Lecture 1

INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

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Today's Agenda

1. The Regulatory Environment
2. Economic Capital
3. Models for assessing capital requirements
4. Capital requirements and profitability

1 The Regulatory Environment

➢ **Solvency Capital**

One of the regulator's roles is to ensure that financial promises made to members of the public are kept.

A provider of financial benefits will need to hold provisions for:

- liabilities that have accrued but which have not yet been paid
- future periods of insurance against which premiums have already been received
- claims already incurred but which have yet to be settled.

Given that the future is impossible to predict with certainty, capital may be required in addition to the provisions to ensure that adequate security is provided.
A regulator will then monitor the adequacy of the provisions and capital that a provider sets aside against future liabilities. The security given by a regulatory regime is measured by the total of these two elements. A regulator will require that the total is sufficiently prudent and it may prescribe the assumptions and methodology to be used for the calculations.

1 The Regulatory Environment

The approach used may involve:

1. the regulator requiring a best estimate approach for the calculation of provisions. In addition, the provider will be required to hold significant further capital as a buffer for general adverse experience
2. the regulator requiring provisions to be calculated on a basis significantly more prudent than best estimate. Only a much smaller (or zero) amount of capital would then be required compared with the situation if provisions were best estimate.

The total assets required to be held in excess of provisions calculated on a best estimate basis is the solvency capital requirement. In both of the approaches described above, the solvency capital requirement is effectively the same.

Solvency II follows the first of the approaches above, with companies required to hold provisions established on a best estimate basis (plus an additional risk margin) together with a risk-based solvency capital requirement calculated using a method that gives direct recognition of the risks accepted by the business.

The additional risk margin represents the fair value of the non-market risk within the best estimate liabilities and is hence considered as a part of the best-estimate provisions rather than as an additional capital requirement.

1 The Regulatory Environment

Some countries use a different approach, under which provisions are determined on a prudent basis and/or additional solvency capital requirements are based on simple formulae. This has the disadvantages that:

- levels of prudence within provisions vary between providers, making it difficult to make comparisons
- solvency capital requirements are not risk-based, making it difficult to ensure that sufficient security is provided to policyholders.

➢ **Solvency II for Insurers**

Solvency II is a regulatory regime for all European Union states.
Solvency II succeeded Solvency I, which prescribed minimum additional solvency capital amount that applied to EU insurance companies. However, these additional capital requirements were not entirely immune to the actual risks faced by the insurance companies and were an addition to the provisions that varied considerably because of the different level of prudence amongst the different EU member states. As a result the overall solvency capital requirement also varied significantly.

1 The Regulatory Environment

Solvency II has a broader scope than Solvency I and includes more than just the additional solvency capital amounts, such as estimating asset value, valuing provisions, assessment of the companies' risk management systems etc. The framework is based on three pillars:

- quantification of risk exposures and capital requirements - this pillar deals with the quantification of assets and provision of liabilities as well as estimating the minimum capital requirements and solvency capital requirements
- a supervisory regime - this pillar deals with the qualitative aspects such as the company's control system, its risk management process, its strategic capital needs. Here the company is monitored by the regulator's frequent visit
- disclosure requirements – this deals with the public and private disclosure to the regulator by the company

Solvency II establishes two levels of capital requirements:

- the Minimum Capital Requirement (MCR) — the threshold at which companies will no longer be permitted to trade
- the Solvency Capital Requirement (SCR) — the target level of capital below which companies may need to discuss remedies with their regulators.

1 The Regulatory Environment

The SCR is greater than the MCR
If the company's available capital stands at less than the MCR, then the company is deemed insolvent and cannot carry its operations. If the available capital is greater than the MCR but less than the SCR, then the company needs to take measurer to prevent technical insolvency.

Suggest examples of remedies that may be required in the event of a company breaching the SCR.

The SCR may be calculated using a prescribed standard formula or a company's internal model, where the latter may be benchmarked against the output of the standard formula.
Considerable work is needed to justify using an internal model, and all but the largest companies are likely to find that any reduction in capital requirements is more than offset by the work needed to support the internal model.
The regulator can compel the insurance company to develop its own internal models, if any standard formula des not do justice to the company's risk profile.

1 The Regulatory Environment

The SCR is calculated by assessing the capital required for each risk against a 0.5% ruin probability in one year. Thus the SCR is a risk based capital requirement, where the amount of capital held is directly associated with the risk factor of the business.

The various risks are aggregated using a correlation matrix to make allowance for any diversification benefits. In the standard formula the risks tested and the correlation matrix are prescribed. For the market risks, firms may need to use an economic scenario generator to assess the capital required for each risk.

Currently the Solvency II Directive applies to all insurance and reinsurance companies with gross premium income exceeding €5 million or gross technical provisions in excess of €25 million.

1 The Regulatory Environment

The Basel Accords for Banks and Credit Institutions

Solvency II provides solvency requirements for insurance companies' risks. Comparable measures of capital adequacy for banks are the Basel Accords issued by the Committee on Banking Regulations and Supervisory Practices of the Bank for International Settlements (BIS).

These accords set requirements for the levels of capital that banks need to hold to reflect the level of risk in the business that they write and manage.

2 Economic Capital

- **Economic Capital Requirements**

Businesses should not solely be run on the basis of a regulatory requirement, and thus other approaches should be considered.
The SCR under Solvency II is a risk-based capital measure.

In practice, financial product providers will have a risk appetite that limits the amount of risk they are prepared to take on. The risk appetite is commonly expressed as a requirement for the company to hold an amount of capital that is based on the regulatory capital requirements.

The risk appetite may be considered wit respect to the SCR. The solvency II regime also requires an insurance company to have its own view of capital requirements as well as the capability of meeting its business and strategic goals over a reasonable time span.

Under Solvency II Pillar 2, all firms are also required to consider their internal economic capital requirements under the ORSA.
ORSA stands for the company's Own Risk and Solvency Assessment.

2 Economic Capital

Economic capital is the amount of capital that a provider determines is appropriate to hold given its assets, its liabilities, and its business objectives.

Typically it will be determined based upon:

- the risk profile of the individual assets and liabilities in its portfolio
- the correlation of the risks
- the desired level of overall credit deterioration that the provider wishes to be able to withstand.

This is known as risk-based capital assessment, where the level of economic capital is determined using an internal model.
This internal-ratings based approach of Basel II and the internal model approach of Solvency II has allowed companies to move their regulatory capital requirement calculations to be more in line with their economic capital requirements.

2 Economic Capital

Depending on the provider and its regulatory regime, either economic or regulatory requirements may drive the need for capital. To meet the need for either economic or regulatory capital, various types of capital can be used. The cost to a provider of the various types of capital will depend on the level of relative risk exposure to the investor and on the availability of capital at any time in the market.

Economic Balance Sheet
The first stage in a risk-based capital assessment for a provider is to produce an economic balance sheet.

This balance sheet shows:

- the market values of a provider's assets (MVA)
- the market values of a provider's liabilities (MVL)
- the provider's available capital, which is defined as MVA – MVL.

The available capital is then compared with the economic capital requirement to assess the provider's solvency status.

2 Economic Capital

Market values of assets are usually easily and instantly available from the financial markets. As for assets that do not have real time values available, an alternate approach would be to reproduce market values.

The determination of a market value for a provider's liabilities is not so easy and a high level of judgment is required to determine market-consistent liability values. One approach is to determine the expected value of the unpaid liabilities stated on a present value best estimate basis and to add a risk margin.

The value of using an economic balance sheet as a starting point for capital requirement assessment is that it starts with assets and liabilities both being assessed on the same, market-consistent, basis.

It is worth noting that Solvency II is an example of the economic balance sheet assessment being the first stage. This is because the first pillar of Solvency II being technical provisions comprise best estimates of liabilities and a risk margin.

Other methods that involve a deterministic valuation of liabilities necessarily use a basis that does not set out to be market-consistent. Some liability valuation bases used for supervisory purposes have an inbuilt prudential margin, to a greater or lesser extent, depending on the regulatory regime.

3 Models for Assessing Capital Requirements

➢ **Standard Formula**

Under the Solvency II standard formula, the capital requirement is determined through a combination of stress tests, scenarios and factor-based capital charges.

The standard formula allows for:

- Underwriting Risk – mortality risk, longevity risk, morbidity risk, policy lapse risk, expenses being higher than accounted for
- Market Risk – interest rate risk, expected returns, currency risk etc
- Credit Risk – reinsurers going back on their due diligence
- Operational Risk - administration risk, team management etc

3 Models for Assessing Capital Requirements

Examples

- **Underwriting Risk**

Capital requirements for underwriting risk must also cover risks relating to mortality, longevity, catastrophe etc
Underwriting risk should be estimated using a stress tested method such as an increase in mortality rates etc
Capital secured for underwriting risk should not only cover risks associated with the insured event but also other risks such as a high withdrawal rate.

- **Market Risk**

Market risks could be allowed for by analysing the impact of stress test such as adverse market movements in gold value etc
Solvency II aims to assess the company's net risk and determine its capital requirement after recognising all the risk mitigation arrangements the provider has in place.

3 Models for Assessing Capital Requirements

The main objective of Solvency II is for firms to have solvency standards that reflect its risk profile thereby encouraging efficient risk control. Hereby firms with an efficient risk management mechanism must be rewarded with lower capital requirements. Alternately companies with higher risk profiles must also have a higher capital requirement.

➢ **Factor-based Charges**

It is a mechanism for determining capital requirements.
Factor based capital charges could be of the form:

- Factor x sum at risk – determining mortality risk capital requirement
- Factor x reserves – determining insufficient reserve risk capital requirement

The Solvency II standard formula for SCR combines the factor based capital charges and the stress test results to produce capital requirements for each risk.

3 Models for Assessing Capital Requirements

The overall capital requirement is less than the sum of capital requirements for each risk because of the benefits of diversification. The standard formula also demonstrates how each capital requirement needs to be aggregated allowing for diversification benefits.
Using the standard formula has the advantage that the Solvency Capital Requirement calculation is less complex and less time-consuming.
However, using the standard formula has the disadvantage that it aims to capture the risk profile of an average company, and approximations are made in modelling risks which mean that it is not necessarily appropriate to the actual companies that need to use it.

- **Internal Model**

As an alternative to using the standard formula for deriving Solvency II capital adequacy requirements, a company can use an internal model of its risks. Regulatory consent would be needed to use an internal model. Internal models aim to create a stochastic model that reflects the company's own business structure.

3 Models for Assessing Capital Requirements

Internal models are more sophisticated and robust than factor-based capital requirements, stress test and correlation matrices. A stochastic model generates results for a range of future scenarios thereby covering all the risks a company faces. For this mode needs to produce internally-consistent future scenarios. Also this model automatically allows for correlations between different scenarios.

Companies can also use internal models:

- to calculate economic capital using different risk measures, such as Value at Risk (VaR) and Tail Value at Risk (Tail VaR)
- to calculate levels of confidence in the level of economic capital calculated
- to apply different time horizons to the assessment of solvency and risk
- to include other risk classes not covered in the standard formula.

The difference between a 99.5% VaR and a 99.5% Tail VaR is that Tail VaR measures the expected shortfall in the lower 0.5% tail of the distribution. This risk measure demonstrates the required capital companies need to hold to meet this expected shortfall.

3 Models for Assessing Capital Requirements

A particular company has an internal capital model that uses one-year 99.5% VaR as the risk measure.

The company is considering changing to a conditional Tail VaR risk measure to be targeted at the same stringency of required capital as for the one-year 99.5% VaR measure.

Explain whether the Tail VaR confidence level would be expected to be greater or less than 99.5%.

4 Capital Requirements and Profitability

➢ **Components of Profit**

The profit made by a financial product provider can be expressed as two components:

- trading profit
- investment profit.

In outline, trading profit is the total of premiums and investment income on the provisions for future liabilities, less claims, expenses, tax and the net increase in any provisions for future liabilities.
Investment profit is the investment return, less tax and investment expenses, earned on that part of the assets not required for the provisions for future liabilities.

➢ **The Cost of Capital**

The price for a financial product is calculated by allowing both for the need to establish provisions for future liabilities and also for the need to earmark part of the capital to support the business written.

4 Capital Requirements and Profitability

The amount of capital required to support the business written may be determined on a regulatory basis, which may be formulaic or risk-based, or on the provider's own economic assumptions, which will normally be risk-based.

The premium charged should include an allowance for the loss of return on the capital tied up in the contract. This cost of capital reflects the likelihood of investment restrictions on capital supporting business in force, meaning that the investment return is not as great as if the capital tied up in the business could be used for some other purpose.

This means that whenever capital is employed in running a business, means that it will earn a lower return than if it could be invested more freely and used for other purposes. This resulting reduction in return is what is known as the opportunity cost.

The investment profit is that earned on the free assets, whether or not they are earmarked to support the business written.
The aim of the product provider is that the shareholders should earn the same return on the free assets whether they are used to support business issued or whether they can be invested freely.

4 Capital Requirements and Profitability

In the first case the investment profit is restricted because there are limits on how the assets can be invested. However, the difference is made up from the additional trading profit that is earned from the allowance for the cost of capital built into the premiums or contributions.

In the second case the whole return comes from investment profit.
If all the assumptions made in the product pricing are borne out in practice, then the expected profit will emerge each year throughout the life of the policy.