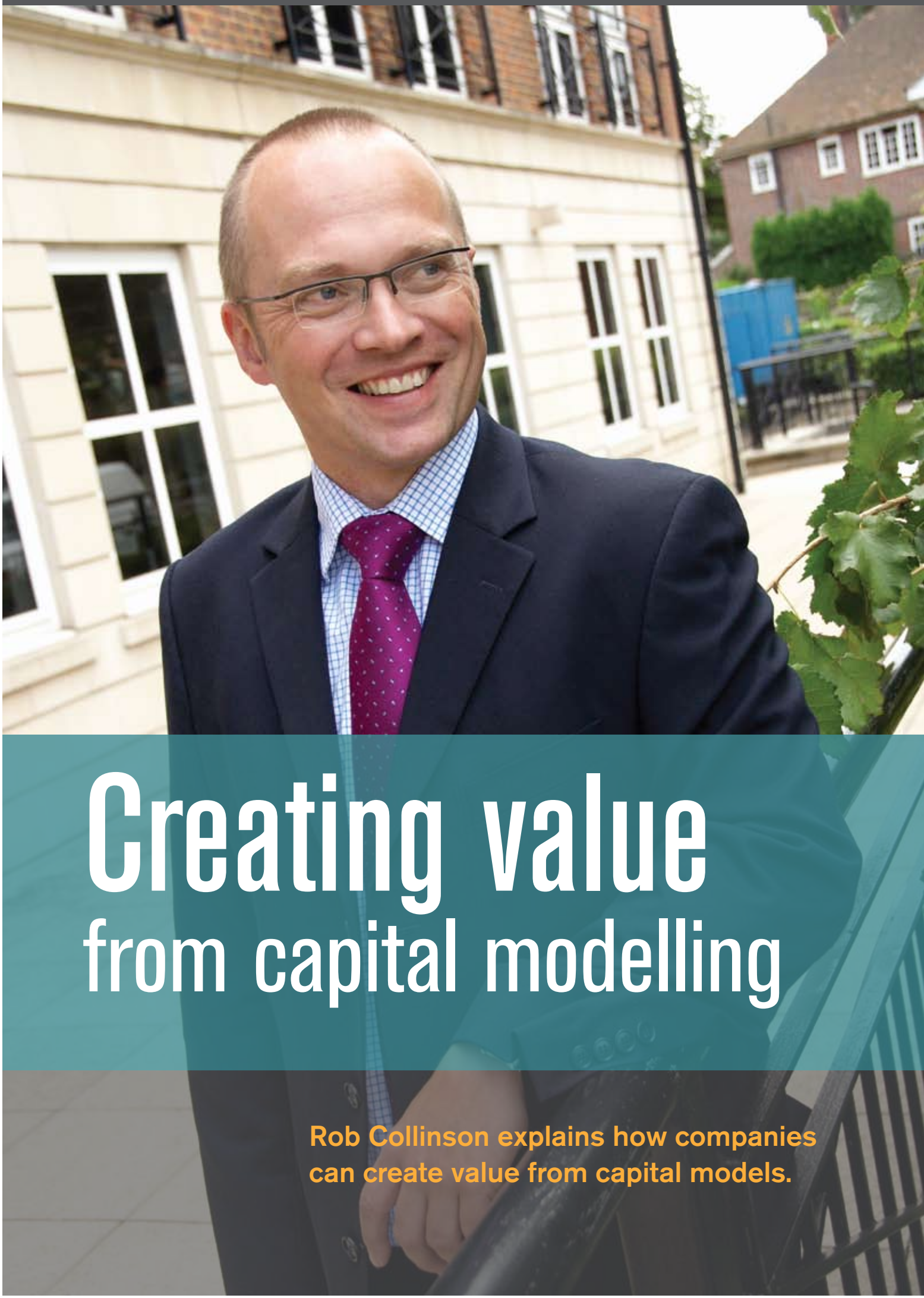


Creating value from capital modelling

Rob Collinson explains how companies can create value from capital models.

Capital models are now ubiquitous throughout the UK insurance community following the highly successful implementation of the ICA risk-based capital regime – a trend set to expand throughout Europe as Solvency II approaches completion within the next few years.

Insurers are placing additional demands on these models to create value, whilst regulators stress the importance of the risk-based framework pervading all aspects of operations. This article considers an approach by which an internal model can be integrated within the organisational decision-making framework.

The regulatory trend

In the FSA *Lessons learned* publication, it was noted that significant progress has been made to effectively model the capital requirements of a business under stressed conditions, but that more emphasis needs to be applied to the risk dynamics of the business in less extreme situations.

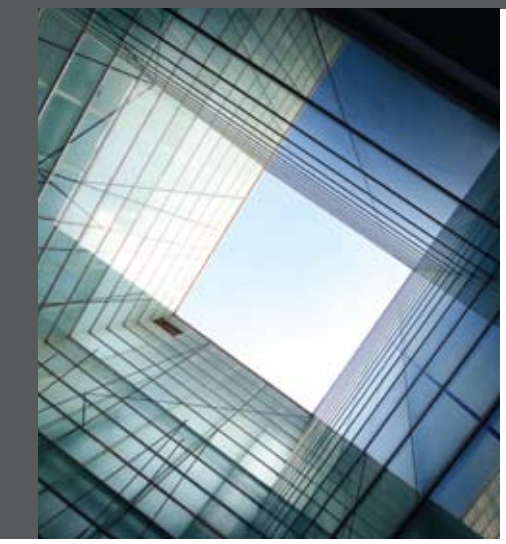
In our own experience, we have noted that many models have been designed to consider the impact of stressed conditions on the value of assets and liabilities without adequate integration with strategic and tactical decision-making frameworks. In light of this observation we would emphasise that more work is required to embed risk models as part of the corporate risk management framework.

Looking forward, this integration of risk and capital management frameworks is particularly important to organisations wishing to use internal models for Pillar 1 capital requirements under Solvency II.

Barriers to the use of capital models

The use of capital models to inform strategic and tactical business decisions presents insurers with a number of key challenges. These include:

- **Time.** Many decisions need to be made within a relatively short timescale, whereas capital models have traditionally required a significant period of time to calibrate, run and interpret.
- **Ease of interpretation.** Capital models typically produce large volumes of complex output. It is important that consistent reports are produced to enable non-technical consumers to absorb and interpret this information effectively, hence allowing better-informed decisions. Ideally, it should be possible to present a consistent format of analysis to decision-makers that is broadly independent of the nature of the decision.
- **Relevance.** Analysis based upon the output from the capital model must retain the key features pertinent to the decision, whilst maintaining the clarity necessary to inform non-technical decision-makers.



Capital-based approach to decision support

Generally, capital models can best contribute information to business decisions when these can be broken down into a set of choices such as:

- Should we undertake a particular course of action?
- If so, to what extent?
- Is there a 'better' course of action?

Clearly, this raises the question of what precisely is meant by 'better'. When considering such choices within a capital framework it is possible to define objective criteria under which one course of action may be evaluated against another. This article suggests an approach by which scenarios may be objectively ranked and presented in a consistent manner that is broadly independent of the nature of the decision.

The method that we consider is highly general, but within this article we consider two specific examples of business decisions to illustrate the approach.

Example 1: Deciding on asset allocation

In this simple example, we consider what proportion of equities should be held in the mix of assets supporting technical reserves. The analysis follows the steps set out below:

Prepare a base model and a number of alternative possible scenarios.

Prepare the capital model in a number of scenario configurations ranging from 0 to 100 per cent equities. Other investment classes are cash and bonds. Each model is then run with an appropriate number of simulations.

Consider the capital requirement for each strategy.

The capital requirement is then calculated for each strategy. Whilst the basis must remain consistent between scenarios, capital may be estimated for any appropriate measure of impairment (such as probability of ruin or probability of a ratings downgrade).

The capital requirements from each scenario may then be compared.

Figure 1 | Capital versus strategy

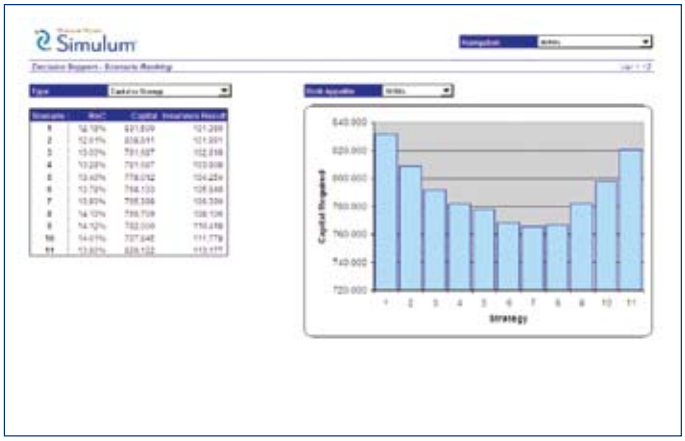


Figure 2 | Return on capital versus capital required

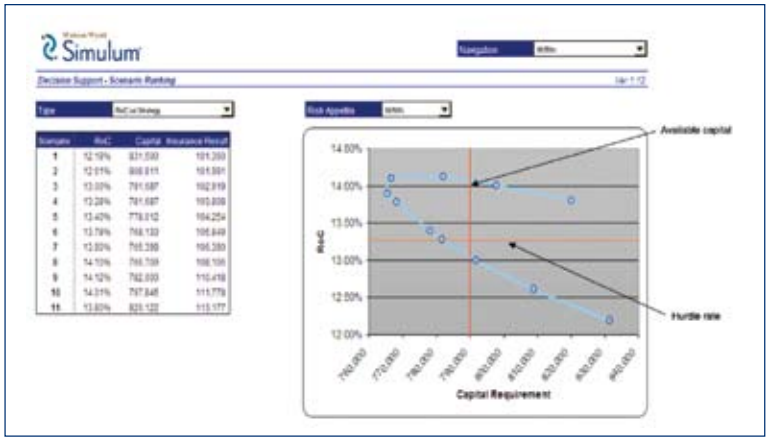


Figure 1 (on the previous page) demonstrates how the capital changes as the proportion of equities is varied from 0 (scenario 1) to 100 per cent (scenario 11).

From Figure 1 it can be seen that increasing the proportion of equities initially results in a reduction of capital requirements as the improved asset performance is well diversified against insurance risk. As the proportion of equities continues to increase, however, capital becomes increasingly driven by the simulations in which equities perform poorly and where this can no longer be 'diversified out'.

From this analysis it can be seen that strategy 7 gives rise to the lowest capital requirement.

However, this has considered only the 'downside' risks of any given course of action, not the possible rewards.

Consider the reward associated with each strategy.

We now consider the expected benefits associated with each strategy. For each case we calculate the expected return on capital. These calculations indicate that initially, as the proportion of equities increases, the expected reward increases more quickly than the capital requirement resulting in an increasing return on capital. After strategy 9, however, this trend reverses.

This analysis indicates that strategy 9 is preferred. How can these conclusions be reconciled? We need to combine risk and reward.

Consider risk and reward simultaneously.

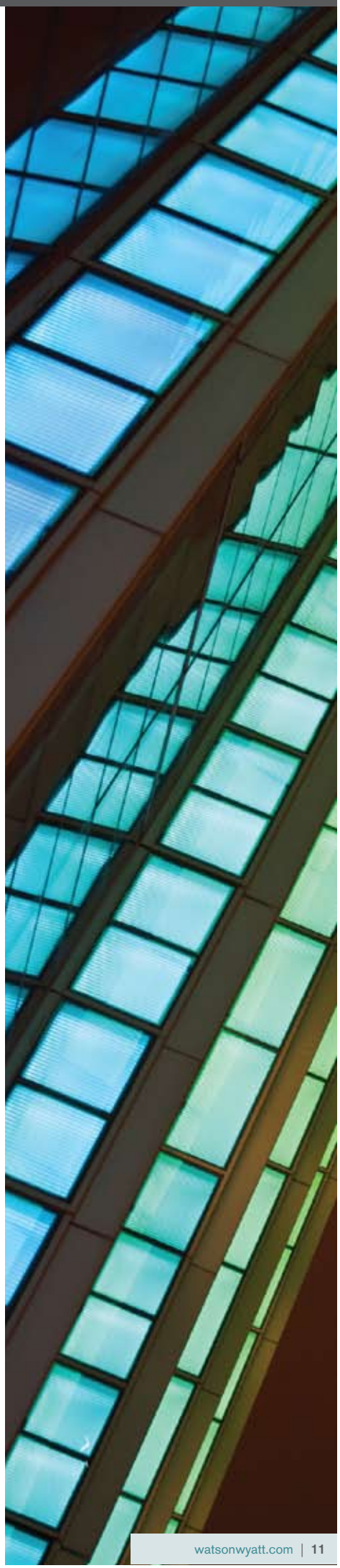
In this analysis we plot return on capital against capital required. Additionally, we also consider the amount of capital available and the 'hurdle rate' describing the minimum acceptable expected performance.

In Figure 2 (on the previous page) each point indicates a particular scenario. This diagram may be interpreted using the following criteria:

- Any point to the left and higher in the diagram may be considered 'better' than another strategy in the sense that less capital is required whilst a higher return on capital is achieved.
- Only strategies to the left of the red 'available capital' line may be considered, as others are not affordable with current resources.
- Only strategies above the orange 'hurdle rate' should be considered as all others fall below the minimum performance criteria.

Based upon these criteria, only those strategies in the top left quadrant satisfy both performance and affordability constraints. In this case, strategies 8 and 9 have been identified as having the highest expected performance whilst remaining under the available capital constraints.

It can also be demonstrated that the choice of reward measure can materially affect the analysis. For example, if expected insurance result is used in place of return on capital then we obtain a curve where increasing the proportion of equities always results in an improved reward measure.



Example 2: Deciding on a reinsurance structure

The approach outlined in Example 1 is highly general and may be applied to a very wide range of problems. For instance, we can use this method in the context of outwards reinsurance to address the following questions:

- Is the current structure good value for money?
- Should purchasing decisions be made at a group or line of business level?
- What is the right price for outwards cover?

We can apply the method by breaking the outwards reinsurance structure into 'program levels' and consider these as strategies. For instance:

- Strategy 11 – fully gross – no reinsurance.
- Strategy 10 – catastrophe cover only.
- Strategy 9 – catastrophe and high level XL only.
- Strategy 8–2....
- Strategy 1 – all reinsurance.

We plot the capital requirement and return on capital for each strategy. For instance, the return on capital results appear in Figure 3.

The risk and reward perspectives can be combined, giving the graph of return on capital against capital required shown in Figure 4.

This case study brought out the following points:

- Running the business gross of reinsurance results in the highest expected return on capital. However, this results in an extremely large capital requirement, well beyond the resources available.
- As additional reinsurance treaties are added, both capital requirement and expected return on capital decrease.
- As more reinsurance is added, it is possible to observe a systematic decrease in value. In the most extreme case additional reinsurance is purchased which makes no difference to, or even increases, the capital required.

Figure 3 | Return on capital versus strategy

Figure 4 | Return on capital versus capital required

- A relatively small number of scenarios require less capital than that available whilst providing a better return than the hurdle rate. Additionally, all such scenarios require far less reinsurance than that currently purchased.

This analysis is of particular benefit in the following cases:

- Identifying candidates for commutation.
- Highlighting misalignment between reinsurance purchasing strategy and corporate risk management.
- Measuring the marginal benefit of additional reinsurance.

Conclusion

Whilst we have considered two simple examples within this article, the approach set out is highly general and may be applied to a wide range of situations including the pricing of deals and entry into new lines of business.

It is important, however, to note that the analysis we have described does not make the decision: rather, it provides objective information regarding the likely quantitative implications of the courses of action considered. As always, key inputs such as choice of risk measure and risk appetite will materially affect the conclusions, and these assumptions must be derived from the experience and aims of the company.

The approach outlined highlights a highly general structure under which a range of strategic decisions may be evaluated using a consistent approach. It is a powerful tool for the executive decision-maker.