THE GENEVA ASSOCIATION

The Nature and Role of Capital in Insurance

November 2016

The Geneva Association

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Established in 1973, The Geneva Association, officially the 'International Association for the Study of Insurance Economics', has offices in Zurich, Switzerland and is a non-profit organisation funded by its Members.

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The Geneva Association—'International Association for the Study of Insurance Economics'
Zurich | Talstrasse 70, CH-8001 Zurich
Email: secretariat@genevaassociation.org | Tel: +41 44 200 49 00 | Fax: +41 44 200 49 99

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Foreword

Anna Maria D'Hulster
Secretary General
The Geneva Association

It has often been claimed that banks and insurers perform similar roles in the economy; i.e. offering a range of financial services to consumers and businesses, of which some may have quite similar characteristics—like a number of retirement products—while other products may not. Moreover, not least in relation to discussions on the regulatory requirements for banks and insurers, it is often assumed that the regulatory path to be followed should be rather similar. Especially in the aftermath of the financial crisis, which spurred global calls for stricter capital rules, the revised global set up is to a large extent being developed along similar lines.

But in effect, insurance and banking operate pursuant to very different business models. As part of their business, they are exposed to different risks and therefore must be treated differently in terms of reporting and regulatory requirements.

The differences come to the fore in the role of capital. In insurance, capital must be held to ensure that at period's end the claim of the last policyholder will be met. Although the occurrence of an insured event will always trigger cash outflows, payments are often spread out over an extended period. Moreover, insured events occur randomly and are rarely bunched together to trigger large and sudden outflows. This is in contrast to the requirements in banking, where a capacity for instant loss absorbency (capital requirement) is needed to stem sudden cash drains and in order to prevent a potential systemic chain of contagion from unravelling.

For insurers, the need to manage capital in such a way that policyholder claims will always be fulfilled requires intricate calculations and assumptions about long-term developments that impact underwriting. To this end, they have developed sophisticated capital modelling techniques and embedded them in comprehensive risk analysis and control frameworks. Thus capital management serves not only to ensure an insurer's long-term solvency, it is also a strategic tool to manage its position in the market.

It is with this in mind that our report endeavours to illuminate the role of capital in insurance. As policymakers around the world are engaging in discussions about a global capital standard, we encourage them to heed the salient characteristics of capital in insurance.

Executive Summary

Insurance at its core is about accepting and pooling risks in a measured and controlled way. This paper is about the role of capital as a key metric used to better understand, quantify and manage risk-taking in the insurance business.

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Our main messages are:

- ***Capital is a measure of funds in excess of what is needed to meet future obligations to policyholders (insurance liabilities)***. It is measured on an available basis (how much does the insurance company have?) and a required basis (how much does the insurance company need?). Given the uncertain and often long-term nature of insurance liabilities, the intricacies of insurance products, and the complexities of risk exposures, answering these questions can involve intensive calculations and assumptions about the way risks may evolve over time. Insurers receive premiums from policyholders and in return, promise to pay future claims. Insurers invest premiums received from policyholders in financial assets to support liabilities that the insurer establishes to cover expected future claims payments.

- ***Insurers receive premiums from policyholders and in return promise to pay future claims.***[1] Insurers invest premiums received from policyholders in financial assets to support liabilities that the insurer establishes to cover expected future claims payments.

- ***The valuation of liabilities is based on assumptions made about the future.*** In addition to covering expected claims, funds must be established to meet unexpected losses. Depending on jurisdictions, the amount set aside to meet unexpected losses may be established solely as capital or partly as capital and partly as liability. From an economic point of view, the ability to cover unexpected losses would be the same. Insurers hold financial assets to support both expected claims and unexpected claims.

- ***Naturally, there is a risk that the future is different than assumed.*** This raises the question whether the financial assets backing the liabilities will suffice to meet all future obligations. Capital is the instrument that insurers hold to help them understand, manage, and mitigate the impact of the risks that might unfold.[2]

- ***Capital is key to securing that the financial promises made to policyholders and society at large will be met.*** However, capital is not the answer to all economic problems potentially affecting insurers. Distress or failure of insurers have historically been rare events. When they occurred, they were primarily the result of (i) poor risk management and/or poor management decisions, (ii) exposure to illiquid assets in times of financial distress, and (iii) activities outside the core insurance business. Moreover, capital is not the only means to secure promises made to policyholders. That is why capital requirements are supplemented by a wide range of regulatory measures including, governance, requirements, Own Risk and Solvency Assessments (ORSAs), liquidity requirements and other qualitative regulatory norms.

- ***Life insurance contracts usually have long-term cash flows.*** An important risk is known as asset–liability mismatch. It concerns the risk that changes in economic and other conditions result in the value of liabilities moving differently than the value of the financial assets held to back them. Conditions that could impact differing valuations include financial market developments such as interest rate and share price movements, but also unexpected changes in longevity, mortality and other underwriting risks.

- ***Non-life (also known as general and as property & casualty) insurance contracts are typically shorter term.*** The dominant risks are either that more adverse than expected future claim events occur (in particular the risk of very large, catastrophic events[3]) or the risk that provisions set aside for past claim events will end up being inadequate (reserve risk).

- ***The investment strategy for the financial assets backing liabilities must reflect the nature of the liabilities.*** This underscores the importance of an appropriate asset– liability management (ALM) framework, especially in the life insurance business where the time horizon of the liability-driven investment strategy may allow an insurer to 'ride out' short-term market volatility. In that sense, short-term market volatility will not impact investment and other decisions. It is on the basis of this sector-specific liability-driven investment approach that insurers can achieve long-term returns for policyholders and shareholders.

1 Future payments made under policies in respect of covered risks (e.g. death, sickness, damage to property, and cars, and third-party liability) and accumulated amounts on savings and retirement products.

2 If liabilities also reflect unexpected losses, capital is reduced accordingly. The ability to withstand unexpected losses is not affected by funds being established as a liability or capital.

3 A series of losses from a single underlying extreme event, either a natural event (for example, pandemics, windstorm, flood, earthquake, hail) or man-made events (terrorism).

- ***Insurers hold assets considerably in excess of those needed to back their expected obligations in order to protect the balance sheet against a future being more adverse than expected.*** Excess holdings also serve to strengthen the resilience against shocks, unexpected losses and may reside in accounting liabilities or capital or both. Such holdings reflect an insurer's own view of the capital it needs to hold. Excess capital (or capital buffers), held over and above regulatory capital requirements, is that insurers can withstand adverse events and still meet regulatory requirements[4], thereby providing policyholders with a high level of security.[5]

- ***Diversification is key to managing and improving resilience to risk.*** Different risks have different characteristics and drivers, meaning that they are not likely to occur at the same time (they are idiosyncratic and typically not correlated) or to the same extent. For example, geographic diversification means that insurers exposed to storms causing severe losses in Spain are unlikely to simultaneously incur severe storm losses in Norway. Similarly, life insurers writing term assurance and annuity business will benefit from natural risk synergies and offsetting loss developments; the former is vulnerable to more deaths than expected, the latter to fewer.

- ***To better manage risk exposures, insurers have developed risk-based capital models.***[6] The models employ sophisticated techniques to generate probability distributions that help insurers understand the frequency and severity of different risk events and/or evaluate the exposures to, and the impact of, specific adverse and extreme risk scenarios. This includes consideration of the likelihood of different risks occurring at the same time in order to estimate the benefits of risk diversification.

- ***Insurers rely on capital models to support business decisions.*** The models also help them determine the type and extent of business (i.e. risks) they will accept. This is usually done in a robust risk framework[7] that defines how the model will be used and governed. In this way, the capital model establishes the basis for risk-taking decisions. Risk-based capital models serve to quantify risk exposures. They define risk appetites, and they help set limits for different risk exposures.

BOX 1: ECONOMIC CAPITAL

Economic capital represents an insurance company's own (internal) realistic assessment of the capital (that is, excess of assets over liabilities) it requires to provide a certain clearly defined level of security to its policyholders, given specific risk exposures. Economic capital is not the equity or surplus resulting from applying a set of accounting rules. It represents the internal measure of the sufficiency of financial assets to cover unexpected losses or to withstand stressed circumstances, whether caused by adverse market and credit developments or by events in the insurance (underwriting) domain proper. Economic capital is used throughout this paper as a generic term for an insurer's own view of the capital needed to cover one or more risks. Hence, the notion of economic capital is not intended as referring to particular models or regulatory frameworks commonly used to establish capital requirements and standards.[8]

4 Minimum level of capital that regulators require.

5 See also pp. 5 for the definition of capital buffers.

6 Another term for risk-based capital is economic capital, which is the minimum amount of capital required in the U.S. by the National Association of Insurance Commissioners. Here, the former, more generic, definition is meant

7 A well-defined and structured process that allows a company to identify, measure, manage and monitor its exposures to different types of risks in a robust governance structure (see p. 16).

8 In this respect, it should be underlined that The Geneva Association does not support one regulatory/capital framework over another.

Introduction

Insurance serves our economies and societies in many ways. It protects individuals as well as small businesses and large corporations against the financial consequences of risk. Its products support retirement saving, and, by investing premium volumes in a broad spectrum of financial assets, the industry is vital for funding investments in the real and financial sec-tors. Insurers hold capital to ensure that the promises made to policyholders will be met even under adverse conditions. The capital needed to fulfil this role must be calculated by reflecting the specific risk characteristics to which insurers are exposed. This makes capital also an important tool of an insurer's internal governance to identify, quantify, manage and monitor risk-taking in support of its main strategic objectives.

THE ROLE OF INSURANCE

Insurance serves customers by protecting them against the adverse financial consequences of risk.[1] By helping individuals to protect their families and the retired to achieve financial security in old age, insurance fulfils an important societal function. Similarly, by extending cover to large and small businesses, insurers support entrepreneurial risk-taking and economic growth. Moreover, by investing premiums set aside for future claims payments, insurers are an important source of funds for investments in the real and financial sectors. These activities make the industry essential for the sustained prosperity of our economies and societies.

The business model of insurance offers protection against unexpected events through the pooling of risk. Risk pooling harnesses the power of the group to eliminate financial volatility for the insured. Its mathematical basis is the law of large numbers, a theorem that describes how repeated observations of random events will converge to a well-behaved and predictable average. Consequently, insurers are only exposed to the expected average risk of the collective of insureds. That average is less than the sum of individual risks, since not all risks materialise at the same time.

CHARACTERISTICS OF THE INSURANCE BUSINESS

The insurer's promise to policyholders comes in different forms. Life insurance and non-life insurance are the two major categories into which insurance is typically classified.

- ***Life insurance*** provides protection against the financial risks of dying early or, in the case of retirement, outliving one's savings. Protection products provide guaranteed benefits on serious illness or death. Savings products allow policyholders to invest for the long term, including for retirement. At-retirement products typically give policyholders the certainty of a fixed future income for a specified maximum term or for the whole of their life.

- ***Non-life insurance*** offers protection against the financial risks of various adverse events impacting the assets of households and businesses. The non-life sector is highly diverse. Insurance cover is provided to individuals (e.g. motor and household cover), relatively small businesses (e.g. commercial property and employer, public and product liability) and larger companies (e.g. marine, aviation, transport, property, credit and various liability covers).

- ***Health insurance*** offers financial guarantees to cover the cost of medical expenses. In a number of markets, these products are considered to be life insurance; in others, they are categorised as non-life insurance. In many markets, life and health protection is provided by insurers through employers and may supplement benefits provided also by the State.

Insurance contracts, in essence, represent a promise to pay, upon realisation of an insured event, benefits to policyholders in order to cover the insured loss. Policyholders, in turn, must make upfront payments (premiums) to insurers, which are invested in various financial as-sets. The assets are chosen in order to reflect to the largest extent possible the risk inherent in future liabilities, not least concerning their duration. In this sense, the choice of assets is driven by the nature of the liabilities, which are backed one-to-one by assets.[2]

Insurance relies on the law of large numbers whereby individual risk events, although subject to large degrees of random variation, become very predictable at a portfolio level. It follows that the more business an insurer writes, the less it becomes exposed to the risk of random events and the more predictable average payments for claims (or insured losses) are.

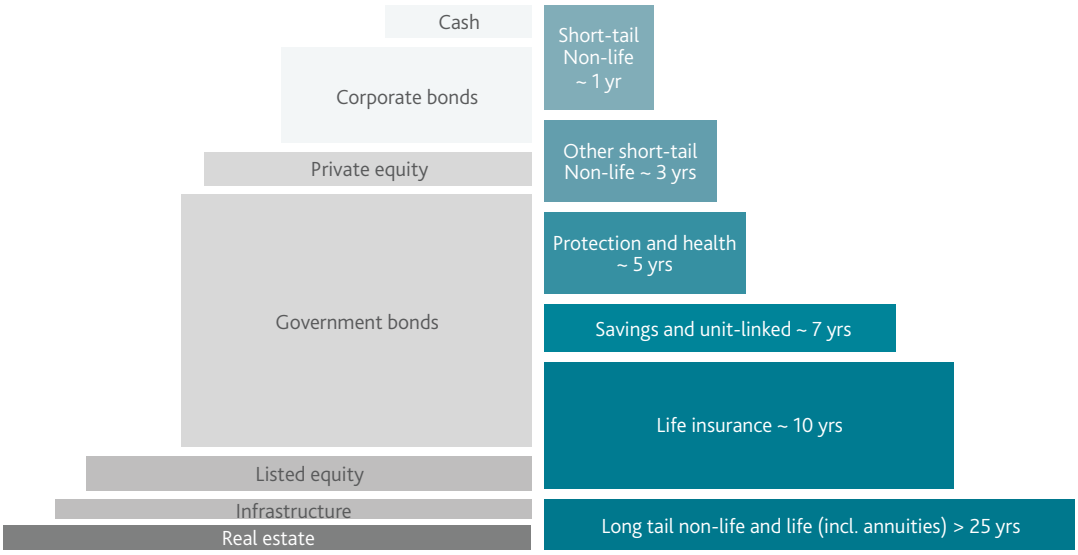
THE INSURANCE BALANCE SHEET

Figure 1 illustrates salient characteristics of the insurance balance sheet. For simplicity's sake, it assumes the structure of a composite insurer that combines life and non-life business lines, and it abstracts from equity and debt positions. The focus is instead on the approximate duration of liabilities. Insurers must meet the promises made to policyholders at all times. Thus, insurance liabilities may extend well into the future, depending on the nature of the business underwritten at inception.

1 Throughout this paper, for brevity, references to 'insurance' and 'insurers', except where explicitly stated otherwise, will also apply to 'reinsurance' and 'reinsurers', for which the underlying principles are broadly the same.

2 In this context, it is often said that insurers do not use leverage. The insurance balance sheet is, of course, leveraged since available capital is only a fraction of total liabilities (or the total amount of insurance limits offered to policyholders), which is commonly understood as leverage. In most jurisdictions, insurers are explicitly prohibited from employing leverage to enhance expected investment yields. This makes insurance distinctly different from many other financial services, not least from banking.

Figure 1:
Maturity Structure in a Stylised Insurance Balance Sheet (excluding debt and equity for simplicity)



Source: Kessler, D., de Montchalin, A, Thimann, C, (2016) 'The macroeconomic role of insurance', in The Economics, Regulation, and Systemic Risk of Insurance Markets, Oxford, U.K.: Oxford University Press.

To fulfil the promises made to policyholders at points in the near and distant future, insurers endeavour to match their liabilities (or future claims payments) with financial assets (an in-vestment portfolio) that closely, if not perfectly, match the duration of those liabilities. This is the challenge of asset–liability management (ALM), which will be discussed in more detail in the next sections. For completeness' sake, one should also add that insurers often endeavour to structure their investment portfolios so that cash flows from expected investment returns match the expected cash flow of future claims (cash-flow matching).

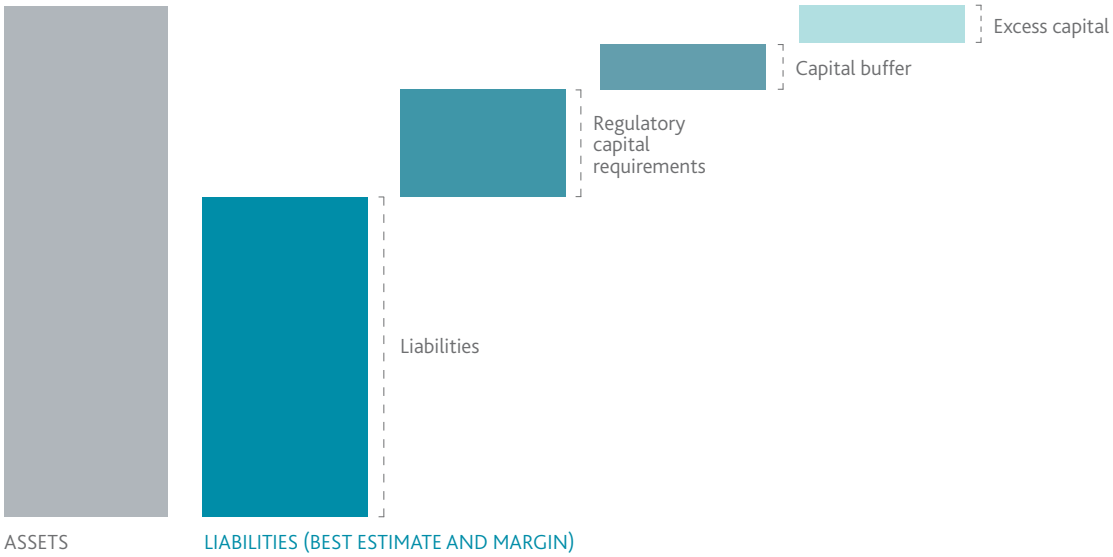
It should be readily apparent that the overriding objective of such a liability-driven investment approach is to meet policyholder claims. However, insurers must also achieve returns for their shareholders, which to some part, may come from investment returns in excess of those amounts going to policyholders. Seeking superior investment returns, however, is not a primary goal of the investment function; the objective is rather one of maximising expected investment returns under the constraint that expected claims payments could always be made. It follows from these considerations that, in general, insurers hold their portfolios, and fixed-income securities in particular, to maturity, even though these instruments may be recorded as 'available for sale' (AFS). This does not mean that insurers maintain a trading book. The AFS classification is merely a matter of convenience. It gives insurers the flexibility to trade these instruments should there be a need (such as changed market conditions) for doing so. The insurance business model does not rely on investments for speculative purposes.

RISK MANAGEMENT

The cash inflows (premiums) on life insurance policies are typically long term in nature, often lasting for decades. Early termination and surrenders of policies[3] are generally low, as the objective of the policy is to provide for the long term and policyholders may not be able to replace the coverage under the same terms. Furthermore there are contractual terms and conditions that apply to policies with cash surrender values. An important risk for life insurers is the extent to which the value of liabilities (that is the value of expected future obligations) might deviate from the value of the financial assets backing these liabilities. Such deviations may be caused by unexpected changes in underlying insurance risks and/or by adverse financial market developments. The

3 Where termination is the act of ending a policy that results in the discontinuance of the insurance contract, and surrender is an arrangement where the policyholder elects to pay no further premiums, which potentially results in the benefits under the contract changing to be commensurate with the new arrangement.

Figure 2:
Assets, Liabilities and the Role of Capital



monitoring of these risks in a comprehensive asset–liability management (ALM) framework is a key objective in the insurance business.

Life insurers typically seek to minimise ALM risk. One way of doing this is by holding assets of durations that match the duration of liabilities. Many products (such as unit-linked policies and, to some extent, products with profit-sharing features) promise payments that are directly or indirectly linked to the value of the assets backing the promise. This minimises ALM risk by design. Under normal financial market conditions, a large part of the invested financial assets are liquid and tradeable. In light of the predictable nature of future outflows, the liquidity risk of insurers is typically small. But in times of financial distress, assets formerly seen as liquid may turn out to be more illiquid. Hence, liquidity risk must also be monitored and managed. However, investments of insurers are not levered and they are consequently not as susceptible to illiquidity risk as financial assets held by banks.

Non-life insurance contracts are generally much shorter term, typically one year, with an option to renew at the end of the period.[4] Hence, in non-life insurance, the long-term ALM risk is not as significant as in life insurance. However, in certain cases, non-life claims will also be paid out over many years. For that reason, non-life insurers, naturally, seek to manage their assets and liabilities in a common, comprehensive framework. In contrast to life insurance, there is greater uncertainty in non-life contracts over both future claims and the eventual amounts insurers have to pay for claims that have already incurred but have not yet been reported to the insurer.

Different lines of business are exposed to different risks. These risks can broadly be categorised as (i) the risk of adverse future claims experience (due, for example, to very large individual claims or to natural or man-made catastrophes which result in a high volume of claims) and (ii) the risk that the provisions made for past claims prove inadequate (due to the full impact materialising only over a very long period[5] or to changes in legal environments). In non-life insurance, low-risk investment strategies are often pursued by relying on short-dated bonds and cash instruments. They are seen to better support the short-term nature and unpredictable timing of claims.

Insurers, and in particular non-life insurers, use reinsurance to manage their risks, especially large individual risks and low-frequency extreme risks. In effect, they insure some risks with companies (reinsurers) that specialise in accepting

4 Certain non-life insurance contracts have cash flows that are long-lasting, such as periodical payment orders (PPOs), or claims that can arise after much time has passed since the contract ended, such as workers' compensation.

5 In the U.K., asbestos claims are a good example. Asbestosis is a lung disease resulting from the inhalation of particles from a material used for insulating buildings. Depending on the level of exposure, asbestosis may take 20 years or more from the time of initial exposure for symptoms to develop.

risks from insurers. Because the risk trans¬fer frees up capital at the ceding primary insurer, reinsurance can also be seen as a capital management tool. Reinsurance expands the space for the pooling and diversification of risk between insurers and across the geographies in which they operate. In the same manner that insurers reduce the volatile financial consequences of risk experienced by policyholders, reinsurers reduce the financial volatility experienced by insurers. Reinsurers typically collect and analyse large volumes of data. This allows for sophisticated risk assessments and specialist underwriting skills also for new or 'hard to price risks' that they make available for primary insurers.

In addition to managing ALM risks, insurance companies monitor and control their overall risks in a number of ways. In particular, management practices include setting risk limits and appetites for underwriting activities, as well as defining the parameters for remedial actions to be taken, contingent on future events incurring (contingency planning).

LOSS ABSORBING CAPACITY TO MEET AND HONOUR POLICYHOLDER OBLIGATIONS

Insurers provide policyholders with a high level of security that the protection and benefits they purchase under policies will be honoured. This is achieved by maintaining various layers of loss absorbing capacity

- ***Liabilities*** are generally established upon issuance of the contract; they reflect the expected value of future obligations. Premium payments received from policyholders are used to purchase financial assets that back the liabilities. In addition to covering expected future claims, liabilities often include—either as result of accounting standards or regulatory requirements—a provision for losses (i.e. claims) caused by an actual experience that varies (to the negative) from what was originally assumed. Such loss provisions serve as 'extra buffers' and have the same purpose as capital. Consequently, they reduce the need for capital. Insurers hold assets to support both the portion of the liabilities related to expected claims and the portion related to unexpected claims. Over time, insurers regularly update their assumptions made to calculate the amount of liabilities they hold. This ensures that liabilities will always reflect the latest available information on the actual loss experience.

- ***Regulatory capital requirements*** specify the minimum threshold for the amount of capital insurance companies are required to have. Regulatory capital requirements are designed to ensure that, even if the future loss experience is more onerous than assumed when the liabilities were calculated, the insurer can still be expected to fully honour future claims. Supervisors will intervene if an insurer ceases to have sufficient capital to meet its regulatory requirements.

- ***The capital buffer*** is a company-defined target level of assets held over and above liabilities and regulatory capital requirements to ensure that insurers can withstand an adverse event and still be able to fully meet regulatory requirements. In some jurisdictions, part of the financial buffer is established as a (loss-absorbing) liability. The greater the capital buffer, the more extreme adverse events can be absorbed by the insurer. Different approaches can be used to determine capital buffers. Examples are (i) funds required to withstand an event so adverse that it would only be expected to occur in one year out of 200 or (ii) funds deemed necessary to obtain a desired minimum financial strength rating (e.g. 'A' or 'AA') from an independent rating agency.

- ***Excess capital*** comprises assets in excess of the sum of liabilities, regulatory capital requirements and capital buffers.

This is shown graphically in ***Figure 2*** on page 4.

Holding assets in excess of liabilities and capital requirements is not the only way for insurers to withstand an adverse loss experience. Management can also act after adverse events have occurred in order to mitigate and prevent further losses. Actions may include (i) reducing or hedging exposure to risky financial assets, (ii) taking out reinsurance to protect against a further adverse loss experience, (iii) lowering future claims payments (such as on surrender, if policy conditions and legal frameworks permit) and (iv) reducing dividends to shareholders. Such management actions may not always be fully reflected in liability and capital values.

With respect to policyholder protection, it is important to note that an insurer in breach of capital requirements is still likely to have more than enough assets to meet future claims payments. However, a breach of regulatory requirements may trigger supervisory intervention.[6] This could, in the first instance, result in the undertaking being required to submit a plan for how it will restore its financial strength, which may include taking some of the management actions described above. In extreme situations, the company may

6 Supervisors and the companies themselves will naturally monitor the level of capital coverage and will react before the breach.

also cease writing new business. For insurance companies owned by shareholders, as opposed to those owned by policyholders (mutuals), the adverse impact of such actions will be borne primarily by shareholders and not by policyholders.

Moreover, holding capital is but one of several supervisory requirements that insurers must meet in order to provide security for policyholders. A range of qualitative requirements (such as concerning governance structure) and disclosure obligations to both the public and the supervisor help underpin the ability of insurance companies to deliver on their promises.

Capital is, in any case, not the answer to all economic and financial problems that may affect insurance companies. Distress or failures of insurers have historically been rare events. When they did occur, they were primarily the result of (i) poor risk management and/or poor management decisions, (ii) exposures to illiquid assets in times of financial distress and (iii) activities outside the core insurance business. Such problems would not be solved by relying on capital only.

THE ROLE OF CAPITAL IN INSURANCE COMPANIES

Capital protects policyholders by ensuring that the insurance undertaking can meet claims even under very adverse conditions. It can also be seen as a necessary means for the company to engage in underwriting and produce insurance liabilities. Policyholders, analysts, rating agencies and the media refer to capital as an indicator of financial strength. Through their actions and reports, they exert pressure on companies to be well capitalised.

Insurance companies must hold sufficient financial resources to deliver on their promise, including in case of very extreme events, or a series of events, without having to raise additional funds. The legal requirement to hold funds in excess of liabilities is called a solvency requirement. Insurance companies must hold capital, i.e. assets that are not set aside to cover liabilities, of an amount at least equal to the solvency requirement.

Various jurisdictions have developed their own frameworks or regimes to determine solvency requirements. Despite differences in the way various regimes have evolved over time, they require insurers to hold sufficient capital to withstand unforeseen and extreme events without jeopardising promises made to policyholders.

The remainder of the paper reviews the role of capital in more detail, beginning by describing and defining different types of capital. It then sets out the core features used to calculate capital by explaining the importance of capturing specific risk characteristics to which insurers are exposed. Finally, it describes how capital is used in robust governance structures to identify, quantify, manage and monitor risk-taking and risk exposures in support of an insurer's main strategic objectives. Their ultimate goal will, of course, always be the supply of high-quality products and services to policyholders.

Types of Capital

The capital insurers must hold to meet their future claims obligations can be viewed through different lenses. Regulators and rating agencies define outside views. Regulatory capital is the minimum insurers must hold to comply with legal requirements designed to protect the interest of policyholders. Rating agencies look at levels of capital needed to obtain and maintain certain credit or financial strength ratings. The internal view is embodied in economic capital. It is the management's view of the funds needed to successfully run the business, given its risk appetite, risk exposures and its assumptions about broader underwriting and financial market developments.

THREE VIEWS OF CAPITAL

The nuanced expectations of different stakeholders about the role of capital lead to a number of variations in their definition and calculation. The main variations are:

- ***Regulatory capital***—the minimum capital an insurer must hold in order to comply with regulatory requirements. Regulatory capital needs to be seen relative to the liabilities insurers must establish. The total assets required to support liabilities and capital is the framework regulators impose to ensure that the company has sufficient assets to meet expected obligations under adverse conditions. Jurisdictions around the world have developed their own frameworks to determine regulatory capital requirements.

- ***Economic capital[7]:*** a company's internal view of the risk-based capital[8] required to support its business on the basis that management believes to be most appropriate and realistic. In the internal view, economic capital is used as a measurement and risk-based decision-making tool for the allocation of capital to its most productive use. Given the heterogeneity of the insurance sector, including the variety in underwriting risks and the varying assumptions about the future, the internal view may take many forms.[9] Subject to supervisory approval, internal models may in some jurisdictions also be used to calculate regulatory capital requirements.

- ***Rating agency capital:*** capital that rating agencies expect an insurer to have in order to obtain, or maintain, a desired credit or financial strength rating. Rating agencies have been increasingly paying attention to internal economic models in addition to relying on their own rating models when assessing the capital adequacy of an insurance company.

7 Again, it should be emphasised that economic capital is used as a generic term for an insurer's own (internal) view of the capital needed to cover one or more risks. Hence, the notion of economic capital is not intended as referring to particular models or regulatory regimes used to define capital requirements and standards. Reference is also made to ***Box 1***.

8 Not to be confused with the U.S. NAIC Risk Based Capital regulatory capital requirements.

9 Internal models must satisfy a number of regulatory requirements. In particular, they must result in appropriate calculations of solvency capital, be an integral part of an insurer's risk management and internal governance processes, and meet a number of statistical, reporting and documentation standards as set forth by supervisors.

REGULATORY CAPITAL

The fundamental reason why insurers hold capital is to protect policyholders, i.e. it is held to ensure that the insurer will always fulfil the promises it made. Supervisors, as protectors of policyholder interests, play an important role in ensuring that insurers have sufficient financial resources to provide for the appropriate level of policyholder protection. To this end, regulatory bodies require the establishment of liabilities and capital to meet the dual objectives of policyholder protection and solvency of the insurer.

However, setting the regulatory capital bar very high is not necessarily in policyholders' best interests for at least two reasons.

- First, the cost of capital, and subsequently, the premiums for insurance products, may go up as shareholders require adequate returns on the capital they provide. This may deter market entrants, potentially stifling innovation or, perhaps worse, deterring individuals from purchasing insurance products for saving and protection. Policyholders may no longer be able to afford protection, or they may opt for lower levels of protection, in turn creating wider economic inefficiencies due to the poor allocation of financial resources.

- Second, if regulatory capital requirements are excessive or fail to properly account for the nature of insurance, they may falsely indicate the insurer is in distress when that is not the case.

RATING AGENCY CAPITAL

Rating agency capital can be broadly defined as the level of capital that would be required to obtain and sustain a certain credit rating. It is similar to regulatory capital because it is solvency-driven and set by a third-party institution (although ratings are optional for non-listed insurers). The Solvency II capital calibration, for example, is considered to be broadly consistent with the capital required to obtain a 'BBB' credit rating.[10]

Each rating agency has its own approach and capital

10 Solvency II is a solvency regime applicable to EU insurers from 1 January 2016. It consists of three pillars: Pillar 1, covering quantitative requirements (covering models, calculations, scenarios and assumptions), Pillar 2, setting out governance and risk management requirements (including the Own Risk and Solvency Assessment—ORSA), and Pillar 3, on reporting and disclosure.

model. Different rating agencies place more or less weight on quantitative and qualitative aspects (the latter, for example, based on the perceived quality of enterprise risk management). Historically, rating agencies have relied on a factor-based approach for quantitative assessments but are now increasingly using economic capital calculations and reviewing insurers' internal models. Factor-based approaches are described in more detail later.

In general, a higher level of capital allows for a better credit rating, and a higher credit rating results in a lower cost of borrowing, allowing issuing debt with lower coupon payments.

ECONOMIC CAPITAL

The common objective of economic capital in insurance is to measure capital using realistic assessments of potential economic and non-economic risks. Economic capital is an insurer's own measure of capital needed to cover unexpected losses or withstand stresses based on management's realistic assumptions about the future.

The development of internal capital models by some companies predates regulatory developments such as Solvency II. It was driven by the desire to better manage risk exposures, understand diversification effects, and in general, make better risk decisions for the benefit of both policyholders and shareholders.

The approaches insurance companies take in their economic capital calculations reflect the nature of their products, underwriting risks, ALM risk and broader risk management issues. This is explored further in the next section.

Capital Calculations

The determination of the capital needed to run the business profitably and meet the promises made to policyholders at all times requires sophisticated modelling. The models typically require choices about risk horizons, about how the risks on the asset and liability sides of the balance sheet may interact with each other, and how risks are likely to distribute over various periods. Models must be well calibrated at the outset and frequently updated with new information. It is also crucial for senior management to develop a critical understanding of the limitations inherent in all modelling exercises.

CORE FEATURES

There are many variations in the approaches taken to calculating capital, especially across different lines of business and jurisdictions. However, the differences can usually be reduced to three features:

- ***target security:*** the probability that the insurer can withstand some definition of 'failure' over a given risk horizon;
- ***risk horizon:*** the period of time over which the probability of 'failure' is assessed;
- ***risk measure:*** the technique applied to define the financial resources or incurred losses consistent with the above elements and how they are calibrated; common risk measures used are value at risk or conditional tail expectation.[11]

For regulatory capital, the target security will, of course, be set by the supervisor. Solvency II and the Swiss Solvency Test use a 1-in-200 level over one year.[12] In the U.S., supervisors, in general, require the capital needs to be seen over the whole run-off period, i.e. the time it would take an insurance company to run off all existing contracts.

However, companies may also model capital using their preferred approach. For such purposes they may choose an even higher target security, such as one that is considered to be a good proxy for a desired external rating.

CHOICE OF RISK HORIZON

The risk horizon is a core concept in the capital calculation of insurers. Two different approaches are pursued[13]:

- ***The run-off approach*** considers the assets in addition to those backing liabilities in such a manner that the cash flows from these assets are sufficient to meet claims and expense payments up to the expiry of the last policy. In a run-off approach, the capital is determined such that it is sufficient, when combined with the assets backing liabilities, for an orderly run-off of the company even under a very extreme stress scenario. In other words, all payments to policyholders can be covered based on the performance and sale of the company's assets.
- ***The one-year approach*** typically considers the loss (change in assets in excess of liabilities) at the end of one year after extreme stress events. The implicit assumption is that this defines the minimum amount of assets (or capital) in excess of those backing liabilities needed to ensure that, post stress, the liabilities (and backing assets) could, if required, are transferred to another, stronger insurer at fair value.[14]

The nature of an insurer's most important risks and how they are likely to evolve will influence its internal approaches, although local regulatory requirements will also play a significant part. Many non-life risks (particularly reserve risk) and certain life insurance risk (such as longevity risk) evolve over time and may be better captured using a run-off approach. In contrast, risks that tend to emerge over a much shorter period, such as market risk and catastrophe risk, may be better suited to a short horizon.

Capital under a run-off approach is usually determined under the assumption that the company is closed to new business, whereas capital under a one-year approach is often determined on a going concern basis. Under a going concern basis, the insurer's portfolio is expected to grow so that the business can take on new risks over the specified time horizon.

These considerations underscore the importance of longer time horizons in the determination of insurance capital requirements. Capital, that is, the amount of financial assets in excess of liabilities, must be held to ensure that at period's end the claim of the last policyholder will be met. Thus, insurance capital is not held to absorb shocks at the outset. Although it is true that the occurrence of an insured event triggers cash outflows, such payments are often spread out over an extended period. Moreover, insured events occur

11 Value at risk ('VaR') or conditional tail expectation ('CTE' or 'Tail VaR') are techniques used to define a threshold of loss for a given risk horizon and target security. The CTE risk measure is computationally more challenging than VaR but has the advantage of capturing any unusual non-linear features in the tails of distributions. Non-life catastrophe events (and the interaction of different types and layers of reinsurance) exhibit such features. For this reason, a number of non-life insurers use CTE risk measures.

12 1 in 200 is equivalent to the 99.5th percentile, therefore a '1-in-200 event' represents the worst outcome with a probability of occurring of 0.5 per cent.

13 These approaches may be tied to different philosophies/systems of resolution of insurers. The run-off approach is common in the U.S., whilst the one-year approach is common in Europe. Thus, the choice made by regulators on the two approaches is often determined by historical developments, and one system cannot be said to be better than the other.

14 The present value of the liabilities discounted at the risk-free rate and valuing any optionality embedded with liabilities consistent with the observed price of relevant market instruments.

randomly and are rarely bunched together to trigger large and sudden outflows. This differs from the capital requirement in banking, where a capacity for instant loss absorbency is needed to stem sudden cash drains at the outset and prevent a systemic chain of contagion from unravelling.

INTERACTIONS OF ASSETS AND LIABILITIES

A key feature of insurance risk, especially in life insurance, is the interaction between the liabilities and financial assets supporting them, which makes it essential for capital calculations to reflect these interactions. This is illustrated by the different approaches seen in regulatory capital calculations across the globe.

- ***Factor-based capital calculations*** are applying a set factor (e.g. a percentage) to a specified risk measure, for example, technical provisions pertaining to a particular product type or asset holdings. In a factor-based approach, an insurer's change in capital will be driven by changes in the size of the risk measure. While a risk measure is intended to serve as a proxy for a risk, the process of applying distinct factors to distinct risk measures to determine required capital may fail to adequately capture the risk sensitivities and the interaction between liabilities and backing assets. To overcome potential shortcomings, regulators may prescribe conservative reserve requirements and/or other prudential measures to ensure insurers hold sufficient assets to cover the risks they have underwritten. Such prudential measures may include cash flow and/or liability adequacy testing.

- ***Scenario-based capital calculations*** consider the change in a company's assets and liabilities under particular scenarios, such as after stress.[15] They capture the interaction between assets and liabilities and reflect the likelihood of the risks occurring in synchrony (known as 'diversification'[16]). Under this calculation, capital will be responsive to a change in the nature of the risk, and it recognises the diversification benefits that various combinations of risks may bring.

The more precisely an insurer's capital calculations reflect the underlying risk drivers, the more accurately it will quantify risk exposures. Consequently, the company, its supervisors and the rating agencies will arrive at a better understanding of the risks and the amount of capital the insurer needs to protect policyholders and achieve its strategic objectives. Capital stress testing, liquidity stress testing, and ORSA provide supplemental means to better evaluate risk exposures.

Scenario-based approaches are used to measure and quantify risk exposures, which is critical to the role of capital in risk management. Companies' business plans and strategies involve seeking out certain risks because their expected rewards (risk premiums) are attractive and avoiding other risks because their rewards are insufficient or insufficient relative to the expected downside risk or the cost of risk mitigation.

Insurers use dynamic cash flow calculations to assess how assets and liabilities react to adverse events and how diversification effects may work out. These allow insurers to directly assess the effects of business decisions and the extent of their risk exposures. Risk capital analysis is therefore key to identifying and incentivising good risk management behaviour, a point which will be discussed in more detail in the next section.

Factor-based approaches do not always capture the often complex interactions between assets and liabilities. They would therefore be less appropriate for more complex liabilities and complex ALM activities. For this reason, factor-based approaches may be combined with other prudential measures to ensure the regulatory framework incentivises sound risk management practices.

RISK DISTRIBUTIONS

Although economic capital calculations understandably focus on very extreme events (tail events), it is also important for insurers to understand how less adverse loss experience might evolve. For the purpose of setting capital buffers at the right level, they may want to know what a 1-in-20-year event would be and how likely different risks are to occur jointly.

Scenario generators are at the core of many risk-based economic capital models. They generate future scenarios, based on simulation approaches tailored to meet the specific characteristics of different risks. Simulations are statistical techniques that project a range of plausible, but not necessarily likely, scenarios of how the world might look like in order to estimate the impact of different risks in various hypothetical scenarios.

15 A stress in this context is a hypothetical adverse risk event (an event that is possible, but that has not actually occurred) at a specific confidence level, for example, equity values declining by 40 per cent over the course of a year at a 99.5th percentile confidence level (or 1 in 200 years).

16 Diversification captures the extent to which different risks may be likely or unlikely to happen at the same time. The less correlated risks are, the less likely they will materialise together and consequently the greater the positive diversification effect.

For example, an assumption might be that equity values increase on average by 5 percent each year. However, in practice, share prices will vary and returns might be greater or lower in individual years even if, over the long run, they average at 5 per cent. A series of simulations of future returns will be designed to capture the potential for such variations around an assumed long-term average.

Similarly, interest rates will be simulated to fluctuate around a central assumption. Variations in interest rates and in the values of equity securities may be linked in some way. For example, over the short term, rising interest rates may be associated with, or to an extent cause, declining equity values.

In practice, individual risk driver simulations need to be combined in order to calculate capital and to reflect on the extent to which different risks are, or are not, likely to be correlated (i.e. likely to materialise jointly). In the above example, the capital calculation should capture the possible interaction between interest rates and equity values and in doing so, reflect on the benefits of investment portfolio diversification.

Scenario generators are not only used to simulate financial market risks, they may also be used to simulate catastrophe risks, such as extreme floods in non-life insurance as well as pandemics and longevity in life insurance. These models are especially important in the non-life business, where catastrophe risk can be one of the most material risks. They draw on expert geological, meteorological and engineering input to generate both future catastrophic event scenarios (floods, hurricanes and earthquakes) and to quantify the likely claims costs arising from them, capturing the correlation and accumulation of risk.

These sophisticated techniques and models help insurers derive the economic capital in a VaR or CTE framework and the capital buffers needed in extreme adverse environments to protect policyholders. For the calculations, particular attention is paid to the tail (i.e. extremity) of the risk distribution where events are typically infrequent but potentially severe.

TRANSFERABILITY AND FUNGIBILITY CONSTRAINTS

Insurers and insurance groups in particular, may have to observe restrictions on the extent to which available assets can, or cannot, be used to absorb certain losses. This can reduce the diversification benefit that would otherwise accrue. For example, suppose a group consists of two wholly owned subsidiaries and that one gets into financial difficulty, but the other is financially strong. At a group level, it will make a big difference whether or not capital from the strong subsidiary can support the weaker one. If this is not the case, there will be limited, if any, diversification benefits from the risks in the two subsidiaries. Similar restrictions can also apply within a company. For example, excess assets attributable for profit sharing business[17] cannot be used to absorb losses on another business and are in practice ring-fenced.

Understanding such restrictions and constraints is important. There are two key concepts that are linked, but different:

- ***Fungibility*** refers to the extent to which assets (or funds) may absorb any losses, i.e. they are not dedicated or earmarked for a certain purpose. Profit-sharing funds for policyholders are an example where fungibility constraints apply.

- ***Transferability*** refers to the ability to transfer funds, e.g. between legal entities, after taking into account the costs and time it would take to do this. For example, there may be legal restrictions or exchange controls in some jurisdictions that prevent such transfers.

These features are reflected in companies' models.

MODEL CALIBRATION AND VALIDATION

Models are only as robust as their underlying assumptions and parameterisation. The phrase 'garbage in, garbage out' is therefore as relevant to economic capital models as to all other models.

A key difficulty in setting the assumptions underlying the capital models (model calibration) is the focus on the tails of risk distributions where there is limited historic information. However, data scarcity does not invalidate the use of models, but it implies that greater reliance must be placed on what is commonly called expert judgement. It involves relying on an expert, and, more typically, on a panel of experts, who can bring in experience to compensate where there are limited historic data available for model calibration.

17 An insurance policy where the policyholder participates in the profits of the insurance company. Such policies provide flexibility to insurers that helps to achieve long-term objectives.

The reliance on expert judgement for setting long-term assumptions and determining appropriate sensitivity/stress tests is a long-standing and common practice, particularly in actuarial and risk management activities. Central to this is the monitoring of experience over time to set and update assumptions as new information becomes available.

It is important to note that even where there are significant historic data available, expert judgement is still required. It must decide whether past experience is a good guide to the future, or if there are other trends and developments that one should consider. A good example is the likely impact of global warming on the frequency and severity of extreme weather events such as hurricanes and floods.

Given the importance of economic capital models, including their role in making business decisions, great attention is given to the appropriateness of their underlying methodology and assumptions. That is why insurers carry out detailed validation exercises, including the use of independent teams, to review and challenge their models and calibrations. Such exercises include reviewing historic data in support of assumptions and sensitivity tests. They may also extend to back tests and retrospective tests known as profit and loss attributions in order to understand how well the model explains and captures the sources of profit and loss in recent financial years.

Notwithstanding validation exercises, uncertainty about the future will always exist. However, uncertainty, provided it is recognised, does not invalidate the use of models and the input of expert judgement to set assumptions about the future.

The key for insurers is to understand what their biggest risks are, how they might evolve over time, how they can be mitigated, and how they might interact and combine with other risks. The capital models of insurers inform about these questions. Validation tests such as sensitivity tests help understand which assumptions are the most important and where uncertainty over their values might have the most impact.

Although calibrating extreme events is very challenging and involves expert judgement to model uncertain and remote future events, the alternative of not trying to quantify and understand risk exposures and 'flying blind' would be far worse.

MODEL LIMITATIONS

All models are representations, and therefore approximations, of a complex real world. Notwithstanding their sophistication, the same is true of many capital models. They will have their limitations. The above discussion on model calibration illustrates these limitations.

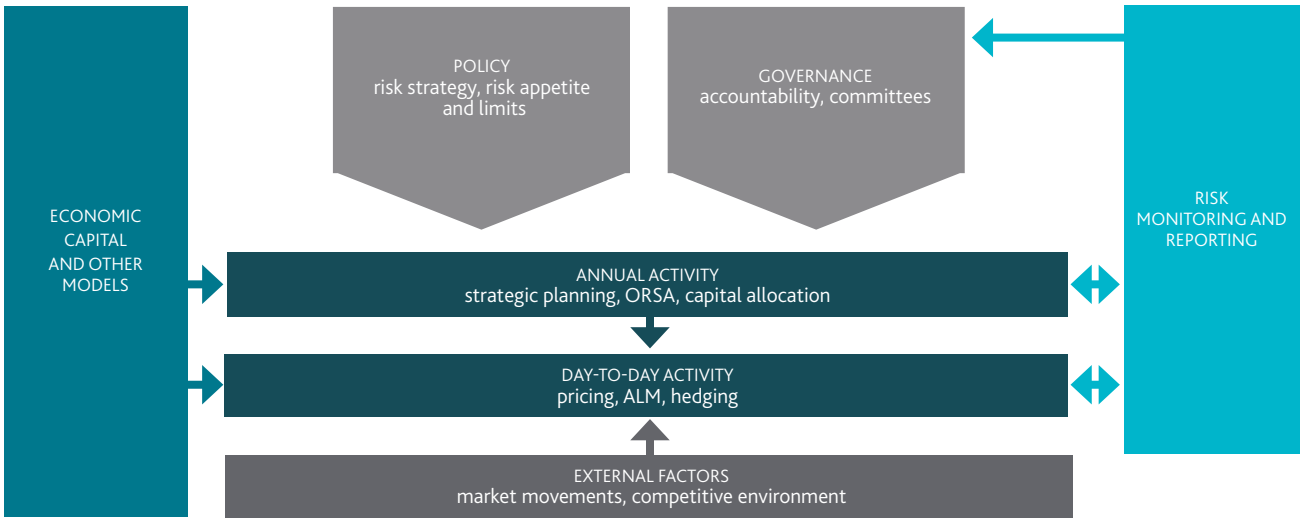
For these reasons, a good understanding of model limitations is required. Models should not be black boxes. There must be an understanding of what types of decisions and circumstances they provide critical insights on, when additional information might have to be brought in, or when they should perhaps not be used at all. The validation exercises performed by independent parties are key to identifying and, where possible, addressing such limitations. They can also lead to a better understanding of models, especially at senior management levels.

Model governance, and more broadly, how and when models are to be employed (in a risk framework, for example), is important to ensuring that capital calculations are used appropriately in the organisation. This point will be developed in the next section.

Role of capital in a risk framework

Capital modelling and capital metrics play an important role in the intricate frameworks developed by insurers to identify, measure, monitor, and manage the risks associated with all aspects of their business. Thus capital models are a key tool for developing and implementing an insurer's strategy and keeping track of the company's performance and risk profile.

Figure 3:
The Role of Capital in a Risk Framework



RISK FRAMEWORKS

The purpose of a risk framework is to identify, measure, manage, monitor and report significant risks in a controlled and robust structure that has clear objectives, priorities, responsibilities and accountability. Internal economic views of capital are at the core of this framework in quantifying risk exposures and allowing them to be monitored against defined limits.

Figure 3 shows the key elements of a risk framework, illustrating the role of economic capital in relation to the annual and day-to-day activities of insurance companies and the factors (internal and external) influencing these activities.

Successful and influential capital models are those that engage with all levels of an insurance company. Capital metrics (the way various risks are analysed and monitored) will feature in feedback loops that link with decision-making bodies (Boards of Directors and senior management). They are also influencing and helping shape key functions, such as risk steering and preferences, product design and pricing, reinsurance strategy, ALM, capital and liquidity management.

This section addresses the many ways in which decision-making bodies in insurance companies are connected to the capital calculation. Its focus is on the role of capital in formulating a company's risk appetite, developing its Own Risk and Solvency Assessment (ORSA),[18] and on developing and implementing its strategy.

RISK APPETITE

Capital is the starting point for defining the risk appetite an insurer must have. Insurers are in the business of taking risks. A clearly articulated risk appetite, set by the Board of Directors, will line out how the company should go about its business risk selection and volumes, and help it do so in a measured and controlled way.

Risk appetites commonly cite a capital benchmark to serve as a threshold for the risk the company accepts. The type of capital (regulatory, rating agency or economic) used for this threshold varies from firm to firm.

An insurer will also have specific risk preferences. There are certain risks it will avoid or minimise, and there are others it will actively pursue. Economic capital will be used to identify the risks that insurers will either avoid or seek to have on their balance sheets. The insurer will also be guided by its views on the risk premiums associated with different risks

18 ORSA is broadly defined as a set of company-wide processes that contribute to risk-conscious strategy development and decision-making in a continuous forward-looking manner. It comprises a number of steps that include the definition of a risk profile and its corresponding implementation as well as the production of a comprehensive ORSA report.

and its ability to absorb and manage them. The views will also reflect any competitive advantage or disadvantage an insurer may have relative to other firms.

Insurance capital models guide how best to allocate capital to specific activities, products, geographic regions or entities. Making business decisions that optimise diversification benefits reduces overall risk, and economic capital models are central to understanding this. Examples of decisions for which insurers might rely on capital models are:

- ***investment and ALM strategy:*** understanding liability duration to help minimise ALM risk and the possible benefits of hedging certain risks to stay in line with risk appetite or to reduce risk concentrations, thereby improving the benefits of diversification;
- ***reinsurance strategy:*** understanding and optimising reinsurance cover to free up capital for alternative uses;
- ***product design/pricing decisions and distribution strategy:*** understanding capital intensity and the extent to which different products bring risk exposures that either increase existing risk concentrations or help offset and diversify other risks.

CAPITAL IN THE ORSA

In most major jurisdictions, Own Risk and Solvency Assessment (ORSA) requirements are already in place, or will be coming into place. The ORSA is a forward-looking process that uses stress and scenario testing to evaluate the capital needs of an insurer over the business cycle. It reflects the company's own view of risk, using metrics and approaches that it believes to be appropriate. This requires for risk and features that might not be well captured in regulatory capital.

Capital modelling is used in the ORSA not only to demonstrate the ability of an insurer to withstand an adverse event today, but also in the future as the ORSA extends over the strategic planning horizon of the company (typically three to five years). The ORSA considers explicitly an insurer's ability to meet solvency requirements in the future and align its business plans accordingly. Projecting capital needs under normal and stressed conditions allows for a better understanding of the potential consequences of assumptions made in the business plan. Examples include the impact of specific product designs or different planned volumes of new business under various economic conditions.

Stress and scenario testing allows companies to perform 'what if' analyses under different scenarios to understand how risks might evolve, combine, impact and, importantly, what mitigating actions could be taken and when it would be best to do so.

Reverse stress testing can provide further insight to support preparations for the 'perfect storm.' Reverse stress testing begins by analysing an adverse outcome, such as failing to meet minimum solvency requirements, or the failure of a particular business model, to identify the circumstances that might cause it to occur. Understanding the sources of risk supports the development of a plan for managing them.

STRATEGIC PLANNING

Companies also use their ORSA to introduce new, more granular performance measures in their planning processes. ORSA then serves to support reviewing the basis on which insurers allocate risk factors and account for the cost of capital in their pricing.

Capital models, when used for regulatory and economic purposes (such as approved internal models under Solvency II and SST), are integral to risk decision-making and steering. They enable a consistent view across business units, ensure that the long-term nature of the insurance business is properly accounted for, and support strategic decision-making.

CONCLUDING REMARKS

The insurance industry serves customers by protecting them against the financial consequences of risk and helping them save for the future. Insurance benefits our economies and societies alike. Accepting, pooling and managing risk is central to the economic and societal role of insurers.

Insurers invest premiums received from policyholders to cover expected future claims. The financial assets support liabilities that are established on assumptions about the future. In addition to covering expected claims, liabilities established are often required—either by accounting standards or regulatory requirements—to include a provision for unexpected claims. Insurers hold capital in addition to establishing liabilities to further protect policyholders should the future unfold other than assumed. Insurers hold assets considerably in excess of those needed to cover the liabilities and the level of capital deemed necessary to fulfil the promises to policyholders.

Internal economic views of capital build on available knowledge and expertise to facilitate good business planning and sound risk-taking. Economic capital models significantly enhance the understanding of an insurer's risk profile and how it plans to manage future uncertainty, in turn benefiting how society prepares for, and endures, extreme circumstances. The most effective capital models are embedded deep in the organisation. They reflect its view of the true economics of risk and are used for, and aligned with, the way insurers manage risk.

These methodologies have been at the forefront of developments as insurers have striven to build more robust and insightful tools to manage their business. Since the burst of the dot com bubble in 2000 and the Global Financial Crisis in 2008/2009, much progress was made, including and extending to the breadth and depth of risks considered by capital models and the frameworks in which they are embedded in the business. In light of the benefits and competitive advantage they offer, it is reasonable to expect that improvements in insurance capital modelling and risk management practices will continue. Their value goes well beyond generating mere balance sheet reporting numbers. It allows insurers to better understand risks and develop contingency plans for their mitigation. After all, 'plans are nothing; planning is everything.'[19]

19 Dwight D. Eisenhower.

Insurance and banking have very different business models. As part of their business, insurers are exposed to different risks and therefore must be treated differently in terms of regulation and reporting. This report examines capital and its role in the insurance business model.

The Geneva Association—'International Association for the Study of Insurance Economics'
Zurich | Talstrasse 70, CH-8001 Zurich | Tel: +41 44 200 49 00 | Fax: +41 44 200 49 99