White Paper of the Swiss Solvency Test

Schweizer Solvenz Test
Test suisse de solvabilité
Proba di solvibilità svizzera
瑞士偿付能力测试

Swiss Federal Office of Private Insurance

November 2004

0. Introduction

The insurance regulator in Switzerland (Federal Office of Private Insurance – "FOPI") was assigned the goal to ensure that the receivables of policyholders are protected. Historically (as in many other countries) this goal has been achieved with a combination of measures. These include prudent reserving and pricing requirements as well as prescriptions over what assets are allowed to be held by insurance companies. On top of this, there is a requirement to meet a minimum solvency margin based on a simple standard formula.

The financial stability of several insurers has been shaken in the past few years. Events which have had significant adverse effects include the crash in the equity markets in 2001 and 2002, the steady fall in bond yields as well as the impact of increased longevity. These events have significantly reduced market values of equity investments, and at the same time have increased the value of some embedded options and guarantees which have been sold by insurers in the past, leading to required reserve increases. For some insurers, the effects of the fall in the equity markets have been compounded by deteriorating technical results and large catastrophe claims.

This has led to a number of changes in the way insurance companies are being regulated, monitored and valued around the world. This includes changes to accounting rules, increased requirements for corporate governance within insurance companies, and enhanced solvency regulations and standards. While there are many strands to these changes, they all have common themes: more appropriate assessment of the specific risks companies are running using an improved and comprehensive financial reporting framework, standardization of approaches between countries and industries where sensible, and improved transparency and comparability.

Herbert Lüthy, director of the FOPI, embarked on an analysis project for the reorientation of insurance supervision in autumn 2002 with the support of a task force. At the same time, a draft Insurance Supervison Act (ISA) was elaborated, submitted to the Federal Council and subsequently tabled in Parliament. In reference to solvency, the bill states that the solvency requirement should take account of the risks to which an insurance company is exposed.

In spring 2003 the director of the FOPI initiated the Swiss Solvency Test (SST) project with the aim of defining basic principles of a future system for determining solvency. This was done in cooperation with the insurance industry, consulting companies and academia.

This White Paper sets out the proposal by the FOPI for a new solvency standard in Switzerland. While further parts of this White Paper include more detailed descriptions of the proposed implementation, the overview aims to introduce the background and rationale for the proposed methodology and to give a high level description of this methodology.

1. Overview

1.1. Aims

The goal of the FOPI is to ensure that the interests of policyholders (whether they are individuals, companies or other entities) are protected.

Standard formulaic approaches to setting minimum solvency requirements are very difficult to apply because they are not flexible enough and tend to unload responsibility for risk management on the regulator.

An example where the current approach does not work is the current EU solvency margin requirement to hold 4% of life insurance mathematical reserves as solvency capital. Companies writing similar business often have quite different levels of reserves depending on the views of the company's management. This puts prudent insurers at a competitive disadvantage as they have more capital locked in the mathematical reserves and in addition are subject to higher solvency requirements than their competitors.

This has led the FOPI to propose a "risk-based" solvency standard, which is based on the actual risks run by the companies. It puts the responsibility on the companies to investigate their own risk situation and to take this into account in the target capital calculation. In this way, transparency and competition will be enhanced, as companies are rewarded for better managing their risks.

The proposal, which is described in more detail in later sections of this document, can be summarized as protecting insurance customers by ensuring that each insurance company has sufficient capital available. 'Sufficient' means that even in an unlikely situation (e.g. one with a probability of 1%), there is (on average) enough capital to allow the assets and liabilities of the company to be transferred to a third party. There must then still be sufficient assets to cover the liability and the future capital costs of that third party.

Adoption of these proposals will have a number of significant impacts on the insurance market in Switzerland and on the regulator. It will accelerate the transition to a more risk-aware culture, which has been underway for some years now. Furthermore as the sophistication of companies' risk-management techniques improves, an equivalent advance in sophistication of the regulator will be required.

All of these changes are necessary for the industry to meet its future challenges, and the regulator looks forward to working with all parties involved in the insurance industry to help ensure that those challenges can be met.

1.2. Transparency

Regulators have historically taken a number of approaches to protecting policyholders. The most common approach has been to set strict standards for provisioning for future liabilities, for pricing of products, and even regulating benefits. While these approaches can indeed help protect policyholders, they can also carry systemic risks. For instance, prescribing a standard set of pricing assumptions for all insurers will create systemic risk for the market in that all insurance companies will be susceptible to the same mispricing risks. More importantly it gives no incentive to companies to compete on prices and to develop innovative products.

At the same time companies are rewarded if they can "beat the system" and write business which increases those types of risk that are not monitored by the regulatory regime. In particular, asset – liability mismatch risks have been poorly identified and assessed by the regulatory regime in the past.

Examples of how these systemic risks have impacted the industry include (see also [EGKMRS]):

- Insensitivity to equity risk in Solvency I leading to large share exposures of European insurers;
- Coarse rating separation in Basel I was partly to blame for the Asian financial crisis;
- Potential for regulatory arbitrage between insurers, banks and pension funds.

The FOPI proposal is both to improve the protection for policyholders and to enhance the company's risk-management within a more transparent system. This translates into introducing a risk-based solvency standard in Switzerland.

The aim of risk-based solvency is to relate the actual risk taken on by a company to its capital requirement. The higher the risk, the higher the capital requirement, and in the extreme case when there is no risk, there should be no extra capital requirement.

This risk-based supervision aims to take all financial and insurance risks into account, especially asset and liability risks. The system will focus on explicitly measuring risks and minimizing systemic risk via transparency. In the medium term, this should lead to the convergence of regulatory measurement and company specific economic risks models.

The first prerequisite for a transparent and comparable regime is that assets and liabilities are valued in a consistent way by each company. This is discussed in more detail in the next section.

1.3. Consistent Valuation of Assets and Liabilities

Companies, investors and regulators have long struggled with interpreting accounting information where assets and liabilities are valued on different bases. The inconsistency can cause artificial volatility in free capital.

This has led to companies building internal models that focus more on the "economic" value of their businesses. The theme has been followed on in discussions at the IASB, and proposals for a "Fair Value" accounting system, and also by various regulatory bodies around the world.

The SST is based on "market-consistent valuation" of both assets and liabilities. This is described in more detail in later sections, but essentially it means that assets are valued at their price in the market, while guaranteed liabilities are valued based on the price that financial markets would place on these liabilities, taking into account all embedded options and financial guarantees.

The market-consistent valuation has a number of advantages:

- Completeness: the valuation takes into account all options and guarantees within the liabilities;
- Best Estimate Principle: the valuation contains no implicit or explicit loadings, but is based on the best estimate assumptions for insurance risks (e.g. mortality, disability);
- Up-to-date: the valuation is always based on the most recent information;
- Objectivity: the valuation is based on observable market parameters and is less prone to manipulation;
- Consistency; assets and liabilities are measured consistently.

Details of the methods companies can use to calculate this market consistent value are described in a later section.

1.4. Incentives for Risk-Management

Since risk profiles of the supervised insurers can be very heterogeneous, a regulatory model capturing correctly the risk situation of each company would be very complex. For the SST, simpler models were developed which have to be adapted by each company to fit its specific risk profile, thereby also making companies responsible for target capital calculation.

While a standard model is being developed to ensure that all companies can implement a minimum standard, the SST encourages companies to develop internal models (within a given framework) and to complement these models with scenarios. Companies can deviate from the standard models, parameters etc. with the permission of the regulator. This permission is granted if a company can show that its internal model better reflects the risk situation than the standard model.

The appointed actuary of each company has to evaluate the effect of potential adverse scenarios on the risk-bearing capital (market consistent value of assets minus best-estimate of liabilities, see also Section 2.5) of the company. While some scenarios are proposed by the regulator, others will have to be created or adapted by the actuary to reflect the specific situation of the company.

The possibility of using internal models will lead to convergence of regulatory and economic capital. Responsibility for economic capital remains with the companies which then have an incentive to introduce and apply better risk management techniques and processes, leading to lower economic capital requirements and thus directly to lower target capital requirements.

1.5. Non-zero Failure

In the past, failures of insurance companies in Switzerland (referring to failure in the strict legal meaning of the term) have not been observed. While some companies have been in financial distress, other insurers always took over their portfolios or shareholders injected capital. However, in the future one cannot always rely on this to happen. For that reason, the supervisor will have to take timely measures if the financial situation deteriorates. Measures can include – but are not restricted to – the following:

- A requirement to draw up a plan to meet the target capital
- A shift to less risky assets
- An improvement in ALM
- Audit by an independent actuary
- Audit by independent auditors
- A reduction in earnings appropriations
- A reduction in dividend payments
- Raising of new equity capital
- Closing to (reducing) new business
- The prohibition of acquisitions
- A transfer of portfolio segments to other insurers
- Putting the liabilities into run-off
- The appointment of a management team designated by the supervisory authority.

1.6. Compatibility with Solvency II

A new solvency regime - Solvency II - is currently being discussed across Europe. Solvency II consists – in analogy with the Basel II framework in the banking industry - of three pillars:

Pillar 1: Minimum capital requirements
Pillar 2: Supervisory review of capital adequacy
Pillar 3: Public disclosure

Pillar 1 consists – among others - of the statutory requirements and Solvency I. The statutory valuation is based on implicit prudent margins, but there is no explicit valuation of options and guarantees and no explicit consideration of specific risks. While Solvency I calculations are not risk sensitive, they are not model-dependent and thus more "objective".

The target capital, as determined by the SST, belongs squarely within Pillar 2. It is a review of the economic capital adequacy of a company, based on economic risk, with financial and insurance risks considered explicitly (including options and guarantees).

In order for Swiss companies not to be at a competitive disadvantage to insurers domiciled in EU (and EEA) member countries, it is an aim of the SST to be compatible with the future European Solvency II framework. This entails in particular that both a minimal solvency level and target capital have to be calculated and that internal models – provided they satisfy regulatory requirements - can be used for target capital calculation

However, Solvency II compatibility does not mean that the SST will only be introduced when Solvency II is in force. Rather, risk-based solvency requirements will be introduced now within Pillar 2. This will give companies time for the transition as well as lessen the effects of a sudden transition to a risk-based framework. The SST will remain within Pillar 2 as long as the target capital requirement within Solvency II stays within Pillar 2.

See also [SII1], [SII2], [SII3], [SII4] and [SII5] for more comprehensive information.

1.7. Minimal Solvency and Target Capital

Insurers must calculate two capital numbers:

- minimum solvency (statutory)
- target capital (market-consistent).

With minimum solvency and target capital, two complementary views of an insurer's financial situation are incorporated into the SST: the statutory and the market-consistent view.

Minimum solvency is based on the statutory balance sheet. It is easy to calculate but does not refelct directly the insurer's specific risk exposures.

The target capital, conversely, is risk-based and grounded in a market-consistent assessment. Target capital is considered as an early warning signal. While it is risk specific, it is also model dependent. If target capital conditions are not met, the company is not insolvent but gradual regulatory measures are initiated (see Section 1.5).

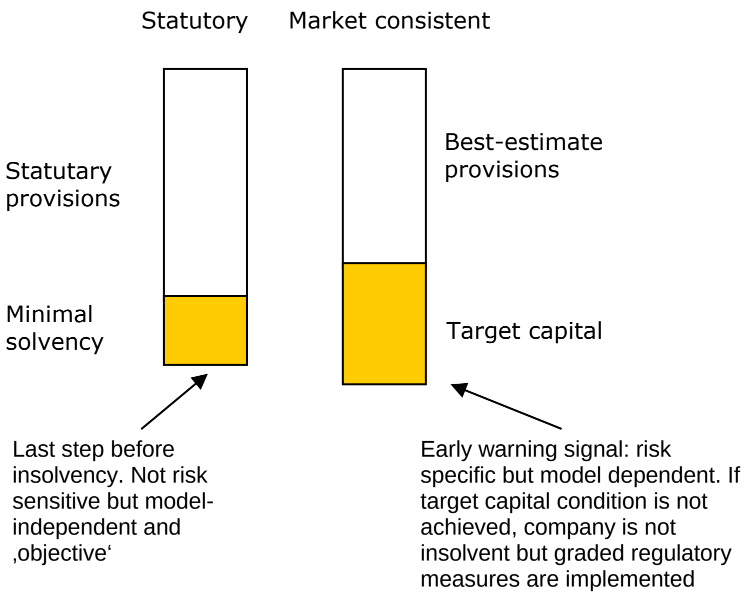

Figure 1. Statutory and market-consistent valuations

Both minimum solvency and target capital requirements would apply to insurers domiciled in Switzerland, together with their branches, i.e. on a legal entity level. Excluded are subsidiaries or branches of insurers domiciled outside Switzerland.

1.8. Examples of Risk Based Supervision

Risk based solvency requirements are by no means exotic or unproven. As solvency supervision approaches, they have a long history in a number of countries.

In Finland, company specific capital requirements were first introduced in 1953 and the stochastic nature of insurance business was taken into account through special equalization reserves ([BPRR]).

In Canada, the Minimum Continuing Capital and Surplus Requirement (MCCSR) was introduced during the middle of the 1980s and has since then been continuously improved. Canadian companies have to model their business plan for the next 3 to 5 years under several scenarios (Dynamic Capital Adequacy Test DCAT) (see [DCAT1], [DCAT2], [MCT] and [MCCSR]).

The United States adapted the Canadian approach and implemented a model known as the NAIC RBC requirement in 1992 for life and in 1993 for nonlife insurers ([NAIC]).

During the last few years, several other countries have begun introducing sophisticated risk-based solvency frameworks, notably Australia ([BR], [APRA1], [APRA2]), the UK ([FSA1], [FSA2]) and Singapore [Sing].

In the near future, the Netherlands will introduce the Dutch Solvency Test (DST), which in many ways is conceptually similar to the Swiss approach. The DST also relies partly on scenarios, which supplement the standard models ([PVK1], [PVK2]).

The International Association of Actuaries (IAA) published in 2004 a paper with recommendations on how to implement a risk based regulatory framework (see [IAA]). Many of the recommendations of the IAA have been incorporated into the SST. Among those taken up are:

- The expected shortfall as a risk measure;
- The total balance sheet approach;
- The time horizon of 1 year;
- The explicit risk margin.

See also [SA] for an excellent overview of different solvency standards.

2. Concept

2.1. Key Elements of the SST

The defining characteristic of the SST is that the result of the calculation is not only the necessary target capital but also the probability distribution of the annual risk-bearing capital. The actual calculation is based on a hybrid stochastic-scenario approach where stochastic models are supplemented with scenarios and both results are aggregated.

The SST can be described as follows:

- Assets and liabilities are valued market-consistently.
- Relevant risks are market, credit and insurance risks.
- Risk is measured using the expected shortfall of change in risk-bearing capital over one year.
- There are standard models for market, credit and insurance risks.

- There are scenarios to take into account rare events or risks not covered by the standard models.
- The results of the standard models and the evaluation of the scenarios are aggregated to determine the target capital.
- In case of financial distress of an insurer, policyholders are protected by a risk margin.
- Internal models can be used for the calculation of target capital. The assumptions and internal models used have to be documented in an SST report.
- Reinsurance can be fully taken into account.
- The market consistent value of insurance liability is the sum of the best-estimate and a risk margin.
- The assumptions and internal models have to be documented in an SST report and must be disclosed to the regulator.

In the following the different points will be explained in more detail.

2.2. Standard-models, Scenarios and their Aggregation

The SST consists of a set of standard models (e.g. for asset, liability and credit risks) and a set of scenarios. Except for the credit risk model (see also Section 6.5) the results of the standard models are probability distributions which describe the stochastic nature of the change of risk-bearing capital due to the modeled risk factors.

The appointed actuary also has to evaluate the scenarios and has to supplement the set with company specific scenarios which better capture the specific risk of the company.

The results of the standard models are combined with the evaluations of the scenarios using an aggregation method (see Section 8). The aggregation consists – loosely speaking – of calculating the weighted mean of probability distribution given the normal situation (captured by the standard models) and special situations (described by the scenarios).

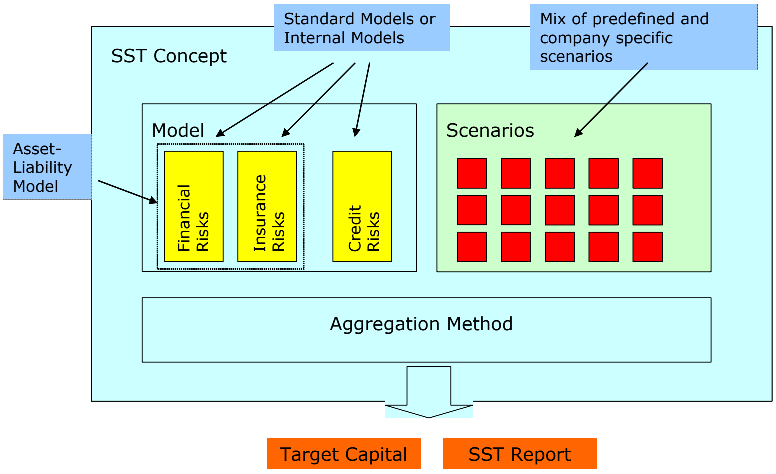

Figure 2. The general structure of the SST

2.3. Standard Models

The SST contains standard models for

- market risks,
- life insurance risks,
- nonlife insurance risks,

- health insurance risks, and
- credit risks.

With the exception of the credit risk model, all standard models result in a probability distribution. The modular setup provides for consistent and transparent integration of different standard models as well as the possibility for the integration of internal models.

For credit risk, the standard model is the Basel II standardized approach. The life insurance model takes into account the biometric risks as well as the risk of policyholder behavior. The nonlife model covers the technical risks both in future claims of the current year and in reserve results. It is less a fixed algorithm than a method to derive a loss distribution. The health insurance model consists of normal distributions for health insurance risks. The asset model will be used for life, nonlife and health insurers; it covers interest rate, foreign exchange, equity and credit spread risks. It is based on a covariance approach and assumes that the individual market risk factor changes follow a multivariate normal law.

All of these standard models depend on three types of parameters:

- Type 1: Parameters which are set by the regulator and which can not be changed. For instance, these include the risk-free interest rate, the safety level and the probabilities of some of the prescribed scenarios as well as some other macro-economic parameters. Other examples would include parameters specifying the frequency and severity of natural catastrophes.
- Type 2: Parameters which have to be set by companies, for example the volatility of the hedge fund exposure, where the exposures of different companies are so different that prescribing any fixed parameter would be pointless.
- Type 3: Parameters which are set by the regulator and which can be changed by the companies. Most of the parameters are elements of this class. The parameter estimation by the company has to follow the guidelines of the regulator. The company has to show the estimation procedure to the regulator.

It is a general rule that if a parameter of type 3 does not reflect the company specific situation, the company has to adapt the parameter to a more appropriate value.

2.4. Market Consistent Valuation

Where possible, market-consistent valuation of assets and liabilities will be based on observable market prices. If no actual market prices are available, market-consistent values will be determined by examining comparable market values, taking into account liquidity and other product-specific features.

It is important to note that for SST purposes all liabilities with the exception of a company's own equity have to be taken into account, even those not currently on the balance sheet.

For most of the assets on the balance sheet, market prices will be available, or suitable proxies can be used.

Market-consistent valuation of insurance liabilities comprises expected future obligations under insurance policies discounted using the risk-free yield curve (for Switzerland). All relevant embedded options and guarantees have to be valued explicitly. This is described in more detail in Section 3.2.

2.5. Target Capital

Risk-bearing capital is defined as the difference between the market-consistent value of assets and the best-estimate of liabilities.

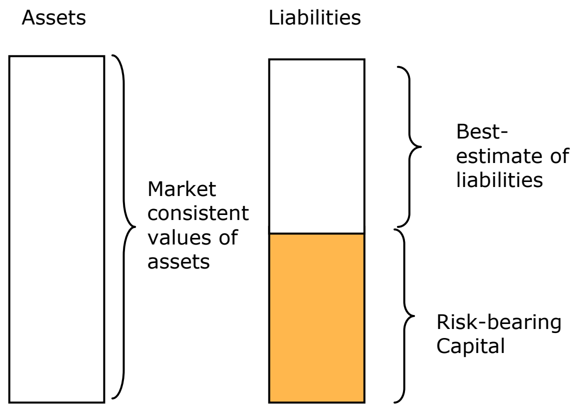

Figure 3. Definition of risk-bearing capital

Target capital relates the risks incurred by an insurer to a capital requirement.

The time horizon for the SST is one year. This means that the derived target capital is the amount needed to be sure on the chosen confidence level that the assets at the end of the year are sufficient to cover the liabilities.

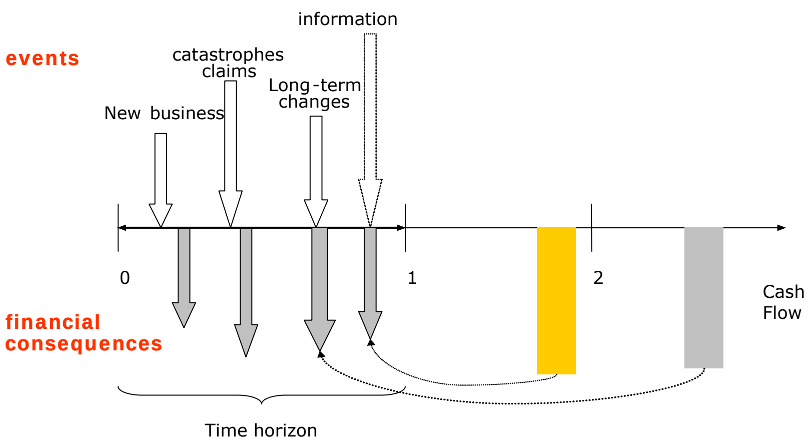

Figure 6. Financial consequences can be due to changes in information during the following year as well as realized claims, catastrophes. The consequences can materialize beyond the time-horizon.

Target capital consists of two components: The **risk margin** and the capital necessary for the risks emanating within a one year time horizon, which is denoted by **ES** (ES since the one-year risk is quantified using the expected shortfall of change of risk bearing capital). The risk margin is defined such that a second insurer would be compensated for the risk – or more precisely for the capital cost due to having to hold regulatory capital - when taking over the first insurer's assets and liabilities (see Section 4).

ES is defined as the amount of risk-bearing capital necessary today, such that if the worst $100\alpha\%$ (e.g. $\alpha = 1\%$) of scenarios over the next year are considered then, on the average of those scenarios, the remaining risk-bearing capital will exceed the risk-margin. See also [ADEH] and [DF] for more information.

In formal terms, ES is the minimum sum capable of compensating for 100α% of the worst-case expected loss.

The confidence level 1-α will be set by the supervisor. The supervisor may permit a higher α for certain types of insurer (e.g. for a dedicated credit insurer).

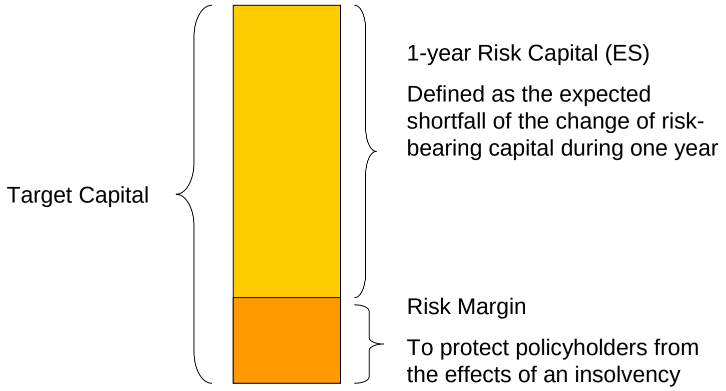

Figure 4. Target capital as the sum of 1-year risk capital and the risk margin

The well-known Value at Risk (VaR) is the threshold value for which in 99% of instances the loss is smaller than the VaR. The expected shortfall describes how large the loss is on average when it exceeds the VaR. Therefore expected shortfall is more conservative than VaR. Since the real loss distribution is expected to show some large losses with low probabilities, expected shortfall is appropriate, because it accounts for the extent of the α% "bad instances".

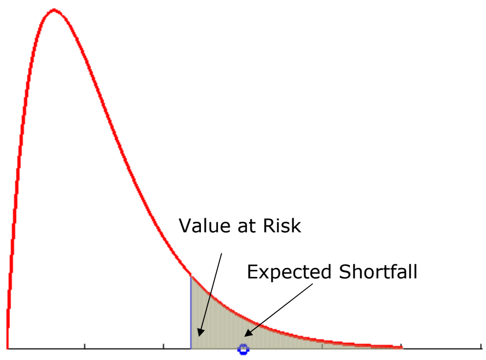

Figure 7. Comparison of Value at Risk and Expected Shortfall

2.6. Risks Considered

Financial and insurance risks give rise to target capital requirements, while some other risks are treated qualitatively.

The split is shown in the following diagram:

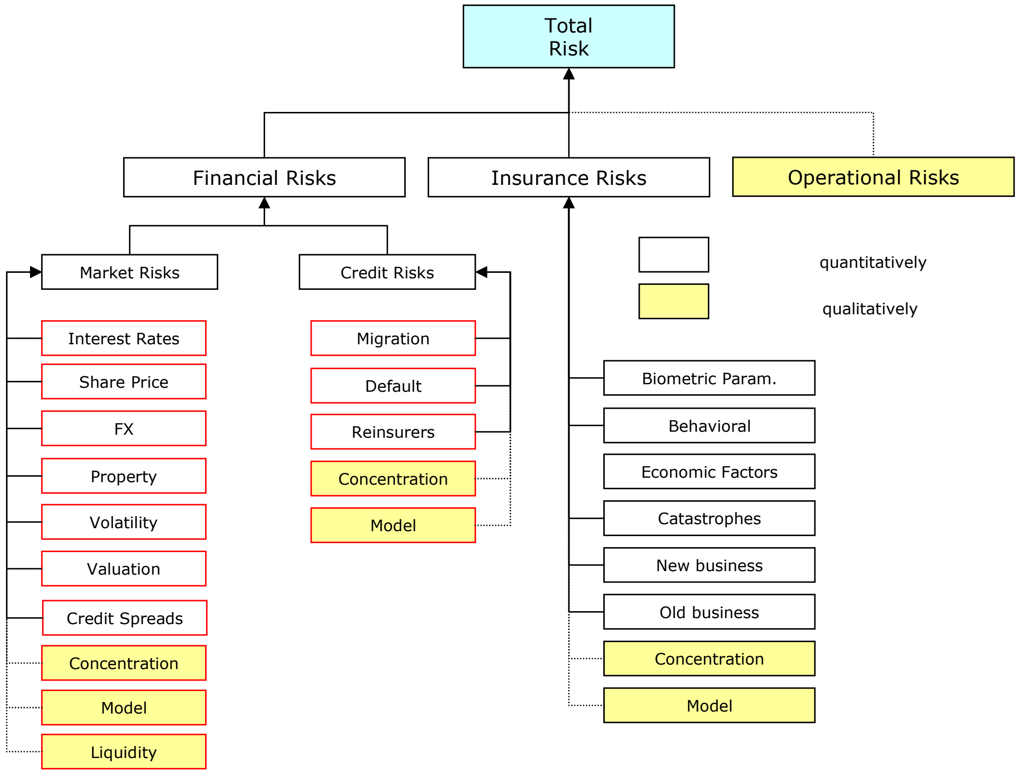

Figure 5. Quantitative and qualitative risks considered by in the SST

Quantitative

Risks which are to be quantified in the SST include:

- Financial risks: For example the risk of a fall in equity prices, or default on loans held.
- Insurance risk: For example the risk of a significant winter storm over Europe, the risk of reserves for liability insurance being inadequate, or of future mortality experience deviating from expectation.

Qualitative

A number of risks inherent to insurance companies are difficult to measure reliably, and treated more appropriately qualitatively than quantitatively until generally accepted methods have been developed.

Examples of risks which are treated qualitatively include:

- Operational Risk: For example employee fraud, errors in systems, political risk etc.

More details regarding operational risks can be found in Section 11.

2.7. Risk Margin

The risk margin of an insurance portfolio is defined as the hypothetical cost of regulatory capital necessary to run-off all the insurance liabilities, following financial distress of the company.

For the regulator it is imperative that in the case of insolvency, the rightful claimants be protected. Policyholders are best served if a third party can take over the assets and liabilities of their initial insurer. A third party will only be prepared to do this if the cost of setting up the regulatory capital that would be required is covered by the portfolio.

2.8. Internal Models

It is an aim of the supervisory authority to encourage the use of internal models. These models need to satisfy quantitative, qualitative and organizational requirements. In particular, they must be deeply embedded into the insurer's internal processes and may not be used exclusively to calculate target capital.

3. Market Consistent Valuation

Consistent valuation of assets and liabilities is one of the cornerstones of the SST. This valuation should be performed on a market consistent way. For assets, that generally means valuing at observed market prices (rather than using book values or amortized cost methods as in statutory accounts).

The market consistent value of a liability is the amount an arm's length transaction in a liquid market would require the transferring insurer to pay to the party taking over the liabilities. As, generally, there are no liquid markets for insurance liabilities, for the purposes of the SST, the market consistent value of liabilities is defined as the best-estimate of the liabilities plus the risk margin.

The party which takes over the liabilities must comply with the requirements of the regulator concerning financial market stability and have a high level of security in respect of policyholder liabilities.

3.1. Assets

In the SST, all the assets on the balance sheet should be valued at their market value. For traded assets, these are easily observed in the market.

Wherever possible, market-consistent valuation is based on observable market prices (marking to market). If such values are not available, a market-consistent value is determined by examining comparable market values, taking account of liquidity and other product-specific features, or on a model basis (marking to model). In particular, market-consistent means that up to date values are used for all parameters.

3.2. Liabilities

For liabilities, the market consistent value is defined as the sum of the **best-estimate** of the liabilities and the risk margin. The **risk margin** is explained in more detail in Section 4.

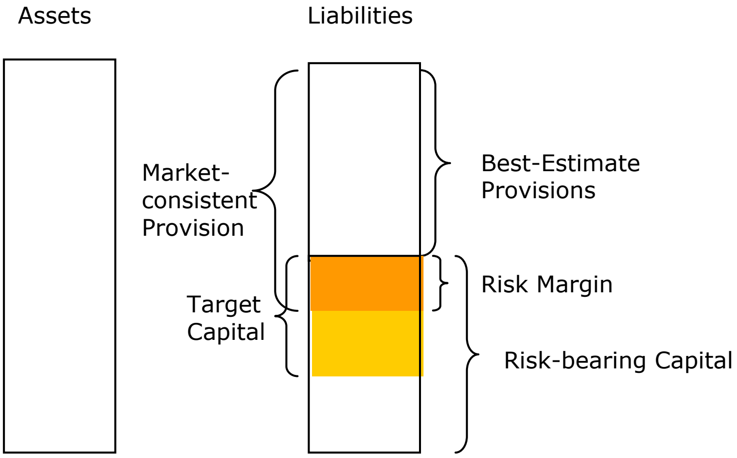

Figure 8. Market consistent assets and liabilities

Best-Estimate

No specific method for valuing the liabilities on a market consistent basis has been prescribed by the regulator. Valid approaches include valuing a replicating portfolio (see for instance [BH]), modeling all policyholder liabilities and interactions with the financial markets on a stochastic basis and using discounting methods (deflators) and/or scenarios (risk-neutral) which ensure market-consistency.

This definition directly implies that all embedded options in a portfolio of liabilities have to be valued, e.g. surrender value guarantees or guaranteed annuity options.

All generally accepted approaches value guaranteed liabilities with cash-flows by discounting the expected cash-flows using the risk-free yield curve, i.e. the price of zero-coupon bonds with government credit quality. The risk-free yield curve will be given by the regulator.

However, policyholders usually do not always act in a fully rational manner. This should be taken into account when valuing insurer liabilities, provided the modeling of policyholder behavior can be justified empirically.

For some lines of business, notably group pensions business (BVG business) in Switzerland, it is not possible to determine the future liabilities with the required degree of accuracy. This is due to the fact that the liabilities are partially defined by external factors, e.g. the Federal Council or the Parliament, that are hard to predict.

In such cases reasonable assumptions concerning the behavior of those institutions need to be made and algorithms created which model their behavior as well as that of the insurer's management.

Several sets of assumptions for the BVG business have been used, reflecting the different business plans (e.g. the 'statutory model', the 'replicating model', the 'roll-over model', etc.) for the field test 2004 and are described in depth in the implementation manual.

Only liabilities which are contractually agreed or required by law have to be considered for SST purposes. This includes mandatory policyholder participation schemes such as the legal quote for BVG business.

All assumptions concerning insurance risks (e.g. mortality, disability rate, etc) are to be made on a best-estimate basis without implicit or explicit safety margins.

The assumptions and the methodology to determine market consistent values for liabilities have to be disclosed to the regulator within the SST-Report.

4. Risk Margin

The risk margin is defined as the capital cost for future regulatory capital needed for the run-off of the portfolio. As the regulatory capital depends on both assets and liabilities, risks emanating from the asset portfolio enter the calculation of the risk margin. The risk margin is set such that one part of it can be used to pay for the necessary regulatory capital for the current year while the other part is sufficient to set up the risk margin at the end of the current year.

4.1. Concept and Rationale

The risk margin of an insurance portfolio is defined as the hypothetical cost of regulatory capital necessary to run-off all insurance liabilities, following financial distress of the company.

Without this risk margin being available, it would not be possible to find a third party to take over the portfolio. It should be noted that the risk margin is only indirectly risk bearing and does not belong to the insurer but to the policyholders, and is part of the market-consistent liabilities of the company. In case of a transfer of the portfolio, the risk margin has to be transferred too.

4.2. Cost of Capital

The risk margin is calculated as being the discounted value of the future costs of maintaining the SST target capital level if the insurance portfolio was being run off by a third party. For the field test 2004, cost of capital was set at 6%.

4.3. Illiquidity of Assets

Asset allocation can be changed to optimally represent the insurance liabilities. This asset allocation is called optimally replicating portfolio. If an optimally replicating portfolio is achieved, target capital requirements are minimized.

The insurance company setting up the risk margin should not be penalized if, in the case of insolvency, a third party does not converge the asset portfolio to the optimally replicating portfolio as fast as possible. However the third party insurer (taking over the portfolio of assets and liabilities and receiving the risk margin) should not be penalized if the original insurer invested in an illiquid asset portfolio. This is allowed for in the model by assuming that future one-period risk capital requirements (expected shortfalls) converge to minimal values, representing a situation where assets optimally match liabilities, as fast as possible given liquidity constrains.

The speed of convergence is given by the speed with which assets could be sold off without losing significant market value.

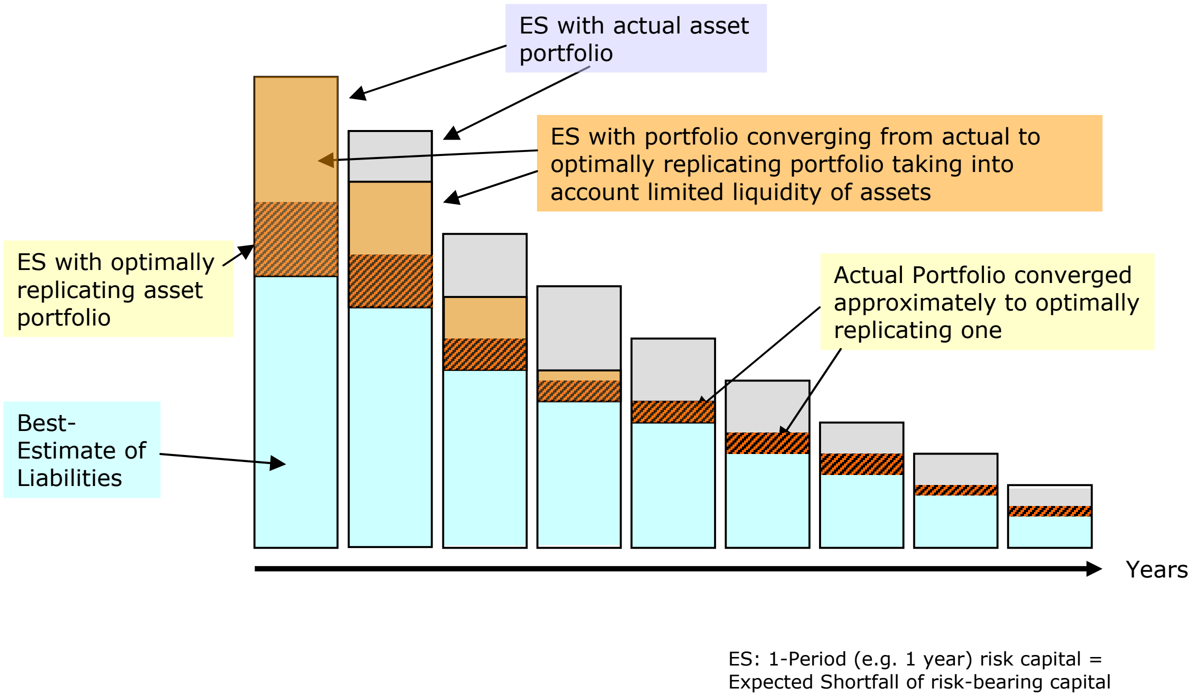

Figure 9. Run-off pattern of the insurance liabilities. It is assumed that the expected shortfall ES (i.e. the regulatory capital for the one-year risk) is proportional to the best-estimate of liabilities. The orange bars show the necessary one-year regulatory capital based on the asset portfolio which converges to the optimal replicating portfolio.

5. Reinsurance

For target capital and market-consistent reserves, full credit is to be given for reinsurance. The appointed actuary must determine the risk transfer commensurately.

The risk of default on the part of the reinsurers, however, must be considered in determining target capital through the application of appropriate scenarios.

5.1. Reduction of Target Capital

Reinsurance is often significant for small and mid-sized nonlife insurers which cede large portions of their insurance risk to reinsurers. The standard nonlife model is designed such that most common types of reinsurance cover (quota share, XL, Stop Loss) can be incorporated easily in a consistent way. For life insurers reinsurance has to be incorporated either by using an internal model or by adjusting the coefficients of the standard life model appropriately.

5.2. Reduction of Market-Consistent Provisions

To determine the reduction to the market-consistent provisions, the appointed actuary has to determine the actual risk transfer from the company to the reinsurers. The expected reinsurance payout can then be deducted from the best-estimate provisions. However, it is not sufficient to subtract, for instance, the reinsurance premiums since these will in general overestimate the risk transfer.

5.3. Default Risk

The specified scenario covering default of reinsurers assumes that all reinsurers default together. The extra loss, given that event, has to be determined by the appointed actuary.

The effect of the default of all reinsurers is relatively easy to determine by doing all the calculation on a gross basis. This leads to a P&L distribution and therefore to an expected shortfall. The expected shortfall takes into account all scenarios except the reinsurance scenario. The difference between the expected shortfall obtained by taking into account reinsurance and the expected shortfall on a gross basis is a proxy for the risk of loss due to the default of the reinsurers.

The probability of the scenario is the default probability of the reinsurers to which most of the risk is ceded to.

In practice, calculating the target capital on a gross basis leads to a distribution function which can be aggregated – weighted according to the default probability - with the distribution function on a net basis using the standard aggregation method.

6. Standard Models

6.1. Asset Model

The asset model quantifies the market risks, which stem from possible changes on both the assets and the liability side due to changes in market risk factors. The asset model considers both assets and liabilities simultaneously.

The asset model is conceptually similar to the well-know RiskMetrics approach (see [RM1] and [RM2]).

The model consists at the moment of 23 risk factors. While it is tempting to introduce more risk factors in order to model with greater detail the market risk, it is important that a regulatory model remains reasonably simple. Introducing many more risk factors would make the model too unwieldy.

The risk factors are described below:

- Discretized term structure of interest rate using time buckets of 0-2 years, 2-3 years, 3-4 years, 5-7 years, 7-10 years, 10-15 years, 15-20 years, 20-30 years, 30 and more years
- Implied volatility of interest rates
- Exchange rates (FX): EUR/CHF, GBP/CHF, USD/CHF, JPY/CHF
- Implied volatility of FX rates
- Share price index (including dividends, modeled by one global index)
- Private Equity (modeled by one global index)
- Hedge Funds (modeled by one global index)
- Participations
- Other equity
- Implied volatility of share price index
- Property (residential and commercial)
- Credit spread (Investments and sub-investment grade)

All the risk factor changes are assumed to be normally distributed (with mean 0). The joint behavior of the risk factors is described by their covariance matrix.

Changes in risk factors lead to changes in the risk bearing capital. For reasons of simplicity, it is assumed that the change in risk-bearing capital is a linear function of the risk factor changes. The coefficients are defined as the difference quotient (the sensitivities) for each risk factor. This means that if the share prices drop by 20%, the change in risk-bearing capital is twice the change that occurs when the share prices drops by 10%.

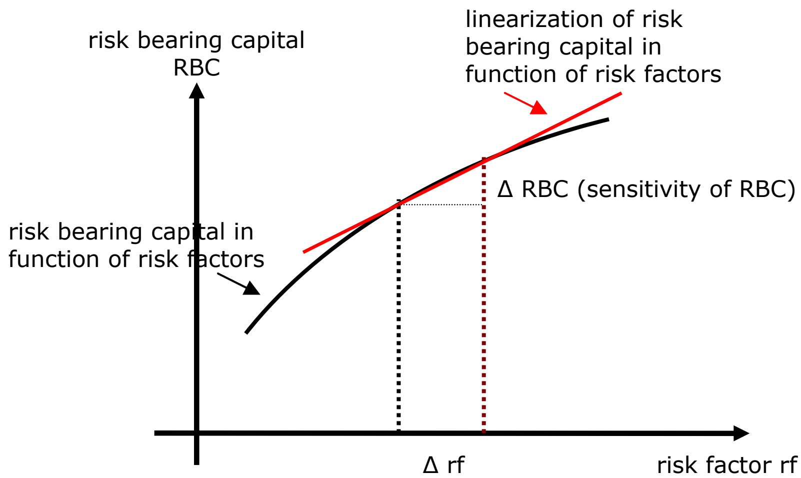

Figure 10. Linearization of change of risk bearing capital

For an insurer it is sufficient to determine the sensitivities of the risk-bearing capital with respect to the risk factors. Given the assumptions outlined above, the change of risk-bearing capital with respect to all the risk factors together is univariate normally distributed. The volatility can be directly calculated from the sensitivities and the covariance matrix of the risk factor changes.

As an example, the sensitivity to interest rates has an impact on both the asset side (an increase will for instance reduce the value of the bonds) and also on the liability side (an increase will reduce the value of the liabilities). The change in risk bearing capital is then the difference between the change in assets and liabilities.

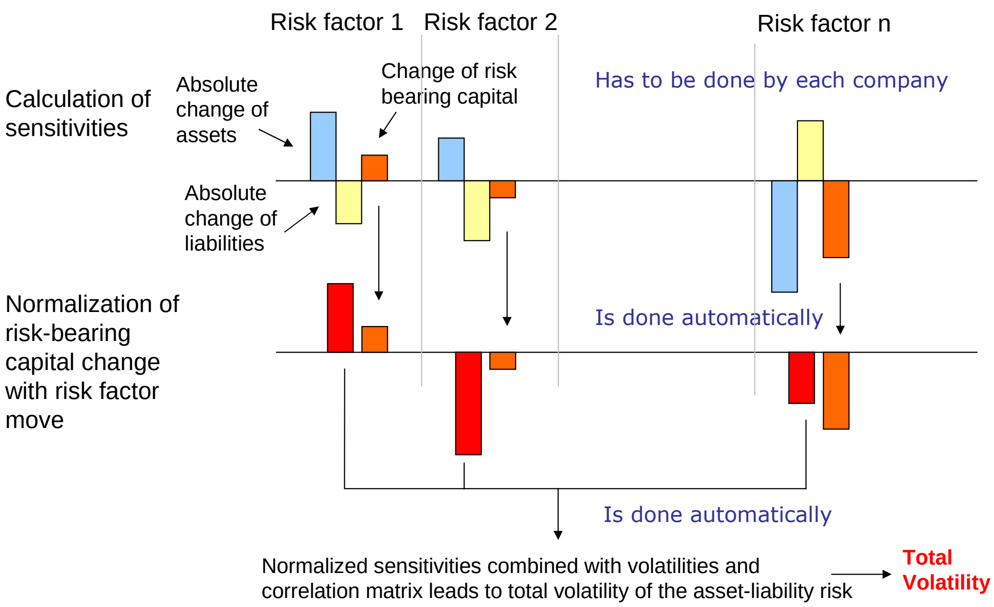

Figure 11. Calculation of total volatility due to market risk factors

Simplifications

This asset model is a simplification of reality. Many risks are not considered, amongst them:

- Specific risks (country, industry, counterparty …)

- Concentration risks
- Liquidity risks

Furthermore, nonlinearities are not captured by the standard asset model. Relevant nonlinear effects – for instance due to derivatives – have to be modeled outside the standard model.

If these nonlinear effects are relevant, then the appointed actuary needs to model them appropriately, for instance by adjusting the sensitivities, by defining scenarios or by some other method.

Data

To calibrate the volatilities and correlation matrix, monthly data is used, if possible. In cases where the market is sufficiently liquid, the volatilities can be estimated directly using observable data. In cases where the market is illiquid, observed data has to be supplemented or adjusted to take into account illiquidity or intransparency.

Some volatilities will be prescribed by the regulator (for example the interest rate volatilities or foreign exchange volatilities) whereas some parameters will have to be estimated by the company (for instance the volatility of the equity portfolio).

The asset model is supplemented with scenarios to take into account non-normality. These are described in the section on scenarios.

6.2. Life Insurance Model

The standard model for life insurance risks is also defined by a number of risk factors. The risk factor changes are assumed to be normally distributed, analogously to the asset model. The company calculates the sensitivity of the risk-bearing capital with respect to the separate risk factors. These sensitivities are then aggregated, taking into account the volatilities of the risk factors and the correlation between the risk factors.

The risk factors are:

	Volatilities	Correlations						
mortality	20%	1.00	0.00	0.00	0.00	0.00	0.00	0.00
longevity	10%	0.00	1.00	0.00	0.00	0.00	0.00	0.00
disability (BVG)	10%	0.00	0.00	1.00	1.00	0.00	0.00	0.00
disability (non-BVG)	20%	0.00	0.00	1.00	1.00	0.00	0.00	0.00
recovery rate (BVG)	20%	0.00	0.00	0.00	0.00	1.00	0.00	0.00
lapse rate	25%	0.00	0.00	0.00	0.00	0.00	1.00	0.75
capital option	25%	0.00	0.00	0.00	0.00	0.00	0.75	1.00

(The numbers above were used for the field test 2004).

For the standard model the change of the risk factors within one year is relevant. Again, it is assumed that the change of risk-bearing capital is linear.

The risk factors can change due to two reasons:

- due to random fluctuations (stochastic risk);
- due to the risk that the risk factors was incorrectly estimated or may change (parameter and trend risk).

Depending on the size of a portfolio, the underlying insurance cover and the risk factor, the influence of the stochastic risk and parameter risk can differ. For a small portfolio consisting of YRT (yearly renewable term) policies, the stochastic mortality risk will be relatively large compared to the parameter risk. For a large annuity portfolio, the parameter longevity risk will dominate the stochastic risk.

Since the risk factor changes are assumed to be normally distributed, they are defined by the standard deviation (volatility). In the standard model, the regulator has defined the volatilities as well as the correlations between the risk factors. For the life insurance risk factors, there is little adequate data available to estimate the correlations or volatilities properly. Hence, the parameters were set in discussion with experienced actuaries and constitute the best estimate of a number of professionals.

During the 2004 field test, volatilities were set at an overall level (i.e. parameter and stochastic risks were taken together and there was no differentiation between small and large portfolios).

6.3. Nonlife Model

The underlying methodology for the nonlife model is similar to internal models as well as to some regulatory models, for instance the one used in Australia or the UK (see [BR] and [FSA3]). However, in contrast to many regulatory nonlife models, it is not a factor model. Instead, the appointed actuary quantifies the risk by using explicit probability distributions. This approach is more complex to implement than a factor model, however, the benefits outweigh the overhead. A distribution based model contains enough degrees of freedom to be adapted to small as well as large insurers. Furthermore, the most common reinsurance treaties can be modeled easily and consistently. This is particularly important for small and midsized companies which often tend to cede a large part of their risk to reinsurers. Capturing this risk transfer is crucial for companies to obtain the correct capital relieve.

Technically, the aim of the nonlife model is to determine the distribution of the annual change of the risk bearing capital due to the variability of the technical result. The technical result is determined by earned premium, cost, future claims, and the reserving result, i.e. changes in the existing liabilities. Future losses are modeled by separating large losses and attritional (normal small) losses. Some catastrophic losses are modeled using scenarios. The change in reserves is modeled with one distribution for all lines of business (LoB). Risks related to loss pools (such as elementary damage, nuclear, aviation, water barrage liability) have to be modeled explicitly by the participating companies.

Future Losses for the Current Accident Year

Claims occurring during the current accident year are split into higher-frequency smaller claims (attritional losses) and rare large claims. These two types of claims are best treated separately, both conceptually and numerically.

Modeling of the attritional losses consists of estimating the future earned premiums and the variability of the loss ratio (excluding large losses) for each line of business. With these values and given correlation coefficients between the LoB, the mean and the variance of the overall distribution for the attritional losses are derived, which can then be used to model these losses via a Gamma distribution. There is also the possibility of using an internal model for the attritional claims by fitting an appropriate distribution to company-specific data.

Large claims are modeled individually by LoB using a compound Poisson, i.e. the claims number being Poisson distributed. The claims severity is assumed to be Pareto distributed for each LoB with predefined parameters. The Pareto distribution can be cut off at company specific values. However, given that the cut-off point is significant for the result, guidelines will be given by the regulator.

After deriving the distribution of future losses, discounting of the future payments has to be included by estimating the future payment patter and discounting the cash flows using the given risk-free discount rate.

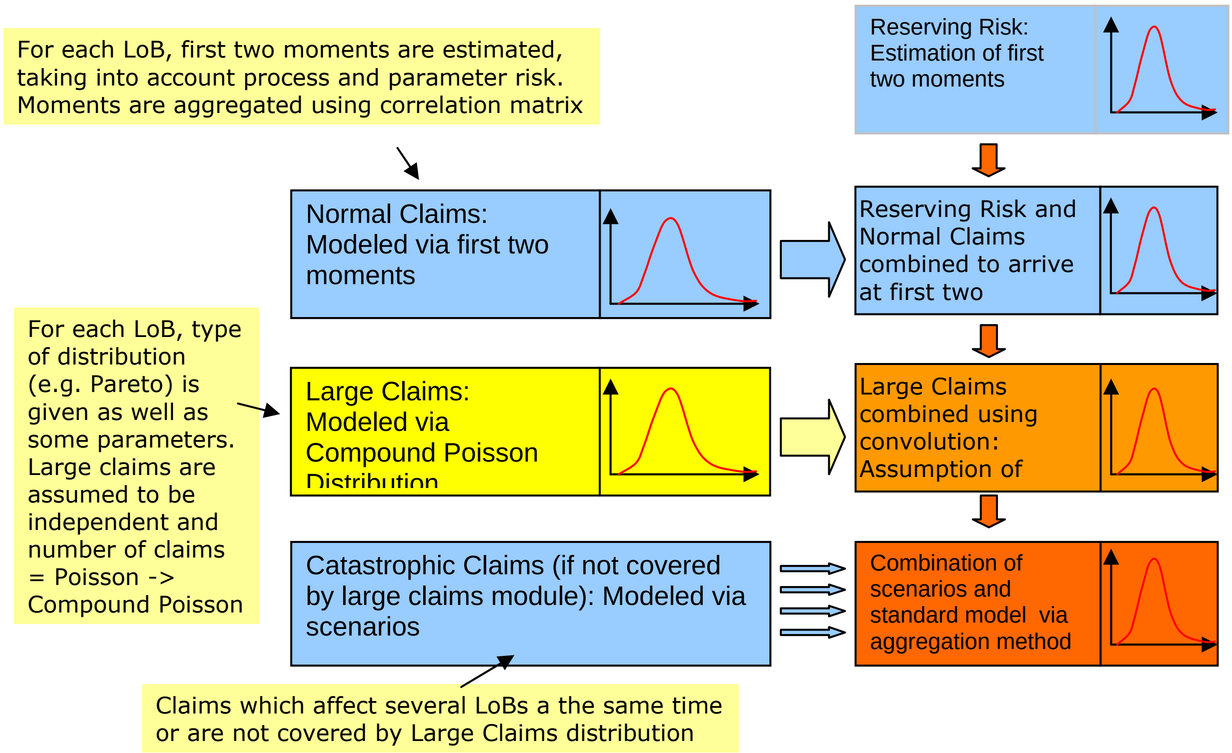

Figure 12. The calculation flow for the normal claims module

Losses of Previous Accident Years

In order to obtain a probability distribution for the reserving gains and losses, historical volatilities of reserve results are used to estimate the variance for each line of business. By assuming independency between LoB, the aggregated variance is given by the sum of the variances. The model assumes that the reserve result is a shifted inverse Lognormal variable defined by a zero mean and the aggregated variance.

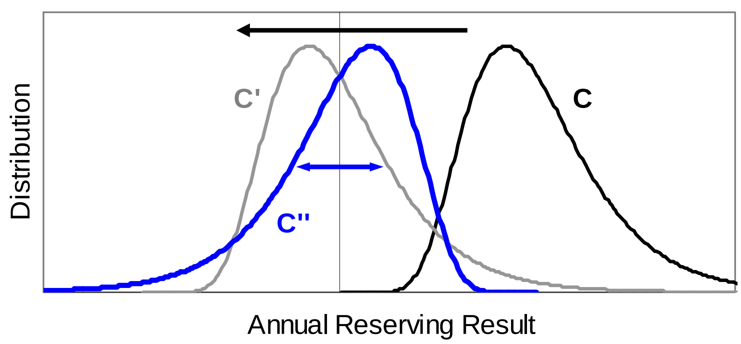

Figure 13. Distribution of the Reserving Result (schematic). First, a lognormal variable C is shifted to obtain a centralized variable C'. Secondly, a swap in sign leads to the left skewed distribution (C'') for the reserving result.

After deriving this distribution, a proper discounting of the future payments has to be included by estimating the future payment pattern and discounting the pattern with the given risk-free discount-rates.

Aggregation

First attritional losses and the annual reserving result are aggregated. It is assumed that the aggregate distribution is a shifted lognormal with given mean and variance. The mean and variance are obtained by using the first two moments of the attritional loss distribution and reserving result distribution and using a given correlation matrix.

Large claims are assumed to be independent of attritional losses and the reserving result so that the Compound Poisson-Pareto distribution is aggregated using convolution.

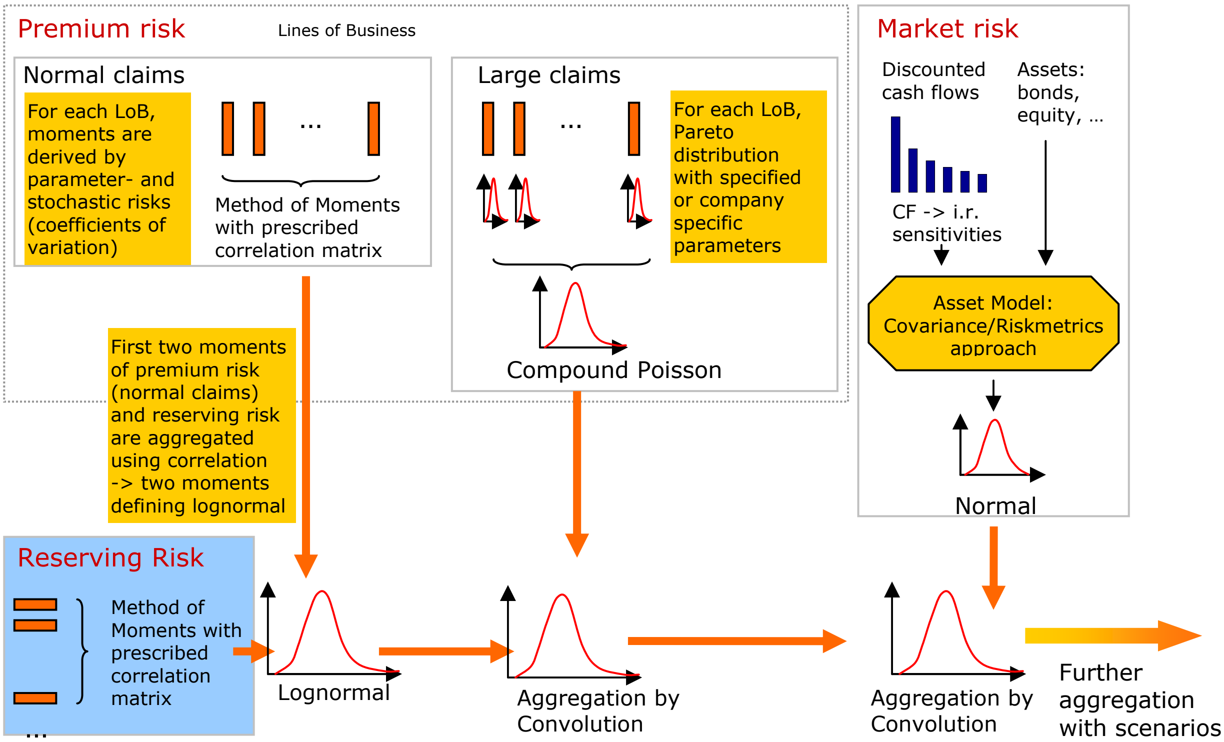

Figure 14. The calculation flow of the standard nonlife model

6.4. Health Insurance Model

Within the standard model, insurance risk is assumed to be independent of financial risk. In addition the technical result is assumed to be normal distributed. This allows a very simple aggregation with the result of the asset model.

The standard model considers two lines of business:

- Individual health care costs and daily allowance
- Daily allowance for groups

Based on the loss history of their own portfolio, companies determine the expected value and the standard deviation of the result both of these lines. The results are then aggregated, taking into account a (specified) correlation between the two lines.

6.5. Credit Risk Model (Basel II)

In this section all credit risk except reinsurers' default risk and credit spread risk are considered.

In order to limit the possibility for arbitrage of credit risk from the banking to the insurance sector (and the reverse), credit risk quantification follows as closely as possible the one used by the banking regulator. Therefore, a credit risk charge is calculated using an approach compatible to Basel II. This charge is then added to the target capital for insurance and market risks.

The standard model

The standard model for credit risk is the Basel II standardized approach, with operational risk excluded. This approach can be implemented quite easily and without much extra effort.

Internal models

Internal models for credit risk have to be calibrated to the same risk measure as used by Basel II, namely the Value at Risk on the 99% quantile. Possibilities for internal models are for instance

- Basel 2 Internal Ratings-based approach (Foundation)
- Basel 2 Internal Ratings-based approach (Advanced)
- Credit risk portfolio model

If a company intents to use a portfolio model, it is prerequisite that all the credit risks within the scope of Basel II are captured (see for instance [BIS], [CR] or [CM]). This means in particular that all the requirements of Basel II to use the internal ratings-based approaches need to be satisfied.

6.6. Reinsurers

For reinsurers, no standard model will be developed. Rather, reinsurers have to develop internal models calculating the target capital. The internal models have to follow the methodology of the SST and they will need to be embedded in an appropriate risk-management framework.

The reason that no standard model will be supplied for reinsurers lies in the fact that given the divergent nature of business written by different reinsurers, a standard model would be unduly complicated if it were to capture the risk correctly.

7. Scenarios

Scenarios are descriptions of possible states of the world. They are more general than simple stress tests, which consist often of stressing a single risk factor (e.g. share prices drop by 20%). Scenarios are described by stressing not one but the whole set of risk factors. This provides a much more complete picture.

An adverse scenario is a scenario which negatively impacts the financial situation of the company.

Scenarios are an integral part of the SST. A number of adverse scenarios are prescribed. In addition, the appointed actuary should define scenarios that reflect the insurer’s specific exposures.

Qualitative and quantitative scenarios are distinguished. The former are evaluated but do not enter the target capital calculation whereas the latter are aggregated with the results of the standard models.

In both cases the appointed actuary needs to evaluate the scenarios on the basis of a market consistent valuation, anticipated new business in the first year and a going-concern basis.

The appointed actuary needs to evaluate the prescribed scenarios and also needs to define scenarios which are relevant to the specific risk situation of the company.

For a quantitative scenario, a probability has to be determined. This can be done either by the regulator or has to be done by the appointed actuary.

Scenarios are used within the SST since the standard models do not necessarily reflect the tail behavior of the distribution of the change of risk bearing capital after one year adequately due to assumptions and simplifications made. For instance the standard asset model assumes that the risk factor changes are normally distributed. This is often not true especially during times when markets are depressed. Standard models better describing the tail behavior would become unduly complicated for regulatory purposes. Therefore the impact of a number of scenarios has to be determined and aggregated with the results from the standard models.

There a number of additional reasons why scenarios are part of the SST:

- They can be easily communicated to the management;
- They provide more information than a single target capital number;
- The heterogeneity of risks is taken into account;
- They facilitate the dialog within the company and company-regulator;
- They can be used to evaluate systematic risks;
- They are easy to adapt and enhance;
- They complement the stochastic standard models.

7.1. Examples

A number of scenarios have been defined for the field test 2004:

- Industry scenario: An explosion in a chemical plant, which results in personal injuries (deaths, disablements, injuries), property damage, and business interruption.
- Pandemic event (Spanish Flu epidemic of 1918 transported to 2004): Epidemic which results in personal injuries (deaths, disablements, injuries)
- Accident scenario: (i) An accident at a company outing (bus accident), where all involved persons are insured with the insurance company.
  (ii) A mass panic in a football stadium, resulting in many deaths, injured and disabled.
- Hail scenario: Four hails storms, which lead to building and motor hull damage. The definition includes storm footprints in terms of damage degrees per post code.
- Liability for a collapsed water barrage/dam. A maximum loss and a probability for this loss are defined. Each insurance company has to estimate its own loss by taking into account the company’s pool share.
- Disability scenario: Defined increase in disability rates
- Daily allowance: increase in rate of daily allowance.
- Default of reinsurer: The loss under this scenario is defined as the difference gross minus net of the technical result.
- Financial distress scenario: Equity values drop by 30%, downgrade to subinvestment grade (if company is rated), new business -75%, lapse = 25%.
- Reserve scenario: 10% increase in claims provisions
- Health insurance scenario: Anti selection

- Terrorism
- Historical financial risk scenarios
  - Stock Market Crash 1987
  - Nikkei Crash 1989
  - European Currency Crisis 1992
  - US Interest Rates 1994
  - Russia / LTCM 1998
  - Stock Market Crash 2000
- Longevity: The effect of lower mortality rates on the risk capital has to be modeled.

The relevance of these scenarios for life, nonlife and health insurers is given in the following table.

Scenario	Life	Nonlife	Health
Industrial explosion		×	
Pandemic	×	×	×
Accident (UVG, UVGZ)		×	
Hailstorm		×	
Collapse of water barrage		×	
Disability	×		
Daily allowance			×
Default of reinsurer	×	×	×
Financial distress	×	×	×
Reserve		×	×
Anti-selection			×
Terrorism	×	×	×
Historical Asset Scenarios	×	×	×
Longevity	×		

8. Aggregation of Scenarios with Standard Models

The SST is a hybrid stochastic – scenario model. To arrive at the target capital, results of the standard models and evaluations of a number of scenarios are aggregated.

Calculating the 1-year risk capital (ES) using the standard models, a probability distribution is arrived at which describes the situation of the company given none of the scenario events occurred.

In most cases, scenarios will cause an extra loss for the company so that risk-bearing capital is correspondingly reduced. For some scenarios it is assumed that – given a scenario occurs – the other risks stay the same. Therefore the economic state of the company is again described by the probability distribution obtained using the standard models, however shifted with the extra loss under the scenario.

Some scenarios might result in a probability distribution with a different shape than the one obtained by the standard models. This could occur for instance if the behavior of financial markets change and market risk factors become more correlated.

In all cases, a scenario results in a probability distribution.

These probability distributions are then aggregated with the distribution from the standard models using a weighted average, where weights are given by the probabilities of the scenarios.

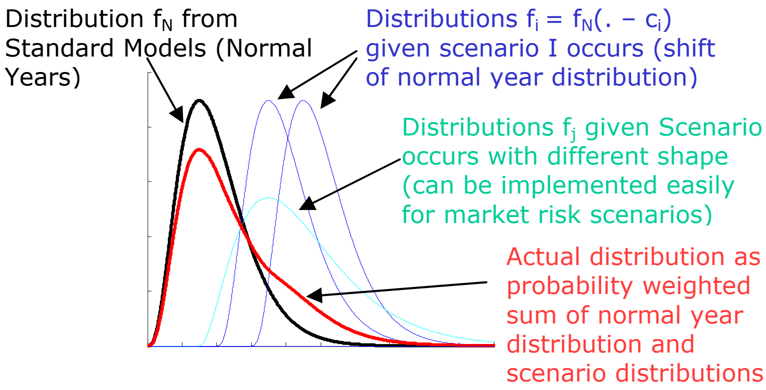

Figure 15. Aggregation of normal results with scenarios.

There is no extra effort necessary for companies for the aggregation. Given the extra loss under the different scenarios and the probability of the scenarios, the aggregation can easily be done on a spreadsheet.

9. Internal Models

The supervisory authority encourages the use of internal models for target capital calculation. Using a wide range of models reduces the danger of a systematic risk caused by the standard model imposed by the supervisory authority.

Internal models are permitted provided they meet certain requirements prescribed by the supervisory authority. The internal models need to satisfy quantitative, qualitative and organizational requirements. In particular, they must be integrated into the insurer's internal processes and may not be used exclusively to calculate target capital.

The internal model may itself lead to a distribution function of the (discounted) risk-bearing capital in one year, or it may be embedded within the standard models and partly modify the standard SST.

See also [GDV] and [BA] for examples of requirements for internal models.

9.1. Qualitative requirements

All relevant risk factors must be factored into the internal models. The dependency structure of the risk factors must be taken into account.

Data and parameters in internal models must be up-to-date and relevant for the insurance company. If the insurance company's internal data does not satisfy these requirements, they must be supplemented by external data. Such data has to be of relevance for the insurance company's specific exposure. The data sources must be cited.

The appointed actuary has to asses the model risk and stability of the results by means of a sensitivity analysis, back-testing, or similar methods.

The internal models must be reviewed regularly and adjusted if necessary.

9.2. Quantitative Requirements

The market-consistent value must be used for all items and the internal models must be calibrated to the same confidence level and risk measure as the SST.

9.3. Organizational Requirements

Internal models need to be deeply embedded within an appropriate organizational framework. In particular, they need to be integrated into the company's daily risk-management processes, regularly updated and tested.

While it is relatively straightforward to formulate guidelines regarding quantitative and qualitative requirements, defining regulatory preconditions on the organizational framework is more difficult. The regulator does not intend to specify rigidly what type of corporate governance, and risk-management structure a company needs to possess in order to use internal models. However, minimal requirements depending on the complexity and scope of the business will have to be met before an internal model can be used for target capital calculation.

9.4. Incentives for using Internal Models

It is an aim of the SST to give incentives for companies to develop and use internal models for target capital calculations. Since the regulator does not expect all companies to develop their own internal models, standard models can be used. If internal modes are accepted by the regulator, they can be calibrated to 'best-estimate' assumptions, i.e. they do not need to contain implicit or explicit safety margins (note that this does not mean that for instance financial market parameters need not be adjusted for illiquidity or intransparency). To give an incentive for companies to switch from standard to internal models, the standard model is more conservative than 'best-estimate'.

Conservativeness in the standard models is achieved – when possible – by the use of a conservative methodology. For instance the treatment of reinsurance risk within the standard model assumes that all reinsurers default at the same time. An insurer can use an internal model describing more adequately the dependency structure of default between different reinsurers.

10. SST Report

10.1. Purpose

The SST report summarizes the risk position of the company. It has a mandatory minimum content prescribed by the regulator. It is to be provided to the regulator on an annual basis and has to be signed-off by the CEO.

It is important that the SST-Report will be as concise as possible but as detailed as necessary such that the relevant information is contained in it. All relevant information to understand the target capital calculation has to be part of the SST-Report.

The risk management and the risk governance have to be described within a separate report (**risk management report**), which also has to be sent to the regulator.

10.2. Content

The risk position of the company, including SST target capital and coverage

This section of the report consists of two parts:

1. A template which is defined by the regulator and which has to be completed by the company.

2. Comments and explanations of the template, describing the:

1. Market consistent valuation of assets
    a. Valuation methodology and, if necessary, assumptions
    b. Reconciliation with statutory assets
2. Market consistent valuation of liabilities
    c. Assumptions (with justification and assessment of quality)
        i. Financial
        ii. Actuarial
        iii. Policyholder behavior
        iv. Political parameters
        v. Management behavior (asset allocation etc.)
        vi. Expenses
        vii. New business
    d. Methodology
    e. Reconciliation with statutory reserves
    f. Validation approach
3. Determination of the Risk Margin
4. Available Capital
5. Standard models
    g. Deviations from the standard models and justification
    h. Results of the sensitivities
    i. Standard model target capital
6. Internal models
    j. In depth Description / description of changes to previous year
    k. Result (i.e. target capital)
    l. Reconciliation with standard model results, explanation of deviation
    m. Validation approach
7. Scenarios
    n. Additional company specific scenarios
    o. Validation
8. Description of risk mitigation
    a. Reinsurance programs
    b. Securitization
    c. Pooling
    d. other risk mitigations
9. The main risks of the company and assessment whether these risks are adequately reflected in the SST
10. Description of concentration risks
11. Description of treatment of operational risks
12. Assessment of other relevant risks (e.g. strategic, political,…) as well as possible future relevant risks to which the company might be exposed

> Note if some of the above points are already described within other reports for the regulator, then it suffices to refer to the relevant documents.

Within the **risk management report** some parts are of particular relevance for the SST:

- The risk strategy, including the risk objectives and risk appetite
- The risk manual / guidelines
- The risk procedures of identifying, quantifying and controlling risks
- The allocation of responsibility and accountability
- The allocation of the executive authority to take remedial action
- The risk reporting process
- The tasks of the involved functions (CRO, CCO etc.)
- The validation and review process
- The tools, like risk assessments, Hits and near Misses databases, product approval etc.

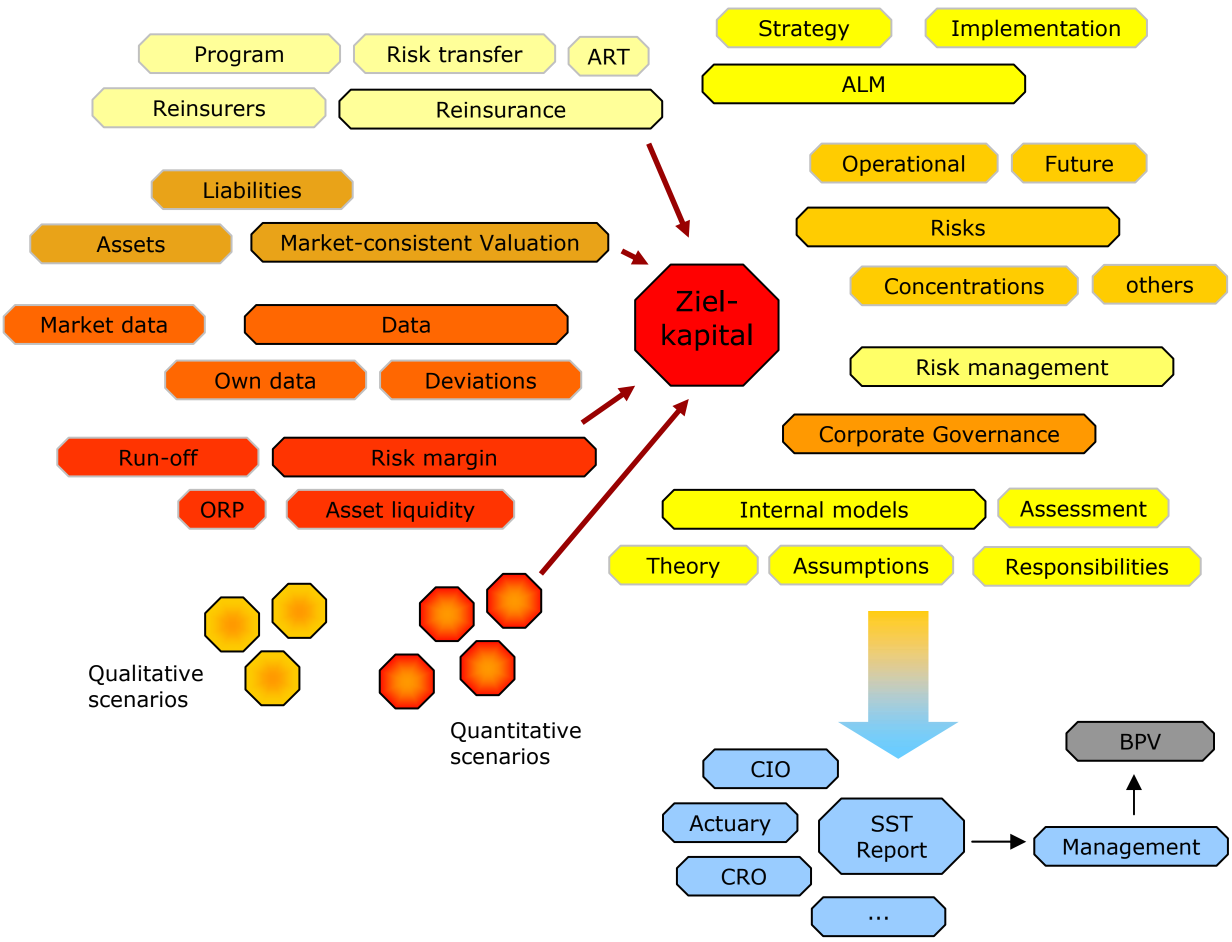

Figure 16. Contents and Responsibilities of the SST-Report

11 Operational risks

Operational risks are difficult to quantify so a qualitative assessment approach will initially be used. Capital requirements for these risks would be too arbitrary.

Sufficient empirical data are not yet available. However, banks are now compiling such data to comply with Basel II. It is therefore conceivable that operational risks could be quantified in the future if insurance companies were to compile relevant data.

Operational risks can be controlled, e.g. through appropriate corporate governance measures. For the supervisory authority, it is therefore important that insurance companies should have efficient internal risk management systems.

Risk management is monitored via a structured self-assessment questionnaire that every insurance company is required to complete.

The supervisory authority will discuss the self-assessment with the insurance company at least every three years.

11.1 Self-assessment

The self-assessment comprises a structured report in the form of a questionnaire that every insurance company has to fill out. Its purpose is to provide an insight into how well the company manages operational risks. The supervisory authority sets the questions and the assessment benchmark.

The completed forms have to be signed by the Board of Directors and the management.

The self-assessment form must be submitted to the supervisory authority annually. If necessary, the supervisory authority will discuss the report with the insurance company. In any case, it should be discussed every three years even without specific cause.

The self-assessment should be contained in the audit report. In other words, the auditors must check that the questionnaire has been completed correctly (insofar as the data are verifiable).

11.2 Incentives / sanctions

Three types of sanctions/incentives can be applied in the case of poor management of operational risks:

a) Graduated supervisory control
b) Addition of a loading to target capital
c) Public disclosure.

At present, use is mainly made of option a). However, the regulations should include the possibility of using the other two options.

Graduated supervisory control

This means stepping up supervision of an insurance company if the result of the self-assessment is poor. Increased control may take the form of more frequent contact with the supervisory authority, specific reporting requirements or an increase in local checks. Alternatively, specific risk management requirements may be imposed.

Adding a loading to target capital

If a target capital were to be defined to cover operational risks, this would not be expected to absorb all operational risks. On the contrary, it should be regarded as an incentive/sanction system for inadequate risk management. This option should be left open in the regulations, even though it is not used at present.

Public disclosure

Public disclosure requirements would be an additional incentive to ensure good risk management.

11.3 Compilation of data

In addition to the self-assessment, claims data has to be compiled to facilitate assessment of operational risks. Both aspects act as incentives for good risk management. Moreover, compiling data ensures equality of treatment for banks and insurance companies and can be used as a basis for quantifying operational risks in a few years' time.

12. Flowchart

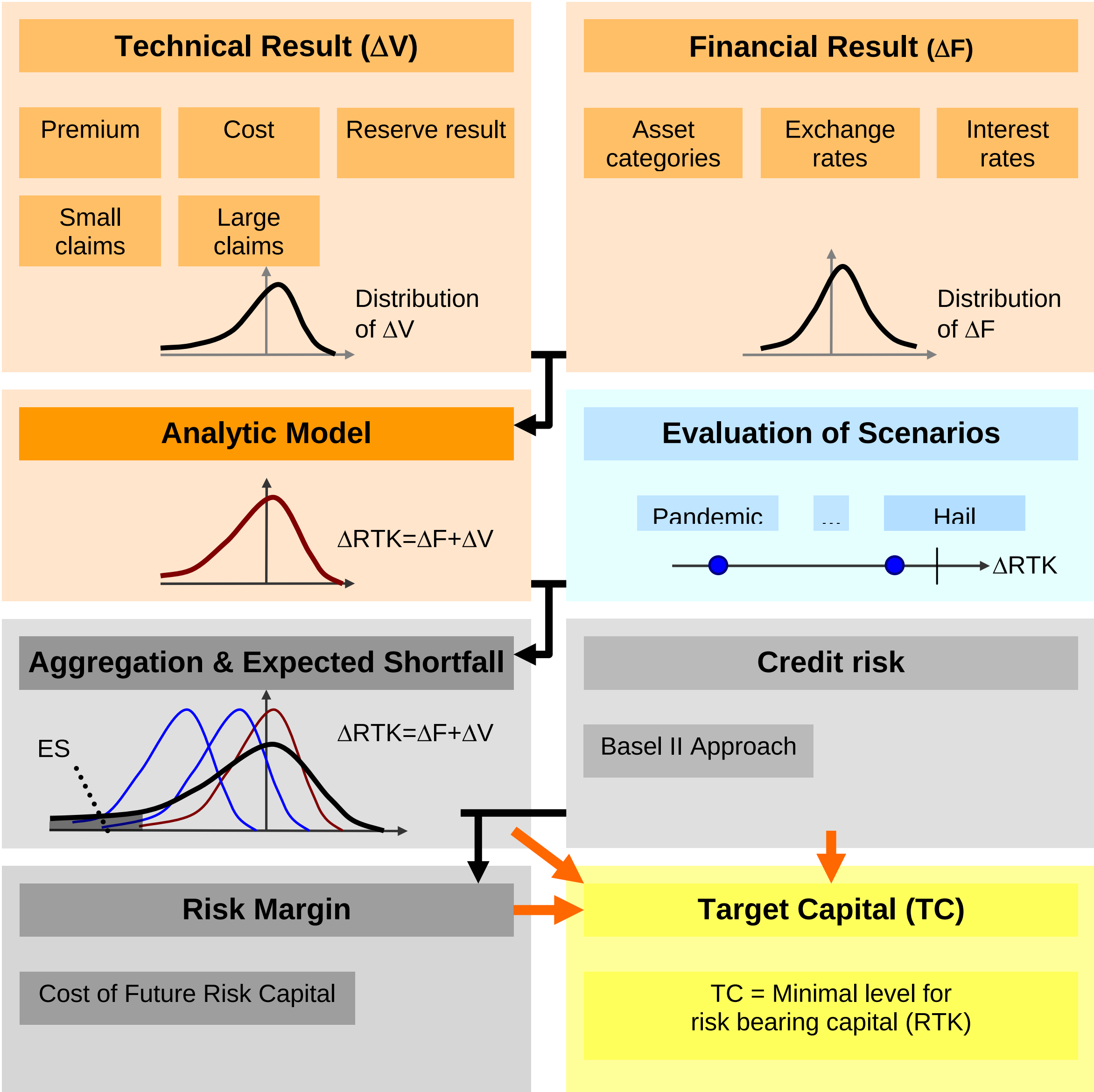

Figure 17: Flow chart of the SST model to determine the Target Capital TC (F). Insurance and market risks models consist of insurance and financial result distributions (A1, A2). The outcomes are aggregated in the stochastic model (A3). Scenarios portray additional losses due to adverse but rare events (B), e.g. a pandemic. The stochastic model is integrated with scenarios (C) to derive overall distribution, from which the expected shortfall is determined. Using a simplified Basel II approach, credit risks are taken into account (D). The risk margin (E) allows for future risks in case of a run off situation after the asset liability portfolio had to be sold to another investor. The target capital (F) is equal to the sum of (C), (D), and (E).

13. Lines of Business (Nonlife)

LoB SST	LoB Standard
UVG	Obligatorische Berufsunfallversicherung Obligatorische Nichtberufsunfallversicherung Freiwillige UVG Versicherung
Unfall ohne UVG	Einzelunfallversicherung UVG Zusatzversicherung Motorfahrzeuginsassen-Unfallversicherung Übrige Kollektivunfallversicherungen
Einzel Kranken	Obligatorische Einzelkrankenversicherung Freiwillige Einzelkrankenversicherung
Kollektiv Kranken	Kollektivkrankenversicherung
Sach	Feuerversicherung Elementarschadenversicherung Bauwesenversicherung Unternehmensachversicherung Engineering, Maschinenversicherung Diebstahlversicherung Hausratversicherung (falls trennbar von Privathaftpflicht) Übrige Versicherungen gegen Sachschäden
Haftpflicht	Gebäudehaftpflichtversicherung, Privathaftpflichtversicherung, Unternehmenshaftpflichtverischerung Bauherrenhaftpflichtversicherung Allgemeine Haftpflichtversicherungen
MFK	Motorfahrzeugkaskoversicherung
MKH	Motorfahrzeughaftpflichtversicherung
Finanz und Kaution	Kreditversicherung Kautionsversicherung Baugarantieversicherung Versicherungen gegen finanzielle Verluste
Luftfahrt	Luftfahrzeugkaskoversicherung Luftfahrzeughaftpflichtversicherung
Transport	Transportgüterversicherung Schienenfahrzeugkaskoversicherung Wasserfahrzeugkaskoversicherung Wasserfahrzeughaftpflichtversicherung
Andere	Reise-, Touristen-, Verkehrsserviceversicherung Rechtsschutzversicherung Epidemieversicherung

14. Glossary

α: Minimum probability of occurrence of a plausible scenario
1-α: SST confidence level
ALM: Asset Liability Management
APRA: Australian Prudential Regulation Authority
ES: One-year risk capital
FOPI: Federal Office of Private Insurance
FSA: Financial Services Authority (UK)
GDV: Gesamtverbands der Deutschen Versicherungswirtschaft
IAIS: International Association of Insurance Supervisors
IAA: International Actuarial Association
IASB: International Accounting Standard Board
ISA: Insurance Supervison Act
LoB: Lines of Business
Loss: Change in risk-bearing capital (discounted to present value)
NAIC: National Association of Insurance Commissioners (USA)
OSFI: Office of the Superintendent of Financial Institutions (Canada)
RBC: Risk-based capital
SST: Swiss Solvency Test

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We would like to thank all members of the working groups for their assistance with this project.

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Nasir Ahmad
Hans Ammeter
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Sabine Betz
Urs Bienz
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Urs Boegli
Peter Boller
Georges Bolli
Jean-Louis Bonnet
Hansueli Braeker
Markus Buchwalder
Guy Castagnoli
Marc Chuard
Bertrand Cleuvenot
Hansueli Edelmann
Fritz Ehlers
Herbert Eichhorn
Farhad Farhadmotamed
Damir Filipovic
Hans-Jörg Furrer
Andrew Gallacher
Stephan Gaschen
Peter Giger
Alois Gisler
Andreas Glatter
Bruno Gmür
Anja Göing-Jaeschke
Alexander Gräwert
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Bruno Hubler
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Markus Kaelin
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Ute Kunze
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Adrian Schmid
Stephan Schreckenberg
Daniel Seiler
Rudolf Stehle
Mark Stober
Gerold Studer
Felix Waldmeier
Jürg Waldmeier
Hansjürgen Wolter
Hans Peter Würmli
Marcel Wüthrich
Mario Wüthrich
Patrick Zuber

We would also like to thank the persons listed below for their valuable comments and suggestions:

Philippe Artzner	Gundula Griessmann
Allan Brender	Jos Kleverlaan
Hans Bühlmann	Ronald M. Lukassen
Freddy Delbaen	Lutz Oehlenberg
Peter Diethelm	Jukka Rantala
Paul Embrechts	Gottfried Rey
Olaf Ermert	Thomas Schubert
Petra Faber-Graw	G.C.M. Siegelaer
Hans Geiger	Gerhard Stahl
Stefan Jaschke	Alan Yip

We would also like to thank the consulting companies participating during the field test 2004: Deloitte, Ecofin, Ernst&Young, Mercer Oliver Wyman and Tillinghast.

Finally we would like to thank the colleagues from FOPI for the participation and support.

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