European insurance supervision is to be geared to modern requirements. Unlike the present solvency regime, Solvency II is designed to reflect a prospective and risk-oriented economic view. It will be based on a total balance sheet approach and harmonised with accounting rules and regulations. Assets and liabilities will consistently be recognised at market values. In principle, IFRS provisions can be used as a basis for valuing the assets. If market values are unavailable, the balance sheet items must be revalued. Figure 1 shows the components of an economic balance sheet.

This article presents the fundamental principles of the total balance sheet approach and the implications of Solvency II for a property-casualty insurer. They are based on the proposal for a Framework Directive by the European Commission in February 2008 and on the implementation of the Directive within the fourth Quantitative Impact Study QIS4. A total of 1,412 insurance companies participated in the study up to July this year.

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### Components of an economic balance sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Market value of assets</td>
<td>Free assets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Available capital (own funds)</td>
<td>Solvency capital requirement SCR</td>
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<tr>
<td></td>
<td>Minimum capital requirement</td>
<td></td>
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<tr>
<td></td>
<td>Risk margin</td>
<td>Market value of liabilities</td>
</tr>
<tr>
<td></td>
<td>Best estimate</td>
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</tbody>
</table>
Important aspects of the technical provisions and capital requirement calculation were dealt with in a prior report.¹ This is now followed by an outline of the remaining components on the liabilities side of a property-casualty insurer's solvency balance sheet.

Eligible capital (own funds)

Eligible capital (own funds) is essentially the difference remaining after liabilities have been deducted from assets. Insurance companies need capital in order to absorb potential losses arising from the risks of insurance transactions. Own funds therefore also serve as a risk buffer for an insurance company. The amounts of these own funds are determined in connection with the solvency capitalisation calculation using a three-step process:

1. Determination of own funds
2. Classification of own funds
3. Eligibility of own funds

The amount of the eligible own funds is derived from the basic own funds on the balance sheet and the ancillary own fund items not on the balance sheet. The latter comprise liabilities that an insurance company may use to increase its own funds and thus to absorb losses.

Not all own funds may be used fully to absorb losses. The eligibility of these fund items to cover capital requirements for supervisory purposes is therefore limited. Own funds are classified in different tiers. As such, they have to be analysed in terms of the extent to which they meet certain criteria.

Tier 1 own funds must possess the following characteristics:
- Subordination
- Loss absorbency
- Permanence
- Perpetuality
- Free from mandatory fixed charges
- Clear of any encumbrances

Tier 1 own funds are basic own funds only. Ancillary own funds that meet the above criteria, and basic own funds that also meet all the criteria (with the exception of full loss absorbency) are allocated to tier 2. All other basic and ancillary own funds are classified as tier 3 own funds. To a varying degree, all own funds can be used to cover the solvency capital requirement.

Formally, the following applies:
\[ \text{tier 1 + tier 2 + tier 3} \geq \text{SCR} \]

At least one-third of eligible own funds must be tier 1, whereas at most one-third of the eligible own funds can be tier 3. To cover the minimum capital requirement, the proportion of eligible tier 2 items should be limited to one-half. Ancillary own fund items and tier 3 own funds are not eligible to cover the minimum capital requirement.

The results of QIS4 show that the eligible own funds tend to rise by an average of 27% overall under Solvency II. Own funds of the highest category (tier 1) account for 95%, tier 2 for 4% and tier 3 for only 1%, which permits the conclusion that the limitation approach will hardly lead to a restriction of the eligible own funds in Europe. Reasons for the increase can essentially be attributed to the change in the valuation system.

¹ Cf. www.munichre.com >> Solvency II >> Archiv Munichre Info: Solvency II.
Solvency capital requirement

By having available a certain amount of own funds as solvency capital, a company limits its insolvency risk to an acceptable extent. The European standard approach is designed to reflect an insurance company's full risk spectrum.

The solvency capital requirement is arrived at using the formula tested in QIS4: to be able to assess an insurer's risk situation, a risk measure and confidence level first need to be defined. These are used to quantify a loss from a prior period at a predefined confidence level and find out how much capital the company needs to have available in order to maintain the confidence level. In the proposal for the Directive, the European Commission establishes the value at risk as the risk measure and a 99.5% confidence level for a one-year time horizon. This means that the probability of the capital requirement being exceeded by the total loss may not be more than 0.5%. The supervisory authority thus requires that, to cover this solvency capital requirement, an insurance company's eligible own funds should be of at least the same amount after one year.

The European standard approach is a bottom-up approach. Figure 2 essentially shows the individual modules that need to be calculated.

Under the proposed concept, a property-casualty insurer must quantify capital requirements for the risk modules underwriting risk, market risk and counterparty default risk. Within the individual risk modules, correlation effects between the partial risk modules need to be considered. In the case of investments, dependencies between equities and fixed-interest investments need to be analysed. In general, there are different theoretical concepts for modelling dependency structures. In the European standard approach, dependencies are measured by means of linear correlation. The capital requirements of the individual risk modules then need to be aggregated, taking into account correlation effects in the basic solvency capital requirement BSCR measure. The operational risk needs to be determined separately.

The property-casualty insurer's overall risk results from the addition of the BSCR and the operational risk, with dependencies, however, being neglected.

The QIS4 results show that the capital requirements of all participating European companies tend to rise under Solvency II. But to conclude that this leads to a lower coverage ratio compared with the current system is wrong. Since the increase in own funds is stronger on average than the increase in capital requirements, most companies actually have a higher coverage ratio.

Underwriting risk

The underwriting risk, which is inherent in insurance transactions, is of great significance for non-life insurers. It is the risk that an insurer's premiums and provisions are inadequate to cover the liabilities of a given period in the contractually agreed manner.

The solvency capital requirement for the underwriting risk SCR_{nl} is calculated on the basis of the capital requirement for the premium and reserve risk and of the capital requirement for the catastrophe risk.
The results of QIS4 clearly show that this risk module is the main risk driver for property-casualty insurers. The requested segmentation into individual geographical areas does not appear to have any recognisable added value for many of the insurance companies that took part in the study but it involves extra work and cost. The situation for groups and reinsurance companies is different. Here, the influence of geographical diversification on capital requirements is appreciable.

**Market risk**

The market risk is the main risk driver for life insurers, but it is also significant for property-casualty insurers.

Insurance companies receive premium payments for insurance transactions, as a rule at the beginning of a period of insurance. As a result, they are usually in possession of substantial sums of capital that need to be invested in a manner consistent with the company's goals. The duration of commitment of the investments depends on the underwriting liabilities' due dates. The market risk results from the lack of information needed to determine the actual payout structure of the underwriting liabilities. It ultimately derives from the volatility of the market prices of financial instruments. Fluctuations in capital market prices are triggered by changes in interest rates, equity prices, property prices or share prices. In the solvency balance sheet, fluctuations may directly impact the market value on the assets and liabilities sides of the balance sheet. In the case of liabilities, the discounting of technical provisions is mainly responsible for this.

The European standard approach prescribes that the capital requirements for the following partial risk modules must be determined separately:

- Interest rate risk
- Equity risk
- Property risk
- Spread risk
- Currency risk
- Concentration risk

Market values are assigned to the individual partial risk modules. The evaluation of the interest rate, equity, property and currency risks is performed on the basis of scenarios, whereas the spread and concentration risks are valued on the basis of factors. The capital requirements for these partial risk modules are then aggregated, taking into account dependencies with regard to the overall risk capital for the module market risk $\text{SCR}_{\text{mkt}}$.

**Interest rate risk**

Interest rate changes have an immediate impact on the market values of assets and liabilities of an insurance company's balance sheet. The risk of a change in capital-market interest rates always arises when the durations or market values on the assets and liabilities sides of the balance sheet differ, i.e. interest rate risks usually arise when the investment periods of assets do not tally with the underwriting liabilities' due dates.

If, for instance, the term of a financial instrument on the assets side of the balance sheet is longer than that on the liabilities side — this is often the case with property-casualty insurers — a rise in interest rates could result in the elimination of corporate value. If, on the other hand, the term of financial instruments on the assets side of the balance sheet is shorter than that on the liabilities side of the balance sheet, a fall in interest rates could harbour a certain risk for property-casualty insurers in the liability classes of business (including motor liability) and in personal accident business with premium refund.

After a decline in interest rates occurs, assets requiring reinvestment owing to the respective liability's not yet being due can only be reinvested at a lower interest rate. The risk therefore arises when a company has not hedged against a decline in interest rates.

The capital requirement under Solvency II is derived from a revaluation of all assets and liabilities sensitive to interest rates as a result of the less favourable interest rate scenario. In order to quantify the interest rate risk, it is necessary to consider the change in market value for all assets and liabilities whose values respond to changes in the interest rate curve or interest rate volatility as the result of a given rise or decline in interest rates. To this end, the market value on the assets side is reduced by the market value on the liabilities side before or after the interest rate scenario, i.e. the change in own funds needs to be analysed. As a consequence, the market value of the interest rate-sensitive assets and liabilities needs to be determined using the prescribed interest rate curve. Of significance in the European standard approach are interest rate changes affecting net provisions on the liabilities side and interest rate changes impacting fixed-interest securities, financing instruments and interest rate derivatives on the assets side. The requirement regarding the risk of declining interest rates is derived by deducting the increase in the market values of assets (gain) from the increase in the market value of liabilities (loss). The requirement for the risk of rising interest rates is derived by deducting the decline in the market values of liabilities (gain) from the decline in the market values of assets (loss). Usually, the loss of market value on the assets side is greater than the gain from lower liabilities on the liabilities side. The European standard approach does not allow any risk relief via the interest rate risk. If the gain is greater than the loss, the capital requirement is valued at zero.
Equity risk
The equity risk results from changes in the capital market prices of equities and equity-like securities. To quantify the equity risk for a property-casualty insurance company, the change in the market value is considered for all assets and liabilities whose values respond to changes in equity prices. The standard approach differentiates between two types of assets:

- Equities of companies listed in EEA and OECD states and participations in companies domiciled in EEA and OECD states (“global” bonds)
- All other equities and participations in companies2, “other securities”

The capital necessary to cover the equity risk is calculated in two steps: First, the regulatory capital requirement for both types of asset, i.e. “global” and “other”, resulting from the given stress scenario, is determined taking into account all direct and indirect assets and liabilities susceptible to changes in share prices. In the valuation, hedges need to be taken into account. Subsequently, the capital requirements are aggregated into an overall capital requirement for the equity risk, taking into account dependencies.

Property risk
The risk of property investments derives from the analysis of a given scenario on the assets side of the balance sheet. The market value loss must be shown for the scenario where property prices suffer a relative decline of 20%. Financial instruments serving to hedge property risks may be offset.

Spread risk
The term “spread risk” denotes the risk of a loss in the market value of assets following a change in the credit spread above the risk-free interest rate. The change is attributable to the difference between intermediate rates for risk-free and risk-carrying investments. One reason for the discrepancy between interest rates may be due to changes in market conditions or the credit rating of the issuer. To be able to determine the spread risk, it is necessary to analyse the investments subject to a credit risk. The valuation of this risk module is based on a factor approach. The capital requirement is derived from three risk components: bonds, structured credit products and credit derivatives. The individual components depend on the rating of the respective investment and its effective duration.

Currency risk
A currency risk arises when the insurance liability and respective asset are quoted in different currencies and the asset currency depreciates against the liability currency. The capital requirement is derived from the analysis of scenarios. A change in market value owing to an exchange rate gain of 20% for all currencies in which the insurance company invests must be stated in euros, as must an exchange rate loss of 20%. The capital requirement is derived from the less favourable scenario. Financial instruments serving to hedge property risks can be offset against them.

Concentration risk
The term “concentration risk” denotes the risk arising owing to risk concentrations in investments or assets on credit. Factors such as concentrations in geographical areas or industrial sectors are not taken into account, nor are investments and guarantees by OECD or EEA countries or bank balances of up to three million euros with a term of less than three months and a rating of at least AA. To determine the capital requirement, three amounts need to be calculated. The volume amount used is the market value of the investments. To establish the concentration risk, it is necessary to calculate the share that is attributable to one and the same counterparty and exceeds at least one limit in terms of total assets – the limits are given in the standard approach and depend on the counterparty’s rating. The value above which the concentration risk needs to be determined for equities and fixed-interest securities of issues having a rating of at least A is 5%. The concentration risk for bonds by issuers whose rating is below A is determined from a risk exposure exceeding 3% of total assets. The risk factor for the concentration risk attributable to a counterparty is also dependent on the rating.

Counterparty default risk
The counterparty default risk is the risk arising from an unexpected default or deterioration in the credit standing of an insurance company’s counterparties or debtors. The calculation of a counterparty’s default risk is based on a factor approach and cannot be determined until the capital requirements of the individual risk modules SCR\textsubscript{nl} and SCR\textsubscript{mkt} are known.

In QIS4, the participants indicated that the evaluation of this risk module is very complex, in particular if the number of counterparties is high.
Operational risk
An insurer’s operational risk is the default risk resulting from inadequate or failed internal processes, or from personnel and systems, or external events. Operational risks also include legal risks. Reputational risks and risks arising from strategic decisions are not deemed operational risks. It is extremely complicated to assess operational risks. The approach prescribed under QIS4 is based on very simple assumptions: the capital requirement for operational risk is based on gross premiums and technical provisions. For the sake of simplicity, correlations with the risks within the basic risk are not taken into account. The analyses conducted in QIS4 produce, on average, a capital requirement ranging between 5% and 10% of the total solvency capital requirement. The approaches’ lack of risk sensitivity is widely criticised.

Conclusion
The implementation of Solvency II will involve a great deal of effort from the European insurance markets. The present pragmatic structure of the insurance supervisory system will become much more complex once Solvency II is introduced. Unlike the present system, the new set of rules will enable insurers to be more precise in recording their risk exposure, to control risks better, and to gear capital allocation more closely to their own security and return targets, thus providing the basis for long-term sustainable growth.

The standard approach developed by the European insurance industry, actuaries and supervisory authorities is geared to creating an economic-risk-oriented framework for the European insurance industry. The quantitative impact on the insurance industry was again tested in QIS4. The scope and complexity of this fourth study has shown how important the future quantitative requirements are for the development of a risk-based solvency system.

However, the study’s scope was also influenced by the fact that the companies were asked to calculate several different options. Compared with QIS3, the valuation basis for group companies was further developed. The range of results, however, remains very broad, which makes comparative evaluation difficult. But even if the results of this study can only be a conservative estimate of the effects of the new quantitative requirements on total capitalisation, they are a good opportunity for companies to address the issue on a broad scale. The crucial aspect for individual insurers will be to identify the classes and products that strongly contribute to risk capital requirements but do not create long-term added value for the company. Options for action include adjusting, restricting or terminating certain products or taking up new ones to achieve greater diversification effects.

Solvency Consulting for your company
The results of the study have made one thing clear: insurers need to make greater efforts to master the future quantitative requirements in practice. This is where Munich Re’s Solvency Consulting unit comes into play. It advises and supports clients in creating value where special expertise is needed. It thus provides primary insurers with significant added value, allowing them to optimally prepare for the new requirements regarding risk control, modelling and capital management.

Our advisers in Solvency Consulting, in close cooperation with our clients’ contact persons, come up with suitable solutions, from preparing for the changed regulatory environment to developing customised solutions, and from traditional reinsuffrage programmes to alternative securitisation approaches. Munich Re’s risk expertise and financial strength makes it a much sought-after partner, for it is in the nature of the primary insurance markets that the necessary stability can scarcely be achieved without risk transfer. Reinsurance will continue to be the first choice as far as flexibility and practicality is concerned. In addition, it enables primary insurers to achieve diversification and growth targets they would not be able to reach using other means or only with added expenditure.