

ISSUES IN BRIEF

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DETERMINING RISK APPETITE

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AS I WRITE THIS INTRODUCTION, SOLVENCY II IS STILL ON COURSE FOR A 1 JANUARY 2014 LAUNCH, BUT IT IS GOING TO BE TIGHT. THE CONCEPT OF MARKET CONSISTENCY HAS COME UNDER CONSIDERABLE STRAIN IN RECENT MONTHS, WITH THE COMBINATION OF ULTRA-LOW GOVERNMENT BOND YIELDS IN GERMANY AND VERY HIGH YIELDS IN OTHER PARTS OF THE EUROZONE CAUSING WIDESPREAD PROBLEMS, AND SOME INTERESTING DIVERGENCES OF VIEW AMONG ACTUARIES. THE UNCERTAINTY FOR UK ANNUITY WRITERS DRAGS ON—ALTHOUGH THE CONCEPT OF A MATCHING ADJUSTMENT HAS BEEN CARRIED FORWARD INTO THE TRILOGUE DISCUSSION ON OMNIBUS II (ALONG WITH ITS COUSINS THE ILLIQUIDITY PREMIUM AND THE SYMMETRIC ADJUSTMENT MECHANISM), IT REMAINS TO BE SEEN WHETHER THE CONDITIONS ATTACHING TO ITS USE WILL SERIOUSLY IMPAIR ITS IMPACT.

In this edition of *Issues in Brief*, we address two aspects of Solvency II: internal model validation and the impact on reinsurance of protection products. We also consider how to set a company's risk appetite, an important component of the Pillar 2 requirements, in an article based on some research carried out for the UK Actuarial Profession, and look at dynamic ALM, which was discussed at a recent Staple Inn Actuarial Society meeting.

NICK DUMBRECK
PRINCIPAL AND
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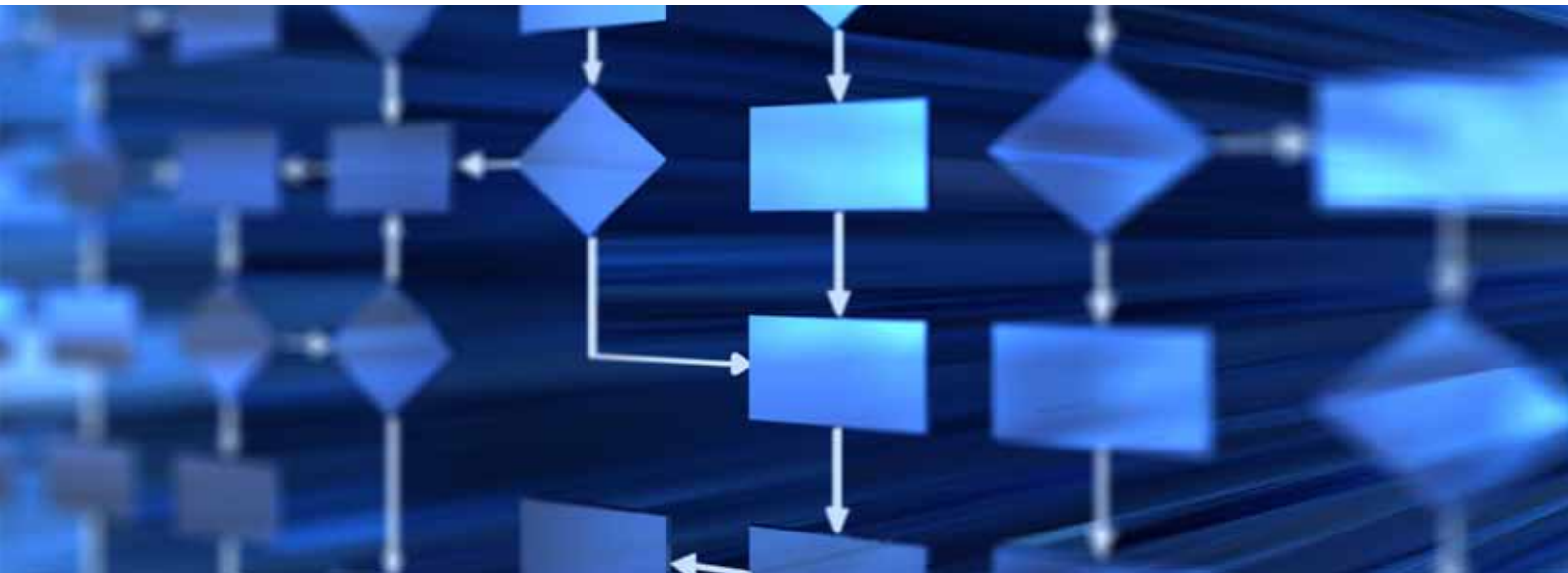
As the FSA prepares to make way for the Prudential Regulation Authority and the Financial Conduct Authority, the regulation of with-profits business—an area in which both of these successor bodies have an interest—has advanced with the publication of PS12/4. While some of the more contentious aspects of consultation paper CP11/5 have been dropped, at least for now, the FSA has maintained its view on the fundamental issue of the interest of with-profits policyholders in the estate. We summarise the main aspects of PS12/4 in this issue.

The expansion of Milliman's presence in Europe continues, with new offices in Brussels and Dusseldorf having opened since the start of the year. This brings the total number of European offices to 12. As well as the usual map, the back cover includes contact details for all these offices.

Enjoy the summer!
Nick Dumbreck

SOLVENCY II

INTERNAL MODEL VALIDATION



Now that internal model development has gathered pace and we move closer to the long-awaited implementation of Solvency II, focus is beginning to switch to the validation process. Up until this point, it has not been high on the agenda, or at least not sufficiently high to attract much attention.

Validation applies to all aspects of internal models. It needs to capture the entire modelling process, including the underlying concepts and theory of the model, statistical and data issues, and the governance process around it. It can be thought of as both a quantitative and a qualitative assessment of the model. The Solvency II Directive places much importance on internal model validation. After all, decision making on the basis of such models can only be as sound as the models themselves. Model validation, therefore, is a much broader concept than simply focussing on the calculation kernel of the model.

Article 44 of the Solvency II Directive entrusts much of the responsibility for model validation to the risk management function. This includes testing and validation of model, analysis of the performance of the model, and reporting of results and recommendations to the management body. Of course, the

validation process is ultimately owned by the board.

Internal model validation should not be thought of as a one-off task to be completed as part of the internal model approval process. True, it is a critical step in this process. However, it is much more than that: it is really a key control process in itself, one which must remain active long after the model has been approved. Article 124 of the Directive describes the need for a continuing process. It mentions that validation should become a regular cycle, monitoring the performance of the model on an ongoing basis. It should include validation of the statistical aspects of the model, examination of the stability of results, including the sensitivity of these results to key assumptions, and should also consider the accuracy, completeness and appropriateness of data.

It is clear that the process must also cover the specific tests (including calibration, statistical quality, profit and loss attribution, documentation and the use test) which must be passed before initial supervisory approval of the model can be achieved. This process should become a cycle of continuous improvement of the model, which should in turn lead to improved information feeding into the decision-making process. In this way, the process

itself becomes as valuable as the result as the internal model becomes more refined and better understood by all stakeholders.

There are a number of separate stages in the validation process. Before embarking on model validation, it is important to take time to set out a roadmap so that appropriate time and energy can be devoted to each aspect of the model. Validation is not a trivial task. It is much easier to go through the process accumulating “negative assurance” (for example, that certain aspects of the model are not unreasonable) as opposed to gaining “positive confirmation” (for example, that a particular assumption is appropriate and well founded). Proper identification of the various stages in the process as well as appropriate delegation of responsibility to an appropriately skilled team are key steps.

The initial validation process can be broken down into a number of steps. These include:

- An examination of what the model is setting out to achieve
- Questioning the theoretical basis on which the model is being developed (noting that emerging or existing market practice does not provide assurance in itself)

- Taking a close look at the data and parameters being used
- Carrying out detailed implementation validation (which is something that is often overlooked) which, in practical terms, involves making sure that the theory upon which the model is based has been correctly implemented in the coding underlying the model
- Consideration of the governance framework around the model (including the particular controls in place relating to implementation of model changes)

The model validation process will be highly bespoke to the business being modelled. In particular, it is important to bear in mind the nature, scale and complexity of the business and risks being modelled. It is also important to look out for use of "expert judgement" in the model, as validation of aspects of the model which rely on expert judgement can pose challenges of their own.

Once initial model validation has been completed, provision must be made for the ongoing validation of the model. This involves monitoring the performance of the model over time and comparing this to what was expected. As new risks arise or it is found that model improvements are required, then further validation must take place until the model is again deemed to be fit for purpose. In the long term, this process can be linked to the Own Risk and Solvency Assessment (ORSA) process as well as to the use test. The ORSA process will link into the internal model and explicitly consider sensitivity testing, scenario testing, reverse stress testing and back-testing (through experience attribution analyses), which are key steps associated with model validation.

Independence is important when it comes to the internal model validation process, as highlighted by the text of the Solvency II Directive. Article 229 discusses the need for validation to be independent of the development and operation of the internal model. Care should be taken when putting together

a model validation team, especially if reporting lines become blurred. There may be a number of options available, ranging from the creation of a team of internal resources to the use of internal audit or external experts who have not been involved in the model development phase (as it should be recognised that external does not necessarily imply independent in all instances). Ideally, a combination of these approaches would be used, coordinated by the risk management function, where the particular skill sets of each group can be better matched to the particular aspects of model validation being considered.

There are many challenges to be overcome by those engaged in model validation. Achieving the buy-in of senior management is vital as otherwise advocating changes to the model, particularly if resources are constrained (as is often the case), may be very unpopular. There is a need for model validation experts to have a direct line to the management body so that key messages can be communicated quickly and effectively. In order to satisfy the use test, there will also need to be clear evidence of challenge to the model at each step of the way, through a well-

documented and transparent validation process. Ultimately, a report must be prepared by the risk management function for the board, addressing aspects such as the tools used as part of the validation process, the scope of the validation that has been carried out, the outcome of the process and any key observations and recommendations.

Validation is not just a negative process or a hurdle to be cleared in achieving regulatory approval. It may bring many benefits to a range of stakeholders. It can provide assurance to management that it is on the right path and can identify opportunities for firms to achieve tangible benefits (such as improved capital efficiency) through model improvement. It can also enhance policyholder protection through identification of any shortcomings in models so that product providers can be adequately capitalised. It can improve confidence in the entire system. Proper validation is indispensable.

If you would like to discuss any of the topics raised in this article, please contact Eamonn Phelan at eamonn.phelan@milliman.com, or your usual Milliman consultant.

VALIDATION IS NOT JUST A NEGATIVE PROCESS OR A HURDLE TO BE CLEARED IN ACHIEVING REGULATORY APPROVAL. IT MAY BRING MANY BENEFITS TO A RANGE OF STAKEHOLDERS.

FINANCIAL MARKETS CORNER

EUROPEAN VARIABLE ANNUITY ECONOMIC HEDGE COSTS: MARKET UPDATE

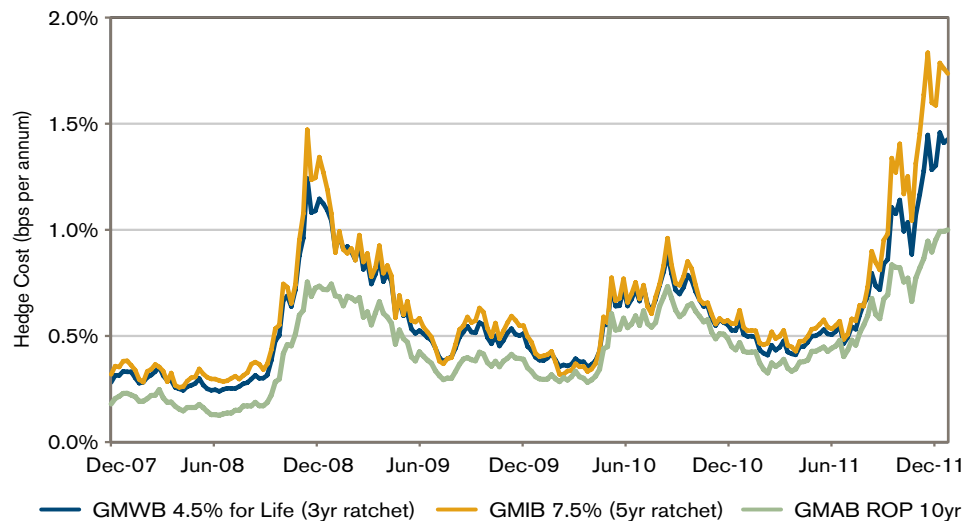
The following graphs illustrate how economic hedge costs for our typical standard example reference variable annuity products and model points have varied since the start of the global financial crisis, in both the UK and Eurozone markets.

In the latter half of 2011, we see a harsh environment for the cost of guarantees. In all cases for both the UK and Eurozone, economic hedge costs reached levels higher than at the depth of the initial crisis in 2008. This is particularly pronounced for the longer-term retirement income guaranteed minimum withdrawal benefit (GMWB) and guaranteed minimum income benefit (GMIB) guarantees, and unsurprisingly more pronounced in the Eurozone market. For the UK, GMWB and GMIB guarantees are 18 bps and 26 bps higher than their December 2008 peak (respectively) for the particular model point and basis illustrated. For the Eurozone, the equivalent deviation from December 2008 is even higher, at 55 bps and 75 bps for the particular respective GMWB and GMIB guarantee model points and basis illustrated.

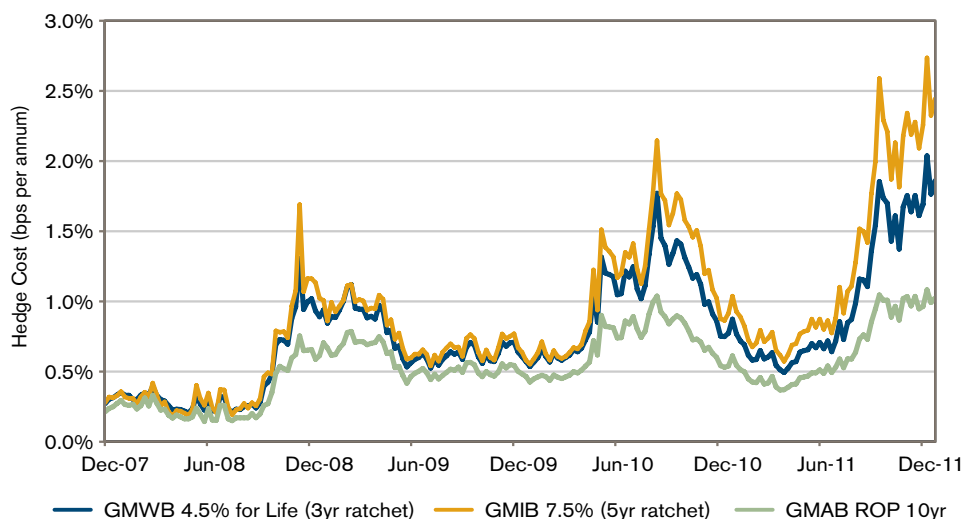
The biggest driver has been the steady decline in mid- to long-term interest rates during 2011. In the Eurozone at the end of 2011, we see the 30-year EUR swap rate at all-time-low levels around 2.5%, illustrated in the chart below. This is combined with a creep back up in equity volatilities, with the five-year DJ Eurostoxx approaching the 30% mark once again. The UK market has similarly seen interest rates steadily decline over 2011, with the 30-year GBP swap rate now dipping below 3.0% in early 2012, also illustrated below. FTSE five-year volatilities have also risen, but less markedly so than in the Eurozone.

As well as the VA market, this low-interest environment will have been a challenging one for more traditional retirement products. Fixed and index-

UK EXAMPLE VARIABLE ANNUITY HEDGE COSTS
Calculated by Milliman



EUROZONE EXAMPLE VARIABLE ANNUITY HEDGE COSTS
Calculated by Milliman



linked annuity market rates are also suffering from the corresponding falls in high-quality bond yields, and the cost of offering retirement guarantees on with-profit funds has also been affected.

A continuation of this environment will mean that re-pricing or further modifications in product design are inevitable.

EURO INTEREST RATES (SWAP CURVE ON A SPOT BASIS)
Source: Bloomberg

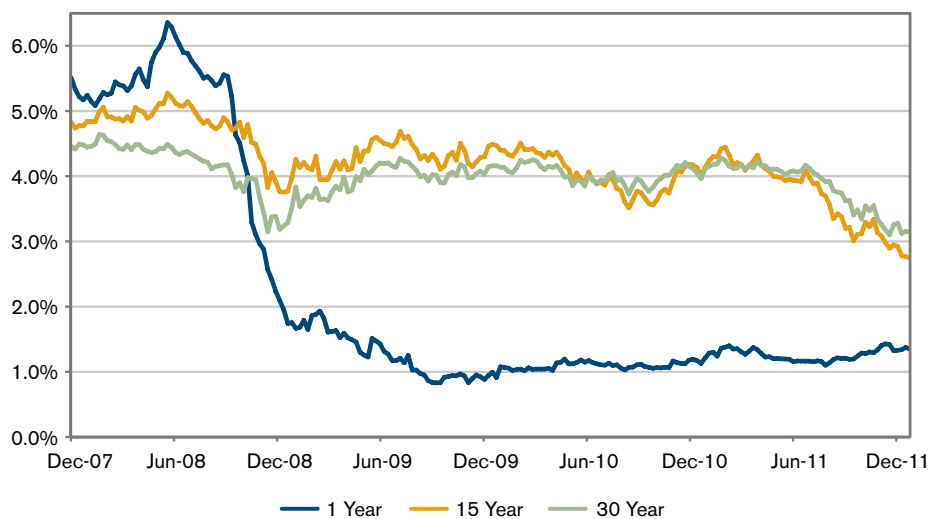


In response to the increased cost and variability in cost of financial guarantees, we are also seeing an increasing interest amongst product manufacturers in protection-account-style products. These products, whilst not offering an explicit guarantee, use dynamic hedging and fund volatility management techniques to offer the investor considerable levels of downside protection, as well as significant participation in upside performance. These products have minimal capital requirements, as the policyholder in directly owning the hedge assets also bears the residual risks, and the actual cost of hedging is instead borne out in the investment experience of the hedge assets.

For more information on the Milliman Guarantee Cost index, you can now refer to ticker MLHCI Index on Bloomberg.

If you have any questions about risk appetite or any other aspects of your risk management, please contact Neil Dissanayake at neil.dissanayake@milliman.com, or Peter Lin at peter.lin@milliman.com, or your usual Milliman consultant.

UK STERLING INTEREST RATES (SWAP CURVE ON A SPOT BASIS)
Source: Bloomberg



ALM-CHEMY? – CREATING VALUE FROM ACTUARIAL MODELLING



When actuaries and risk management professionals are knee-deep in the complexities of upgrading financial models to prepare for Solvency II, it is sometimes hard to see the exercise as anything more than a (necessary) cost for the insurance company. In our view, this overlooks the great potential to use the insights which sophisticated modelling of the assets and liabilities, and their interactions, can give to improve the asset-liability and risk management of a company and hence improve risk adjusted returns.

We refer to this technique as dynamic ALM. Whereas historically the investment strategy has been something which has been fed into the modelling process as an input, we now see the optimal investment strategy being an *output*. This can allow us to fundamentally change the role of the models in the decision-making process of the company so that rather than just providing some basic information on the liabilities such as the duration, the models are one of the key inputs into the selection of the investment strategy.

One of the keys to this approach is the fact that, for lines of business with complex interactions between assets and liabilities such as participating business, the economic

value of liabilities and the value at risk are both dependent on the investment strategy. In actuarial valuations, it will normally be appropriate to model the current investment strategy in order to determine items such as the MCEV or the Solvency II technical provisions. By additionally carrying out valuations on a range of alternative investment strategies, we can calculate and compare key metrics across these strategies. We can then define the strategy (or strategies) which gives the best results for these metrics to be optimal.

We might typically define metrics relating to both risk and return and measure these over a range of candidate investment strategies. It is possible to search for an efficient frontier and to try and identify an optimal investment strategy. A typical

metric for return could be the discounted value of future profits averaged over a range of stochastic economic scenarios. Value at risk using a definition similar to that for Solvency II SCR would be a typical measure of risk. Furthermore, it is not necessary to limit the process to only these two measures. There might, for example, be a further metric related to expected policyholder returns, since achieving good returns for policyholders is likely to influence future new business and hence the franchise value of the company.

Choosing appropriate metrics and criteria for investment strategy should be a decision taken by appropriate bodies within the company and will be dependent on the risk appetite of the company.

OUR DEFINITION OF INVESTMENT STRATEGY IS BROAD AND COVERS NOT ONLY THE CURRENT ASSET ALLOCATION, BUT ALSO THE RULES FOR DECIDING WHAT TO PURCHASE WITH CASH OR WHAT TO SELL TO MEET A REQUIREMENT FOR LIQUIDITY...

Our definition of investment strategy is broad and covers not only the current asset allocation, but also the rules for deciding what to purchase with cash or what to sell to meet a requirement for liquidity and for when assets will be rebalanced to achieve goals such as keeping asset and liability durations matched or maintaining a certain target return for policyholders. The strategy may also define cases where these rules will vary according to the market scenario. In other words, the investment strategy is not only the current asset allocation, but also all the dynamic management actions which will depend on the modelled future outcomes for the company across the full range of economic scenarios.

The resulting optimal investment strategy should be documented in a way which is clearly understood by all relevant parties in the company. If the current investment strategy or expected future management actions deviate materially from this optimal approach, the company should ideally try to rationalise the reasons for these deviations and possibly refine the metrics used to define the optimal approach in order to reflect these factors.

Not only can optimal investment strategies help to improve the investment process, but also, by having such strategies within

FOR THIS PROCESS TO BE SUCCESSFUL, VERY EFFECTIVE COMMUNICATION WITHIN THE COMPANY WILL BE NECESSARY SO THAT ALL RELEVANT MANAGERS UNDERSTAND THE NATURE AND LIMITATIONS OF THE CALCULATIONS BEING CARRIED OUT.

the model used to determine SCR (either on an internal or standard model basis), the company can avoid holding capital in excess of that which would be implied by a model which included a sub-optimal investment strategy.

The optimal investment strategy can also improve the process whereby the effectiveness of the investment strategy is monitored on a continuing basis. The models and the projected economic scenarios will of course never get near the complexity which can be seen in real-world outcomes. But having an idealised benchmark against which to compare actual outcomes can help provide an understanding of the causes of over- or underperformance.

For this process to be successful, very effective communication within the company will be necessary so that all relevant managers understand the nature and limitations of the calculations being carried out. If we succeed in this communication, the dynamic ALM approach can be an extremely powerful one in improving the efficiency and sophistication of the company's risk management.

If you would like to discuss any of the topics raised in this article, please contact Ed Morgan at ed.morgan@milliman.com, or your usual Milliman consultant.

RISK APPETITE



Risk appetite is central to the essence of enterprise-wide risk management. It articulates the boundaries, and sources, of acceptable uncertainty around desired business outcomes. The risk management and internal control systems of a firm are therefore dedicated to ensuring that these are achieved. Without a clear risk appetite, risk management has no focus.

For European insurers this is at the heart of the Own Risk and Solvency Assessment (ORSA) required under Solvency II regulations, as they are obliged to judge their performance against a stated risk appetite. For general corporates, formal risk appetite is also moving higher on the agenda, due in part to the attention of the Financial Reporting Council, whose latest UK Corporate Governance Code makes boards "... responsible for determining the nature and extent of the significant risks it is willing to take in achieving its strategic objectives."

Despite its importance, the establishment and operation of risk appetite remains something that many firms struggle to do

well, if at all. Some have difficulty at the outset, not being able to appropriately describe the overall view of their board with respect to risk. Others find it impossible to be sure that the limits they set on operational activity will keep their performance within the overall risk appetite levels set by the board, often resorting to an inefficient layering of buffers into their measures to protect against breaching the risk appetite. Many suffer from a lack of buy-in so that they rapidly fall into disrepair, becoming little more than a box-ticking exercise. In this article we outline some of the approaches you can use to make your implementation of risk appetite more successful.

DEFINING RISK APPETITE

We recently worked with the Universities of Bath and Bristol on a research project for the UK Actuarial Profession, part of which related to risk appetite (the research).¹ In that study we defined risk appetite as "our comfort and preference for accepting a series of interconnected uncertainties related to achieving our strategic goals." This definition explicitly recognises that risk appetite, in nearly all industries, must reflect the fact that

a company's purpose is partly about the active acceptance of risk on behalf of others as well as limiting its exposure to unwanted risks. It also explicitly captures the idea that uncertainty arises from many different factors, which interact in a non-linear way. There are several aspects of risk appetite which make it surprisingly difficult to implement, and most come back to the inherent complexity of a business.

A risk appetite framework must start right at the top, by taking the strategy and risk strategy and clearly articulating the overall business objectives and the acceptable levels of uncertainties around them.

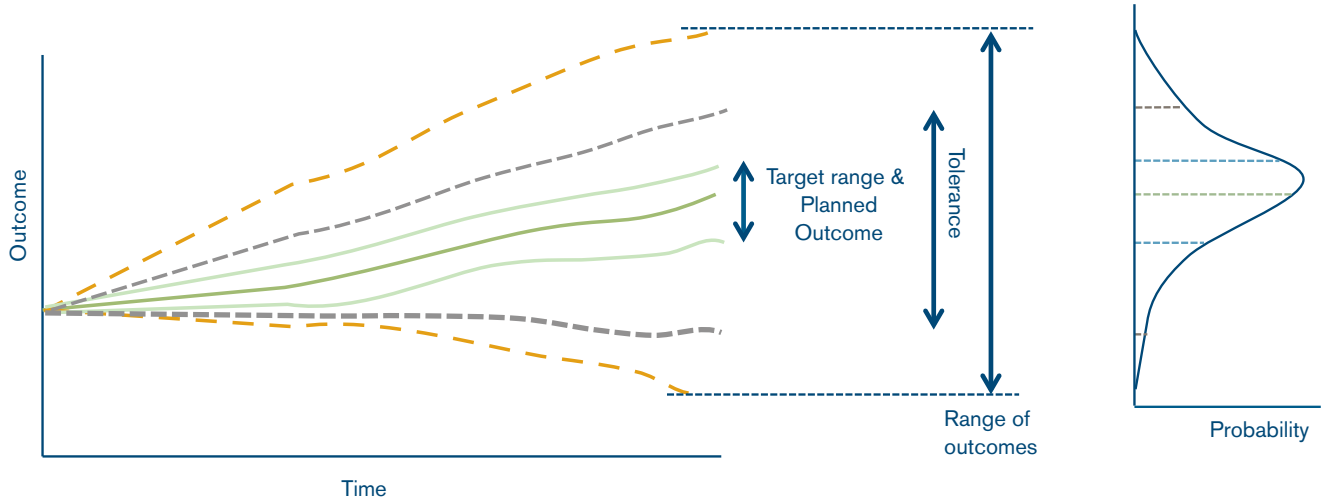
Risk appetite statements require three main components:

- A target operating range: the range of outcomes which is typically expected
- A risk tolerance: a boundary beyond which outcomes should not go
- A return period: an expression of how often one would accept performance moving from the target operating range to the boundary set by the tolerance

¹ The report can be accessed via the Profession's website at <http://www.actuaries.org.uk/research-and-resources/documents/review-use-complex-systems-applied-risk-appetite-and-emerging-risks>

FIGURE 1

Components of risk appetite statement—describe the target range of outcomes we usually expect, the boundaries of tolerable outcomes, and the frequency with which we would accept breaching those boundaries. For some outcomes we may constrain upside as well as downside.



These three components (see Figure 1) therefore convey the degree of uncertainty acceptable to the board in relation to key business goals. The manner in which they are expressed will likely vary depending upon the outcome being considered, but they must be observable and measurable in some way for the expression to be helpful.

As an example, consider an insurance company whose target objectives included a level of capitalisation. It might decide that it wants to operate at a level of capitalisation consistent with companies rated A to AA, and that it would wish to remain above the level of BBB-rated companies even after a 1-in-25-year event. This gives a clear expression of the level of capital that the board expects to see under normal and stressed conditions. (Scenarios are usually extracted from the firm's model to give examples of what a 1-in-25-year event might look like, for example.)

Depending upon the business goal being considered, it may be more appropriate to specify

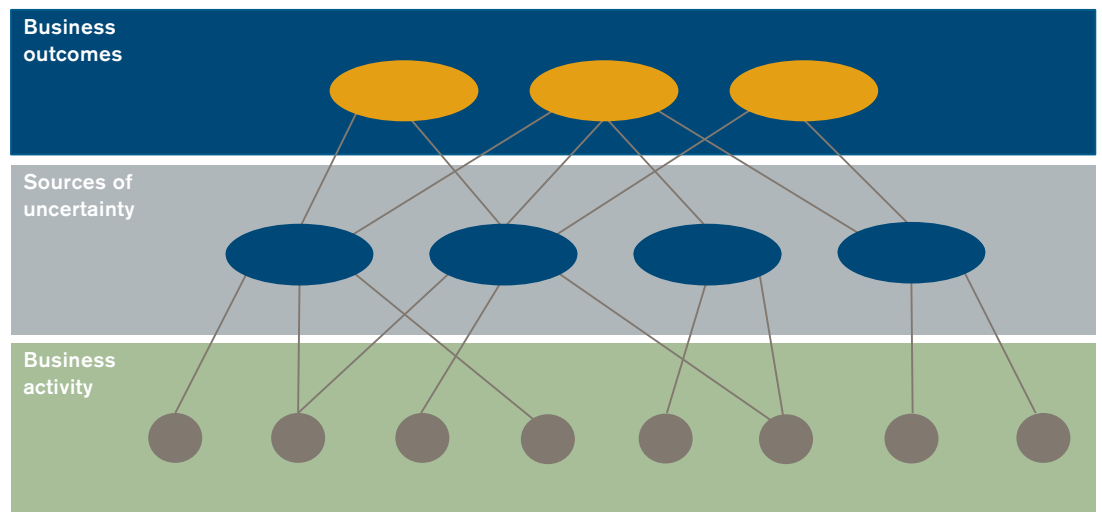
risk appetite in terms of a “corridor” rather than a single threshold. For example, firms which are listed on stock markets often want to deliver relatively stable earnings. An unexpected surge in earnings could be as damaging as a fall, with analysts querying whether management is able to control its businesses effectively. For these types of business outcome, the board may therefore specify an upper boundary as well as a lower one.

SOURCES OF UNCERTAINTY

Having identified the key business outcomes for which uncertainty matters, and having articulated how much uncertainty the business is prepared to accept, the next step is to explain carefully which sources of uncertainty are desirable, acceptable and unacceptable. It is clear that there are many reasons why a firm's outcomes could differ from what was

FIGURE 2

Linking business activity to uncertainty in business outcomes. By explaining how uncertainty in business outcomes is generated, you can more rigorously set operational limits to maintain risk within the desired appetite.



planned. The risks a company is actively seeking will be the ones that it builds core competence around, so that it can manage them well and earn a reward for doing so. Core activities sometimes bring associated risks which, although not strictly desirable, the company has to accept and manage. There will also be a (potentially large) range of risk types that the company does not want to take and will therefore seek to avoid or transfer at all times. This balance of risk-taking and risk-avoidance is one of the core differentiators between firms and industries as they organise themselves to compete as effectively as possible.

This part of the risk appetite framework is very important as it effectively starts to translate the high-level statements into business terms. This occurs through two mechanisms: identifying the sources of uncertainty in the overall objectives and identifying the business activities which generate those sources of uncertainty. The risk appetite framework must cope with the fact that each business activity can interact with many others, and hence the uncertainties it leads to may be numerous and may not be immediately obvious. It also has to cope with the changing nature of the business environment.

Traditional reductionist approaches to this challenge tend to embed a prior assumption about how things work before you have really investigated how they do in reality; this introduces a high risk that one of the core parts of your risk framework is immediately incomplete at the design stage.

A “complex adaptive systems” approach to analysing how uncertainty in business outcomes arises takes a holistic view first, and can rapidly elicit a well-structured representation of how various business activities interact to produce that uncertainty (a stylistic representation is shown in Figure 2). This gives a robust and repeatable approach for capturing the information needed to join the parts of the risk appetite framework together. The research paper outlines methods, such as cognitive mapping, which can be used to achieve this.

In order to actually set constraints on business activities in such a way as to constrain business outcomes to meet the stated risk appetite, we need a way to model the interactions between the key business drivers. The research shows how a Bayesian network model can be used to achieve this, based upon the understanding of the business gained from the cognitive map analysis. These techniques are fundamentally about helping people prioritise the key features of the business dynamics, fully taking into account the fact that there are many complex interactions occurring between the parts.

EMBEDDING THE FRAMEWORK

At the start of the article we highlighted the central nature of risk appetite in an effective risk management framework. Delivering a set of risk appetite statements and associated limits on business activity is only part of the story, though. Unless the framework is implemented in a way that staff both understand and find helpful in their work, then it will not be effective.

The methods described earlier are not only insightful when faced with needing to make sense of a complex situation, but they also directly use the language of the contributors in constructing the models of the business. By doing so, everyone can quickly reach a deep appreciation of how their part of the business interacts with others to produce uncertainty in business outcomes. Even for organisations who feel they already have a good common understanding of the business, such methods are useful in communicating that to other stakeholders such as rating agencies and regulators.

This deep understanding goes beyond simply getting the staff to “buy in” to the aim of the exercise – it actually engages them as part of the emerging risk framework. Their understanding of business dynamics will help them to spot patterns of unanticipated threats and opportunities much more quickly and will help them to articulate what they have identified more coherently to others.

The tools developed in the research to help set coherent limits can also be used by business personnel to test theories about the current levels of risk being taken. If they find that the level of risk implied by current indicators does not match their intuitive assessment, or that suggested by other tools or models, then it asks a question of the risk management system which requires resolution. The ability of models, like Bayesian networks, to integrate expert judgement and hard data makes it easier to ask such questions early in the development of a risk, when data about outcomes is unlikely to be available in sufficient quantities to perform meaningful statistical analysis.

So a key element needed for risk appetite to become embedded is to ensure that it can help to answer questions at different levels of the organisation in a joined-up way. When someone at a lower level in the company has a concern about an aspect of local business performance, their consideration of the issue is more likely to be around understanding whether this is of importance to anyone outside their area and what the practical actions are that need to be taken to remedy it. A good risk appetite framework will be able to help them understand whether their

THE TOOLS DEVELOPED IN THE RESEARCH TO HELP SET COHERENT LIMITS CAN ALSO BE USED BY BUSINESS PERSONNEL TO TEST THEORIES ABOUT THE CURRENT LEVELS OF RISK BEING TAKEN.

local issue could precipitate a chain of events that would cause the organisation to be concerned about a key business objective, and therefore help them to communicate that appropriately.

CONCLUSIONS

Risk appetite is absolutely pivotal within a risk framework. It provides clear direction from the Board about how business should be conducted and sets the boundaries for acceptable business performance in normal and stressed conditions. Done badly, it is simply another monitoring task for senior management and a data provision task for staff – in this guise it is unlikely to yield meaningful insight for the board. Done well, however, it provides a translation mechanism that helps those deeply engaged in the processing of the business to identify and communicate relevant issues quickly to those who are monitoring business outcomes, and to become a living component of the risk management system. It also helps the board to ask, and have answered, deep

and relevant questions about where uncertainty in business performance is coming from and to leverage their experience to help the management deliver more consistent results.

If you have any questions about risk appetite or any other aspects of your risk management, please contact Neil Cantle at neil.cantle@milliman.com, or Fred Vosvenieks at fred.vosvenieks@milliman.com, or your usual Milliman consultant.

RISK APPETITE IS ABSOLUTELY PIVOTAL WITHIN A RISK FRAMEWORK. IT PROVIDES CLEAR DIRECTION FROM THE BOARD ABOUT HOW BUSINESS SHOULD BE CONDUCTED AND SETS THE BOUNDARIES FOR ACCEPTABLE BUSINESS PERFORMANCE IN NORMAL AND STRESSED CONDITIONS.

IMPACT OF SOLVENCY II ON TERM INSURANCE AND REINSURANCE



Solvency II will have an impact on reinsurance design and purchasing as companies focus more on their risk profile and capital efficiency.

This article compares and contrasts capital requirements for pure term insurance products under Solvency I and Solvency II, and also examines the impact of reinsurance. Companies should consider these factors when designing and pricing products in anticipation of the new regime.

This article focuses on pure term insurance, but the conclusions can be applied more widely across different product types.

Throughout this article, we use the terms “gross” and “net” to refer to gross and net of reinsurance.

BACKGROUND

In the UK, life companies have generally reinsured a high proportion of their term insurance. Typically 75% to 90% or more is reinsured, with varying levels of underlying per policy retention.

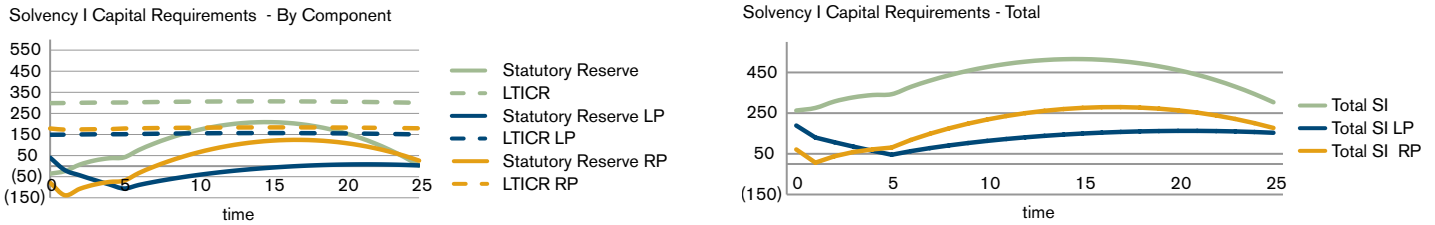
This has been driven by a number of factors, including:

- Prudent reserving and capital requirements for insurers creating a regulatory arbitrage.
 - This reserving differential impact was reduced to some extent by the changes in PS06/14, which allowed insurers to move closer to a realistic reserving basis.
 - However, under EU rules, reinsurers can still hold lower levels of required solvency capital, as the Reinsurance Directive allows them to calculate this on the more generous non-life solvency margin rules (percentage of premiums / claims), as opposed to the percentage of reserves and sum at risk required under the Life Framework Directive. Capital rules for non-EU reinsurers are frequently more favourable as well.
- Reinsurers will typically have access to significantly more mortality data than an individual insurer, and can use this to set assumptions with a higher degree of certainty, and perhaps more aggressively, compared with those that an insurer may be able to justify, both in pricing and reserving.
- Competitive reasons: at times, individual reinsurers may choose to offer particularly attractive rates for strategic and commercial reasons.
- Added value services provided by the reinsurer: e.g., underwriting manuals and systems, claims support, product development assistance, etc.
- In some cases, it can be shown to be beneficial to financial metrics (e.g., internal rates of return, present value of profits) to reinsure. As the reinsurance also removes potential volatility from the financial results, there is a clear driver for reinsuring as much as possible.

Reinsurance has been either on a risk premium basis, whereby the reinsurance rates increase over time as the life insured ages, or on a level premium basis, whereby the reinsurance rates remain constant for the lifetime of the policy. Discounts and/or rebates in the early years of a policy were also common, although these have been reducing in recent years.

Solvency II will undoubtedly drive changes in the reinsurance decision-making process, as companies focus more on their risk profile and incorporate this into their product development and pricing.

FIGURE 1:



SOLVENCY I CAPITAL REQUIREMENTS

Figure 1 shows a comparison of the reserving and capital requirements under Solvency I, on a gross and net of reinsurance basis, for our sample policy and for the two reinsurance options.

The gross position shows the typical profile of negative reserves in the early years, becoming positive and falling to zero as the policy reaches full term. However, the dominant feature is the high Long Term Insurance Capital Requirement (LTICR), which remains broadly level throughout the term, and which is driven by the 0.3% of sum at risk calculation.

On a net of reinsurance basis, the pattern is similar, but lower, and in particular, the required Solvency I capital is reduced due to the reinsurance (up to 15%/50% reduction on reserves and sum at risk, respectively, which we have taken to apply at the policy level. In reality, at a portfolio

level, this restriction may be higher or lower depending on the amount of reinsurance elsewhere in the portfolio).

A key observation is that the total level of required capital (i.e., reserves plus solvency capital) is consistently lower on a net of reinsurance basis. As we will see, this is not necessarily the case under Solvency II.

SOLVENCY II AND REINSURANCE

Figure 2, on page 14, shows the progression of the three components of the Solvency II capital requirement (best estimate liability [BEL], risk margin and standard formula SCR), on a gross basis and also on a net basis under the two reinsurance structures. The bottom graph merely presents a convenient comparison of the total capital requirements shown in the top three graphs.

It is immediately apparent that the impact of the reinsurance structure is critical to

the level of capital required—with some exceptions in the early years, reinsuring on a level premium basis reduces the overall capital requirement, whereas the risk premium method actually increases the amount of capital which the company must hold over much of the contract term. Overall, the level of capital required under the level premium option is significantly lower than for risk premium reinsurance.

Figure 3, on page 15, compares the total Solvency II capital requirement to the Solvency I equivalent.

For the gross of reinsurance and level premium reinsurance structure, the Solvency II total capital is lower than under Solvency I. However, this is not the case for risk premium reinsurance, where the total capital required exceeds the Solvency I equivalent during the mid part of the policy term.

In order to explain these results, it is instructive to analyse the makeup of the

ASSUMPTIONS

Sample policy

For the purposes of this article, we have modelled a 25-year term policy for a male aged 40, with a sum insured of £100,000 and premium of £15 per month.

We have made a number of simplifying assumptions:

- Tax is based on a gross roll-up basis
- Investments are all government fixed interest, and matched to liabilities
- Investment returns are assumed to be risk free

- Commission is paid evenly over the initial period (i.e., not on an indemnity basis)
- Solvency II calculations are based on QIS5 assumptions
- Capital requirements are based on 100% of the Solvency I LTICR/ Solvency II SCR and risk margin (i.e., no additional capital buffer)

Reinsurance

75% of the sum assured is reinsured for the lifetime of the policy.

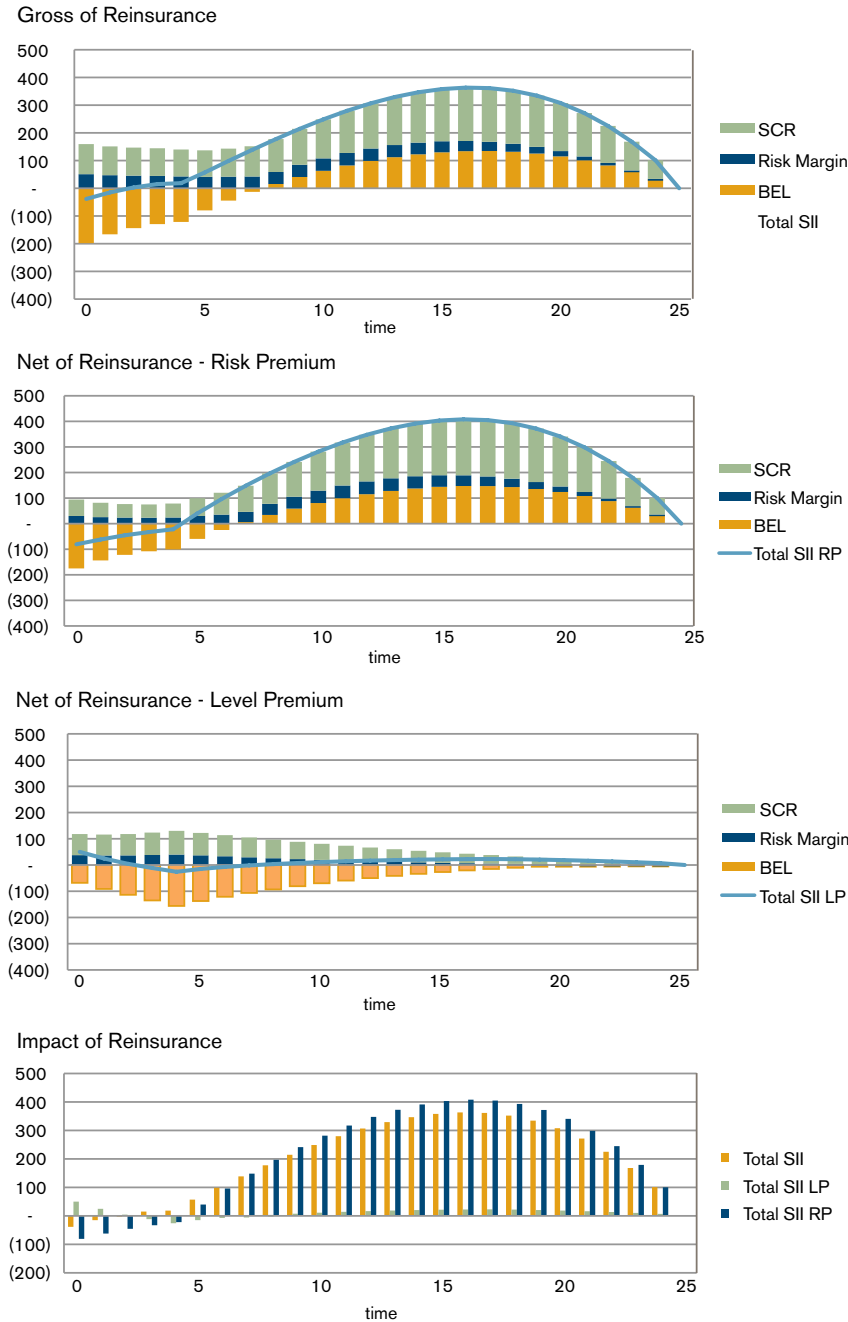
For the purposes of modelling reinsurance, we have modelled both

risk premium and level premium bases, with no initial discount/ rebate period.

For the central scenario, we have taken the risk premium reinsurance rates as equal to the insurer's best estimate rates, plus a margin of 5%, to reflect reinsurer's margin for capital and profit. We have then set the level premium rates to have the same present value as the risk premium rates. However, sensitivities to these assumptions do not produce materially different results.

We have assumed a single reinsurer, rated A.

FIGURE 2:



Solvency II capital requirement and the impact of reinsurance rates and structure in more detail, and to examine the differences between a risk premium reinsurance arrangement and a level premium one.

BEST ESTIMATE LIABILITY

Figure 2 demonstrated that for the risk premium reinsurance structure there is a

higher net BEL (less negative in the early years) compared with the gross BEL. This is due to our modelling assumption that the reinsurance rates include a 5% margin over the insurer's best estimate assumptions. This loss of value to the insurer reduces the profitability of the contract, requiring higher reserves.

Under the level premium reinsurance structure, there is still a loss of overall value due to the reinsurance margin, and

the BEL remains negative (i.e., an asset) for a longer period. In the later years of the contract, the insurer does not need to establish such high reserves as under the gross or risk premium structures, since it has effectively "pre-funded" a proportion of its reinsurance premium.

Reducing this assumed reinsurance margin to zero, which could represent, for example, the situation where a reinsurer takes a more aggressive view on best estimate assumptions, reduces the BEL under the reinsurance options. The BEL for the risk premium structure would then equal the gross BEL, while the level premium BEL becomes lower throughout, but with a similar overall shape.

SOLVENCY CAPITAL REQUIREMENT

We have analysed the constituent risks which make up the Standard Formula SCR, as shown in figure 4, on page 16.

As expected, the major constituent of the SCR is the life module, with market, reinsurer default and operational risk contributing relatively little to the overall SCR under all cases. The curved lines on the graphs represent the diversified SCR, and hence are slightly lower than the sum of the constituent risk modules. Reinsurer default risk is included in the two reinsurance structures, but this can be seen to be relatively small (based on a single-A-rated reinsurer).

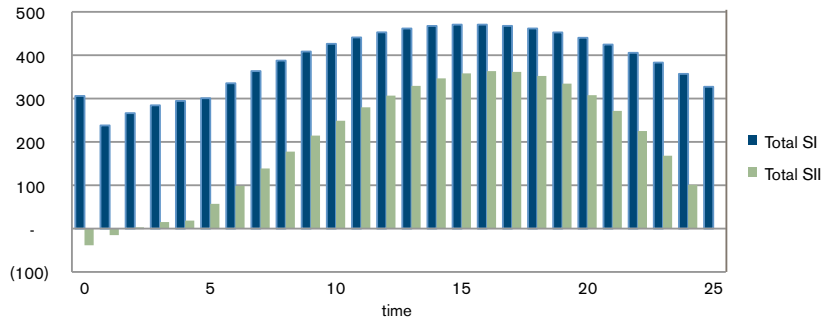
Figure 5, on page 1, analyses the life module (SCR_{Life}) further into its constituent parts, with the curved lines representing the diversified SCR_{Life} .

High-level observations from this analysis include:

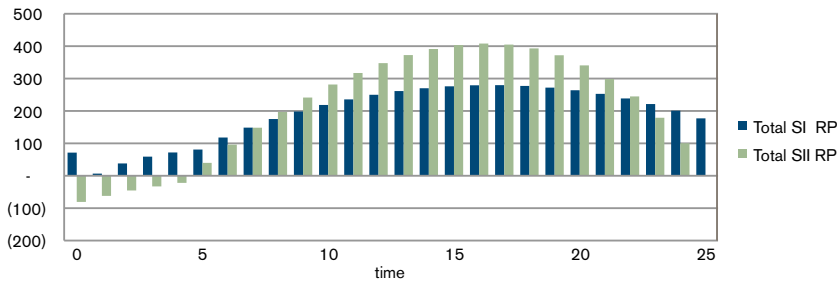
- Lapse risk is the dominant risk in all cases, with mortality following as the secondary risk factor. Note that the biting constraint changes from an exposure to an increase in lapses (including the mass lapse test) to a decrease in lapses partway through the policy term, causing the reduction

FIGURE 3:

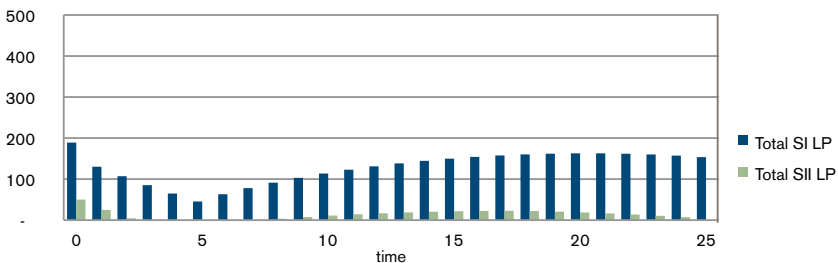
Requirements - Gross



Requirements - Net Risk Premium



Requirements - Net Level Premium



The relationship between the individual risk stresses and the diversified SCRLife (indicated by the yellow line), also shows that there is a higher degree of diversification on the gross basis compared to the risk premium basis. This impact is particularly seen in the later years where the lapse stress becomes increasingly dominant due to the reduction in the (diversifying) mortality exposure.

Based on this example, we can draw some initial conclusions:

- Solvency II total capital requirements are generally lower than the Solvency I equivalents, on a gross of reinsurance basis, and for level premium reinsurance. However, for risk premium reinsurance this is not always the case, and the Solvency II total can be higher.
- Under Solvency II, reinsurance does not necessarily lead to a reduction in capital requirement and can in certain circumstances increase the requirement.
- Lapse risk is the key driver for term insurance capital under Solvency II, with mortality a secondary risk.
- For reinsurance premiums with an equal present value, level premium reinsurance is significantly more capital efficient than risk premium reinsurance.
- Alternatively, this implies that the insurer may well be willing to pay an additional margin for level premium reinsurance compared with risk premium reinsurance due to its increased capital efficiency.

PORTFOLIO LEVEL

The above holds true for an individual term insurance policy in isolation, and we would also see a similar picture if we take a tranche of, say, one year's new business. Hence, these would apply, for example, to a start-up company selling only term insurance.

and then increase of the lapse stress. The point of change is close to where the best estimate liability moves from negative to positive.

- The mortality element reduces by 75% under both reinsurance options, as expected, due to the proportionate nature of the reinsurance.
- The contributions of the life catastrophe and expense risks are relatively small throughout.

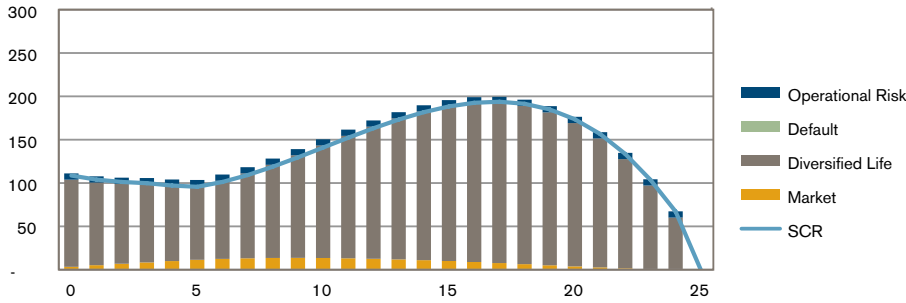
The key observation, however, is that the lapse stress is very different in both amount and shape depending on the type of reinsurance used.

Under the risk premium structure, the overall shape is very similar to the gross of reinsurance equivalent. However, it can also be seen that the net of risk premium lapse stress is lower in the early years and then similar (in fact marginally bigger) in the later years than the equivalent gross of reinsurance stress.

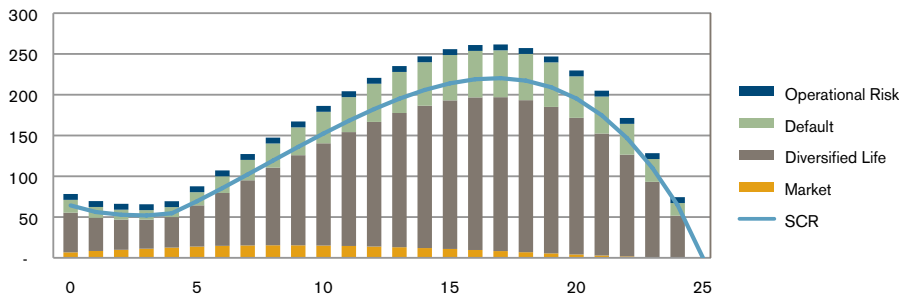
With the level premium reinsurance structure, the lapse stress takes a very different shape, starting off at a broadly similar level to the risk premium structure, increasing slightly in the early years, but tailing off rapidly in the later years. Although there is a change in the direction of the lapse exposure, its impact is much less marked.

FIGURE 4:

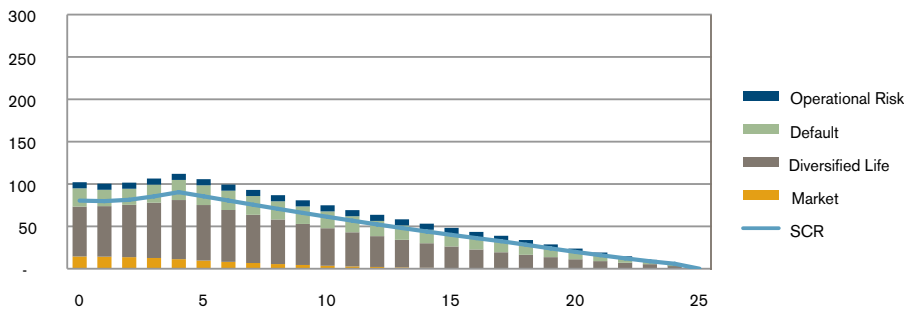
Gross SCR Components



Net SCR Components - Risk Premium



Net SCR Components - Level Premium



WHETHER THE EXPOSURE IS DUE TO AN INCREASE OR A DECREASE IN LAPSES DEPENDS ON THE TIME THE POLICY HAS BEEN IN FORCE. THE STANDARD FORMULA APPROACH REQUIRES THAT THE LAPSE TEST IS DONE AT A POLICY LEVEL

However, for an established company, combining these results with an in-force portfolio of other term business may produce different conclusions.

We have seen above that lapse risk is the dominant risk for term business in the standard formula calculation, but that the level of lapse risk can vary significantly over the policy term.

Whether the exposure is due to an increase or a decrease in lapses depends on the time the policy has been in force. The standard formula approach requires that the lapse test is done at a policy level (or at least at the level of a homogeneous group of policies), so it is not possible to net off the lapse up and down exposures.

Looking across a portfolio of term insurance policies of different durations, and hence with different relative lapse and mortality exposures, will to some extent average out the peaks and the troughs within the calculations, leading to a more stable overall result.

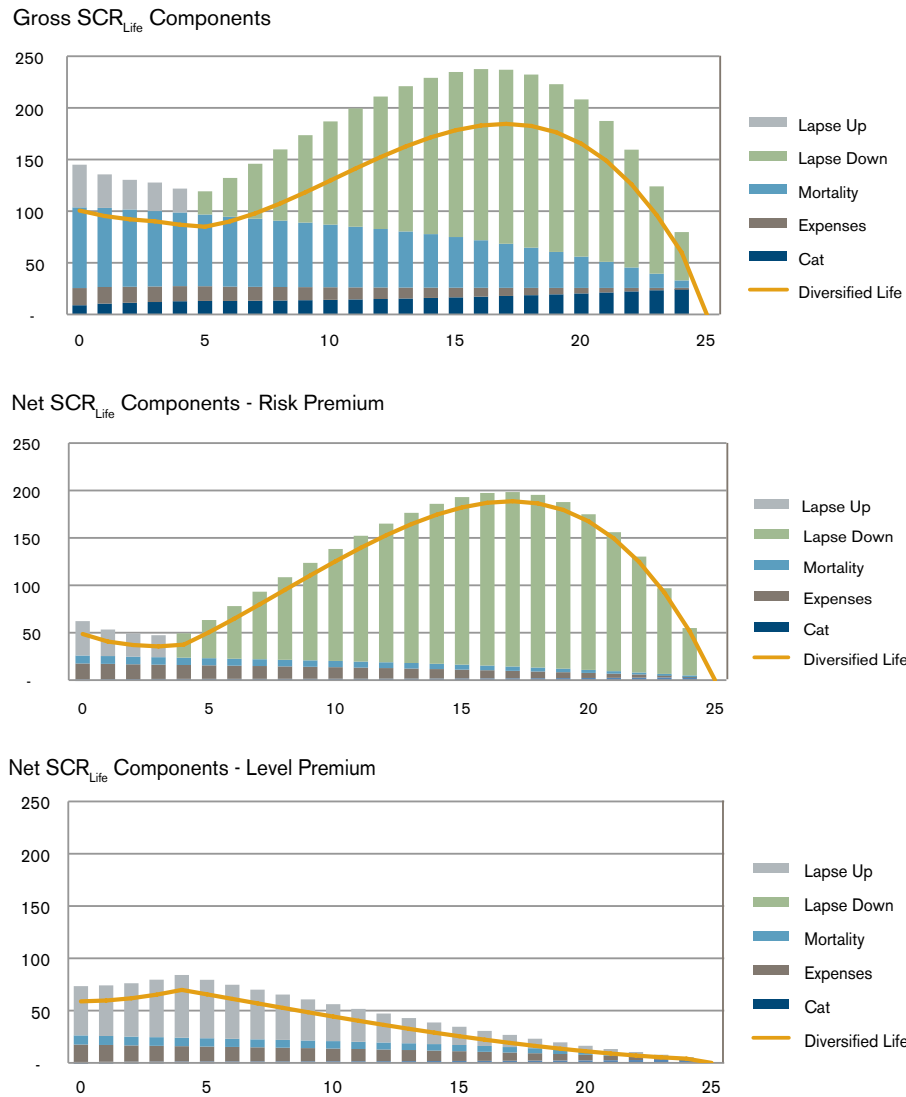
COMPANY LEVEL

Extending this to the overall company level, which might include with-profits, unit-linked and annuity business, means that the interactions with other risks need to be taken into account.

For example, the addition of term insurance to an existing annuity book (market and longevity risks) should provide good additional diversification, and the marginal capital required may be very low.

On the other hand, term insurance combined with unit-linked business (principally market and lapse risks) will tend to increase the overall lapse exposure, and therefore may not be as capital efficient.

FIGURE 5:



CONCLUSIONS

Solvency II will level the playing field between insurers and (EU) reinsurers, removing some of the current rationale for reinsuring significant volumes of risk business. Capital arbitrage opportunities for non-EU reinsurers may well continue to exist, however.

Insurers will clearly still want to protect against excessive claims volatility and catastrophe risks (e.g., pandemics). As we have seen, however, different forms of reinsurance can lead to very different capital requirements.

Companies need to consider their overall risk profile, and the optimum reinsurance strategy will depend on the mix of other risks and the mix of business. So there is no “one-size-fits-all” approach to reinsurance under Solvency II.

Reinsurers will clearly continue to provide added value services such as underwriting and claims support, and the value of these will need to be factored into any assessment by an insurer. Reinsurers will also be considering their own risk profiles, including exposure to mortality and lapse risks, and their own relative appetite for each.

What is clear, though, is that reinsurance purchasing will become increasingly sophisticated—simply reinsuring a high percentage of the mortality risk is unlikely to provide an optimal solution.

If you would like to discuss any of the topics raised in this article, please contact Chris Lewis at christopher.lewis@milliman.com, or your usual Milliman consultant.

PROTECTING WITH-PROFITS POLICYHOLDERS



On 7 March 2012 the Financial Services Authority (FSA) published Policy Statement PS12/4, 'Protecting with-profits policyholders'.

PS12/4 provided a summary of the feedback received by the FSA on the proposed changes set out in Consultation Paper CP11/5 to aspects of its rules and guidance regarding the operation of with-profits funds, as well as the FSA's conclusions and the consequential final text of the amendments to its Handbook of Rules and Guidance which were implemented on 1 April 2012.

WHAT ACTIONS MUST FIRMS TAKE?

In respect of the operation of with-profits business, firms must now:

- **Review the terms on which new business is written in a with-profits fund.**

Concerns were raised by respondents to CP11/5 that the proposed prohibition on writing business in a with-profits fund which is expected to be loss making was too widely drawn.

The FSA refined those constraints.

Based upon appropriate analysis, the governing body must be satisfied that the terms, volumes and expected durations of each contract type (when viewed as a whole) are unlikely to have an adverse effect on the interests of with-profits policyholders of the fund considered collectively.

This requirement applies to new business plans decided after **1 April 2012**, and from **1 July 2012** for new business plans decided prior to 1 April 2012. It will not apply to increments and new business arising out of options applying to existing business.

- **Review the investment of a with-profits fund in strategic assets.**

Concerns were raised that constraints on strategic assets proposed in CP11/5 were too tightly drawn, and would also apply to mutuals

The FSA refined those constraints, and confirmed that they will apply to mutuals.

The governing body must be satisfied, so far as it can reasonably be, that the purchase or retention of a strategic asset is likely to have no adverse effect on the interests of the with-profits policyholders

of the relevant with-profits fund. Adequate records must be kept of the strategic purpose for which such an asset is purchased or retained for the fund.

Review of compliance with the rules will need to be undertaken by **1 October 2012**.

- **Review the approach to applying Market Value Reductions (MVRs) on early surrender of unitised with-profits policies**

Concerns were raised that the requirement proposed in CP11/5 that MVRs target 100% of asset shares was too restrictive.

The FSA relaxed the proposed constraint.

As was already the case in respect of adjustments to payouts arising from smoothing, the rules permit asset share payouts to be delivered in aggregate over time, and not necessarily on each individual policy maturing or being surrendered at all times. The rule has applied from 1 April 2012.

- **If they have not done so previously, submit a run-off plan to the FSA by 31 December 2012 for any with-profits fund which has ceased to effect new contracts.**

THE FSA STATED IN PS12/4 THAT ITS INTENTION IS TO IMPROVE THE QUALITY OF DECISIONS TAKEN BY THE FIRM'S GOVERNING BODY IN ORDER TO PROTECT WITH-PROFITS POLICYHOLDERS BETTER, NOT TO IMPOSE THE WITH-PROFITS COMMITTEE'S VIEW ON THE FIRM'S GOVERNING BODY.

The requirement proposed in CP11/5 to draw up distribution and management plans appropriate to the reasonable/sustainable new business plans of all with-profits fund will NOT apply.

- **Review its with-profits governance arrangements**

In CP11/5 the FSA questioned whether all members of a with-profits committee should be independent of the firm.

The consequential loss of in-depth understanding and in-house experience of the fund, the additional training costs that would be incurred, and the availability of a sufficiently large pool of potential members were all raised as issues by respondents to CP11/5.

An independent majority of members of a with-profits committee will continue to be an option.

CP11/5 proposed that for with-profits funds over a minimum size, the operation of a with-profits committee was the only appropriate means of providing independent judgement on the firm's governing body's exercise of discretion.

The FSA acknowledged that a large fund is not necessarily complex and that particular issues can arise in smaller funds.

The FSA said that it has seen how with-profits committees function in practice and perform a valuable advisory and challenge function within the corporate governance of many firms. However, it

acknowledged that much of what they do has not been visible to policyholders.

Respondents queried whether the combined effect of the proposals relating to governance and the operation of with-profits funds would be to place the with-profits committee in the role of policyholder advocate, with a remit to seek its 'pound of flesh' for agreeing to any changes made to the status quo.

The FSA stated in PS12/4 that its intention is to improve the quality of decisions taken by the firm's governing body in order to protect with-profits policyholders better, not to impose the with-profits committee's view on the firm's governing body.

The current alternatives to operating a with-profits committee will remain available, and an independent person or one or more non-executive directors may be appointed to provide independent judgement in respect of a with-profits fund, but the firm's governing body must consider whether or not such an arrangement is appropriate having regard to the size, nature and complexity of the operation of the fund.

Firms have until 1 July 2012 to make any necessary changes to existing governance arrangements of with-profits funds to comply with the new rules.

Having seen all the various arrangements in action, the FSA believes that there is considerable merit in the suggestion that a with-profits committee is made the general rule except for those firms where a low level

of complexity makes one unnecessary, for which the use of an independent person would be permitted. In the FSA's view, such a change would be sufficiently different from its proposals to require re-consultation.

So we may see further proposals in this area.

THE FUTURE OF WITH-PROFITS?

Concerns were raised that the combined effect of proposals set out in CP11/5 appeared to be seeking to prioritise the claims of existing with-profits policyholders on the inherited estate (capital in excess of realistic liabilities) of a with-profits fund over those of other policyholders and shareholders, or members in the case of mutuals.

Respondents questioned whether the FSA's general rulemaking power enabled it to make some of the rules it proposed in CP11/5.

Arguably, those rules could result in the demise of the mutual insurance sector.

The FSA has deferred certain decisions relating to mutual insurers.

In respect of Project Chrysalis (the FSA's discussions with mutuals about the consequences of material reductions in, or cessation of, the volumes of new with-profits business written), the FSA stated that it is minded to consider further the broader consumer interest in having a diverse market in financial services providers in which mutuality has a future alongside proprietary companies. It is possible that mutual may be subject of an FSA discussion paper this year or next.

More generally, the FSA said that it is conscious that protecting policyholders need not be achieved at the cost of the continued existence of with-profits funds, and the firms that offer them, and that a proper balance between the different interests of a with-profits fund is required. Nevertheless, the revised rules require capital arising in the fund which the governing body determines is no longer required to be held in the fund (commonly referred to as 'excess surplus') to be

distributed between policyholders and shareholders in the proportion applied to distributions of surplus arising in the normal course of the events. An alternative allocation of such capital to reflect, for example, the origins of such capital will no longer be permitted. This change appears to improve the position of existing with-profits policyholders.

In terms of with-profits business, the FSA states that it intends to prioritise its work on mutuals and on preparing for Solvency II over revisiting any unresolved issues arising from CP11/5 and its planned work on customer communications.

On 1 May 2012 Reliance Mutual published details of its proposal to split its main with-profits fund between (i) with-profits policyholders of the fund and (ii) a mutual capital fund (MCF), which will provide capital for the future operation of the mutual. The proposed changes are subject to the approval of policyholders.

EXPENSES CHARGED TO A WITH-PROFITS FUND

CP11/5 proposed a ban on the deduction of charges from a with-profits fund in excess of actual costs incurred.

Respondents questioned the potential adverse effects on policyholders of with-profits funds of this proposal, such as:

THE FSA STATED THAT IT IS MINDED TO CONSIDER FURTHER THE BROADER CONSUMER INTEREST IN HAVING A DIVERSE MARKET IN FINANCIAL SERVICES PROVIDERS IN WHICH MUTUALITY HAS A FUTURE ALONGSIDE PROPRIETARY COMPANIES.

- Greater risk might be retained by the with-profits fund. For example, some firms currently charge per-policy fees which are fixed (subject to a specified increase linked to a relevant inflationary index) for a period of years to a with-profits fund. This effectively removes the risk of expense overruns from the with-profits fund, and transfers it to the service company of the firm's group.
- Higher expenses might be charged to with-profits funds if the effect of the rule change was that the provision of services is transferred to an external firm, which would be permitted to include loadings for risk and profit.
- Removing a motivation for firms to consolidate closed with-profits funds with the aim of generating a profit on the services provided to those funds.

The ban will NOT apply.

Nevertheless, the FSA noted that the fairness of such charges will continue to receive scrutiny from a firm's internal governance and from the regulator.

If you would like to discuss any of the topics raised in this article, please contact Andrew Gilchrist at andrew.gilchrist@milliman.com or contact your usual Milliman contact.

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27-28 June 2012	IFRS	IFRS Foundation Conference: Frankfurt
27-29 June 2012	Milliman	European Forum: Portugal

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