Analysis of an Insurance Company’s Balance Sheet

FSI Seminar
27 July 2004
Guido Schätli, Swiss Re
Agenda

1. Introduction
2. Insurance and reinsurance overview
3. Assets and liabilities
4. Risk assessment
5. Economic risk capital
6. Summary
Introduction -
Main questions

- What does ALM mean in an insurance and/or reinsurance company?

- What are the links between ALM and risk management?

- What are the links between ALM and capital adequacy?

- What are the main processes?
Introduction –
Today’s agenda

- Overview of insurance business
- Assets and liabilities
- Economic view vs. accounting view
- Risk management
- Economic risk capital
- Capital adequacy
<table>
<thead>
<tr>
<th>Introduction – Tomorrow’s agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ ALM as part of integrated risk management</td>
</tr>
<tr>
<td>■ Strategic and tactical asset allocation</td>
</tr>
<tr>
<td>■ ALM processes</td>
</tr>
</tbody>
</table>
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Insurance

- Insured object        Trigger        Claim
  - The insurer assumes risks
  - The insurer is liable to the policyholder
  - The insurer assumes the financial consequences of such risks
Insurance based on mathematical concepts

- Law of large numbers (Jakob Bernoulli)
  
  Jakob Bernoulli (1655 – 1705)

- Time value of money (Leonard Euler)

  Leonard Euler (1707 – 1783)
<table>
<thead>
<tr>
<th>Basic principles of insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Assessibility</td>
</tr>
<tr>
<td>- Randomness</td>
</tr>
<tr>
<td>- Mutuality</td>
</tr>
<tr>
<td>- Economic feasibility</td>
</tr>
<tr>
<td>- Threats of the same kind</td>
</tr>
</tbody>
</table>
## Market players in the insurance industry

<table>
<thead>
<tr>
<th><strong>Policyholder</strong></th>
<th><strong>Insurer</strong></th>
<th><strong>Reinsurer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual risks are transferred to the insurer</td>
<td>Risk pooling</td>
<td>Part of the risk and the premium is ceded to the reinsurer</td>
</tr>
<tr>
<td>Premium is paid upfront</td>
<td>Claims are paid as agreed in the policy</td>
<td></td>
</tr>
</tbody>
</table>

- **Policy**
- **Cession**
Reinsurance definition

- Reinsurance is spreading the negative financial impacts of an accidental loss on single economic units to a community of units, thereby reducing the overall opportunity costs for an economic system.

- Risk transfer is a core competence of a reinsurer.

- Risk transfer comprises identifying, assessing, underwriting and diversifying risk in order to minimize the total capital cost of carrying such risk.

- Main focus is on poolable or diversifiable risk.
Reinsurance is not banking

- The banking system is intrinsically illiquid because clients can cash in short-term accounts.

- In the (re)insurance sector, policyholders do not have access to cash without presenting a claim.

- The policyholder has the obligation to reduce the amount of loss as compared to a holder of a pure financial instrument.
Why reinsurance?

- To limit annual fluctuations
- To be protected in case of catastrophe and large claims
Example: NY blackout August 2003
**Example:**
**Epidemics and insurability**

**Influenza pandemics 1918 / 19**
- More than 20 m deaths caused by “Spanish Flue”
- US death toll 500 000; insurance claims of USD 125 m (0.5% of US GDP)

**SARS**
- 774 SARS deaths for period 1 November 2002 to 31 July 2003 (of a total of 8’099 cases in 30 countries)

Source: WHO, 23 September 2003
Value creation through diversification

Lines of business

Portfolio

Optimum

monoline

multiline

small

big

international

national
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### Financial statements of an insurance company

#### Main income statement items

<table>
<thead>
<tr>
<th>Revenues</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premiums earned</td>
<td>Claims paid</td>
</tr>
<tr>
<td>Investment income</td>
<td>Increase in reserves</td>
</tr>
<tr>
<td>Realised capital gains</td>
<td>Expenses incurred</td>
</tr>
</tbody>
</table>

#### Main balance sheet items

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investments</td>
<td>Reserves and unearned premiums</td>
</tr>
<tr>
<td>Receivables and recoverables</td>
<td>Payables</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>Debt</td>
</tr>
<tr>
<td>Other tangible assets</td>
<td>Other liabilities</td>
</tr>
</tbody>
</table>
Accounting vs. economic view

- Accounting rules for insurance and reinsurance companies are not always in line with an economic view
- Premiums earned vs premiums written
- Realised capital gains vs. total investment return
- Nominal vs. discounted reserves
- Capital costs are not considered in accounting
- Treatment of intangible assets
Assets and liabilities of an insurance company

- **Assets**
  - Investments (fixed income and equity securities, mortgages and loans, real estate, short term investments)
  - Premium receivables and reinsurance recoverables
  - Intangible assets
  - Other assets

- **Liabilities**
  - Technical reserves and unearned premium reserves (life and non-life)
  - Payables (reinsurance and other payables)
  - Other liabilities
  - Debt
Economic net worth

Accounting balance sheet

- Book value of assets
- Technical reserves
- Debt
- Book equity

Economic balance sheet

- Market value of assets
- Economic value of insurance liabilities
- Debt
- Economic net worth

Traditional accounting

Economic view
Economic value of liabilities

Replicating portfolio = combination of tradable instruments whose cash flows match best liability cash flows as well as expenses, taxes and capital costs

Economic value of liabilities = market value of replicating portfolio
Economic value of liabilities: simple example

- One-year contract with
  - expected claims: 100
  - expenses, taxes and capital costs: 10

- Replicated with risk free zero bonds paying 110 at maturity

- Economic value = discounted value at risk free rate (eg 2%)
  \[=\frac{110}{1+0.02}=107.8\]
Capital costs

Leveraged investment fund

Market value of assets
Replicating portfolio
Economic net worth

Insurance operations

Replicating portfolio
Economic value of liabilities

Capital costs = Market return benchmark + Frictional capital costs (risk and regulatory capital costs, double taxation cost)

Generated by investments

Generated by insurance operations
### Income statement (simplified)

<table>
<thead>
<tr>
<th><strong>Accounting view</strong></th>
<th><strong>Economic view</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Premiums earned</td>
<td>+ Premiums written</td>
</tr>
<tr>
<td>+ Investment income</td>
<td>+ Total investment return</td>
</tr>
<tr>
<td>+ Realised capital gains</td>
<td>- Claims paid</td>
</tr>
<tr>
<td>- Claims paid</td>
<td>- Increase in reserves</td>
</tr>
<tr>
<td>- Increase in reserves</td>
<td>- Expenses incurred</td>
</tr>
<tr>
<td>- Expenses incurred</td>
<td>= Econ. result before tax</td>
</tr>
<tr>
<td>= Result before tax</td>
<td>- Taxes</td>
</tr>
<tr>
<td>- Taxes</td>
<td>= Econ. result after tax</td>
</tr>
<tr>
<td>= Profit after tax</td>
<td>- Capital costs</td>
</tr>
<tr>
<td></td>
<td>= Economic profit</td>
</tr>
</tbody>
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Risks and assessment of risks

- Assets and liabilities as well as the income statement are exposed to various risks
- The economic view is the basis for risk assessment
Risk identification

- Interest rates
- Tropical cyclones
- Earthquake California
- Stock markets
- Inflation
- Terrorism
- FX rates
- Liquidity risk
- Company defaults
- Operational risks
- EMF
- Lethal epidemics
- Market value of assets
- Economic value of liabilities
- Economic net worth
- ... and many more
Large risks for (re)insurers

- Catastrophic events
- Mistaken trends – misjudging price cycles
- Bad investments

Questions:
- Has the world changed?
- Are there new risks?
- Are the new risks comparable to risks we had in the past?
New risks for (re)insurers?

- GMO
- EMF
- BSE
- Terrorism
- VJ CD - Hospital Crisis
- Nanotechnology
- Pervasive Computing
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Losses caused by natural and man-made catastrophes

Strong upward trend due to:

- higher insurance penetration
- growing property values
- coastal value concentration
- 2001: new threat dimension

Annual insurance cat. losses 1970-02 (Property/BI) worldwide (2002 price levels, in USD bn)

Source: Swiss Re sigma 2/2003
Life & Health insurance: mortality trend in U.S.A.

Trend?

Standardised Mortality Rates, USA, Men

Year

Deaths per Million


Sources: Stanford University, US Food & Drug Administration,
US Civil War Center & Center for Disease Control

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Globalisation leads to increased correlation between financial markets

Example: correlation between US & Europe

Source: Bank Leu
Interest rates are low – for how long will they remain low?

Long-term interest rates (10-year government bond yields)

Source: Swiss Re Economic Research & Consulting, Global Insight
Example: Prolonged bear market

<table>
<thead>
<tr>
<th>Period</th>
<th>Share prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929 - 32</td>
<td>-68%</td>
</tr>
<tr>
<td>1972 - 74</td>
<td>-42%</td>
</tr>
<tr>
<td>1999 - 02</td>
<td>-40%</td>
</tr>
<tr>
<td>1916 - 21</td>
<td>-25%</td>
</tr>
<tr>
<td>1939 - 42</td>
<td>-22%</td>
</tr>
</tbody>
</table>

Only two stock market crashes in 100 years were more severe than the recent

Note: Basis - S&P 500, values per year-end
Reinsurer rating downgrades 2001-2003

Swiss Re  Munich Re  Berkshire Hathaway  Employers Re  Hannover Re  Gerling Global Re  Converium  Allianz Re  SCOR  Partner Re

S&P rating

AAA  AA+  AA  AA-  A+  A  A-  BBB+ and lower

11 Sept ‘01  10 Nov ‘03
Risk definition

- There is not a single definition for “risk” that is consistently used in the industry

- Risk is used as one element to describe unknown future events

- In the finance industry risk describes the unexpected event, i.e. the deviation (positive or negative) from the expected outcome

- Risk should be distinguished from uncertainty
How does risk materialize?

- Earning targets not achieved
- Impairment of shareholder value
- Loss of market share
- Downgrading
- Capital base not sufficient
- Default

Undesirable

Catastrophic

- Differentiate between different risk potentials
- Compare the different risks
- Establish an enterprise-wide integrated view
Goals of risk management

- The art of risk management is to find the right balance between the opportunity to take risk and create value for the firm and the threat risk poses to the survival of the firm.

- Challenge:
  - common risk culture
  - complete and accurate assessment of risk
  - quantitative assessment of risk
Risk management philosophy: The three pillars

- Pillar 1 - quantitative risk measurement
  - systematic determination of total risk and the contributions of individual risk sources

- Pillar 2 - clearly defined risk management processes, incl. organisation as well as roles and responsibilities
  - common understanding of risk management function and basis for implementing and monitoring risk management policies

- Pillar 3 - transparency, which leads to proper behaviour, promotes mutual understanding, trust, and discipline in taking risks
  - confidence in the risk management organisation
The three pillars (illustrative)

Enterprise-wide Risk Management

Pillar 1
- Capital Adequacy
- Risk Capital
- Risk Aggregation
- Risk Analysis
- Risk Measurement
- Risk Models

Pillar 2
- Risk Capital Planning
- Risk Mgmt Guidelines
- Separation of Duties
- Risk Mgmt Policy / Limits
- Risk Mgmt Processes

Pillar 3
- Annual Shareholder Report
- BoD Risk Report
- Risk-adjusted Performance Report
- ALM Report
- Risk Report
- Transparency

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Quantitative methods - Industry best practice

<table>
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<tr>
<th></th>
<th>1980’s</th>
<th>1990’s</th>
<th>after 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy Risk</td>
<td>What-if Analysis, Peer Analysis, Assessment by Capital Markets and Outside Constituents</td>
<td>Scenario Analysis</td>
<td>Economic Risk Capital</td>
</tr>
<tr>
<td>Market Risk</td>
<td>Position and Sensitivity Limits</td>
<td>Scenario Analysis</td>
<td>- Comprehensive and consistent risk measure</td>
</tr>
<tr>
<td>Credit Risk</td>
<td>Position and Concentration Limits</td>
<td>Exposure Limits</td>
<td>- Increased risk transparency</td>
</tr>
<tr>
<td>Insurance Risk</td>
<td>Underwriting Guidelines</td>
<td>Threat Scenarios</td>
<td>- Basis for risk adjusted performance measures</td>
</tr>
<tr>
<td>Business Risk</td>
<td>Scenario Analysis &amp; Earnings-at-risk Models</td>
<td>Portfolio VaR</td>
<td>- Input into capital allocation process</td>
</tr>
<tr>
<td>Operational Risk</td>
<td>Scenario Analysis, Key Risk Indicators, Business Continuity Planning, Impact Scoring</td>
<td>Compliance, Internal Audit</td>
<td></td>
</tr>
<tr>
<td>Reputation/Brand Risk</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Risk measurement

- Risk is measured as unexpected loss of economic net worth within a given confidence level and time period.
- Assets and liabilities are affected in various ways by the individual risk factors.

Economic balance sheet

- Market value of assets
- Economic value of liabilities
- Economic net worth
- Risk
Risk modelling

- Stochastic modelling of risk factors, eg S&P 500, yield curves, loss frequency
- Dependency structure among risk factors, eg between equity markets, between credit and capital markets
- Exposure data, eg exposure per business unit to each risk factor
Risk aggregation and diversification

- Risk aggregation takes into account diversification effects
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From risk to risk capital

- Risk quantification allows for
  - risk monitoring and reporting
  - risk controlling and limiting

- Risk capital is needed to absorb unexpected losses

**Economic balance sheet**

- Market value of assets
- Economic value of liabilities
- Economic net worth
- Available risk capital
- Required risk capital
- Risk
Objective of enterprise-wide and integrated risk management

- From a enterprise-wide and integrated risk management perspective a company needs
  - to clearly define its risk appetite with respect to the various risks it is or wants to be exposed to, and
  - to make sure that risk is managed so as to stay within the self imposed boundaries

- Overall risk appetite needs to be defined to reflect the company’s risk tolerance and the amount of available risk capital
Required capital

Model risk factors, dependence, exposures → Estimate distribution of economic net worth → Apply risk measure to obtain required capital → Compare (available vs required capital)

Risk factor
Exposure
Dependence

Required risk capital = Available risk capital
Example: Swiss Re’s risk adjusted capital (RAC)

**Economic balance sheet**
- Market value of assets
- Economic value of liabilities
- Economic net worth

**Depletion Capital**
Average of the 1% worst economic outcomes (1% shortfall) within a business year

**Risk Tolerance Capital**
Capital required to withstand a second large event on a post-depletion book
Diversification of risk capital

Sum of locally required capital

Globally required capital
What is capital adequacy?

- A capital adequacy framework defines available capital (risk bearing capital) and required capital (economic risk capital)
- Different parties (regulators, management and rating agencies) have differing frameworks
Use of economic risk capital

- Risk measure
  - stand-alone risk and diversified risk measure
  - risk monitoring
  - risk limits

- Capital measure
  - capital adequacy
  - capital allocation
  - capital management

- Performance measure
  - economic profit
  - capital costs
Economic risk capital applications

Risk Capital Measurement → Capital Adequacy → Capital Resources

Risk Management

Risk Capital Measurement

Risk Capital Adequacy

Risk Capital Resources

Market Risk

Credit Risk

Insurance Risk

Diversification Benefit

Total Required Risk Capital

Available Economic Capital

Adjustments

Book Equity

Capital Needs → Performance Measurement → Capital Resources

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Summary

- Overview of (re)insurance business
- Assets and liabilities of a (re)insurance company
- Economic view
- Risk management
- Economic risk capital
- Capital adequacy
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