



INSURANCE

Risk and capital management: a new perspective for insurers

FINANCIAL SERVICES

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Introduction

Economic capital:

The organization's capital to cover potential losses at a given risk tolerance level and time horizon.

For insurance companies worldwide, the ability to identify and manage risks as well as to use and allocate capital efficiently is becoming increasingly important in a highly competitive, risk-focused marketplace. The abilities to manage risk and to allocate capital are intrinsically linked since a better capitalized company is able to take higher risks and, conversely, a company with good risk management needs less capital to support its business.

Risk and capital management is a unified framework that combines these aspects through the use of "economic capital" as a common risk measure. Economic capital is the capital considered necessary as a buffer against potential losses inherent in business activities (it may also be called "risk capital" or "risk-based capital"). Insurers' focus on economic capital is part of an industry-wide movement to use reliable practices and techniques to make strategic decisions, measure risks, optimize performance measurement and, ultimately, strengthen long-term profitability and competitiveness.

Risk management has gained attention in the insurance industry as a result of a number of important factors:

- Shareholders and investors want to know that insurers' strategic decision-making is based on a reliable assessment of both risks and capital needs.
- Financiers within the capital markets expect that insurers, in their efforts to use scarce resources efficiently, will determine their capital requirements according to a comprehensive assessment of their risks.
- Rating agencies are increasingly basing their evaluations of insurers on the manner in which they identify, aggregate and manage risk.
- Regulators worldwide are increasingly evaluating insurers with risk-based approaches – for which the European Commission's proposed Solvency II capital adequacy framework will eventually provide important guidelines (see Appendix I).

For insurers, risk and capital management can help drive a number of important business benefits:

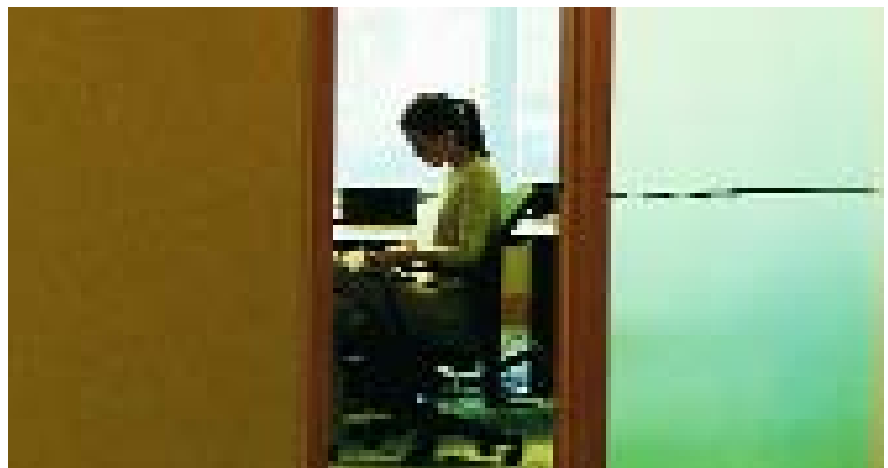
- Improved understanding of risks and their true costs to the organization.
- Translation of investors' expectations into a management framework.
- A company culture enhanced by a greater awareness of risks and a consistent definition and application of risk appetite.
- Improved product pricing that could lead to higher quality of earnings.
- Risk-adjusted approach for comparing the performances of individual business units.
- Efficient allocation of funds and management resources within the company.
- Stronger ability to quantify risk adjusted capital adequacy positions to regulators and rating agencies.

This document discusses the evolving importance of risk and capital management for insurers. It addresses risk and its measurement as well as risk diversification and it lays out a framework for capital management. It describes how a holistic approach can help insurance companies achieve a variety of business benefits as well as meet the needs of their shareholders, other stakeholders and supervisory authorities.

Key questions for leaders

In evaluating risk and capital management issues, leaders are considering questions including:

- Do we understand the nature and level of risk the company is taking?
- How much capital is needed to support total risk?
- Is the company over- or under-capitalized in relation to its risks?
- What future capital requirements are anticipated and what management actions can be taken to reduce their impact?
- What are the expected and required returns on economic capital?
- Are individual business lines creating or destroying shareholder value?
- How can we improve portfolio performance? Which exposures should the company buy or sell and in what quantities? What is an optimal strategy for hedging/selling down risk?
- What opportunities for growth or diversification exist within the company?
- How should capital be managed within constraints imposed by investors, rating agencies and regulators?



The current environment

When the European Commission and its member states initiated the Solvency II project in 2000, a primary goal was to better align capital adequacy requirements with the true risks of insurance companies. The capital markets will increasingly demand improved transparency in the insurance companies in which they invest. High-profile failures of insurance companies in countries worldwide underscore the need for regulators to improve solvency regulations – and for insurance companies to better understand their risks. To that end, close alignment between Solvency II and the International Financial Reporting Standards (IFRS) is expected.

Moreover, in the wake of Basel II, the European Commission and other regulatory bodies also saw an increasing need for a level playing field across the financial sector globally as well as an emerging trend towards convergence of prudential rules for different sectors. The presence of financial conglomerates (of banks and insurance companies) and regulators' consolidated supervision of such entities creates additional pressure on regulators to impose similar standards for capital requirements and accounting across sectors. Cross-sectoral arbitrage – for example where risk is transferred from the banking sector to the insurance sector because less capital is required to support the risk, such as in the use of credit derivatives – is becoming increasingly prevalent.

Besides these regulatory drivers, the needs of a variety of external stakeholders play an important role in the impetus behind risk and capital management:

- Shareholders understand that an insurer's assessment of risk and calculation of capital adequacy is critical to investment decision-making.
- Capital market financiers provide lower-cost capital to those insurers that can demonstrate that their premiums are adequate for the risks they are taking as well as demonstrate how they manage short and long term risks.
- Rating agencies' assessments of insurers' risk and capital management can increasingly serve as an important factor in their analyses. In this respect, the ability to calculate economic capital is an important measure of the quality of a company's risk management.

What's more, many senior insurance leaders – who need to know their companies' risks and allocate capital accordingly – are also driving the need for more sophisticated risk management techniques and capital allocation processes. For example, respondents to a recent KPMG International survey (see page 30) conducted among over 100 insurance companies in 19 countries indicated that effective risk management was aligned with increased access to global capital markets as well as competitive advantage (see Appendix III). Sixty-four percent indicated a desire to integrate risk and capital measurement processes more closely into risk management efforts. The same percentage seeks to support senior management with robust risk assessments.

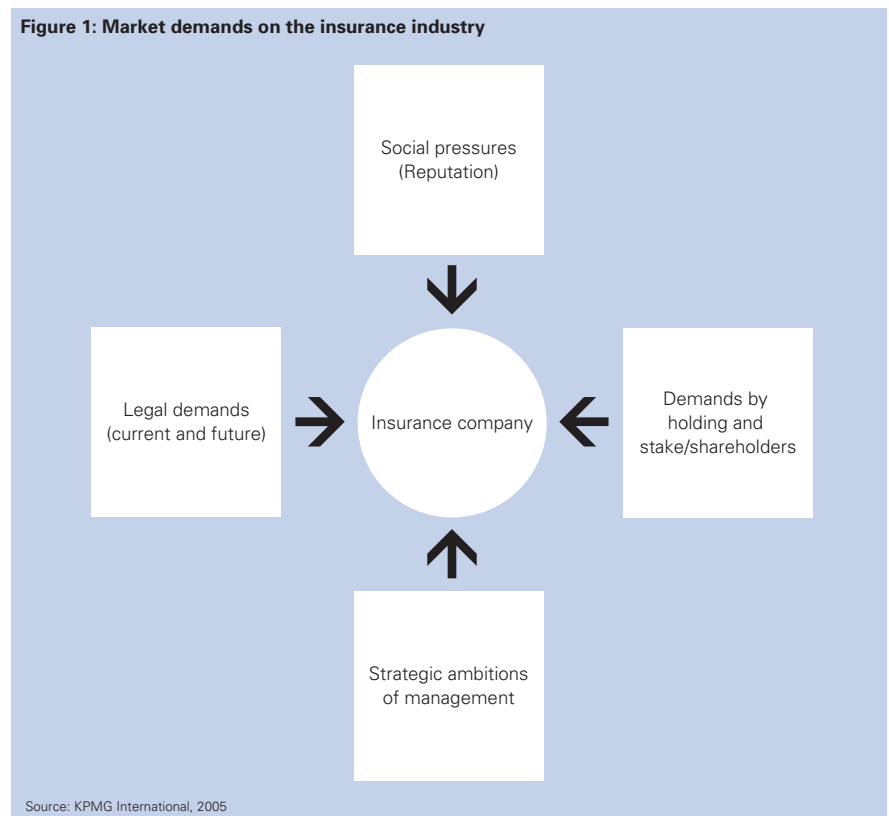
The challenge for insurance companies is that many of them lack highly developed risk management models to make risk decisions with complete effectiveness:

- Many insurers have not yet identified or differentiated all their risks – market, credit, insurance, operational, strategic and other risks – and determined the interactions between them.
- Additionally, many insurers lack highly sophisticated means of evaluating exposures to losses.
- Like banks, insurers struggle with defining risk appetite (that is, how much risk am I prepared to accept?) and then building the answers into a policy framework that drives the risk management of the business.

Building the systems and capturing the necessary data can demand sizeable investments of time, energy and financial resources. Many companies have yet to be persuaded of the value of those investments. Others are reconsidering their business priorities. They know that by managing risk effectively, they can be better positioned to make informed strategic decisions and also gain increased access to global capital markets and thereby enhance competitive advantage.

Evolving regulatory capital requirements as well as a growing desire for a sound and integrated risk management function are creating increasing pressures on insurers, see figure 1.

Figure 1: Market demands on the insurance industry



Source: KPMG International, 2005

Issues and challenges

Linking risk to capital requires:

- Identification of all material risks and introduction of a timely indicator system to confirm these remain the key risks.
- Specification of the risk-appetite and time horizon under consideration.
- Measurement of risks over this time period and aggregating them for business lines and for the company as a whole.
- Calculation of the economic capital that corresponds with this appetite.
- Implementing a risk management framework based on economic capital.

Considerations in measuring performance

Insurers lack a single industry standard for measuring risks. The most widely used risk measures are Standard Deviation (SD), Value at Risk (VaR) and Tail Value at Risk (TailVar). These measures are explained in Appendix II: understanding risk measures – some technical details.

Criteria for a company's risk-adjusted performance may be the ratio of expected profit to economic capital. The risk is worthwhile if this ratio is higher than the so-called hurdle rate, i.e., the return that is required by the shareholders. This risk-adjusted performance measure is also called RAROC or RARORAC, (Risk-Adjusted Return On (Risk-Adjusted) Capital), see Appendix II: risk-adjusted performance measurement.

Taking and managing risk

Investors are likely to expect and demand appropriate returns based on the level of risk assumed by an insurance company. To help meet this expectation, many companies have already established risk management teams responsible for identifying risk and distinguishing well-priced opportunities. These teams should continually review such questions as:

- What kinds of risks are generated by the business and how can the company measure these risks consistently to make them comparable?
- How can an appropriate limit aggregation system for all risks and business lines be established that keeps the company from taking on too much risk?
- Does the company have enough capital to support the risks it takes?
- How can risk be integrated into a performance measurement and incentive system that aligns employees' economic interests with those of the company?

In many cases, answering these questions may likely call for monitoring and even redesigning the company's internal methodologies and processes.

Identifying risks to assume

The insurance business model rests on covering risks for a premium that is higher than the expected loss caused by these risks. Risk measurement focuses on unexpected losses, which generally arise through lower than expected returns from assets or higher than expected costs for liabilities (including expenses) or operational failures. It is usually unexpected loss that leads to severe volatility in the earnings of a company, ranging from lower profits to losses, even possibly to bankruptcy.

Different business activities lead to various unexpected losses. Even in the case of rare but likely events that might generate unusually high unexpected losses (e.g., as in some past stock market crashes), the intent is that the insurer's capital should be high enough to ensure the viability of the institution. Another notable class of risks that can lead to very large losses are operational risk, which can be especially hard to measure and only a portion of which can be mitigated via insurance or outsourcing. Traditionally, insurers have priced business using specific insurance risk factors and have attempted to take into account operational, credit, market and other risks using broad expense and contingency factors.



Risk and economic capital measures

Risk measures provide the opportunity to translate the risks into the amount of capital needed to withstand the impact of the risks that have been assumed. To accurately derive the amount of this economic capital, two parameters have to be addressed:

- The probability with which the risks are to be withstood. This confidence level depends on the company's risk appetite, which is established by the Board.
- The time horizon under consideration. The choice of time horizon should depend on the business the company underwrites. It is often set at one year but other choices are also possible (see Appendix II).

Economic capital has two fundamental applications:

- It has an operational purpose by directly estimating the funds needed to withstand the risk, given the risk appetite of the company.
- It serves as a common measure that allows a company to compare and aggregate the effects of risks of completely different nature – thus providing a quantitative basis for enterprise risk management.

Risk and return

While assuming more risks should result in a higher return on average, these risks may lead to a lower return for some periods. Economic capital is supposed to cushion this risk. However, if a lower return materializes, the first question to ask is whether it is really a consequence of the volatility of the business or whether it is due to structural changes. In the latter case, management action should be taken because economic capital only covers volatility risk. Structural changes can also have a positive effect and return can also be determined by both structural changes and volatility risk, a fact that adds challenge to the analysis of the return. A good system of key risk indicators and regular (long term) scenario calculations can aid in identifying the reason for lower returns, especially if the structural change emerges slowly over time.

Challenges in introducing a risk and capital management framework

Some firms have already started developing an economic capital model. Others choose instead to use a regulatory capital model to satisfy existing or upcoming national regulations or the expected requirements of Solvency II.

Whichever route a firm chooses, it must resolve a number of technical and cultural challenges before it can implement a risk and capital management framework. Technical challenges range from the difficulties in modeling certain classes of business risk to the calculation of diversification effects. These problems are exacerbated by the lack of data in many areas. At the same time, management must recognize the sensitivity of models to the important decisions they make in identifying key assumptions and parameters.

Consequently, when introducing a risk and capital management tool the organization should embark on an internal program of validation and communication as early as possible. Otherwise, leaders risk the possibility that those being asked to use the model ultimately may not have faith in what it does or tells them.

Organizations that seek to use the model as a regular business tool may need to consider what the organization will look like when the model has been developed and implemented. Considerations could include such issues as how the organization defines its strategy and goals, how it is structured, the competencies it requires from its people, how it defines its culture and values and the behavior it could expect in each of these areas.

For example, to use the model for the basis of decisions may require the organization to reconsider some of the more traditional responsibilities, structures and business processes. One consideration for a property and casualty insurer might be whether a central pricing engine room should take some of the underwriting decision power from underwriters, or whether they should be empowered with sophisticated technology that allows them to see the true cost of a risk at the point of underwriting the risk. Both decisions have cultural and technical implications. Preventing conflicts of interest is another challenge. For instance, a department that both delivers input data for the economic capital calculation and at the same time is evaluated by its return on economic capital could be tempted to deliver data that systematically errs on the positive side.

In addition, further technical challenges emerge in building a risk and capital management model when the intention is to use it for day-to-day management decisions. These challenges range from choosing appropriate confidence levels to building a model that is repeatable and receives timely and accurate data upon which decisions can be based. For example, a decision around the design of an annually purchased reinsurance program can be readily informed through a relatively basic model. Basing day-to-day rate decisions on a model requires a high level of model sophistication and technical support.

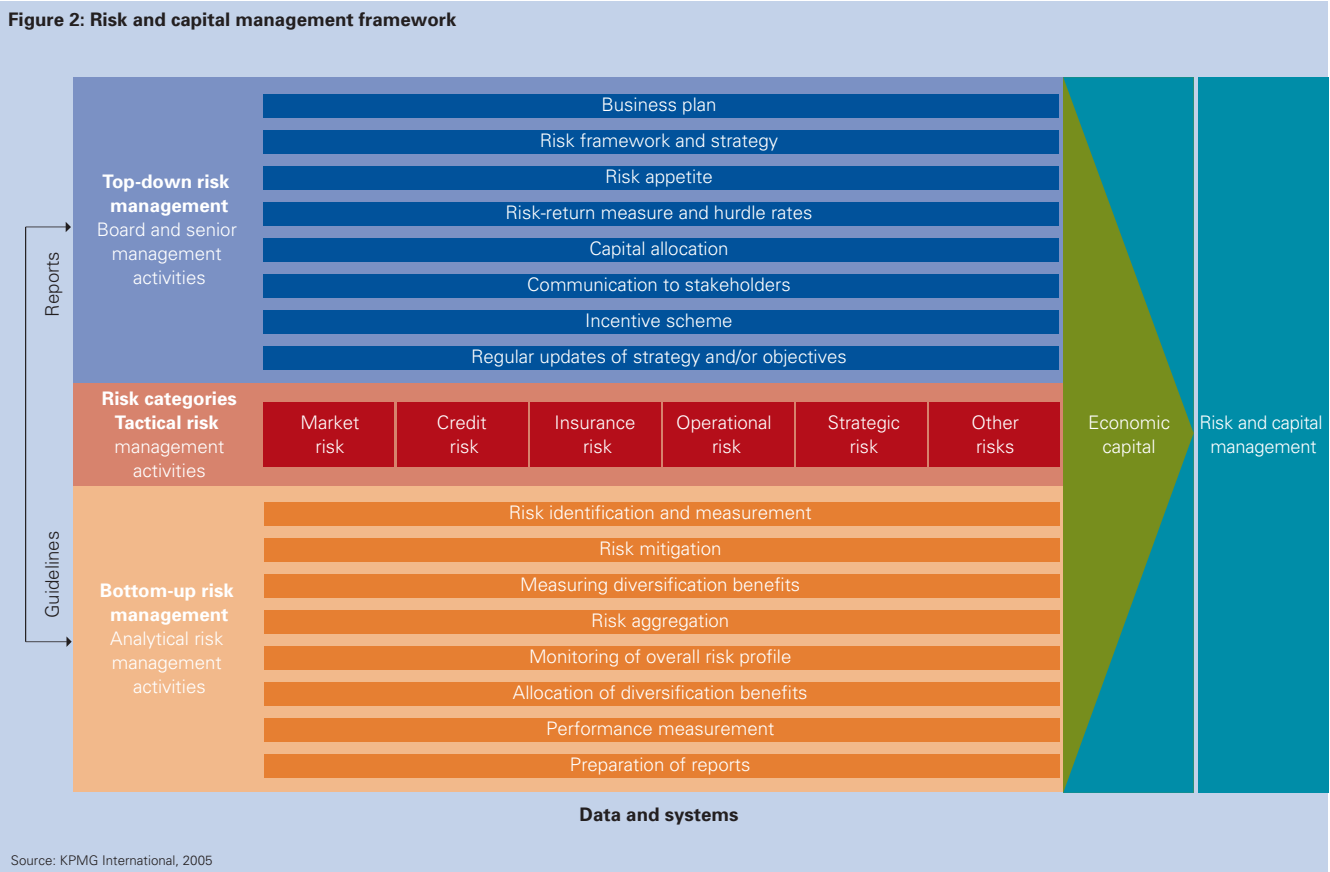
Key questions for leaders

- Do underwriters understand what capital is required as a result of their decisions?
- Are leaders seen to take decisions on the basis of a risk assessment?
- Does risk management sit at the heart of business decisions?
- Is reporting done on the basis of risk metrics?
- Are all significant stakeholders aware of the risk model and what it is intended to achieve?



Understanding risk and capital management

Many leading institutions understand the capital implications of their risk-taking activities, and how the efficient use of capital can be embedded within their businesses. Figure 2 shows a framework for risk and capital management. It encompasses many issues that should be addressed. These issues are described below.



Top-down risk management

Company management could begin by defining a general business plan describing the insurer's overall objectives and business case. This plan could include, among issues with respect to performance and growth, specifications for which risks to assume and measure as well as how to manage, monitor and report these risks. These guidelines must be communicated clearly throughout the organization.

Two key elements of a risk management strategy are the specification of the probability with which the risks are to be withstood and the time horizon under consideration. The risk appetite can be expressed as maximum allowable probability of default within this time horizon. A higher risk appetite and, thus, a higher assumed total risk, leads to a higher probability of default.

Assessment of the assumed risks requires measuring the company's performance and linking it to the risks that were taken. The process of linking calls for measuring the performance in a risk-adjusted way, for instance by using the RAROC concept. In order to have performance benchmarks for each individual part of the company for which performance is to be assessed, so-called hurdle rates, i.e., required levels of RAROC, must also be defined. These hurdle rates would typically be defined for individual legal entities and business lines. Additionally, the company must allocate its available capital to these individual parts (this allocation may be virtual, i.e., it may not involve the transfer of real physical funds).

The allocation of available capital to the business lines therefore has two goals:

- **Limiting risk:** just as a company limits its overall risk by tying capital allocation to risk appetite, its business lines would develop a risk-limit system that is tied to the capital assigned to each of them.
- **Earning the required return:** by benchmarking their risk-adjusted performances against the assigned hurdle rates, a company could have a transparent tool to monitor and analyze whether the return of the company satisfies the requirements of the shareholders.

At the same time, new investments (and therefore risks) can be assumed only if the request for the corresponding extra amount of capital is approved and if the investment can generate enough return to meet the hurdle rate.

Developing a risk management framework and setting earnings targets are important first steps, but actually achieving established goals requires the support of both senior and line management. Specifically, an insurer's leaders need to make sure that these goals are embraced at all levels of the company and are reflected in daily business activities by clarifying and effectively communicating business objectives including the chosen risk appetite. In a company with a good risk culture employees can see their own work in a larger context. Business objectives must be clearly communicated to create this culture.

Additionally, the rewards of the insurer's middle and (where appropriate) lower management should be directly linked to the degree to which these individuals add value to the company on a risk-adjusted basis. To this end, a clear definition of responsibilities, fully supported by staff buy-in, has to be established.

Finally, company management should regularly receive risk and performance reports that clearly indicate whether risk limits and performance targets are met. If such reports are not forthcoming, the board should decide to update its risk framework and strategy, its capital allocation and possibly even its business objectives.

Key questions for the board and senior management

In evaluating their risk and capital management board members and senior managers should consider questions including:

- What are the company's business objectives and what are the main risks threatening these objectives?
- What is the organizational structure and what entities are subject to risk and capital management?
- Which material risks have been defined and included in the risk measurement framework?
- What are the management actions that could mitigate risks in the event of adverse scenarios?
- Is a process in place to identify risks outside the organization's risk appetite?
- How does the company allocate its economic capital to individual business lines?
- Which performance measures and hurdle rates are used as key drivers for each business unit?
- Is an incentive scheme in place to encourage risk management aligned with business objectives?
- What is the process for reviewing the adequacy of the management system on an ongoing basis?



Bottom-up risk management

Bottom-up risk management activities include the identification, consistent measurement, mitigation (where warranted) and monitoring of the individual key risks. They also encompass the aggregation of individual risk measures to a single risk metric and the monitoring of the overall risk profile and performance in relation to the insurer's capital. The results of these activities must be reported to the board and senior management on a regular basis.

Economic capital calculations call for risk capital corresponding to identified risks to be aggregated to a single risk metric. However, simply summing up economic capital values for individual risks would ignore the fact that not all risks are fully correlated and would therefore ignore possible diversification benefits. Consequently, the resulting overall minimum capital requirement is likely to be too conservative. Measuring the diversification benefits calls for a thorough analysis of the correlations between individual risk types.

Economic capital may be calculated for different parts of the company (or group) in accordance with the allocation of the available capital. If individual business lines within one legal entity should be assessed on this basis – typically as part of the strategic planning effort – then the economic capital at entity-level should be allocated to the individual business lines. This allocation could also imply the allocation of parts of the total asset portfolio (asset risks) as well as costs to these business lines.

The company must allocate the diversification benefit, which has been calculated on a higher level, back to the various levels within the company for which risks and performances are to be assessed. That is, it must determine the contributions of each level to this benefit. There are various possible approaches differing in complexity and focus available for carrying out this allocation. However, since the diversification benefit manifests itself only in the aggregate portfolio, none of these methods can be considered as providing a single, absolutely fair solution to this problem. Therefore, risk managers have to strive for a compromise between pragmatism and intuitive fairness.

Key questions for risk management

In evaluating the actual risk management activities, risk managers have to consider questions including:

- What is the process for identifying key risks?
- Which risks are addressed in the calculation of economic capital and how are they modeled?
- What method is used to account for diversification in aggregating the risk silos?
- How is the adequacy of data and systems determined with respect to consistency and reliability for the risk and capital management process?
- What is the process for monitoring movements in the risk profiles?
- What are the relevant performance measures (e.g., return on equity, risk adjusted return)?



Risk types

Identifying and classifying risk types are critical components of a fully functional risk and capital management framework. Board and senior leadership may not be able to efficiently perform management activities without clearly defined risk categories that are aligned with business needs. In parallel, certain bottom-up risk management analytical activities require guidance to appropriately identify, measure, monitor and report key individual risks. Below are the key risks borne by many financial organizations.

Market risk: the risk that the economic position of the company is affected by the performance of the financial markets. It includes the potential effects on the actual values of the assets and the liabilities (and therefore on the volatility of the surplus) as well as the potential effects on the level of the insurance liability cash flows through profit-sharing arrangements. Specific issues such as guarantees and embedded financial options, potential effects on policyholder behavior and management discretion applied in performance-linked profit sharing should also be addressed. Market risk includes inflation risk as far as inflation can affect future insurance liabilities (indexation) and expenses.

Credit risk: the risk of default and change in the credit quality of issuers of securities (in the company's investment portfolio), counter-parties (e.g., on reinsurance contracts, derivative contracts, or deposits given) and intermediaries to which the company has an exposure.

Insurance risk: relates to the uncertainty on the frequency, severity and time to payment of future claims and associated expenses. Also called "underwriting" or "liability" risk, its definition strongly depends on the specific character of the insurance product. Typical examples are mortality and longevity risk for life insurance, morbidity risk for disability insurance and uncertainty on frequency and severity of claims for property and casualty insurance (e.g., car insurance).

The different sources of insurance risk are:

- Model and parameter uncertainty (including the risk of parameters that change in time, such as uncertainty due to mortality trends or changes in legislation)
- Volatility risk
- Extreme event risk (catastrophes).

Insurance risk also includes risks/uncertainty due to policyholder behavior once the insurance contract has come into force.



Operational risk: encompasses the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events. Operational risk, which can have more far-reaching effects on a company than other risks, includes the following:

- Business risk
- Legal risk
- Compliance risk
- Tax risk
- Fraud risk
- Processing and administrative risk
- Physical asset risk
- People related risk
- Facility risk
- Mis-selling risk.

It can also include such risks as underwriters writing outside of the business plan guidelines.

Operational risk is especially difficult to quantify because robust and objective quantitative data is neither readily nor consistently available in many organizations. Nevertheless, these risks cannot be neglected simply due to a lack of existing data. According to current estimates as well as KPMG firms experience, 8 to 20 percent of an insurance company's risk-based capital is needed to cover operational risk. Therefore approaches have been developed that incorporate historical loss data, qualitative information based on risk assessments and the results of scenario-based approaches.

For risk managers, the task of identifying, quantifying and mitigating operational risk presents a much greater challenge than for other risk types. This is because the nature of operational risk touches on the raw nerve of whether a company's culture fosters openness to admitting or anticipating operational failure.

Key questions for operational risk managers

In understanding operational failure and its impact on a company's economic capital, risk managers should be able to answer questions including:

- How does the company define operational risk? Does the definition include people, processes, systems and external events?
- Is that definition applied consistently across the whole organization?
- Is an operational risk policy in place?
- How does the organization define its appetite for operational risk?
- Is a process in place for recording operational risk losses and "near misses"?
- Can the company quantify its capital requirements in respect of operational risk?



Strategic risk: arises from an inability to implement appropriate business plans and strategies, make decisions, allocate resources, or adapt to changes in the business environment.

Other risks: a company may be subject to specific risks that are not considered as part of the risks described before, or that are considered and dealt with explicitly because of their relevance. Possible examples include:

Liquidity risk is the potential that the firm may be unable to meet its obligations as a consequence of a timing mismatch between asset and liability cash flow patterns. Liquidity risk can also be induced through higher than expected mortality, due to, for example, an epidemic. A further course could be a higher than expected lapse, which could be triggered by worsened economic conditions or unfavorable press about the company. Here there is also a link to operational risk.

Concentration risk refers to higher-than-normal relative exposure in a single risk. It is the opposite of diversification. Investment of a high proportion of assets in a single economic sector, for example, or a high proportion of storm damage insurance liabilities from a single, relatively small region, might be considered concentration.

Group risk appears when a company must consider the likelihood and financial consequences of both insolvency and the credit downgrading of another member in the group. Given that the firm shares the parent's name there is a large risk of association. Another type of group risk is contagion risk, which arises if a group member is in distress and has to be bailed out by other group members (e.g., because of regulatory requirements). Another form of contagion risk can be induced through the sharing of services (e.g., an IT failure in one group member that affects the whole group). The size of the group risk can depend on the ownership structure of the firm, on how it is funded by the parent and on the level of integration of group members.

Risk and capital management: an approach

Success in a competitive global financial market demands that company leadership see the big picture as well as the fine details. The board must have robust oversight policies and procedures in place, and senior management needs sound information on risks and returns at the group and business-line levels. Implementing such a highly complex corporate governance/risk management approach is not easy. Thus, it necessitates a structured and disciplined approach.

Moreover, for many insurance companies, a program for risk and capital management is likely not to be the only program in progress within the institution. A number of insurers in Europe, for example, have programs underway to help enable them to move from a local accounting standard to International Financial Reporting Standards (IFRS). In addition, many are dealing with new internal controls regulations imposed in the United States by the Sarbanes-Oxley Act of 2002.

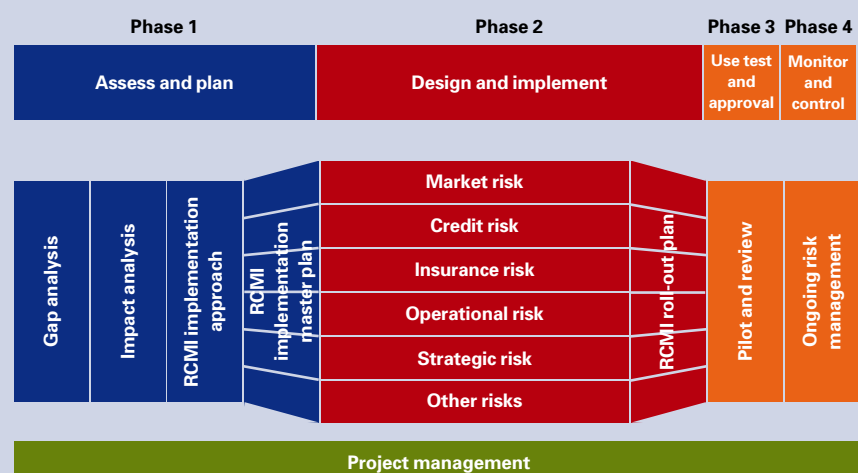
Interdependencies among local, regional and other regulations create both risks and opportunities. Logistically, delays in one program could cause delays in another.

Regulatory changes should be taken into consideration when introducing a risk and capital management framework. The key challenge is to identify the links and overlaps among the various programs and to understand their effects and the opportunities they present for enhancing corporate governance and risk management. For instance, the concept of “fair value of liabilities” is necessary for calculating economic capital but is also fundamental to the valuation of reserves within the future IFRS standard. As Figure 2 provides a framework for risk and capital management, Figure 3 puts these components into a logical project structure to help enable the development of an implementation plan.

Such an approach can be considered in the four phases depicted in Figure 3 and described in the following pages.



Figure 3: A phased approach to developing a framework for risk and capital management for insurers



Source: KPMG International, 2005

Phase 1 encompasses (1) a gap analysis comparison of an insurer's current state against risk-based standards and desired future state, (2) examination of the organizational impact of the desired future state and (3) design of a project approach for implementing the changes. Insurance companies should also consider interdependencies with other programs and regulations, such as IFRS conversion or Sarbanes-Oxley.

An important step prior to embarking on the RCMI implementation is development of a master plan, structured by key topic areas. The master plan should encompass key milestones, project scope, project risks, needed resources, interdependencies and a step-by-step plan.

In **Phase 2**, the insurance company could establish teams to address specific aspects of implementation of the project scope, including corporate governance and risk assessment, credit risk, operational risk, market and other risks, economic capital management, disclosures and the supervisory review process. Teams focus on defining data needs; risk assessment and quantification approaches designing the organizational structures, processes and systems; and rolling out the plan. Developing and executing a plan can help teams to address organizational considerations such as communications, training and quality assurance.

During **Phase 3**, an insurance company could conduct post-implementation review and use testing to assess its approaches to capital adequacy, its compliance with minimum standards and its control environment. European regulators can expect to see insurance companies "living" their chosen approaches well in advance of the launch of Solvency II.

Ongoing monitoring, in **Phase 4**, is important both internally and externally. Insurance companies may need to establish monitoring processes and systems that suit the needs of their own organizations and that of their regulators and other stakeholders (see Figure 4).

Figure 4	Stakeholder issues
Stakeholders	Business drivers
Policy holders	<ul style="list-style-type: none"> • Expect promised benefits. Risk of failure is not anticipated • Seek protection through regulator
Regulators	<ul style="list-style-type: none"> • Require risk sensitive capital measures and use qualitative supervision for companies and non-company financial institutions to assess capital adequacy • Seek to protect the policy holder but also to safeguard the functioning of the insurance market to avoid damage to the economy as a whole
Debt-holders	<ul style="list-style-type: none"> • Expect repayment of interest and principal • Rely on external ratings as a useful estimate of a company's ability to repay its creditors. (A company with a higher risk of default may need to pay its debt-holders a higher rate of interest. Therefore, a company needs to understand how the uncertainty of outcomes of its activities affects its overall risk of default.)
Rating agencies	<ul style="list-style-type: none"> • Interested in reviewing and understanding the results of risk-based capital models • Use capital adequacy as one of many criteria when assigning a rating, but may perceive an economic capital framework as an important signal of an institution's management strength as well as its financial strength
Equity analysts	<ul style="list-style-type: none"> • Use RAROC as a means of understanding the risk-adjusted profitabilities of the companies they cover • Can use line-of-business RAROC to compare profitability in similar businesses across companies • Consider economic capital and RAROC to be signs of good management
Boards	<ul style="list-style-type: none"> • Need to understand the true economic risk the business faces • Expect management to improve business performance by allocating scarce capital resources to value-enhancing operations and other business opportunities • Seek to develop and communicate a long-term business risk vision and risk strategy
Staff	<ul style="list-style-type: none"> • Expect high stability of the company as a condition of job protection • Interested in the impact the risk and capital management framework has on business processes that could directly affect them
Shareholders	<ul style="list-style-type: none"> • Seek dividend payments and share price appreciation • Expect compensation for the risk (volatility of returns) they bear • Expect good governance.



Conclusion

Although companies have been addressing risk and capital management issues for some time, evolving industry standards and new regulatory developments give further impetus to these efforts:

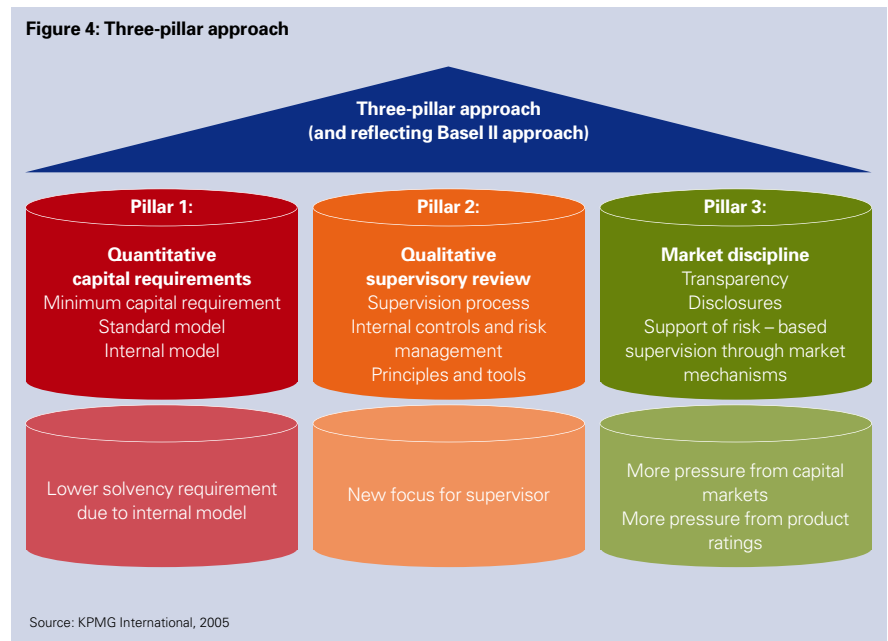
- Risk and capital management help enable companies to identify business lines and business opportunities that create shareholder value.
- A focus on economic capital management can help a company ensure compatibility of company strategy and business-line management. Such a focus can also drive improvement in systems and data collection and thus help improve knowledge and awareness throughout the organization.

The challenge for companies will be to leverage the business benefits while focusing on risk adjusted performance measurements to help drive their businesses. Many leading institutions are seeking to monitor and understand their risks and capital usage and then allocate and manage capital proactively. The development and implementation of a capital management process – backed by the board and senior management and embraced by employees – is helping companies understand the capital implications of their risk-taking activities as well as helping them ensure their businesses are using capital efficiently.

Appendix I: understanding Solvency II

Solvency II will require insurers to determine capital adequacy based on the level of risk posed by specific business activities. It has a three-pillar architecture analogous to Basel II:

- Pillar 1: risk based quantitative capital requirements
- Pillar 2: enhanced qualitative supervisory reviews
- Pillar 3: greater degree of market discipline.



The EU is developing a standard risk model that promises to be more detailed than the solvency calculations required under the present Solvency I regulation. In addition, the framework will probably allow companies to use their own internal models to establish economic capital requirements.

Solvency II also focuses on the risk management framework adopted by an organization's board and senior management. Through the provisions made under Pillars II and III, an insurance company may be under a greater degree of scrutiny from both regulatory authorities and the market than is currently the case.

Solvency II seeks to address those issues through:

- Establishment of new solvency requirements that reflect the true risks a company faces and are directly linked to an adequate level of economic capital.
- Better risk management through new, qualitative supervision and enhanced market discipline.
- Embedding of economical capital models into a company's risk management framework and decision-making process.
- Improved level of policyholder protection through affording supervisors an adequate buffer/time window to identify and remedy adverse experience.
- Creation of a level playing field for financial service providers through greater comparability, transparency and coherency.
- Greater harmonization among regulators within the EU.

Preparing for Solvency II

Even though the timeline for Solvency II's launch has been extended past 2008, leading insurers have understood the need to embrace economic capital management models and, moreover, to invest in the information technology required to support them. As Solvency II evolves, national regulators worldwide are moving toward risk-based capital adequacy models in a variety of ways. Insurers need to consider now their strategies for meeting the increased regulatory burden to preserve, or enhance, their competitive position in the market. They should consider how to align systems and data management strategies with parallel standards such as IFRS.

By requiring companies to determine capital adequacy based on the level of risk posed by specific business activities, companies may have to develop and use an economic capital management model. The business benefits a company can derive from such economic capital approaches extend beyond Solvency II compliance.

Solvency II is therefore more than a regulatory issue. In fact, it is an impetus for improving organizations' own management information systems as well as enhancing internal awareness of the high costs of unknown risk.

Appendix II: understanding risk measures – some technical details

Examples of risk measures

For insurers, three of the most important risk measures are standard deviation, Value at Risk (VaR) and Tail Value at Risk (TailVaR).

Standard deviation is a measure that aims to capture volatility by quantifying how much the possible outcomes of a distribution differ from the expected value. While this measure belongs to the fundamentals in statistical theory, it is of limited use for calculating sound economic capital because linking its level directly to insolvency with a certain probability is generally not possible. An exception is the important special case where losses follow a so-called Normal (or Gaussian) distribution. A further disadvantage is that it does not differentiate between positive and negative deviations.

Value at Risk (VaR) addresses the real objectives of economic capital more adequately. The idea is that unexpected losses over a given time horizon should exceed the required economic capital only with a pre-defined probability: given a level of confidence (for example, 95 percent) that reflects the risk appetite of the company, VaR measures the maximum possible loss to this confidence level over the time span under consideration.

Thus only negative deviations are measured and, while the risk appetite of the company is considered, this measure does not differentiate between losses beyond this risk appetite.

VaR reflects the point of view of a shareholder who assigns a zero value to his/her shares in the case of insolvency. However, other points of view are valid. Regulators, policyholders and debt holders may be interested in which proportion of the liabilities can be salvaged.

These points of view are addressed with a modification of the VaR known as the **Tail Value at Risk (TailVaR)**. Given again a confidence level, the Tail Value at Risk is the expected loss under the assumption that a loss occurs that is larger than the Value at Risk. Unlike VaR, it therefore also accounts for possible losses beyond the confidence level and weighs them appropriately. This measure has the property that the TailVaR calculated from a combined portfolio does not exceed the sum of the TailVars calculated for its parts. While this property may appear to be self-evident, it is not shared by the VaR measure (see the example in Section “Aggregating Risks” on page 26).

Determining and distributing diversification benefits

Diversification has always been a key risk management tool. The earnings of a well-diversified portfolio are less volatile and thus less risky than a similar, but less diversified, portfolio. Thus, a single asset or liability contributes different amounts of risk, depending on the portfolio to which it belongs; this concept is the so-called portfolio effect or diversification benefit. An illustration of the portfolio effect for a company is depicted in Figure 5.

The portfolio effect has two important implications for company management:

- Identifying portfolio effects and allocating them to the particular subportfolios, business units and/or legal entities lowers their economic capital.
- The risks of a particular asset or liability might have varying attractions depending on the structure of the total asset and liability portfolios.

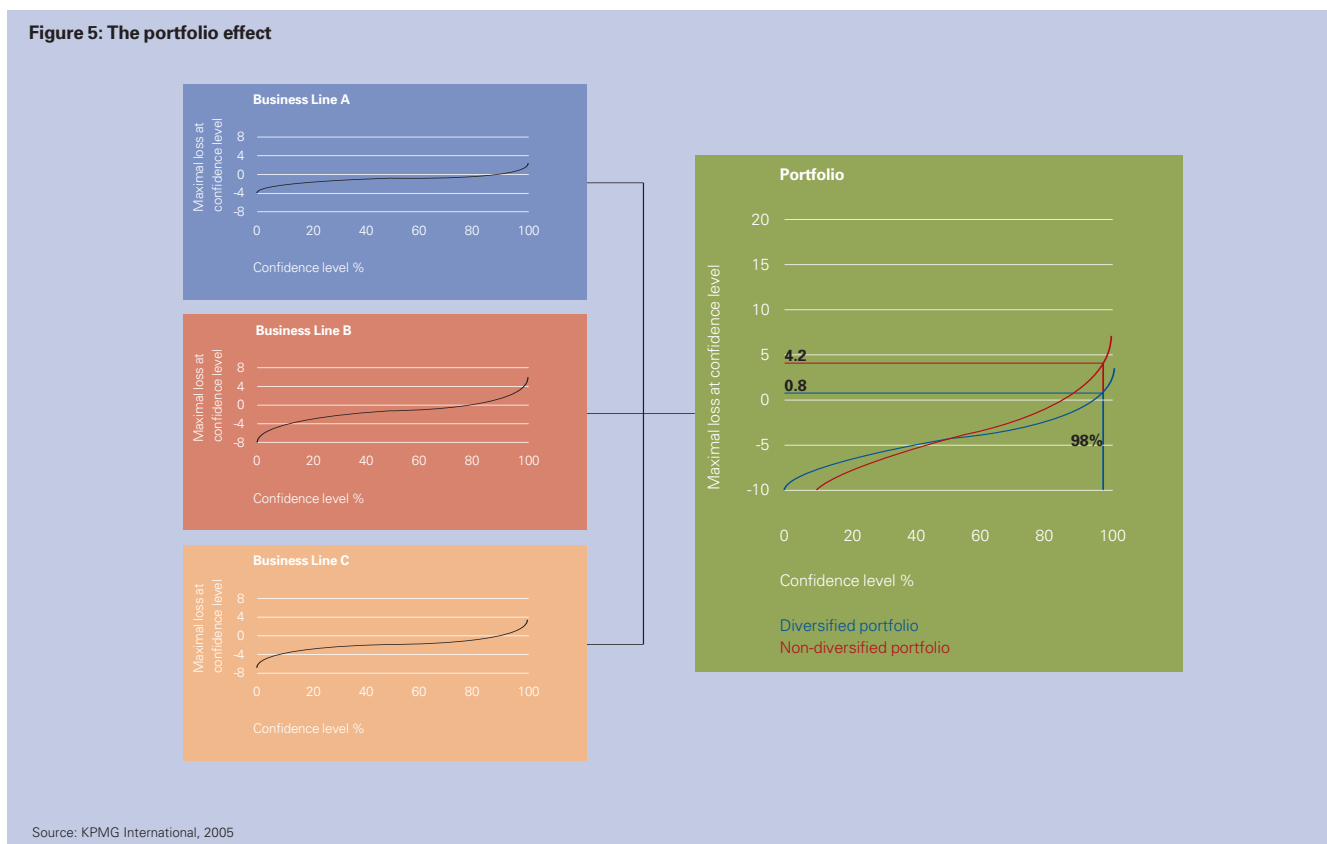


Figure 5 considers a company with three lines of business. At left is shown the maximum loss for each level of confidence for each line of business. On the right, these loss diagrams have been aggregated into a loss diagram for the company as a whole using two methods, first by taking diversification into account (blue) and second without taking it into account (red). The portfolio effect means that collectively, taking diversification into account, the performance profile exhibits a lower loss at a high confidence level. For example, at a confidence level of 98 percent in the combined diversified portfolio, at most 0.8 can be lost. Without the diversification effect, up to 4.2 could be lost at the same confidence level.

Aggregating risks

The diversification benefit can be characterized by the discount on the economic capital that can be achieved by aggregating the amounts of economic capital associated with the individual risks. Aggregating risks across all categories into one amount of economic capital creates challenges.

In practice, this calculation is done by quantifying the diversification effects between various risk categories. A mathematical quantity that goes some way to doing so is the "correlation" between two risks. Its definition is based on similar ideas to the definition of the standard deviation and these concepts are closely linked: If two risk categories have standard deviations σ_1 and σ_2 and their correlation is denoted by ρ , then the standard deviation of the compound system consisting of both risk categories is simply given by:

$$\sigma_{\text{Total}} = \sqrt{\sigma_1^2 + \sigma_2^2 + 2\rho\sigma_1\sigma_2}$$

In the case that the loss distributions are Normal distributions, the VaR's of the individual risks are a multiple of the corresponding σ 's. As a result, the formula of σ_{Total} carries over to the VaR as well:

$$\text{VaR}_{\text{Total}} = \sqrt{\text{VaR}_1^2 + \text{VaR}_2^2 + 2\rho \text{VaR}_1 \text{VaR}_2}$$

However, this formula does not hold if other types of loss distributions are involved. In practice it is often still used with the understanding that it is only an approximation.

In general, there are different dependencies of risks in different parts of their distributions and there are different ways capital charges derived from such distributions could be aggregated. A single correlation parameter is not sufficient to capture this concept and, as an alternative, so-called copula functions have been introduced. In particular, the copula concept gives a structure for aggregation that allows more complex dependencies. The scope of all possible copula functions is enormous. Based on thorough analysis of all risks – their commonalities, correlations and pertinent model assumptions – current research is attempting to restrict itself to relevant copula categories.

Examples

To illustrate, assume two risks with normal distributions and correlation ρ . The formula for the aggregate variance,

$$\text{VaR}_{\text{Total}} = \sqrt{\text{VaR}_1^2 + \text{VaR}_2^2 + 2\rho \text{VaR}_1 \text{VaR}_2}$$

implies $\text{VaR}_{\text{Total}} < \text{VaR}_1 + \text{VaR}_2$ when $\rho < 1$. Consequently, there will be a diversification benefit when the two risks are not fully correlated ($\rho < 1$).

While the existence of a positive diversification benefit is a reality, the risk measure VaR may not always reflect this fact. The following simple example calculates the aggregation for a loss distribution which is not a Normal distribution. The example will show that TailVaR and standard deviation can capture the intuition of diversification better than VaR.

Consider the following loss profile:

- In 96 percent of all cases 10 are lost
- In the remaining 4 percent of all cases 100 are lost.

As in 96 percent of all cases 10 are lost, the VaR to a confidence level of 96 percent is just 10. Hence in the VaR to a confidence level of 95 percent is also 10. Calculating also the TailVaR and the standard deviation obtains;

	VaR	TailVaR	Standard deviation
Economic capital	10	82	18

Now assume that there are two unrelated lines of business both of the same size and with the loss profile above. Then the aggregate of both lines of business would have the following loss profile:

- In 92.16 percent of all cases 20 are lost
- In 7.68 percent of all cases 110 are lost
- In 0.16 percent of all cases 200 are lost.

In this case the following results were obtained:

	VaR	TailVaR	Standard deviation
Economic capital	110	113	25

It appears paradoxical that the VaR of the diversified portfolio is greater than the sum of the VaR of the individual portfolios – instead of the benefit of diversification one seems to have obtained a reinforcement of risks. This appearance does not reflect the real risk situation but is an artifact of the way VaR is defined. Both TailVaR and standard deviation do not show this behavior.

The choice of time horizon and confidence level

When calculating economic capital, management will generally choose a fixed time horizon. While in banking the time horizon is generally set at a limited number of days (10–30), the common choice in insurance is one year – partly due to the longer term of contracts and the ability of most insurance companies to influence their risk profiles on a yearly basis:

- Non-life companies usually renew their contracts yearly
- Life companies often have yearly surplus declarations.

The one-year time horizon allows for the time needed to take appropriate action when a risk occurs. It has the added benefit of representing the time between the preparation of balance sheets.

The choice of confidence level reflects the risk appetite of the company and may also be motivated by reference to the one-year probability of default that is associated with a particular rating of rating agencies such as Standard & Poor's or Moody's.

The types of risk covered by economic capital

Economic capital serves as a cover for all material unexpected risks that can occur within this one-year period. Risk mitigation strategies that are already in place – such as reinsurance contracts – should be taken into account.

Typical examples of unexpected risks that could occur within the next year that should be covered by the economic capital are:

- Volatility of the value of the available amount of capital due to mismatches between asset and liability cash flows
- The volatility of liability cash flows (net of reinsurance)
- Operational risk.

Unexpected risks that could occur in later years are difficult to cover with economic capital. These unexpected risks should therefore be covered by appropriate margins in the way the related cash flows are valued (a negative margin for assets and a positive margin for liabilities). Typical examples of these types of risks are:

- Risks associated with guarantees and embedded options
- Uncertainty about the future trend of mortality.

Several types of risk, however, are hard to measure in a stochastic setting. These risks include certain types of operational risk, strategic risk, liquidity risk ('run at the bank'), catastrophic risk (earthquakes, cyclones, floods, epidemics, terrorist attacks and so forth) and concentration risk.

They can either be addressed within the risk management framework in a more qualitative way (regulators may move the assessment of some of these risks to Pillar II) or measured by considering the effects of specific stress scenarios. The stress scenarios used should be economically plausible scenarios that may already have occurred or that should not lead to the insurer's insolvency. To achieve this objective, the losses calculated for these stress scenarios could then be covered by capital.



Risk-adjusted performance measurement

Risk-adjusted performance measurement of a business line or a company is based on less conventional performance measurement techniques. There are basically two relevant concepts used. From a risk and capital management point of view, one of them should be implemented:

- **Risk-adjusted return on capital (RAROC):**

There are several variations of this measure and as many different names, including Return on Risk-Adjusted Capital (RORAC) and Risk-Adjusted Return on Risk-Adjusted Capital (RARORAC). However, it is generally RAROC as defined below that is used in practice.

RAROC is a performance measure that takes account of the change of expected losses. Additionally, unlike the more conventional Return on Equity (ROE), RAROC also includes a measure for unexpected losses, by using economic capital as the denominator. It is calculated using the formula:

$$RAROC = \frac{INCOME - Claims - Costs - \Delta EL}{Economic\ capital}$$

Here income comprises both premium and investment income on provisions and economic capital. Income minus claims and costs is the actual net cash flow over the period under consideration, whereas ΔEL denotes the change of the expected loss. As noted earlier, the expected loss should provide cover for all 'expected' risks. All other types of risks are considered as 'unexpected' and should be covered by the economic capital in the denominator.

As stated here, RAROC is a risk adjusted return calculated for a past period using actual values. For many applications it is preferable to calculate an expected RAROC instead. To do so one would replace the numerator by its best estimate expected value. In that case the numerator turns out to be equal to the release of the market value margin, that is, the cover for the expected risks as part of the expected loss for the period under consideration.

- **Economic value added¹:**

In contrast to the relative performance measures such as ROE and RAROC, EVA is an absolute performance measure. Like RAROC it takes account of expected losses as well as unexpected losses. It is calculated using the formula:

$$EVA = Income - Claims - Costs - \Delta EL - Cost\ of\ capital$$

The constituents of this formula are defined as in the definition of RAROC, while cost of capital is specified as the product of economic capital and hurdle rate, i.e., the required return.

This alternative concept is linked to RAROC by the fact that RAROC should at least be equal to the hurdle rate. This is the same as saying that EVA should be positive.

As in the case of RAROC there is a corresponding definition using best estimate instead of actual values. It would model the expected release of the market value margin less the net cost of economic capital.

¹This term is a registered trademark of Stern Stewart & Co.

Appendix III: KPMG International survey on insurers' management of risk and capital

European insurance companies that manage risk effectively stand to gain greater competitive advantages and better access to world capital markets. This was the key conclusion of a KPMG International survey, Risk and Capital Management for Insurers, conducted between May and September 2004 among 102 insurance companies in 19 countries, primarily from Europe but also including Bermuda and South Africa. The document can be downloaded from KPMG's Web site at: <http://us.kpmg.com/microsite/FSLibraryDotCom/index.htm>.

The report notes a genuine desire by insurers to develop risk-adjusted economic capital measurement processes. Sixty-four percent of respondents want to integrate such processes more closely into risk management. However, the report also outlines the scale of the challenge facing the sector in implementing the capital and risk assessment agenda. For example, the results suggest that the biggest obstacle to implementing risk-adjusted capital allocation processes was not lack of management commitment but rather the technical challenges such as IT limitations.

In addition, two thirds of respondents indicate that they do not have a full insight into the level of risk interaction across risk categories, leaving them exposed to the possibility of more than one risk hitting them simultaneously. Such a shortcoming leaves them highly vulnerable, as evidenced during the NASDAQ technology crash in 2000. Not only did the value of capital portfolios plummet as a result of falling share prices but many insurers also received a large number of personal liability claims from beleaguered managers of those failing companies facing investor lawsuits.

There are also indications that many insurers have yet to define their risk appetite – the amount of risk they are prepared to take on. While many companies have a risk management framework, senior management may have difficulty linking their risk management practices to their strategic goals without going through the process of defining risk appetite.

The larger and more complex an organization, the greater the need to calculate and allocate appropriate capital levels to support different parts of the business. The vast majority of firms surveyed are either using Risk-Adjusted Return on Economic Capital now or are planning to adopt it in future. However, not all insurers have, as yet, fully embraced the need to calculate economic capital. Although economic capital is used as part of the planning process and for product pricing, it is some way from becoming a routine tool for influencing management compensation – only nine percent of respondents used it for this purpose.

Less than one third of the respondents calculate economic capital to cover the operational risk inherent in business processes, IT operating systems and individual performance. This oversight leaves them open to IT failure, internet viruses and the 'Nick Leeson' factor, where individual incompetence can, if left uncovered, have highly serious consequences.

Modeling can help reduce the uncertainty, but managers need to be aware that a robust model can take three to four years to build. Less than half of those insurers taking part in the survey use an internal capital model, although there are signs of a more sophisticated, flexible approach emerging with the introduction of integrated stochastic models.

The key to successful modeling – and to calculating risk in general – is access to the right information. As the KPMG International survey shows, along with much needed improvements in IT, organizations also need to develop better management information systems to provide key decision-makers with high-quality data presented in a simple and manageable format.

Nevertheless, no model is perfect and thus risk calculations will always be a combination of science and personal judgement.



Appendix IV: Solvency II – lessons from Basel II

The main lessons from Basel II are that active involvement at the consultative stage and rigorous internal preparations can help to minimize disruption to insurers as they get ready for Solvency II.

Pre-implementation: the need to lobby

There is some concern that the regulatory authorities may seek complex models that are expensive to introduce and require large amounts of data that is difficult to gather. And if smaller insurers are obliged to use standardized models for calculating economic capital, they may have to retain higher capital levels, giving their bigger counterparts a competitive advantage.

With a qualitative supervisory review process a central tenet of Solvency II, national regulators will be assessing overall risk management practices. This could again create an unlevel playing field, with insurers from some countries having to hold higher levels of economic capital than others.

Insurers can reduce the effect of these factors – which are also currently causing some concern to banks – by engaging in regular dialogue with the authorities in an attempt to keep any recommendations as simple and pragmatic as possible.

Implementation – resource planning

Insurers need to plan for the costs of bringing in newer, more sophisticated models and set up the appropriate data collection to power these tools. The lesson from Basel II is that the resources required are greater than imagined originally. It is subsequently taking longer than expected to implement the requirements, meaning that some banks are overly focused on regulatory matters at the expense of economic capital.

There is much uncertainty over Solvency II, particularly regarding the supervisory review process. However, the winners are likely to be those that treat risk and capital management as a competitive tool, rather than merely a compliance issue. By improving processes now, they can not only keep the regulators happy but also reduce their risk profile and lower their overall cost of capital.

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