose between several reinsurance strategies, each with its own trade-offs. Before deciding on which one to implement, it is important to decide:

1. What Key Performance Indicators (KPIs) and Key Risk Indicators (KRIs) the company wants to improve using the reinsurance strategy. Examples of KPIs are return on capital, stable dividend payments, new business growth and operating profit. Examples of KRIs are the solvency coverage ratio, liquidity of the portfolio, credit exposures and capital requirements.
2. What the trade-offs of the strategy are and whether they are acceptable.
3. How these trade-offs evolve during the run-off period of the insurer's portfolio.

If an insurer is well capitalised—there is enough capacity to write new business, volatility in the coverage ratio does not cause serious issues and the company favours a higher profit margin over lower and/or more stable capital requirements—then the need for capital management actions might be less urgent. This does not mean that reinsurance strategies are completely out of the picture. Instead, the company can take preemptive measures by putting capital management actions in place to prepare for situations where the coverage ratio is not at comfortable levels.

An example of such a preemptive measure is a so-called 'just-in-time' reinsurance cover. Here, the insurer implements a reinsurance treaty with minimal risk transfer that can be scaled up relatively easily and quickly when needed, because most of the preparations required for the scaled-up treaty have already been carried out as part of the initial due diligence process.

Therefore, a fourth factor to include when deciding on capital management action relates to timing:

4. When to implement the capital management action.

Based on the answers to these questions the board of an insurer can decide on which reinsurance cover and strategy to implement. It is important to reach this conclusion in the early stages of the process as due diligence of the reinsurance implementation can require quite some time and resources.

## Evaluating reinsurance strategies

When deciding on which reinsurance strategy to implement, the abovementioned key areas of consideration can be broken down further into the following characteristics. We will use these throughout the paper to evaluate the reinsurance covers and strategies considered.

### Capital requirement considerations

1. **Impact on required capital:** An effective reinsurance cover transfers risk from the insurer's balance sheet, generally lowering the capital requirement for the risk transferred. The overall impact on required capital depends on the (i) amount of risk transferred, (ii) diversification benefits, (iii) additional risk introduced by the reinsurance cover and (iv) basis risk.
2. **Additional risk introduced:** Additional risks might be introduced by the reinsurance cover, requiring the insurer to hold capital against them. Examples are (i) counterparty default risk, (ii) expense risk due to a changing expense basis and (iii) a loss in diversification benefits.  
Counterparty default risk can be substantial, depending on the credit rating and scope of the treaty. This can even lead to the Solvency II SF not being appropriate to capture the counterparty default risk.  
Additional capital buffers might be required in this case to protect the insurer against adverse scenarios such as a downgrade of the reinsurer in combination with a decrease in interest rates. These buffers can be substantial and additional mitigation might have to be put in place.
3. **Renewals required:** In cases where reinsurance covers are short-term (e.g., five years) there can be a duration mismatch compared to the liabilities. This requires the cover to be rolled forward at maturity. Replacements can impose additional risks due to, for instance, the absence of liquidity in the market or increased reinsurance costs. This might cause an issue for recognition as a risk mitigation technique as per the requirements under Solvency II.

### P&L considerations

4. **Cost of reinsurance:** Implementing a reinsurance cover leads to several additional costs:
  - (i) A premium is to be paid to the reinsurer. This premium includes a margin that reduces the expected profitability of the insurer.
  - (ii) Collateral can be required to mitigate against counterparty default risk of the reinsurer, leading to additional costs such as letter of credit fees.
  - (iii) Administration costs might be introduced. The insurer for instance might need to provide the reinsurer with data on a regular basis and valuation and financial reporting needs to be adjusted for the reinsurance cover.
  - (iv) The reinsurance contract might lead to additional regulatory reporting such as assessing the effectiveness of the cover in the Own Risk & Solvency Assessment (ORSA).
5. **Capital generation:** The insurer's capital generation is impacted through both the required capital and own funds. Generally, the reinsurance cover leads to an increase in solvency coverage ratio, unlocking capital that can be used to further improve the capital generation, for instance by re-risking the asset portfolio, improving the return on equity. Furthermore, the transfer of risk can lead to a release in risk margin, increasing the own funds further.  
On the other hand, the reinsurance cover might be ceding away profitable business. Additional costs introduced by the cover decrease the profitability even further. This is exacerbated in the case assets are involved in the risk transfer, as it leads to a lower overall return on assets. This can be partially offset when the cover is on a 'deposit back' basis.
6. **P&L volatility:** Transferring risk potentially reduces the overall volatility on the insurer's P&L. This volatility might reduce further in case the risk margin decreases, lowering the interest rate sensitivity on the insurer's balance sheet. However, less risk might decrease diversification, partially offsetting this decrease. Also, in some reinsurance structures the insurer does not retain control over part of its assets and, therefore, has fewer possibilities to use these assets for interest rate and inflation hedging strategies.

**7. Timing and amount of dividend:** An insurer is usually only allowed to pay out dividend where the solvency coverage ratio exceeds a certain threshold. Increasing the solvency coverage ratio therefore enables the insurer to pay out dividends earlier, increasing the value of the company.

In cases where the reinsurance cover leads to a decrease in capital generation, the total amount of dividends paid decreases. As such, there is a trade-off between timing and the amount of dividends to be considered when implementing a reinsurance strategy.

#### Implementation and approval of the reinsurance cover

- 8. Time required to implement the arrangement:** The due diligence phase of a reinsurance agreement can be a lengthy process. Extensive portfolio analysis is required, policy and claims administration might need to be changed to be able to exchange, for instance seriatim data and death certificates. and regulatory approval is needed. This can all lead to increasing transaction costs, increasing the price of the strategy.
- 9. Flexibility of the arrangement:** Reinsurance covers can span many years, even decades, and due to the evolving nature of an insurer's business a reinsurance deal might become suboptimal in the longer run. Optionality to change or dissolve the reinsurance contract could therefore be considered.
- 10. Availability:** For a strategy to be effective it is important that there is sufficient liquidity in the market for the insurer's risk to be transferred, that there are enough reinsurers available in the market willing to take on this risk and that the solutions offered guarantee an effective risk transfer.
- 11. Regulatory approval:** One of the key hurdles ahead of implementing a reinsurance arrangement is getting regulatory acceptance or buy-in. We observe that regulators are generally keen to see reinsurance arrangements involving a genuine transfer of risk, as opposed to companies effectively looking to reduce capital requirements using regulatory arbitrage.

Obtaining regulatory approval can be challenging and introduces further expenses. In cases where the regulator only partially recognises the risk transfer, the reinsurance treaty becomes less capital-efficient.

In the sections below we provide more detail on regulatory considerations and collateral backing the reinsurance contract. Appendix 1 outlines some other considerations such as termination options and operational aspects.

## Regulatory considerations

Demonstrating that the reinsurance deal is genuinely used as a risk-mitigating technique as part of the firm's overall risk strategy is key for regulatory approval. Engaging with regulators early in the process is important especially when considering reinsurance contracts that are highly bespoke in nature.

Demonstrating enhanced policyholder protection is also paramount for most regulators. The main criteria for accepting reinsurance transactions that a regulator will look to see are:

- A clear business rationale for implementing a reinsurance deal.
- A strong understanding of the risks that are being transferred, the risks that remain and any new risks that emerge as part of the transfer, particularly counterparty risk. There is not necessarily a need to have reinsurance every component of the risk but a clear understanding of what is and is not transferred is imperative. Furthermore, a genuine transfer of risk is expected to take place rather than arbitraging regulations to reduce capital requirements.
- A low level of basis risk and a clear understanding of this basis risk.
- Clear analysis and consideration of different possible outcomes, including scenarios where the reinsurance may not be effective.
- A financially strong (and preferably large) counterparty and stringent security in the arrangement, particularly using collateral or other risk-mitigating measures. The reinsurer's jurisdiction may also be relevant to the regulator.
- Regulators are sometimes keen to see that assets transferred as part of a reinsurance transaction are held in local custodian accounts. This is very relevant for insurers that are considering entering into reinsurance deals with reinsurers that operate outside of their jurisdictions.
- Recapture plans in case of reinsurer financial distress or default.

The above criteria are all things that are important to most insurers as part of their internal governance and risk management in any case. Early engagement with regulators is often the best way to achieve a positive outcome in terms of getting regulatory buy-in for a material new reinsurance arrangement.

### **Concentration risk due to reinsurance**

All insurers are aware that entering into a reinsurance transaction may introduce counterparty default risk in the case where the transaction is not fully collateralised. Where an insurer reinsures to a single or relatively few counterparties, the insurer can be exposed to a significant concentration of counterparty default risks. Both the UK regulator Prudential Regulation Authority (PRA) and the Dutch regulator De Nederlandsche Bank (DNB) have highlighted their expectations that an insurer consider concentration risks when making extensive use of risk transfer through reinsurance. If a significant level of risk is transferred, the regulators expect insurers to consider the impact of the concentrations of risk on their risk management systems. This is important when the risk exposure to a reinsurer has a loss potential which is large enough to threaten the company's solvency position.

Reinsurers often use retrocessions to manage their reinsured risks. DNB has also specified that insurers must monitor retrocessions of risk by the reinsurer if the retrocessions have a significant impact on the effectiveness of the reinsurance contract. If this retrocession introduces basis risk or other risks that are not reflected in the SF calculation of the SCR, the reinsurance contract does not qualify as a risk mitigation technique.

DNB requires insurance companies to have policies relating to the management of concentration risk within reinsurance as part of their risk management systems.

Risk management processes should therefore include the following:

- Analysis by the insurer to ensure the appropriateness of reinsurance selected.
- Determination of the appropriate types of reinsurance for the risks ceded and to what extent the insurer can manage and control the risks associated with the selected reinsurance techniques.
- The insurer's own assessment of the credit risk including the effect of concentration risk as part of their reinsurance exposures.

### **Risk margin magnitude of losses in the event of default by the insurer**

If a reinsurer defaults, the insurer is fully exposed to all the underlying risks previously covered by the reinsurance contract. The reinsurance contract no longer qualifies as a risk mitigation technique and thus the SCR increases as a result. As the SCR increases so too does the risk margin, as it is calculated as the present value of the cost of capital arising from future expected solvency capital requirements.

Even if the insurer is entitled to the full best estimate value of reinsurance receivables upon dissolution of the reinsurer, there is still an overall solvency balance sheet loss due to the increase of the risk margin. As the insurer is no longer required to pay future reinsurance premiums due to the default, the increase in the risk margin may be partially offset by the future premiums.

The counterparty default risk module excludes the risk margin from the calculation. DNB has said that if the risk related to the risk margin increase is material then the reinsurance contract may not qualify as a risk mitigation technique under Solvency II.

### **Reinsurance and the Actuarial Function**

The Actuarial Function opines on the reinsurance contracts entered into by the insurer. The Actuarial Function will opine on the adequacy of the reinsurance arrangements of the insurer, examining areas such as the following:

- The extent of risk transfer associated with the arrangements
- The calculation of reinsurance recoverables and the impact on own funds over time
- Counterparty risk associated with the reinsurers involved
- The sufficiency of collateral for material reinsurance arrangements
- Reinsurance coverage under stress scenarios
- Consistency of reinsurance arrangements with risk appetite, underwriting policy and Technical Provisions

The above is far from an exhaustive list of considerations. The Actuarial Association of Europe has published guidance on this subject,<sup>4</sup> as have some individual regulators, including the Central Bank of Ireland, which has published extensive guidance.<sup>5</sup>

There are many other considerations for an insurer in seeking and subsequently implementing a reinsurance transaction. While a number of them are specific to particular companies or particular types of reinsurance transactions, there are some key themes that are usually applicable. We have explored the most material ones in this section, in addition to highlighting some additional benefits of reinsurance in an earlier section of the paper.

## Collateral

Many reinsurance transactions are collateral-backed to mitigate against counterparty default risk of the reinsurer. The amounts of collateral required to back the reinsurance transactions will depend on the type of reinsurance and the reinsurer's creditworthiness. There are several different types of collateral which may be used to back reinsurance transactions, including:

- Letters of credit
- Funds withheld
- Trust arrangements
- Cash or other securities
- Other assets, such as those that directly back the liabilities
- Other third-party sureties

The quality of collateral is a very important component of a reinsurance arrangement and is sometimes the most critical part, particularly for asset-intensive reinsurance. Therefore, collateral typically requires significant focus as part of the treaty negotiations. It is important to set strict limits and investment guidelines on the collateral account when financial investments are involved. It is also important for an insurer to understand how any remaining uncollateralised exposure can move over time and under different possible scenarios.

There are various requirements in the Solvency II regulation to be met in order for collateral arrangements to be recognised in the SCR calculation. Some of the key ones are that the insurer should have access to the collateral assets in a timely manner in the event of default, that the collateral should provide protection by being of sufficient credit quality and stable in value and that the value of the collateral should not be materially dependent on the credit quality of the counterparty. Collateral invested in fixed income can for instance be highly correlated with the credit risk of the counterparty. If this is the case, the collateral placed will not effectively mitigate the counterparty default risk. These requirements can be quite onerous in practice, further emphasising the need for careful consideration as part of the treaty negotiations and design.

It is often desirable by insurers and/or by regulators that collateralised assets do not leave the jurisdiction in which the insurers are domiciled. This is typically possible through the use of custodians operating in the insurer's home territory.

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<sup>4</sup> See [https://actuary.eu/documents/2016\\_01\\_31\\_ESAP2\\_final\\_GA-approved.pdf](https://actuary.eu/documents/2016_01_31_ESAP2_final_GA-approved.pdf).

<sup>5</sup> See [https://www.centralbank.ie/docs/default-source/Regulation/insurance-reinsurance/solvency-ii/requirements-and-guidance/guidance-for-\(re\)insurance-undertakings-on-head-of-actuarial-function-role.pdf?sfvrsn=4](https://www.centralbank.ie/docs/default-source/Regulation/insurance-reinsurance/solvency-ii/requirements-and-guidance/guidance-for-(re)insurance-undertakings-on-head-of-actuarial-function-role.pdf?sfvrsn=4).

## Conclusion

Overall, the effectiveness of using reinsurance as a capital management tool is dependent on the reinsurance premium charged and the amount of capital required for counterparty default risk. If both are too high, the benefits of the reduced SCR, risk margin on both in-force and new business do not outweigh the reductions in future capital generation.

The reinsurance premium and counterparty default risk are dependent on many factors, but two main ones are the size of the block of business reinsured and the credit rating of the reinsurer.

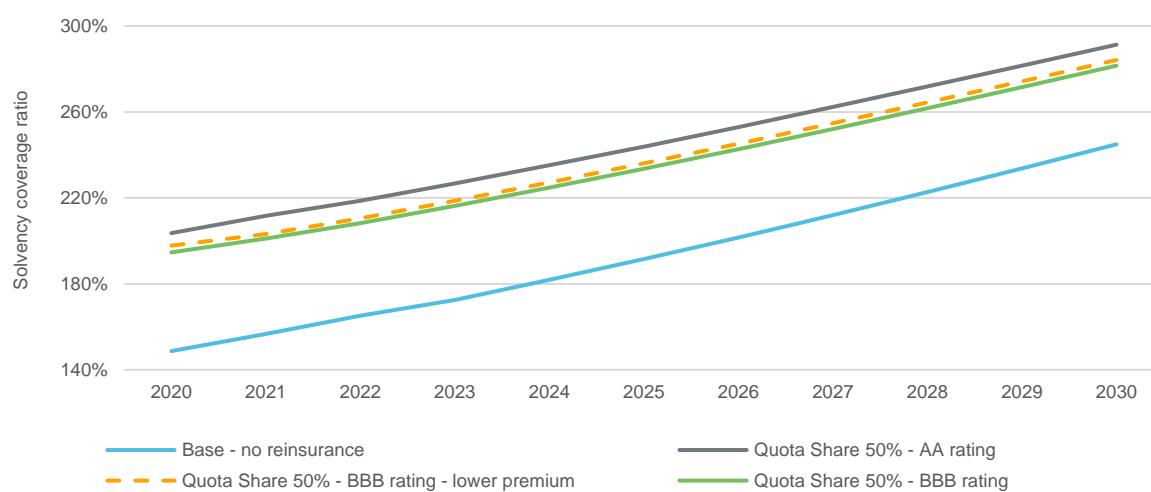
- Reinsurers can offer lower premiums where bigger blocks of business are reinsured. A downside to this is that the exposure to the reinsurer also increases, leading to a higher capital requirement for counterparty default risk.
- A lower credit rating enables a reinsurer to offer lower premiums because they have to hold less capital on their balance sheets. A lower credit rating also requires the insurer to hold more capital for counterparty default risk.

Most reinsurers are domiciled in several jurisdictions with their own capital regimes and credit ratings. As a result, they are able to offer multiple quotes. The insurer therefore has the option to choose between a high premium and low capital requirement and vice versa. It depends on the target of the insurer's capital management strategy which of the two options is the most effective.

One point to note though is that regulatory approval for the reinsurance treaty is generally easier to obtain when the reinsurer has a higher credit rating and is domiciled in the same jurisdiction as the insurer.

Figure 1 shows examples of the solvency coverage ratio of an insurer when implementing a quota-share treaty with different credit ratings and premium levels. As can be seen, the solvency coverage ratio decreases with a lower credit rating. This decrease is partially offset when a lower reinsurance premium is charged.

*Figure 1: Projected solvency coverage ratios*

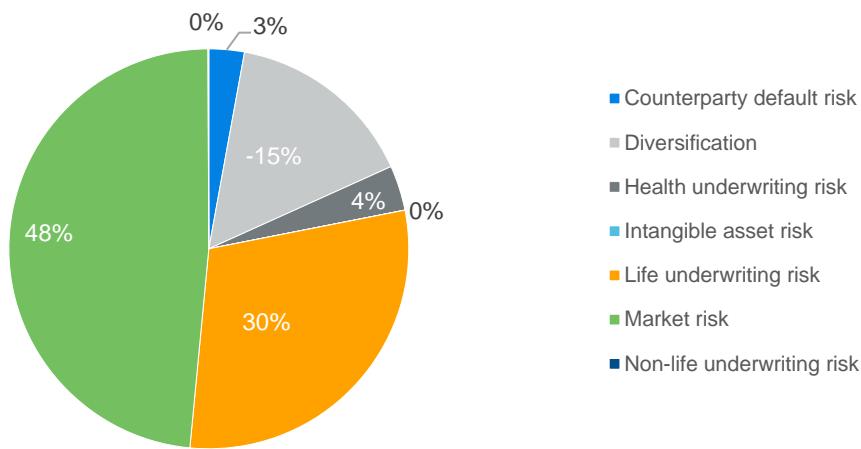


## Overview of reinsurance types in the market

### Introduction

If we look at the reported Solvency II capital requirements for European life insurers per year-end 2018, we see that the capital requirements for market risk and life underwriting risk make up the vast majority of the total. Figure 2 shows the composition of European life insurers by module for solo undertakings using the Solvency II SF, categorised as life undertakings, per year-end 2018. The main life underwriting risks are longevity risk, mortality risk, catastrophe risk and lapse risk. Reinsurance can be used to mitigate these risks.

*Figure 2: Basic SCR Composition of European Life Insurers (EUR billions)<sup>6</sup>.*



When covering reinsurance in respect of different risks in the upcoming sections, we refer to some common reinsurance structures such as quota-share, surplus and excess-of-loss reinsurance and catastrophe bonds. We have assumed they are familiar to most readers and have not explained the structures and their advantages and disadvantages in detail in this paper. We have included more detail on catastrophe bonds in Appendix 2 for any readers interested.

In the sections below we cover the reinsurance treaties at a high level. It is important to realise that, in practice, reinsurers often compete on different deal structures as some work better than others for different reinsurers. Insurers can shop around for a solution that best meets their particular needs. Reinsurers cannot usually apply underwriting judgement for each case, even though they might have entries into the ceding company's account at periodical intervals. In line with this, not all structures are suitable for new insurance companies.

### Longevity risk reinsurance

#### Introduction

Longevity risk is the risk that members of a pension plan or annuitants will live longer than expected. Life spans are generally lengthening, albeit recently at a slower rate in developed countries, due to external factors such as healthier lifestyles, improvements in medical care and breakthroughs in medical sciences. (Obviously, the recent COVID-19 pandemic is partially offsetting these improvements, at least in the short term.) This poses a risk for insurers, though, because an increasing life span also implies having to pay out annuity benefits for longer.

For pension funds and pension insurers, longevity risk can be substantial. High capital requirements, reflecting this risk, is a key reason for insurers looking to de-risk longevity exposures. Many of those companies look to retain some of the risk for an acceptable capital requirement.

<sup>6</sup> European Insurance Overview 2019: Solo undertakings – year-end 2018.

Longevity risk can form a natural hedge with mortality risk. Insurers and reinsurers can therefore use their longevity risk as an offsetting hedge for their mortality risk portfolios and vice versa. In practice, the effectiveness of this natural hedge depends to a large extent on the mortality and longevity bases that are used. The Solvency II SF, however, does assume negative correlation between the two. Transferring longevity risk between parties can therefore benefit both. If, for example, the insurer mainly has longevity risk and the reinsurer mortality risk, then transferring part of the longevity risk from the insurer to the reinsurer creates a more balanced risk profile for both parties, lowering their aggregate capital requirements.

Longevity risk is often transferred between parties using reinsurance, or via a longevity swap. An important prerequisite for such a transfer is that there are parties in the (re)insurance market large enough to absorb the risk. In the future, this prerequisite might not be satisfied. The amount of longevity risk held by pension funds and insurers is growing as life expectancies lengthen. In case (re)insurers cannot absorb this risk anymore, capital markets are required as a destination for longevity risk to be transferred to. This can be a solution if there is sufficient liquidity in the market to transfer longevity risk.

Nonetheless, there is a very active longevity de-risking market across the world. As for most risks, reinsurers offer a continuum of possible solutions in respect of longevity risk. These solutions can involve handing over all the longevity risk in respect of a book of business, ceding a certain proportion of the longevity risk, or retaining most of the risk except for the tail of the risk. This range of structures allows a company to retain the portion of the risk it is comfortable with.

### Determining longevity risk

Determining the longevity risk for an insurer's portfolio can be subject to a substantial amount of expert judgement. Longevity risk is driven by two factors:

1. An estimation error based on base mortality rates. This generally occurs in cases of smaller populations or poorly represented age groups.
2. Mortality improvement or trend. The mortality improvement is non-diversifiable as it affects the whole portfolio and thus cannot be managed using the law of large numbers. The mortality trend differs between generations, socioeconomic groups and region.

Particularly for smaller portfolios, it can therefore be difficult to set robust assumptions for these risks. This is important to keep in mind when deciding on the method to transfer the risk. Determining the expected mortality improvement is part of the due diligence process. Furthermore, some of the longevity risk transfer methods available make use of a standardised index, where the experience is monitored against a notional index rather than the specific underlying portfolio. Applying such a transfer might result in basis risk that should be assessed and monitored on an ongoing basis.

### Overview

In the remainder of this section we show an overview of the longevity risk transfers available in the market, summarised in the table in Figure 3. A more complete overview of these and other reinsurance covers treated in this paper can be found in Appendix 3.

*Figure 3: Overview of Reinsurance and Capital Market Solutions That Can Be Used to Transfer Longevity Risk and Some Characteristics*

Risk transfer	Indemnity-based longevity swap	Index-based longevity swap	Longevity bonds	Quota-share cover
Risks covered	Longevity	Longevity	Longevity	Longevity & asset risks
Basis risk	No	Yes	Yes	No
Collateral placed	High	High	High	Low
Counterparty default risk	Low	Low	Low	High
Suited for small portfolios?	No	Yes	No	Yes
Duration of cover lower than liabilities?	Potentially	Yes	Yes	No

## Indemnity-based longevity swap

Longevity swaps enable insurers or pension funds to transfer the risk of paying annuities to policyholders or members for longer than expected. An indemnity-based longevity swap is a bespoke agreement between an insurer or pension fund and the reinsurer. Before the swap is put in place, both parties first determine the liability portfolio's expected payments and for how long these payments will be payable. Once this is determined, at commencement of the swap the insurer agrees to pay these expected cash flows to the reinsurer. These expected cash flows are fixed and therefore represent the 'fixed leg' of the swap. In return, the reinsurer will pay the actual future payments on the liability portfolio ('floating leg'). By doing so, the longevity risk is transferred from the insurer or pension fund to the reinsurer.

*Figure 4: Workings of a Longevity Swap in Practice*



In practice, a net payment at regular agreed periods is likely to take place. Essentially, if a policyholder lives only for as long as expected, this net payment will be zero. However, it is likely that the fixed payment to the reinsurer for the swap also includes an allowance for the reinsurer's expenses and profit margin.

There are a few advantages and disadvantages to using an indemnity-based swap to transfer longevity risk, shown in the table in Figure 5.

*Figure 5: Advantages and Disadvantages of Using an Indemnity-Based Longevity Swap to Transfer Risk*

Indemnity-based longevity swaps	
Advantages	Disadvantages
The swap transfers longevity risk by removing uncertainty around the length of payments to the policyholder.	The swap is a bespoke and relatively complex arrangement. Sufficient resources along with clean and complete data are required to price the contract.
The insurer retains control of the underlying assets and remains free to implement its own investment strategy whilst longevity risk is transferred.	The longevity swap is a long-term arrangement. Keeping related expenses low requires economies of scale throughout the run-off of the portfolio. Whilst available to portfolios of all sizes, longevity swaps therefore tend to be more suited for larger portfolios. For smaller schemes, an index-based longevity swap might be more suitable.

Collateral management is important in order to maintain the effectiveness of the risk transfer because it can reduce counterparty risk without restricting the balance sheet optimisation mechanism. In case of a longevity swap only longevity risk is transferred and not the underlying liabilities themselves, as is the case when using for instance a quota-share treaty instead. Counterparty default risk is therefore lower when using a longevity swap.

In a longevity swap, collateral in the form of eligible financial assets is traditionally used as security to protect each party should either default on their payment obligations under the swap contract. Several structures can be put in place to oversee the contractual obligations and to administer the collateral accounts over the lifecycle of the transaction. A third party can act as a custodian for the collateral account. Another option is for the insurer to set up a special purpose vehicle (SPV) and perform the intermediation itself. Each structure comes with its own level of expenses, benefits and downsides. Economies of scale play a role here in determining which structure fits the insurer and its portfolio best.

## Index-based longevity swap

Indemnity-based longevity swaps are bespoke arrangements and therefore more suited for larger insurance portfolios. An alternative to this swap is the index-based longevity swap. The main difference between the two is that for an index-based longevity swap the fixed payments are based on the life expectancy of a national or notional population (the index) rather than the specific insurer's portfolio of lives. The notional population is usually determined based on socioeconomic characteristics such as wealth, age cohort and sex. By combining multiple groups, the insurer can construct an overlay to try to replicate the longevity risk in its insurance portfolio as closely as possible.

One example of where indexed-based swaps are used is in relation to pools of deferred lives on guaranteed savings (including with-profit) policies, where the take-up of an annuity is optional at a certain date or at a range of dates. The lives that will be insured (i.e., who take up the annuity option) are unknown, and the experience of those lives that do take up the option is a further unknown, particularly as it can be very far in the future. Given the significant uncertainty arising from these future liabilities, index-based solutions are often used. These solutions are deemed lower-risk by reinsurers and are sometimes seen as good solutions for insurers that are struggling to obtain a more conventional swap based on their own lives insured.

Index-based longevity swaps have several benefits compared to indemnity-based longevity swaps. For smaller portfolios, an index-based longevity swap might be preferred over the standard longevity swap. However, when choosing which method to implement to transfer longevity risk, one does need to keep in mind the trade-off between the lower transaction and hedging costs versus the basis risk. Both impact the overall hedge efficiency of the swap overlay.

When looking at index-based longevity swaps it might be interesting to consider the view of the Dutch regulator (DNB). In its Q&A on instruments to limit longevity risk,<sup>7</sup> DNB indicates that the reduction of solvency capital requirements due to a longevity risk transfer should be in proportion to the reduction of the risk profile and that the premium paid for the reinsurance contract is an indication of this proportion. It can impact the effectiveness of index-based longevity swaps that are far out-of-the-money.

Also, DNB argues that index-based longevity swaps should be treated as financial instruments whereas their indemnity-based counterparts should be treated similarly to reinsurance contracts. As a consequence and in line with Article 38 of the Solvency II Delegated Regulations, DNB does not allow index-based longevity swaps to be taken into account in the calculation of the capital requirements underlying the risk margin. This further impacts the effectiveness of index-based longevity swaps.

*Figure 6: Advantages and Disadvantages of Using an Index-Based Longevity Swap to Transfer Risk*

Index-based longevity swaps	
Advantages	Disadvantages
Both the structure and terms of the index-based swap arrangement are standardised. This makes them more liquid, requires less extensive portfolio analysis during the due diligence phase and reduces the administration effort, as they require no exchange of, for instance, seriatim data and death certificates. Overall, this will likely reduce the transaction costs and price of the longevity hedge.	Being a standardised solution reduces the flexibility of such an arrangement. The use of an overlay based on predefined notional populations can lead to a suboptimal hedge and therefore basis risk. This is especially the case if the availability of population indices is low. Differences in current levels of mortality, mortality improvements and random fluctuations in the insurer's portfolio can all increase this basis risk, requiring rebalancing of the longevity hedge in place.
The longevity hedge can be spread across multiple counterparties and sometimes an exit option and recalibration are possible.	Index-based swaps have a fixed maturity that is often lower than the duration of the portfolio being hedged (though not necessarily so). This requires the hedge to be rolled forward at maturity date.
	If the Q&A on instruments to limit longevity risk <sup>8</sup> is a precedent for the treatment of index-based longevity swaps, it might not be the be most capital-efficient solution to transfer longevity risk.

<sup>7</sup> DNB (16 June 2016). Q&A on Instruments to Limit Longevity Risk. Retrieved 29 June 2020 from <https://www.toezicht.dnb.nl/en/3/51-235667.jsp>.

<sup>8</sup> Ibid.

## Securitisation using longevity bonds

In 2010, Swiss Re issued an eight-year longevity trend bond, called the Kortis bond, based on a longevity index.<sup>9</sup> The longevity index for this bond measured the difference between mortality improvements in the US and mortality improvements in the UK for specific age cohorts, over the duration of the contract. The index of mortality improvements underlying the trigger was constructed from population mortality data from the US Centers for Disease Control and Prevention ('CDC') and the UK Office for National Statistics. If the divergence between the two longevity trends widened and the index exceeded a prespecified trigger limit, payments were due to Swiss Re.

For insurers, catastrophe bonds are beneficial as they provide coverage against extreme events, potentially lowering capital requirements if they are compliant with the risk-mitigating technique requirements in the Solvency II Delegated Regulations. The downside of the bonds is their short-term nature, which requires the hedge in place to be rolled forward multiple times, especially when using them to transfer longevity risk. The maximum coverage the longevity bonds provide for can only be as high as the principal amount.

As is the case for the index-based longevity swap, this longevity bond is also based on a standardised index derived from notional populations. The use of longevity bonds can lead to suboptimal hedges and therefore introduces basis risk.<sup>10</sup> On the other hand, the longevity bond can be used in combination with other longevity transfers available in the market to reduce basis risk. Again, being a standardised solution, the DNB Q&A on instruments to limit longevity might be a precedent for the treatment of longevity bonds, which could make them a less capital-efficient method.

When looking at some recent longevity risk transfers, most of them use either reinsurance covers or swaps.<sup>11</sup> Not too many longevity bond deals are being put in place and therefore investors may have difficulty assessing whether the price of the bond is fair. A too high price would leave less space to hedge other material risks related to the business, inflation and interest rates. Creating a liquid market for these instruments requires significant educational efforts and backing by reinsurers.

This is also the reason why earlier attempts at issuing longevity bonds failed. In November 2004, the European Investment Bank announced plans to issue the first longevity bond that would offer coverage for UK pension schemes and life insurers with exposure to longevity risk for the male population of England and Wales.<sup>10</sup> The issue was withdrawn in late 2005, primarily because the price of coverage was considered too high. In addition, other factors were mentioned such as missing mandates in the pension industry and concerns about basis risk between the index embedded in the bond and the longevity risk faced by insurance and pension funds.

*Figure 7: Advantages and Disadvantages of Using a Longevity Bond to Transfer Risk*

Longevity bonds	
Advantages	Disadvantages
Both the structure and terms of the longevity bond are standardised. This makes them require less extensive portfolio analysis during the due diligence phase and reduces the administration effort. Overall, this will likely reduce the transaction costs and price of the longevity hedge.	Being a standardised solution reduces the flexibility of such an arrangement. The use of an overlay based on predefined notional populations can lead to a suboptimal hedge and therefore basis risk.
The longevity hedge can be spread across multiple counterparties, potentially reducing counterparty default risk.	Longevity bonds have a fixed maturity that is often lower than the duration of the portfolio being hedged (though not necessarily so). This requires the hedge to be rolled forward at maturity date.
	There currently does not seem to be a liquid market for longevity bonds, making it difficult to assess whether the price of the bonds is fair.
	If the Q&A on instruments to limit longevity risk <sup>12</sup> is a precedent for the treatment of index-based longevity swaps, it might not be the be most capital-efficient solution to transfer longevity risk.

<sup>9</sup> Mortimer, S. (2 December 2010). Swiss Re launches longevity risk bond. Reuters. Retrieved 29 June 2020 from <https://www.reuters.com/article/catbond-longevity/swiss-re-launches-longevity-risk-bond-idUSLDE6B11GE20101202>.

<sup>10</sup> OECD Monetary Review - 4th Quarter 2007: Longevity Bonds – a Financial Market Instrument to Manage Longevity Risk. <http://www.oecd.org/finance/private-pensions/41668679.pdf>

<sup>11</sup> Artemis. Longevity Swaps and Longevity Risk Transfer Transactions. Retrieved 29 June 2020 from <https://www.artemis.bm/longevity-swaps-and-longevity-risk-transfers/>.

<sup>12</sup> DNB (16 June 2016). Q&A on Instruments to Limit Longevity Risk, op cit.

### Quota-share reinsurance cover

Besides hedging longevity risk using longevity swaps, a quota-share reinsurance cover or full risk transfer using a similar treaty can also be considered.

A quota share treaty is a reinsurance contract where the insurer and reinsurer share premiums and losses according to a fixed percentage. This allows an insurer to retain some risk and premium while transferring the rest to the reinsurer. There are several reasons to opt for a quota-share treaty instead of other forms of risk transfers.

*Figure 8: Advantages and Disadvantages of Using a Quota-Share Reinsurance Cover to Transfer Risk*

Quota-share reinsurance cover	
Advantages	Disadvantages
It is an indemnity cover, meaning that all risk is transferred (in this case pro rata) and there is no basis risk.	Total investable assets reduce, as both assets and underwriting risk are transferred. This leads to a lower overall return on assets, lowering the insurer's capital generation and future dividend payments. It can be partially offset when the cover is on a deposit back basis
Reinsurance covers potentially require less collateral than capital market instruments such as longevity swaps, reducing collateral costs.	Insurer does not retain control over part of its assets and, therefore, has less possibilities to use these assets for other capital management actions such as interest rate hedging (although we want to stress that the cover provides a perfect interest rate hedge for the liabilities transferred).
There are many ancillary benefits such as new business funding, access to underwriting expertise etc.	A second impact of asset risk being transferred is that the more extensive scope of the quota-share treaty can—dependent on the collateral arrangements—cause counterparty risk to be higher.
	As with many other reinsurance treaties, strict requirements on the administration can be required. This is believed to limit operational risk for the reinsurer, which lowers the risk premium and therefore the reinsurance premium. With quota-share, administration might be easier than in other cases because a fixed proportion of the portfolio is ceded rather than a selection of individual policies.

## Mortality and catastrophe risk reinsurance

### Introduction

Two interrelated risks life insurers can face are mortality risk and catastrophe risk. Mortality risk is the risk of both policyholders dying earlier than expected and more policyholders dying than expected. This risk gradually occurs throughout the duration of the portfolio. If best estimate mortality rates are set too low then, as a result, provisions for mortality covers are insufficient to cover liability payments.

Catastrophe risk is the risk of many policyholders dying or falling sick due to a sudden event, such as a pandemic. The effects of a catastrophe shock are felt more immediately than the effects resulting from a mortality shock. A recent example of this is the COVID-19 pandemic.

### Determining mortality risk and catastrophe risk

Setting robust best estimate mortality parameters for an insurer's portfolio can be subject to a substantial amount of expert judgement, especially in the case of smaller portfolios or where the insurer does not have a lot of experience. Mortality risk can be quite material as a small variance in the portfolio's mortality can readily lead to insufficient reserves. This especially holds true if this variance occurs on life covers from individuals with above average sums assured.

Estimating catastrophe risk can be challenging. Parameters and models used to determine the catastrophe risk are dependent on the event driving it. In the case of a pandemic, for instance, various variables such as social distancing, contagiousness, population age structure and lethality are important.

## Overview

Mortality and catastrophe risk are introduced to the insurer's balance sheet when writing protection covers. As mentioned earlier, longevity risk can theoretically form a natural hedge with mortality risk. Insurers and reinsurers can therefore use their mortality risk as an offsetting hedge for their longevity risk portfolios and vice versa. Transferring mortality risk between parties can therefore benefit both.

Methods to transfer mortality risk and catastrophe risk are quota-share transfers, surplus and excess-of-loss type treaties, mortality bonds and mortality swaps. We provide a more comprehensive overview of these methods in relation to mortality and catastrophe risk in the table in Figure 9. A more complete overview of these and other reinsurance covers treated in this paper can be found in Appendix 3.

*Figure 9: Overview of Reinsurance and Capital Market Solutions That Can Be Used to Transfer Mortality and Catastrophe Risk and Some Characteristics*

Risk transfer	Quota-share cover	Excess of loss cover	Mortality swaps and bonds
Risks covered	Mortality, Catastrophe and Market Risks	Mortality and Catastrophe	Mortality and Catastrophe
Basis risk	No	No	Yes
Collateral placed	Low	Low	High
Counterparty default risk	High	High	Low
Suited for small portfolios?	Yes	Yes	No
Duration of cover lower than liabilities?	No	Yes	Yes

### Quota-share reinsurance cover

A quota-share treaty is one of the covers that can be implemented for the transfer of mortality risk. For catastrophe risk it would be less suited. The cover enables the insurer to balance its risk profile, maximising diversification or maximising the offset with longevity risk, whilst retaining some of the premium income received. It is an indemnity cover, meaning that all mortality risk is transferred (in this case pro rata) and there is no basis risk.

In practice, the quota-share cover will be mainly beneficial for smaller portfolios. Smaller portfolios can employ the law of large numbers to a lesser extent and, therefore, individual losses tend to have a bigger relative impact on the portfolio, increasing the portfolio's volatility. To sufficiently reduce the portfolio's volatility, make the transfer attractive from a reinsurer's point of view and keep the reinsurance premium low, the quota-share percentage for these covers tends to be quite high. As a result, these quota-share treaties could be considered as more a coinsurance construction rather than a risk cover. Advantages and disadvantages of a quota-share cover are included in Figure 8 in the previous section.

### Surplus and excess-of-loss reinsurance cover

Surplus and excess-of-loss type reinsurance covers are a form of nonproportional reinsurance where the reinsurer indemnifies the insurer for (a percentage of) losses that exceed a specified limit. It is possible to set the thresholds in different ways. It can for instance apply to all loss events during the policy period or only losses in aggregate. Treaties may also use bands of losses that are reduced with each claim.

These types of covers are more suited for insurers with smaller portfolios and therefore a relatively volatile P&L, and to transfer catastrophe risk. By only reinsuring risk that falls above a certain threshold, the insurer can achieve capital relief while retaining most of its liabilities.

Tail solutions such as these tend to be quite bespoke to a company and profile of cash flow. It is important to realise that there are several reinsurance structures that can be implemented. An insurer can, for instance, choose per-risk covers and catastrophe covers (CatXL). With per-risk covers, only individual losses are covered. Enacting this reinsurance cover enables the insurer to also sell policies to individuals with a very high sum assured. CatXL typically covers the losses of an entire portfolio, in case a catastrophic event occurs. The difference between CatXL and per-risk covers is analogous to the difference between treaty and facultative reinsurance. Facultative reinsurance covers only a single risk or a defined package of risks whereas a per-risk treaty covers all risks of a portfolio without individual underwriting.

Figure 10: Advantages and Disadvantages of Using an Excess-of-Loss Reinsurance Cover to Transfer Risk

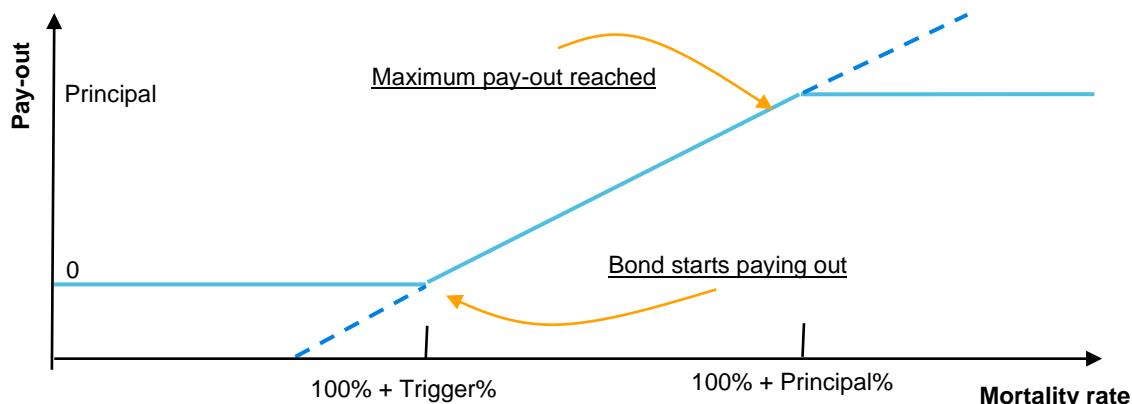
Surplus and excess-of-loss reinsurance cover	
Advantages	Disadvantages
As only one particular risk above a certain threshold is covered, the size of the contract is smaller. Therefore, the counterparty default risk is also smaller. The assets of the insurer remain on its own balance sheet.	It is important to note that stop-loss ratio treaties and facultative reinsurance contracts often specify a limit in losses for which the reinsurer will be responsible. Whilst this protects the reinsurer from dealing with an unlimited liability, this type of cover might not be sufficient for the insurer to get capital relief.
It allows an insurer to underwrite policies that cover high volumes of risks—for instance when having a large sum assured—without having to excessively raise reserves to cover the additional portfolio volatility introduced by these policies.	These reinsurance deals tend to be short-term (e.g., five years) so there is a duration mismatch compared to liabilities. This requires the cover to be rolled forward at maturity and might cause an issue for recognition as a risk mitigation technique as per the requirements under Solvency II.
	Facultative covers can be more expensive than automatic covers and introduce an additional burden on claims administration.

### Mortality and catastrophe swaps and bonds

Catastrophe bonds are usually linked to losses due to a (series of) prespecified event(s) over a prespecified coverage period. Only in the case that this event occurs, and the costs related to it exceed a specific amount over the specified coverage period, will the bond pay out. More detail on the workings of catastrophe bonds can be found in Appendix 2.

In the case of a mortality bond, the catastrophe that would trigger payments is usually set at  $100\% + \text{Trigger}\%$  of the expected mortality. This payment is funded from the principal amount of the bond, which is held in the secured collateral account. Because losses are funded from the principal, this principal amount is also the maximum payout of the bond. In other words, if the expected mortality rates turn out to be materially higher than the trigger point of  $100\% + \text{Trigger}\%$ , then the bond can only cover losses up to the point  $100\% + \text{Principal}\%$ , which is the event where the payout of the bond equals the principal. Losses exceeding this point are not covered, resulting in the insurer still needing to hold capital for catastrophe risk.

Figure 11: Payout of a Mortality/Catastrophe Bond



Mortality bonds and swaps (also known as survival swaps) work in the same way as longevity bonds and swaps. They enable the insurer to transfer mortality risk and catastrophe risk to capital markets rather than reinsurers. Instead of using a mortality improvement as an underlying index, a mortality index based on expected mortality is used. If the mortality swap or bond operates as an over-the-counter transaction, this mortality index could be set equal to the insurer's portfolio expected mortality. If traded on capital markets, a standardised mortality table is more likely to be used instead.

Similar benefits and considerations hold for mortality swaps and bonds as is the case for their longevity counterparts, as can be seen in the table in Figure 12. As a result of the basis risk, low liquidity in the market and the bonds not necessarily covering all extreme events, mortality swaps and bonds are mainly used as an addition to other risk transfers rather than being implemented as a standalone hedge.

*Figure 12: Advantages and Disadvantages of Using a Longevity Bond to Transfer Risk*

Mortality and catastrophe bonds	
Advantages	Disadvantages
Both the structure and terms of the longevity bond are likely to be standardised. This makes them require less extensive portfolio analysis during the due diligence phase and reduces the administration effort. Overall, this will likely reduce the transaction costs and price of the longevity hedge.	Being a standardised solution reduces the flexibility of such an arrangement. The use of an overlay based on predefined notional populations can lead to a suboptimal hedge and therefore basis risk.
The hedge can be spread across multiple counterparties, potentially reducing counterparty default risk.	The bonds tend to have a fixed maturity that is often lower than the duration of the portfolio being hedged (though not necessarily so). This requires the hedge to be rolled forward at maturity date.
	There currently does not seem to be a liquid market for mortality bonds and swaps, making it difficult to assess whether the price of the bonds is fair.

## Lapse risk reinsurance

### Introduction

One of the largest capital requirements for most life insurers arises in respect of lapse risk, which results from adverse changes in policy surrenders, paid-ups and other discontinuances. For most business, higher than expected policy lapses result in the loss of profitable policies, although the converse is sometimes the case, with the risk of loss-making policies remaining in force for longer durations.

The focus of this section is on lapse reinsurance, which can be designed to cover the lapse stresses under Solvency II; where the reinsurer pays out if lapses are higher or lower than expected. Lapse risk reinsurance solutions mainly focus on tail risk transfer and SCR reduction rather than full lapse risk transfer. A 100% quota-share reinsurance of a block of business fully transfers lapse risk in the absence of other risks if full lapse risk transfer is required.

The transactions are written to be 'out-of-the-money' at inception, so may be a low-cost way to transfer lapse risk. An insurer considering entering a lapse reinsurance contract will reinsure the biting SCR lapse stress, thus allowing the insurer to hold less capital against the biting lapse risk. This structured reinsurance strategy is most likely to be used by an insurer calculating its Solvency II capital requirements using the SF. The strategy is most practical where the biting lapse stress requires significantly more capital than the other lapses stress. If any of the other lapse stresses are at a similar level of magnitude, the usefulness of a reinsurance arrangement just covering one type of lapse stress as a capital relief tool is minimal. In this case, it may be necessary to use a lapse reinsurance strategy that covers multiple lapse stresses.

### Overview

Lapse risk exists on most portfolios of life insurance business other than business for which lapses are not possible, such as traditional whole-of-life annuities. There are three main types of lapse reinsurance currently in existence, one for each of the three prescribed shocks under the SF, as shown in Figure 13. A more complete overview of these and other reinsurance covers treated in this paper can be found in Appendix 3.

*Figure 13: Overview of Characteristics of Lapse Risk Reinsurance Solutions*

Risk transfer	Mass lapse	Lapse up/down
Risks covered	Mass lapse	Lapse up/down
Basis risk	Yes	Yes
Collateral placed	Low	Low
Counterparty default risk	Low	Low
Suited for small portfolios?	No	Yes
Duration of cover lower than liabilities?	Yes	Potentially

## Mass lapse reinsurance

Mass lapse reinsurance reinsures the insurer against the adverse financial impact of mass lapses in its portfolio (usually surrenders only). Subject to regulatory approval, it may be possible to use mass lapse reinsurance as a risk mitigation technique in the calculation of the lapse SCR where the mass lapse stress is the biting SCR stress. This type of reinsurance is not very common yet in some European countries but has in our knowledge been used in Sweden, Norway, Gibraltar and, initially, the Netherlands, as well as some others.

A mass lapse treaty is set up with an attachment point which, upon being reached, will result in the reinsurer beginning to pay out. The treaty will also typically have a detachment point that places a cap on the reinsurer's risk, and above which the reinsurer will not make any further payments. The attachment point ensures there is not an immediate loss to the reinsurer and the detachment point is typically set around the Solvency II stress for maximum capital relief. All assumptions underlying the reinsurance contract other than lapses are typically fixed at the outset of the contract.

As an example, a typical mass lapse reinsurance arrangement may be written with an attachment point of 20% and a detachment point of 40%. The contract is structured so that a payout is triggered when mass lapse rates lie between the interval [20%, 40%]. Lapses outside this interval are not covered. Setting the attachment point at 20% reduces the reinsurance cost, as the hedge is initially out-of-the-money at the start of the contract, whilst obtaining capital relief. The detachment point of 40% is typically used as there is little capital relief in setting a detachment point at a higher level when using the SF to calculate SCR. However, a higher detachment level would result in a higher transfer of risk. Indeed, it could also be argued that aligning the detachment point with the SF stress is effectively arbitraging the SF stress. Justification that the SF remains appropriate to the insurer in question will be important in this scenario.

In order to maintain full capital relief for the reinsurance structure, it is necessary to ensure that the risk mitigation is initially longer than 12 months in duration. The Solvency II SF mass lapse stress is an immediate 40% lapse and so mass lapse risk reinsurance contracts are typically structured as a two-year contract with a one-year transaction period to ensure regulatory efficiency. It is also possible to structure mass lapse treaties as multiyear hedges where the terms are altered each year to also reduce risk margin requirements. An additional regulatory factor here in determining effective risk transfer is that the SF mass lapse scenario is based on extreme lapses experienced in the next 12 months. In practice, lapses arising from a trigger event could manifest over a longer period.

## Lapse up/down reinsurance

Lapse up and lapse down reinsurance have not gotten as much focus as mass lapse reinsurance but lapse up/down reinsurance has been considered by some companies in recent years, although we are not aware of any public examples of deals being completed.

Lapse up/down reinsurance is where a portfolio is reinsured against a +/-50% change in lapses in order to mitigate against the applicable SCR shock. Lapse up/down stresses are permanent stresses to the insurer's portfolio and so the coverage period for lapse up/down reinsurance is generally fixed for the lifetime of the contract. As with mass lapse reinsurance contracts, all assumptions other than lapses are generally fixed at the outset to calculate the contract cash flows. Terms can be added to the reinsurance treaty to allow commutation of the contract after a certain period, such as three or five years after the treaty has started. The commutation will take into account projected experience based on what has been observed from the insurer during the initial period. Attachment and detachment points are used in a similar way to mass lapse reinsurance to reduce the cost of the reinsurance and maximise capital relief, with the transaction written out-of-the-money.

## Other overall considerations for lapse risk reinsurance

One consideration for the reinsurer in any lapse reinsurance will be to avoid moral hazard that the insurer itself may be able to influence the lapse experience. Reinsurance might, for example, exclude contracts that are lapsed where the proceeds are reinvested in a new contract with the insurer.

Lapse reinsurance used to cover the lapse SCR stresses is not very frequently used in some markets, but it is increasing in popularity as insurers seek to find ways to optimise solvency capital relief. For insurers wishing to enter into such lapse reinsurance contracts, there are a number of issues to consider.

One of the most important considerations when entering a lapse reinsurance contract is to consider any relevant regulatory restrictions. When designing the structure of the reinsurance arrangement, it should be taken into consideration that regulators may not allow arrangements that are purely designed to reduce regulatory capital without an appropriate risk transfer.

Lapse reinsurance deals are coming under increasing scrutiny by regulators that are challenging the effectiveness of risk transfer of the insurance liabilities. In some jurisdictions, such as the Netherlands in recent years, regulators have not allowed the use of mass lapse reinsurance to mitigate SCR capital requirements. Contrary to this, some Nordic regulators have allowed appropriately structured mass lapse reinsurance to be used to mitigate against lapse risk and obtain SCR capital relief in certain cases. More details on how to address the regulatory challenge are set out in a later section of this paper.

The use of lapse reinsurance may also introduce basis risk. As noted earlier in this paper, a risk-mitigating technique cannot be partially reflected in the SF SCR due to the presence of material basis risk; it should either be reflected fully in the SCR if there is no material basis risk, or else not reflected at all.

Reinsurance in respect of lapse risk is likely to only be efficient where there is a significant reduction in risk and/or capital requirements, and therefore is unlikely to be suitable for small portfolios where the benefit may not be worth the ongoing administration effort, particularly in the case of lapse up/down reinsurance.

It is also possible that the biting lapse risk SCR will change over time as the insurer's portfolios evolve, reducing the effectiveness of a particular lapse reinsurance transaction as a capital relief technique.

## Financial risk reinsurance

### Introduction

The current low interest rate environment is challenging for insurers. Low interest rates can cause reserves to increase for certain products, increased risk margins and higher capital requirements. These factors are not always fully compensated by the growth in market value of the insurer's investments, particularly because risk margin and SCR movements are not typically hedged by bond portfolios held.

Under Solvency II, these financial risks need to be actively managed to stabilise reserves, improving both the insurer's solvency ratio and available own funds and reducing volatility in these items.

### Overview

The most common way to manage financial risks in the insurance industry is by using derivatives. Reinsurance solutions, however, also exist for these purposes. Although a reinsurance solution typically lowers capital requirements, it can materially impact other financial measures such as accounting income. Nevertheless, insurers are exploring possible new reinsurance solutions to have in their financial management arsenal.

There are many different ways to structure such an arrangement. For example, it is often possible for insurers to fully reinsure the guarantees they have provided to policyholders, if so desired. Examples in this space are reinsurance of guaranteed annuity options and guarantees in respect of variable annuity benefits. These arrangements can partly or even fully remove market risk in respect of guarantees from an insurer's balance sheet, replaced of course by counterparty risk.

Other important aspects of these structures are the investment guidelines, matching strategy and risk limits in place at the insurer as they determine the guaranteed asset return the reinsurer can provide. In cases where the insurer has options and guarantees on its liability portfolio, they are likely to be hedged, leading to additional investment expenses. In general, the less that options and guarantees on a liability portfolio are hedged, and the less strict investment guidelines and risk limits are, the more beneficial this type of reinsurance cover will be.

### Asset-intensive reinsurance and full risk reinsurance

Most of the reinsurance types noted in earlier sections are specifically designed to cover one or more individual risks. However, solutions also exist from some providers that can be deemed more 'all-encompassing.' One example of this is asset-intensive or full risk reinsurance. This type of reinsurance is usually applied on in-force blocks of long-dated liabilities, typically with guarantees and heavily weighted on asset and interest rate risk.

Examples of such a product are savings and annuity business and are often held in legacy books or lines of business that are no longer a strategic priority for the company, and therefore that the company no longer wishes to retain. Products with assets that are policyholder-related such as variable annuities or separate accounts, are usually not in scope. The same holds with products that are subject to profit sharing.

Asset-intensive risk reinsurance covers typically deal with all risks, and the investment risk would be just one aspect of it. Because all risks are transferred to the reinsurer, it is basically a form of full coinsurance. The reinsurer pays all future claims and benefits of the reinsured portfolio. Assets are managed by the reinsurer as well but are held in such a way that they are protected from the reinsurer's default.

Similar advantages and disadvantages, as included in Figure 8 above, hold for a full reinsurance arrangement. Full risk reinsurance is typically used to unlock locked-in value in the business, de-risk the balance sheet and remove low-return business to improve the insurer's overall returns and improve profitability of new business through extra yield on investment. It could be an interesting alternative over a quota-share treaty for smaller blocks of business because the more liabilities in scope of a treaty, the lower the premium.

A full risk reinsurance arrangement may in some cases also be deemed a more pragmatic and faster solution than, for example, a full divestment via a portfolio transfer. It can in practice amount to a very similar result in terms of financial and capital benefits. Furthermore, full reinsurance treaties can sometimes be used as an interim solution when a mergers and acquisitions (M&A) transaction has been agreed between two or more parties. If the transaction will involve a portfolio transfer, this can take a prolonged period to get formal regulatory and legal approval. The purpose of reinsurance in this case is to recognise the economic impact to these approvals in advance of formal approval.

*Figure 14: Advantages and Disadvantages of Using a Full Risk Reinsurance Cover to Transfer Risk*

Full risk reinsurance cover	
Advantages	Disadvantages
Full risk reinsurance can be used to unlock locked-in value in the business, de-risk the balance sheet and remove low-return business to improve the insurer's overall returns and improve profitability of new business through extra yield on investments.	Counterparty default risk can be substantial due to the large scope of the treaty, depending on the credit rating. This can even lead to the Solvency II SF not being appropriate to capture the counterparty default risk. Additional capital buffers might be required in this case to protect the insurer against adverse scenarios such as a downgrade of the reinsurer in combination with a decrease in interest rates. These buffers can be substantial and additional mitigation might have to be put in place.
The extensive scope of the treaty might lead to lower premium levels.	Obtaining regulatory approval can be challenging in some cases due to the extensive scope of the treaty, and collateral management is an important topic in the discussions with the regulator. The assets backing the liabilities might be transferred and are placed as collateral. The reinsurer invests these assets in line with investment and risk management guidelines provided by the insurer.
There are many ancillary benefits such as new business funding, access to underwriting expertise etc.	Total investable assets reduce, as both assets and underwriting risk are transferred. This leads to a lower overall return on assets, lowering the insurer's capital generation and future dividend payments.

All risk is transferred meaning that there is no basis risk.

### Other solutions

It is important to note that many of the strategies discussed in this paper in respect of other risks also often help to mitigate an insurer's financial risk. For example, longevity liabilities such as annuities are typically very sensitive to interest rate movements. By hedging longevity risk using a reinsurance arrangement, a company not only reduces its risk and capital requirements in respect of annuity risk, but also typically reduces those in respect of interest rate risk. That is because the insurer's longevity liabilities, net of reinsurance arrangements, are less sensitive than those without the reinsurance arrangements in place.

Some of the arrangements mentioned in the next section are particularly helpful in mitigating market risk and capital requirements. Transferring market risk is also discussed in detail in the section on reinsurance strategies.

## Other types of reinsurance

There are a wide range of other possible arrangements that could help mitigate insurers' capital requirements. We note that in some of the cases here, there have been relatively few implementations. However, each of the items below have been explored by a number of companies and could potentially hold some promise in certain situations.

### VIF monetisation due to contract boundaries

Value of in-force (VIF) monetisations in respect of business not recognised due to the definition of contract boundaries are arrangements that could unlock the value of future margins not recognised on the Solvency II balance sheet.

VIF monetisation was a popular type of reinsurance structure prior to Solvency II implementation. In effect, reinsurers would pay an up-front amount to an insurer in exchange for cash flows from the insurer as profit margins (which were expected) emerged over time. This could help an insurer to free up capital at the expense of giving up future margins and would also remove the uncertainty of those future margins. However, the Solvency II valuation methodology effectively means that future margins are recognised on the balance sheet. This therefore removes the primary incentive for VIF monetisations, although they can still bring some benefits in terms of liquidity and removing the uncertainty of future margins.

However, for some companies there is a secondary source of future margins that is not recognised in the Solvency II balance sheet. Where companies have particularly profitable regular premium business, it may not be possible to recognise the value of future regular premiums on the Solvency II balance sheet due to the application of contract boundaries. A good example of this is regular premium savings business without guarantees attaching (although it is worth noting that the exact determination of contract boundaries applied by a company depends on the specifics of individual products and often involves judgement). Therefore, a VIF monetisation could be a good way to unlock that value up-front rather than waiting for it to emerge over time.

### Investment margin financing

Companies applying the Solvency II rules are required to discount their liabilities using a risk-free yield curve specified by EIOPA. However, companies often back those liabilities with government and corporate bonds which can be expected to earn the company a spread above the risk-free rate. Arrangements can be developed that effectively securitise this investment margin. Under this arrangement, expected investment margins (or a portion thereof) can be advanced by the reinsurer and are paid back to the reinsurer as actual investment margins emerge. This can unlock otherwise unrecognised future investment value on an insurer's balance sheet, and therefore free up available capital. The arrangements can be structured with some insurance risk transfer embedded so it becomes reinsurance rather than a capital market solution.

### Contingent reinsurance

For risks that are hard to hedge, one solution is to enter into a capital-relief reinsurance transaction on the liability side which is contingent on a particular risk event occurring. An example of a risk that may be difficult to hedge is house price inflation but there are many other uses for contingent reinsurance. An insurer may also purchase contingency insurance if it is concerned about a reduction in its future solvency ratio. As an example of how contingent reinsurance might be used in this case, the insurer may take out quota-share reinsurance with a relatively low quota share. A fee is paid to the reinsurer so that the quota share may be increased at any time over a selected time period, say between three to five years. In the event of the insurer's solvency ratio reducing below its required level, the insurer can increase the quota share under the original terms of the treaty. This arrangement would help the company's capital position when it is most required. Contingent reinsurance could therefore prove to be of interest for insurers when optimising their capital management.

### Emerging risks

Reinsurers are increasingly looking to add new reinsurance products to their portfolios, many of which concern emerging risks. As life insurers are also subject to some of these risks, these new reinsurance products could be of interest for them as well. Many reinsurers are involved in the market for cyber risk insurance. There is much uncertainty around how cyber risk will evolve but it is certainly an area to keep in mind when trying to manage operational risk. As most insurers are exposed to cyber risk, we would expect that more and more reinsurance solutions concerning cyber risk will be introduced in the near future.

## Operational risk reinsurance

Operational risk capital can account for a sizable proportion of an insurer's SCR. An insurer may wish to enter into an operational risk reinsurance contract to reduce those capital requirements. Modelling operational risk is a challenging task for insurers as internal loss data on operational risk losses may be confounded with underwriting and reserving losses. Another challenge may be the modelling of emerging risks such as cyber risks which might form the scenario analysis part of the operational risk assessment. These challenges, in addition to the difficulty of assessing the operational risk that a company may face, have meant that operational risk reinsurance is not widely used.

One recent deal is a five-year operational risk insurance arrangement on the basis of an operational risk bond transaction, brought to the market by Credit Suisse.<sup>13</sup> Operational risk bonds operate in a similar way to catastrophe risk bonds and are used to mitigate against operational risks a company may face. The backing insurer of the transaction entered into a reinsurance deal with an SPV. The SPV issues notes to investors allowing capital market investment to provide reinsurance capacity.

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<sup>13</sup> Artemis (2 April 2020). Credit Suisse gets \$461m Operational Re III op-risk cat bond coverage. Retrieved 29 June 2020 from <https://www.artemis.bm/news/credit-suisse-gets-461m-operational-re-iii-op-risk-cat-bond-coverage/>.

# Capital management strategies using reinsurance

## Introduction

In this chapter we discuss various reinsurance strategies and their potential use for life insurance companies. For the more common reinsurance strategies we do this by showing potential impacts on the financial measures of a fictional insurance company described in the section below.

As we focus on capital management, we describe the effectiveness of reinsurance strategies on the basis of Solvency II-related measures. In practice, however, various other measures are used for this as well, such as IFRS operating profit. When assessing a reinsurance cover or strategy, all these measures should be considered.

For each of the strategies considered we provide a brief explanation of the strategy itself and its implementation. We discuss potential consequences as well as considerations when implementing the strategy.

## Fictional insurance company

### Introduction

For the more common reinsurance strategies we show potential impacts and trade-offs by means of a fictional life insurance company. The company faces several challenges that many life insurers also face in practice.

Competition for new business is strong in the market, interest rates are low and policies written generally have a long duration.

Low interest rates combined with the long-term nature of the business require the insurer to hold material amounts of capital and a substantial risk margin for its in-force business. Combined with the strong competition on the market, it also leads to lower profit margins and a higher capital strain on new business written. Writing new business lowers the solvency coverage ratio and, as a result, the volume of new business that can be written is limited.

The assets backing the liabilities are invested in low-risk asset categories such as government bonds and high-rated corporate bonds. Re-risking these assets could lead to an increase in capital generated. However, the increasing capital requirements this would cause leave the insurer with less room to do so.

A management action threshold is set equal to solvency coverage of 125%. In case the coverage ratio falls below this threshold, management actions are required to increase the coverage ratio to more acceptable levels. The insurer is only allowed to pay dividends to its shareholders if the coverage ratio exceeds 180%.

The insurer has two main targets:

- Optimise future dividend payments and timing to maximise the insurer's shareholder value
- Maintain its current market share by writing sufficient new business volumes

These are two opposing targets, at least to an extent. Ensuring stable future dividend payments requires the generation of excess capital and a coverage ratio above the dividend threshold of 180%. Writing new business, on the other hand, decreases the coverage ratio due to its capital strain, although it can ultimately lead to more profit (and capital) generation in the long term.

Balancing these two targets can therefore be challenging, especially in current market conditions. Management of the insurer is exploring whether reinsurance can be used to meet its targets and make the insurer more resilient to the low-interest-rate environment in both the short term and long term.

The sections below focus on Solvency II results. In particular, the amount of dividend the insurer is expected to pay out and the timing thereof, as they determine the shareholder value of the company. Before describing the strategies, we first provide more detail on the insurer, its expected future performance and some details on the main drivers underlying the coverage ratio.

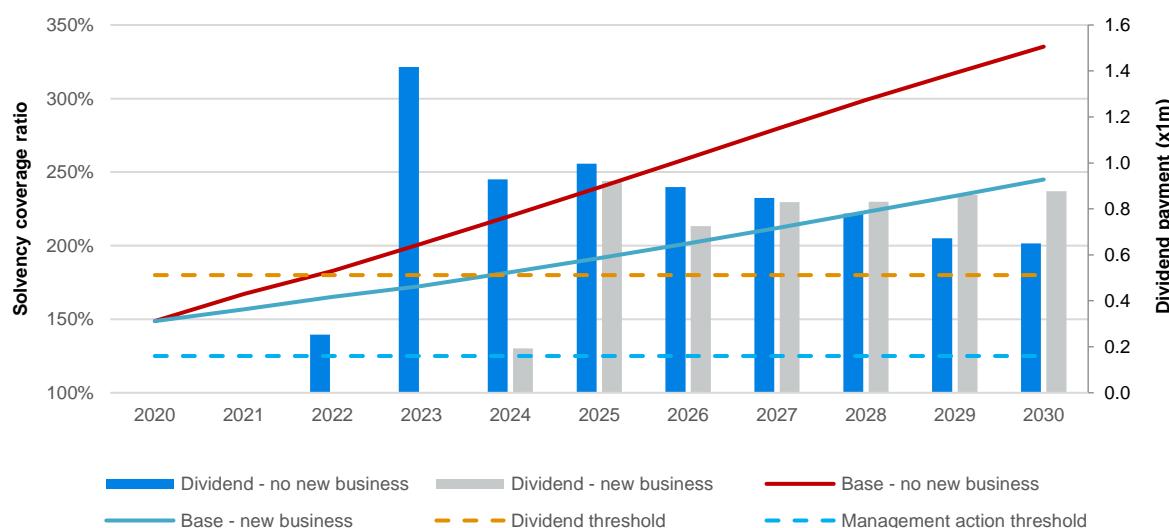
## Base scenario

The fictional life insurer has the following main characteristics:

- Its current Solvency II coverage ratio equals 150%.
- The insurer writes immediate annuities, whole life insurance and mortgage protection business. Due to this mix of products, the insurer is subject to most of the life underwriting risks under Solvency II. Longevity risk is by far the biggest life underwriting risk, followed by lapse risk.<sup>14</sup>
- The average duration of both the in-force book and new business written is 13 years. The duration of the immediate annuities equals 10 years, the mortgage protection business has a duration of seven years and the whole life insurance business has a duration of 18 years. One of the consequences of these durations is that the risk margin for all products is substantial.
- The insurer invests in relatively plain-vanilla assets that are well diversified and euro-denominated. The asset portfolio backing the liabilities is fully invested in AAA government bonds and AA corporate bonds, and shareholder equity is invested in equities, illiquid government loans and infrastructure. Market risks on the insurer's balance sheet are therefore equity risk, spread risk and interest rate risk.
- The insurer's fixed income investments are used to partially hedge its interest rate risk. Apart from this, no other capital management actions are put in place and the insurer is not subject to any counterparty default risk.

The expected coverage ratio including and excluding new business written can be seen in Figure 15, which shows the projected coverage ratio (before any dividend payments) and dividend payments of the insurer in the base scenario, including and excluding new business written..

*Figure 15: Projected Coverage Ratio and Dividend Payments*



From these results it follows that, compared to the case where the insurer decides to stop writing new business and is in run-off, maintaining current new business volumes results in a lower solvency coverage ratio and a delay in dividend payments. This can also be seen from the results in the table in Figure 16, which shows expected dividend payments in (1) the first 10 years and (2) during the run-off period of the portfolio for the base scenario, excluding and including new business written. The results excluding new business are taken as a basis and set equal to 100%.

<sup>14</sup> Please note that in the examples throughout this section we include 10 years of new business. After this period, the portfolio is in run-off.

*Figure 16: Expected Dividend Payments*

	Base: No new business written	Base: New business written
Dividends paid – first 10 years	100%	87%
Dividends paid – total	100%	147%
Dividends paid – total – discounted	100%	142%

## Capital management strategies

### 1. Reduce new business strain by transferring underwriting risk

Writing life insurance business generally causes the solvency coverage ratio to decrease. While new business might be profitable on an IFRS operating profit basis, the premiums charged to the policyholder are not sufficient to compensate for the additional capital requirements and risk margin the insurer needs to hold. Low interest rates cause both these capital requirements and risk margin to be substantial, increasing the new business strain.

From a dividend perspective, writing new business might therefore not seem the preferable strategy in the short term. As an insurer usually only pays out dividends in cases where the solvency coverage ratio exceeds a certain threshold, a lower solvency coverage ratio might lead to lower dividend payments or even a delay of them.

Not writing new business would turn out to be suboptimal in the longer term because the decreasing balance sheet also decreases the total amount of capital generated and, hence, the total amount of dividend that can be paid out.

By transferring part of the underwriting risk using a reinsurance cover, the insurer can aim to lower the capital strain of new business written. Reinsuring new business can therefore be used as a capital management tool to enable the insurer to meet both its dividend and new business targets.

Longevity risk is by far the biggest underwriting risk for the fictional insurer. Transferring longevity risk could therefore be a first capital management action to improve the insurer's balance sheet further. As discussed in the section on longevity reinsurance, there are several ways to do this. In the example below we consider a quota-share treaty and a longevity risk transfer. In both cases 50% of the longevity risk is reinsured.

The impacts on the coverage ratio and dividends are shown in Figures 17 and 18. Both include new business written (1) without any reinsurance cover, (2) including a 50% quota-share treaty and (3) including a 50% longevity risk transfer. Note that the base scenario without reinsurance cover is used as the basis in these numbers and is therefore set to 100%.

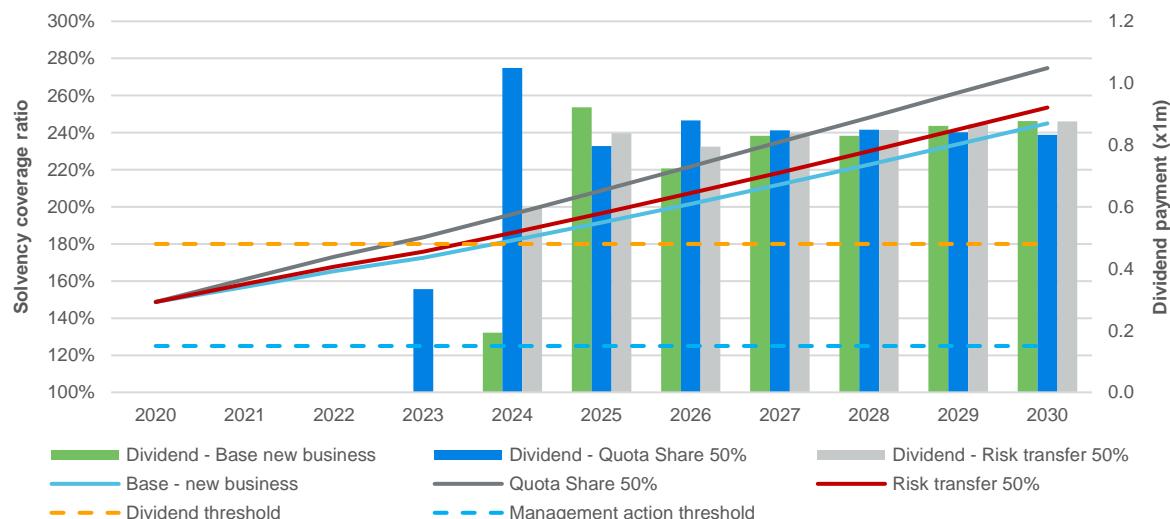
From these impacts it follows that:

- Because only new business is reinsured, the insurer's current balance sheet is not affected and the coverage ratio at the outset of the arrangement remains unchanged.
- Both the quota-share treaty and risk transfer cause the solvency coverage ratio to increase. This increase is bigger in the case of the quota-share treaty because market risk is also transferred here, lowering the SCR further.
- The impacts of the reinsurance treaty become more material over the years, as more new business is written and a larger part of the non-reinsured in-force book is run off. The amount of reinsurance margin paid as well as the capital required for counterparty default risk therefore increase over the years.
- These reinsurance margins and capital requirements for counterparty default risk lead to a decrease in capital generated, the former through the own funds and the latter mainly through both the capital requirements and risk margin. A part of the profitability of the insurer is transferred to the reinsurer. This decrease is bigger in the case of the quota-share treaty because assets are also involved here, lowering the overall excess return on assets.

In the medium term (first 10 years), both the quota-share and risk transfer enable the insurer to pay out more dividend than was the case without reinsurance. The increase in dividend payments is bigger for the quota-share treaty due to its bigger impact on the solvency coverage ratio, which makes it the preferable medium-term option in this example.

In the long term, both reinsurance treaties cause the total amount of dividend payments to decrease. This is due to the decrease in capital generated. Capital generation is less impacted by the risk transfer treaty, which makes it the preferable long-term option in this example.

*Figure 17: Projected Coverage Ratios and Dividends*



*Figure 18: Expected Dividend Payments*

	Base new business	Quota-share	Risk transfer
Dividends paid – first 10 years	100%	110%	105%
Dividends paid – total	100%	90%	96%
Dividends paid – total – discounted	100%	90%	97%

## 2. Reduce capital requirements and new business strain by transferring underwriting risk

There seems to be a natural lower boundary to the size of the block of business that needs to be reinsured for a reinsurance treaty to be attractive for both the insurer and reinsurer. Many smaller life insurance companies, which are mainly looking to lower their new business strain, are impacted by this. Their new business volumes are too low to get either enough or satisfactory quotes from reinsurers. Therefore, they also need to include part of their in-force books in the reinsurance deal to make the transfer attractive for both parties.

Figures 19 and 20 show the potential impact of reinsuring both the immediate annuity back-book and new business of the fictional insurer. Both include new business written (1) without any reinsurance cover, (2) including a quota-share treaty on both immediate annuity in-force portfolio and new business and (3) including a longevity risk transfer on both the immediate annuity in-force portfolio and new business. Again, note that the base scenario without reinsurance cover is used as the basis in these numbers and is therefore set to 100%.

Figure 19: Projected Coverage Ratios and Dividends

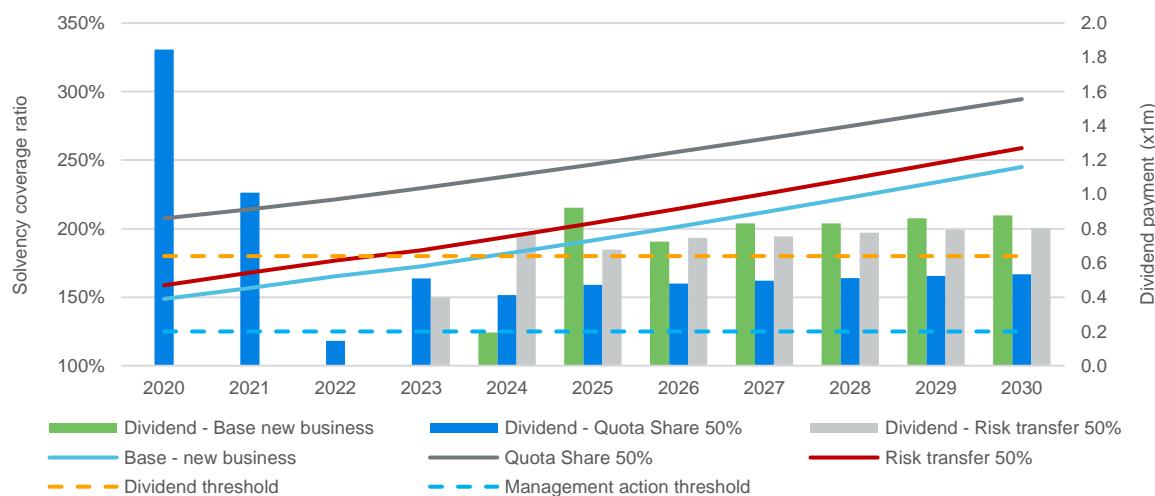


Figure 20: Expected Dividend Payments

	Base new business	Quota-share	Risk transfer
Dividends paid – first 10 years	100%	115%	105%
Dividends paid – total	100%	80%	92%
Dividends paid – total – discounted	100%	81%	93%

One advantage of also reinsuring in-force business over only reinsuring new business is that, in general, reinsurance premium levels are relatively lower because more liabilities are now reinsured. However, transferring more risk also lowers capital generation further. The results of the example above show the following:

- Implementing a quota-share treaty in this example causes a material increase in the solvency coverage ratio at the outset. This is mainly due to a decrease in capital requirements caused by the transfer of both longevity and market risk. This decrease is partially offset by an increase in counterparty default risk.
- A similar conclusion holds for the longevity risk transfer reinsurance, only now market risk is not impacted, resulting in a smaller increase of the solvency coverage ratio at the outset.
- Again, the reinsurance margins and capital required for counterparty default risk lead to a decrease in capital generated. Implementing a quota-share treaty in this example leads to a material decrease in excess return on assets (in absolute terms), lowering the capital generation further.

In the medium term, both the quota share and risk transfer enable the insurer to pay out more dividend than was the case without reinsurance. This is especially true when implementing the quota-share treaty. The quota-share treaty frees up a large amount of capital (own funds) at the outset, which can be paid out as dividend.

In the long term, both reinsurance treaties again cause the total amount of dividend payments to decrease due to the decrease in capital generated. This decrease is most apparent in the case of the quota-share treaty because of the decrease in excess returns on assets it causes.

Of course, not fully paying out all released capital as dividend, but instead using it to improve the return on the insurer's capital and equity, could lead to a further improvement of dividends in the long term. One example of this is the re-risking of the asset portfolio to increase excess returns on assets.

An alternative to the quota-share treaty could be a full reinsurance treaty, discussed earlier in the section on asset-intensive reinsurance covers. An example of implementing such a treaty on the fictional insurer is shown in Figures 21 and 22. Both include new business written (1) without any reinsurance cover, (2) including a 50% quota-share treaty on both immediate annuity in-force portfolio and new business and (3) including a full risk reinsurance treaty on both the immediate annuity in-force portfolio and new business. Again, note that the base scenario without reinsurance cover is used as the basis in these numbers and is therefore set to 100%.

Figure 21: Projected Coverage Ratios and Dividends

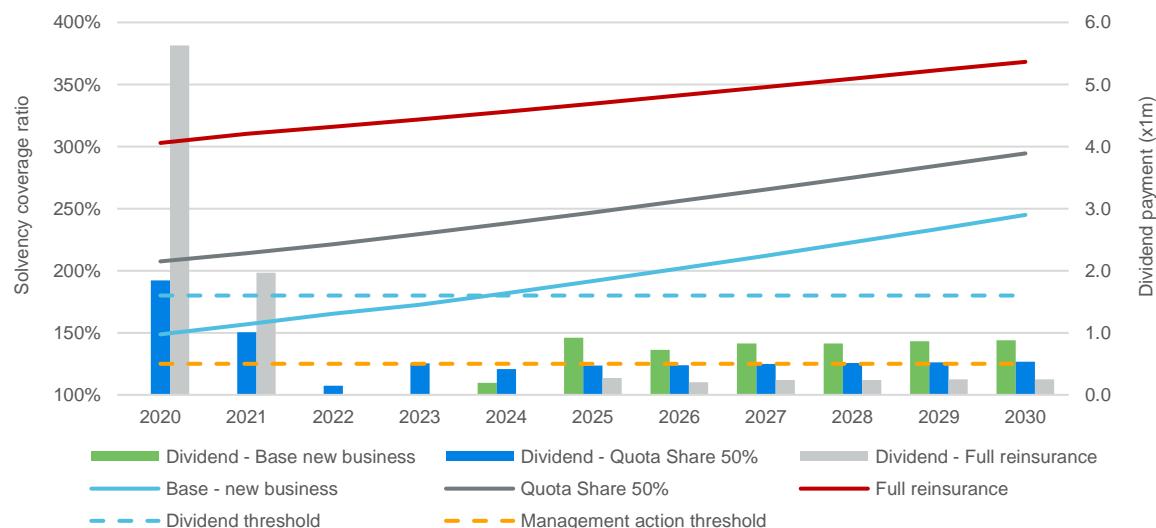


Figure 22: Expected Dividend Payments

	Base new business	Quota-share	Full risk reinsurance
Total dividend paid – first 10 years	100%	115%	137%
Total dividend paid – total	100%	80%	69%
Dividend paid – total – discounted	100%	81%	71%

The conclusions are in line with the quota-share treaty example discussed earlier in this section. The impacts on dividend payments are bigger because now the entire immediate annuity back-book and new business are in scope of the reinsurance treaty.

Fully reinsuring the immediate annuity back-book and new business would give away all profits expected to be generated by this portfolio plus a profit margin for the reinsurer. Whilst the full reinsurance might increase the coverage ratio through reduction in SCR, it may also lead to a drop in own funds over time and limit future dividends paid.

This also follows from the expected dividend payments in the table in Figure 22. The full reinsurance allows the fictional insurer to pay out the unlocked capital in the first two years. Afterwards, dividend payments are minimal due to the loss in profitability. The main use of implementing a full reinsurance treaty on the immediate annuity portfolio of this fictional insurer is therefore to unlock capital currently ‘trapped’ in this low-return portfolio and use it to improve overall returns on the insurer’s other business.

### 3. Reduce capital requirements only by transferring underwriting risk

Of course, an insurer can also choose to only transfer risk on its in-force portfolio. All profits due to new business written now remain on the insurer’s P&L. Dependent on the size of the in-force block of business, a quota-share and full risk reinsurance cover could both be considered. There can be multiple reasons to only reinsure the back-book, ranging from optimising the risk profile and diversification benefits to unlocking capital for other purposes. In the shorter term, the impact on dividend payments in the case of the fictional insurer is likely to be similar to the ones shown in Figure 22. The quota-share percentage applied determines whether the impact is closer to the quota-share results or full risk reinsurance results in this table. In the longer term, the impact of the reinsurance treaty on dividend payments becomes smaller due to the run-off of the reinsured in-force portfolio and new business not being reinsured.

#### 4. Reduce volatility of risk margin

As mentioned earlier, the typically long duration of a life insurance portfolio means the risk margin is substantial. Changing interest rates can materially impact the risk margin and, therefore, also the own funds and coverage ratio. This interest rate risk is not captured by the SF SCR and should be considered when evaluating the insurer's balance sheet and risk profile and when implementing capital management strategies.

This interest rate volatility could be hedged by market instruments (e.g., interest rate swaps), but that can actually create the opposite exposure in the SF SCR. Also, the risk margin doesn't actually alter the liability cash flows of the insurer, while the market instruments will alter asset flows. Interest rate options (swaptions) could be used to hedge the downside risk while limiting upside losses, but this involves paying a significant premium.

A potential alternative approach is to consider reinsurance solutions to mitigate the interest rate risk and reduce the sensitivity of the coverage ratio to changes in interest rates.

Essentially the insurer enters into a capital relief trade, such as those described elsewhere in this paper. Or the insurer might seek direct relief for the risk margin, for example by securitisation of the release of future margins as the risk margin unwinds, or by a contingent reinsurance of the underwriting risk driving the risk margin.

In either case the cover, and so the capital relief, is increased or decreased in size as rates move and, by doing so, mitigates the change in risk margin.

These reinsurance covers work especially well for liabilities such as the risk margin that are considered noneconomic as they basically become pay-as-you-go swaptions. An example is illustrated in the table in Figure 23. The impact shown (1) excludes a risk margin solution and (2) includes a risk margin solution to reduce volatility. The own funds before interest rate shock are lower in case a risk margin solution is implemented due to the premium to be paid. The SCR increases due to counterparty default risk.

*Figure 23: Impact of a 1% Parallel Decrease in Interest Rates on the Own Funds and SCR in the Base Scenario*

Reinsurance strategy (x€1,000)	Base, excl. risk margin solution	Base, incl. risk margin solution
Own funds before interest rate shock	14,000	13,800
Risk margin before shock	2,800	2,800
Risk margin after shock	3,400	2,800
Own funds after interest rate shock	13,400	13,800
Solvency Capital Requirement	9,300	9,350
Coverage ratio before shock	150%	148%
Coverage ratio after shock	144%	148%
Change in coverage ratio, base excl. reins.	<b>6%</b>	<b>2%</b>

#### 5. Release risk margin by transferring underwriting risks

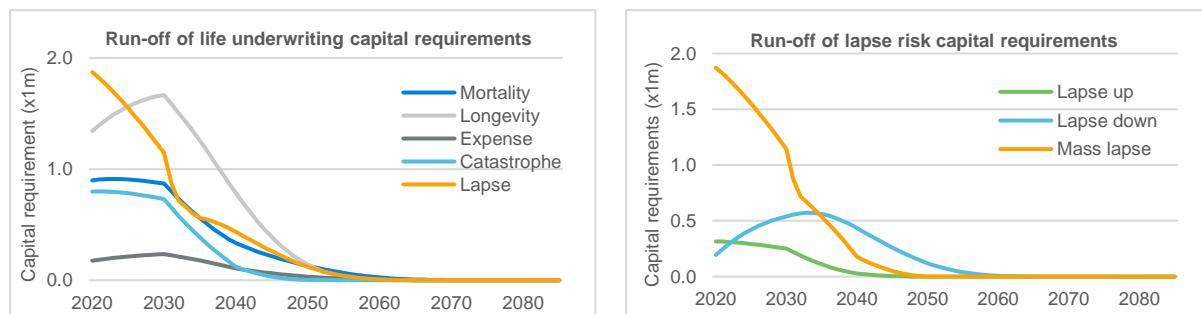
The SCR at the outset is not always fully representative for the run-off of the insurer's risk profile. At the outset, longevity risk is by far the largest underwriting risk for the fictional insurer, followed by lapse risk. In cases where the immediate annuity book runs off faster than the whole-of-life and mortgage protection books, longevity risk would not be the largest in the longer term and risks such as lapse and mortality might contribute more to the risk margin. Another way to improve the value of the company and to reduce the additional volatility introduced by the risk margin is to transfer underwriting risks based on their contributions to the risk margin, rather than the SCR.

The run-off patterns of the life underwriting and lapse risks—after implementation of a 50% longevity risk transfer—of the fictional insurer are shown in Figure 24. The projected capital requirements for life underwriting risk are shown in the left-hand graph and the individual lapse risk stresses in the right-hand. Please note that these results already include the 50% risk transfer of longevity. Also, new business is written in the first 10 projection years. Afterwards the portfolio is in run-off. Next to the longevity risk transfer reinsurance discussed earlier on, the fictional insurer could also consider transferring lapse risk.

If two of the lapse stresses are close to each other in magnitude, the capital requirement for lapse risk is only brought down sufficiently if both stresses are reinsured. Usually, reinsuring both stresses is too expensive for the capital management action to be effective. In the case of the fictional insurer this does not seem to be an issue. The capital requirement for mass lapse in the first years is materially bigger than the requirements for lapse down and lapse up. Transferring mass lapse risk is therefore expected to have a material impact on the capital requirement for lapse risk as a whole.

Once mass lapse risk is transferred, catastrophe risk is one of the bigger remaining risks. This risk can be transferred using an excess-of-loss type of reinsurance. It could be worthwhile to also consider this when reducing the risk margin because these types of reinsurance treaties are usually relatively capital-efficient.

*Figure 24: Run-offs of Capital Requirements*



## 6. Reinsurance pool

Smaller insurance portfolios can employ the law of large numbers to a lesser extent, leading to additional volatility. In earlier sections, we discussed how an insurer could manage this risk by implementing reinsurance strategies such as a quota-share or excess-of-loss reinsurance. Another strategy that the insurer could choose is risk pooling. Risk pooling is an insurance practice where groups of policies are placed together in the same pool of risk or reinsurance pool, whereby experience is shared by all groups in the pool. By doing so, volatility is lowered, allowing the insurer to increase its ability to underwrite specific types of risk. Furthermore, larger insurer pools typically result in lower costs.

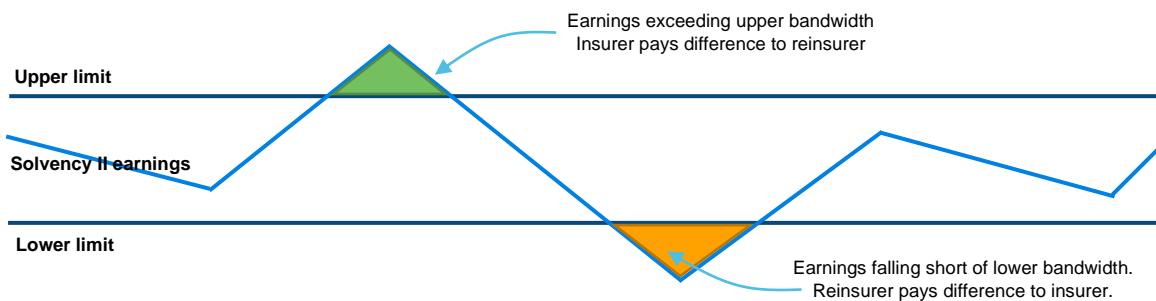
There are several ways to implement a reinsurance pool. One way is for the insurer to cede risk to the pool under a treaty reinsurance agreement. The insurer may be a part owner of the pool and may assume a quota share of the pool risk. Another way is through a captive reinsurance pool. In this case a special-purpose insurer is set up, taking risks from all participating ceding companies. The reinsurance captive does not issue policies directly to insureds and typically does not have a license to provide insurance.

## 7. Smoothing profits, capital and coverage ratio

Contingent capital can be used to smooth profit, capital and the coverage ratio of an insurer. This is important because stability of financial statement profits is generally viewed as a positive by most companies. Shareholders of the company generally prefer more stable emergence of profits as volatility can affect both equity prices and the rating of the company in a negative way. Furthermore, insurers may have profitability targets embedded in their risk appetite policies.

The contingent capital loan is an off-balance sheet arrangement where the reinsurer agrees to provide a capital injection through a loan, purchasing debt or providing equity to the insurer in the case of a certain contingency or if a threshold is crossed and vice versa. Where this threshold is set to be an average expected profit, capital or coverage ratio, the reinsurer will provide a capital injection to the insurer if it is below the threshold in a certain year. In return, the insurer will pay the reinsurer if it exceeds the threshold.

Figure 25: Example of a Contingent Capital Structure Smoothing Solvency II Earnings



The solvency coverage ratio can be stabilised further by combining this cover with other capital management actions such as using financial reinsurance to stabilise asset returns and excess-of-loss reinsurance treaties to stabilise the SCR. However, there are of course limits to this because these treaties also require the insurer to pay reinsurance premiums. This is also the reason why the bandwidth chosen for the earnings stabilisation should remain relatively wide. Furthermore, it is important that the boundaries are not changed after adverse events to increase the expected repayments to the reinsurer, as this would mean the cover would be treated as finite reinsurance.

## 8. Treatment of LACDT, DTA and DTL

Under Solvency II, insurers may hold a deferred tax asset (DTA) or deferred tax liability (DTL) on their balance sheets. They reflect the temporary differences between local tax rules and Solvency II rules.

A Solvency II stress will lead to a loss on the company's P&L and therefore also a loss in taxable income. This loss in taxable income can result in tax reductions, leading to an increase in DTA or a decrease in DTL. Where the insurer has a DTA on its balance sheet, it is important to realise that—in order to increase the DTA—the insurer needs to prove that sufficient future taxable profits are available to offset the losses due to the Solvency II SCR stress.

An increase in DTA or decrease in DTL will partially offset the decrease in own funds due to the losses in the stress scenario. Because the capital requirements are mostly determined as the change in own funds due to stress scenarios, an insurer is allowed to offset the SCR with the impact on DTA or DTL under the stress scenario. This correction is also referred to as the loss-absorbing capacity of deferred taxes (LACDT) and can reduce capital requirements substantially.

If the insurer has a DTA on its balance sheet, reinsurance can be used to prove that there are sufficient future profits to offset losses. The main requirement for such an arrangement is that it sufficiently improves the solvency ratio of the insurer post-stress, leading to an increase in profitability. There are several ways to do this such as contingent loans or contingent reinsurance. In the case of a contingent reinsurance arrangement, the arrangement is activated due to the Solvency II stress and the reinsurer provides the insurer with capital.

## 9. 'Just-in-time' capital

Insurers can choose to put a reinsurance treaty in place that involves a minimal risk transfer initially to prepare for adverse times. For instance, a quota-share treaty could be implemented where only a small portion of the liabilities is ceded to the reinsurer, but the reinsurer commits to a certain level of future capacity in exchange for a facility fee. Because a minimal amount of risk is transferred in this deal, the reinsurance premium is likely to be low and most of the assets and liabilities remain on the insurer's balance sheet, ensuring that its capital-generating potential is maintained.

However, putting such a minimal treaty in place still requires much of the due diligence work to be done. Regulatory approval may be required and underwriting, claims and reserve reviews need to be done. The main benefit of putting such a minimal reinsurance treaty in place is that it can be scaled up quite easily. If the insurer needs to transfer risk, for instance as part of a recovery plan, the quota-share percentage can be increased without too much effort, because most of the required work is already done as part of the initial due diligence process.

## 10. Reducing the impact of options and guarantees

Life insurance policies can have several options and guarantees. Examples are separate accounts and variable annuities. Where the insurer has these guarantees on its balance sheet, it faces the risk that future investment returns will not be sufficient to cover the guarantees to its policyholders. The insurer is required to hold additional reserves for this on its balance sheet, the time value of options and guarantees (TVOG). Even if investment returns exceed the guaranteed rates, a TVOG is still required because there is a chance that in the future investment returns will decrease.

As a result, options and guarantees introduce market risk on the balance sheet and require the insurer to hold additional Technical Provisions on its balance sheet by means of a TVOG (which would be a component of BEL under Solvency II). Hedging options and guarantees can partly or even fully remove market risk in respect of guarantees from an insurer's balance sheet, replaced of course by counterparty risk. Furthermore, the hedge will decrease the TVOG and therefore increase own funds.

There are several ways to implement such a hedge. One of them is to implement an overlay using swaps and swaptions. Reinsurance arrangements can also be used for this purpose. In this case, the reinsurer covers adverse developments in capital markets. In return, the reinsurer shares in the upside in case investment returns exceed guaranteed levels.

## 11. M&A deals

Reinsurance agreements can sometimes be used as an interim solution when an M&A transaction has been agreed between two or more parties. If the transaction will involve a portfolio transfer, it can take a prolonged period of time to get formal regulatory and legal approval. The purpose of reinsurance in this case is to recognise the economic impact to these approvals in advance of formal approval.

## 12. Management of run-off portfolios

Reinsurers (and also private equity firms and consolidators) can offer several structures to manage insurance portfolios in run-off. They range from acquiring the portfolio to co-venturing, profit sharing or partnership structures. This can be of interest for an insurer because retaining legacy liabilities requires the insurer to hold capital with related costs. Disposing of run-off liabilities can release capital, and save on administration costs, which the insurer can redeploy to its core business.

## 13. Reduce capital costs

Reinsurance is not the only way for an insurer to improve its balance sheet. Contingent loans, contingent capital, subordinated debt or intragroup loans are alternative ways to protect the insurer in adverse scenarios. However, all of them come with their own advantages, disadvantages and costs. Reinsurance could be used to replace them, freeing up capital that can be redeployed for other purposes.

# Conclusion

There are several ways reinsurance can be used as a capital management tool. Of course, the above are just examples and, in practice, their efficiency is dependent on a lot of factors. When implementing a reinsurance arrangement, several choices therefore need to be made. Are the capital management actions only applied on the in-force book, new business or both? What is the effectiveness of the actions in both the short term and the longer term? How do the actions impact the volatility of the coverage ratio? For example, is the management action threshold of 125% still reasonable after implementation of the action? And, if the risk profile changes materially, is the Solvency II SF still appropriate for use—or should the company use its own internal measures to gauge risk? These questions make it a complex puzzle to solve.

It is important for the management of the insurer to have answered them before deciding which capital management strategy to implement. Once a reinsurance arrangement is implemented, it can be challenging to recapture it or to transfer it to a different counterparty.

## Appendix 1: Other considerations when implementing reinsurance

### Internal risk assessment

Companies will also need to satisfy their own risk policies when implementing reinsurance cover. Indeed, this should really be the starting point for insurers. All insurers will have a risk appetite, risk tolerances and various risk policies, including reinsurance policies that support their strategies for accepting and transferring risk. Insurance companies will need to ensure that any new reinsurance arrangements satisfy all of these internal requirements. A company's risk team will also review the arrangement to ensure the reinsurance transaction complies with internal risks policies.

The reinsurance arrangement must also be analysed through the Own Risk & Solvency Assessment (ORSA) process, which can help to demonstrate whether a particular reinsurance agreement is achieving its expected objectives and to assess the impact on the risk profile and capital needs of the insurer.

### Operational aspects

Companies will need to be in position to administer their reinsurance arrangements. There are many operational aspects to consider when entering into reinsurance treaties. They will include:

- Providing reinsurers with data on a regular basis.
- Valuation and financial reporting: Companies will of course need to recognise their reinsurance arrangements as part of their financial statements and solvency balance sheets. They will therefore need to have appropriate methodologies and models in place, and sufficient resource to perform and review the calculations.
- Keeping track of items that impact payments under the reinsurance treaty.
- Calculating payments due both to and from the reinsurer under the reinsurance treaty.
- Monitoring credit exposures to reinsurers and monitoring reinsurers' credit ratings.
- Legal costs and dispute resolution.
- Additional resources to monitor exposures, performance and modelling of reporting of reinsurance liabilities and arrangements.
- Monitoring and managing collateral backing reinsurance arrangements.

Extra administration support will be required. The reinsurer may need to conduct periodic audits which will increase workload on claims and administration teams. Claims that may fall outside of treaty limits will require extra resources to agree to them.

### Termination options

Some reinsurance deals can span many years, even decades, and due to the evolving nature of an insurer's business it may need to change its reinsurance arrangements or cancel a contract. The following are examples of options that allow the insurer and reinsurer to dissolve the contract:

- Recaptures: Options for the insurer to take back or recapture some or all of the liabilities under the reinsurance treaty.
- Commutation: This is a termination option where the insurer and reinsurer agree to cease obligations under the contract and thus eliminate the reinsurer's future exposure to liabilities. A payment is usually required to commute the contract. Contracts are usually commuted if the portfolio becomes very small and administrative costs of reinsurance become burdensome for the insurer.
- Novations: These occur where one of the parties to the transaction, the insurer or the reinsurer, is replaced from contract inception with a third party. If the reinsurer wishes to novate the treaty, they are effectively fully transferring the risk of all future liabilities associated with the contract to another counterparty or reinsurer.

Typically, termination options which are held by the insurer, or are held by the reinsurer but require agreement from the insurer in order to be executed, do not have an impact on the effectiveness of the reinsurance arrangement in mitigating capital requirements. If there were particular termination options in the contract that the reinsurer could unilaterally exercise, they could amount to conditions that undermine the effective transfer of risk, which might exclude the use of the arrangement in mitigating capital requirements.

## Intragroup transactions

Companies in groups can utilise intragroup reinsurance (IGR) transactions to manage solvency and liquidity risks. They are an important tool for groups and their subsidiaries to manage capital efficiency throughout the group structure. The rationale for using IGR is often the same as for using reinsurance between two unconnected companies, and most types of reinsurance transactions or strategies that can take place with an external counterparty can also be used for IGR. An IGR transaction will benefit both parties where the ceding company is reducing its exposure to an undesired risk and the other subsidiary is gaining exposure to risks that it would like to hold.

IGR transactions may be used for the following reasons:

- To transfer risk and capital requirements to a subsidiary that has surplus capital (i.e., manage capital efficiency).
- Due to different risk appetites between subsidiaries.
- To reduce overall capital requirements and improve solvency ratios.
- To improve other capital-driven ratios such as rating agency capital adequacy ratios or to meet internal guidelines.
- To manage the level, emergence and volatility of profit in the P&L account of the two subsidiaries and group. Reinsuring risks that are a source of volatility can lead to a more stable emergence of profits and losses.
- To diversify risks throughout the group to improve capital efficiency.
- Where there are different approaches to accounting rules and capital regulation in different sectors or jurisdictions, increasing opportunities for regulatory arbitrage.
- It may be easier for one of the companies to write certain risks in a jurisdiction or sector and another company in the group would like exposure to the risks. The ceding insurer may not want to retain the risks.

It is important to consider the impact of IGR transactions on each subsidiary as well as the impact on the group accounts. An IGR transaction should be assessed independently by both sets of boards and management to determine whether the transaction is in the company's best interests.

Pricing and negotiation of the IGR transactions should be independent and use market pricing. Regulators and tax authorities will also give IGR transactions special scrutiny. There should be clear evidence that the IGR transactions benefit all parties to the reinsurance transaction. It is also important to consider the impact of the transaction on the group as a whole, but a transaction that is beneficial for the group and adverse for both parties is not likely to be acceptable to regulators.

Insurers should monitor the performance of these reinsurance contracts in the same way that they would for an external counterparty.

Insurers using intragroup transactions should also consider the extra risks faced by having an internal counterparty to the reinsurance transaction. For example, reinsuring through different companies across the group can lead to concentration risk where the solvency of the ceding insurer now becomes more dependent on the solvency of the group or to another subsidiary. Insurers should assess the risks from entering into intragroup transactions as part of their risk monitoring systems. The insurer should have a process for measuring, monitoring and managing its material intragroup reinsurance contracts.

## Ancillary benefits of reinsurance

Besides transferring risk, an insurer can gain use of the reinsurer's expertise and additional services. Reinsurers can support insurers on areas such as product design, experience analysis, underwriting and policy administration. Insurers can benefit from the reinsurer's expertise in distribution, marketing, market insights and claims management. This can go as far as the reinsurance cover becoming a coinsurance arrangement, or even the reinsurer carrying out the necessary policy administration.

When entering into a reinsurance agreement, the reinsurer may offer experience refunds to the insurer if the experience is better than the expected experience used in the assumptions of the policy.

Reinsurance might aid asset liability management (ALM). Several reinsurance strategies not only transfer risks related to liabilities but also help to mitigate an insurer's financial risk. The reinsurer may oversee the asset management, which can involve investing the assets within the guidelines and risk limits imposed by the collateral requirements and may find it easier to implement hedging strategies. Regardless of whether the reinsurer oversees the asset management, longevity liabilities such as annuities and variable annuities are typically very sensitive to interest rate movements, for example. By hedging longevity risk using a reinsurance arrangement, a company not only reduces its risk and capital requirements in respect of longevity risk, but also reduces the interest rate sensitivity of the risk margin and SCR for longevity risk.

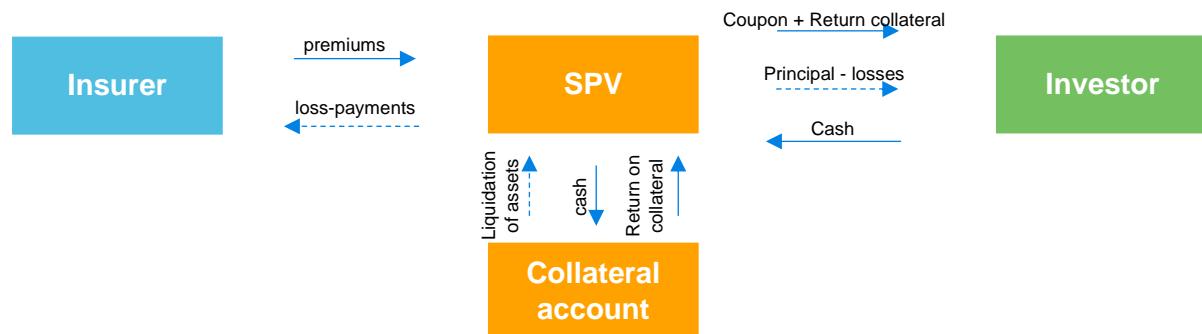
Finally, new reinsurance arrangements can bring diversification benefits that can be shared by both reinsurers and insurers. This is because reinsurers typically have large portfolios of business covering a diverse range of risks. This gives rise to significantly lower capital requirements than the sum of capital requirements for each of those risks held in isolation. While this diversification benefit is primarily on the reinsurer's side, the insurer can share in the reduced costs brought about by the efficiency of the reinsurer's diversification of risk.

## Appendix 2: Catastrophe bonds

Capital markets can also be a means for transferring risk, such as longevity risk. Reinsurers often provide these markets with their expertise and can play a role as market makers or are involved in the risk transfers themselves.

Catastrophe bonds were first introduced in the insurance market in the 1990s and are mainly used to transfer catastrophe risk for (re)insurers of property and casualty (P&C) cover. However, they can also be used to transfer longevity and mortality risk. Longevity and mortality bonds are structured in a way similar to a catastrophe bond.

*Figure 26: Workings of a Catastrophe Bond in Practice*



Generally, catastrophe bonds are issued by the insurer and bought by investors. They are typically structured as follows. The insurer pays a premium to purchase catastrophe reinsurance for a series of prespecified event(s) over the coverage period. The investor pays a cash amount called a principal into a secured collateral account operated through an SPV. The premium and principal amounts are typically invested in low-risk securities such as money market accounts or AAA-rated bonds.

The bond will only pay out to the insurer when a specified event occurs, and the losses related to it exceed a threshold. The investor receives a regular coupon which is funded by the insurer through the reinsurance premium plus the return on the investments in the collateral account. In the case of a loss event occurring, the coupon payments can be cancelled or deferred. If, at maturity, the losses incurred are less than the principal, then the investor receives back the principal minus the incurred losses.

Catastrophe bonds are popular with investors as the bonds generally have high yields and maturities are short-dated. The correlation between the prespecified events underlying the bonds and financial risks in the investor's portfolio are usually low. This allows investors to use catastrophe bonds to further diversify risk within their portfolios.

## Appendix 3: Characteristics per reinsurance type

Please note that the characteristics included in the tables in Figure 27 are a high-level assessment of the reinsurance covers and are highly dependent on factors such as how a treaty is structured, its scope and the insurer's risk profile. This is also the reason that we did not include the full list of characteristics introduced in the chapter on assessing reinsurance for capital management, such as P&L volatility or impact on dividend, as impacts would most probably differ per insurer.

*Figure 27: Characteristics per Reinsurance Type Introduced Throughout the Paper*

Risk transfer	Indemnity-based longevity swap	Index-based longevity swap	Longevity bonds	Quota-share cover
Scope of reinsurance	Underwriting risk	Underwriting risk	Underwriting risk	Underwriting & asset risk
Basis risk	No	Yes	Yes	No
Collateral placed	High	High	High	Low
Counterparty default risk	Low	Low	Low	High
Suited for small portfolios?	No	Yes	No	Yes
Duration of cover lower than liabilities?	Potentially	Yes	Yes	No
Flexibility	High	Lower	Lower	High
Availability	High	High	Low	High
Regulatory approval	Normal	More difficult	More difficult	Normal

Risk transfer	Excess-of-loss cover	Mortality swaps and bonds	Mass lapse	Lapse up/down
Scope of reinsurance	Underwriting risk	Underwriting risk	Underwriting risk	Underwriting risk
Basis risk	No	Yes	Yes	Yes
Collateral placed	Low	High	Low	Low
Counterparty default risk	High	Low	Low	Low
Suited for small portfolios?	Yes	No	No	Yes
Duration of cover lower than liabilities?	Yes	Yes	Yes	Potentially
Flexibility	High	Lower	Lower	Lower
Availability	High	Low	Low	Low
Regulatory approval	Normal	More difficult	More difficult	More difficult



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