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# *Enterprise Risk Management*

*Thus 4<sup>th</sup> Nov 2010*

*Singapore Actuarial  
Society*

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# ***Content***

ERM overview

Progress in recent years

Risk appetite statement and Economic Capital

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Implementation

Current status across the insurance industry

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## *The part actuaries have to play in ERM*

- Chartered Enterprise Risk Analyst credentials.
- ST9 for the UK profession.
- Facilitate the movement of actuaries internationally.
- Increase the influence of the actuarial profession in the sphere of ERM, progressively in other industries.



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# ***ERM and what it means to organisations***

*ERM - A discipline by which an organisation in any industry assesses controls, exploits, finances and monitors risks from all sources for the purpose of increasing the organisations' short and long term value to its shareholders.*

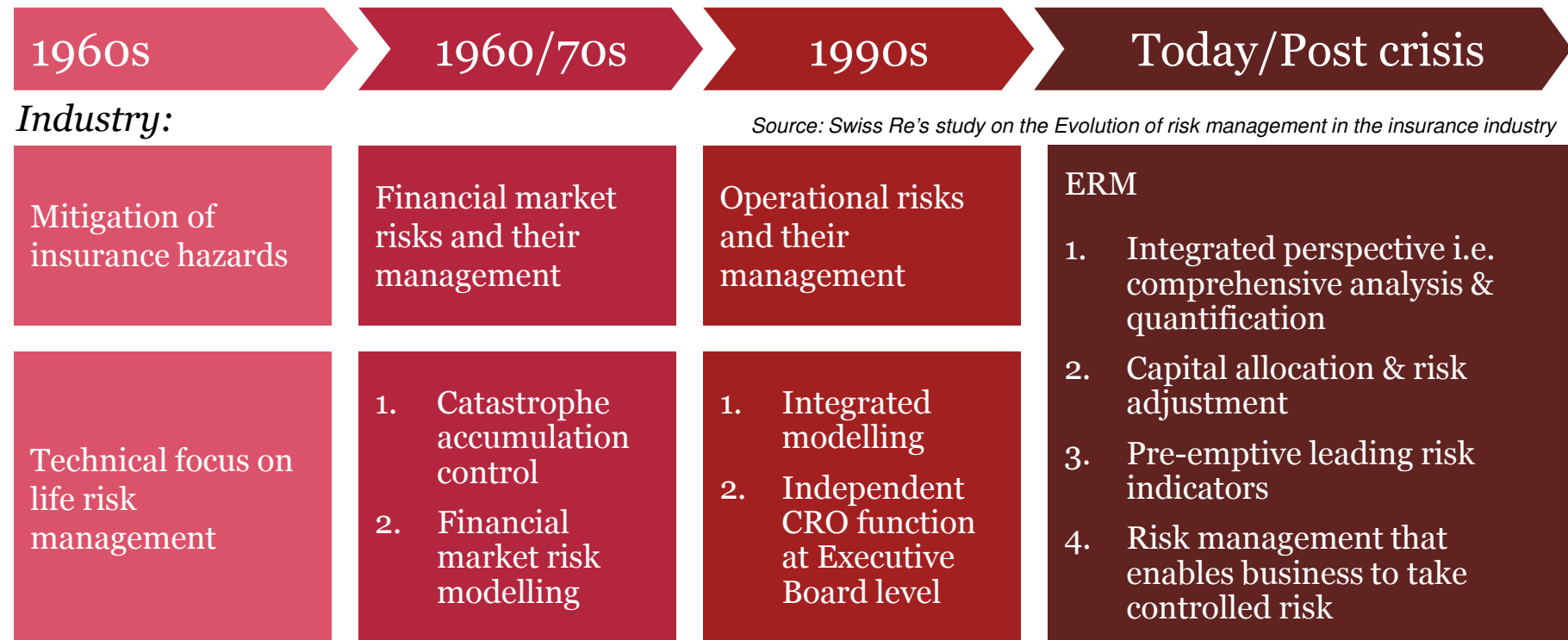
- Embraces a concept of a **wider, holistic** view of an organisation's **risk profile**.
- **Not** dealing with different risk types in isolation.
- Positive aspect is to encourages thinking away from downside risk towards creating an optimal risk/reward position.
- The aim is to '**embed**' a framework into the company's culture.

## ***In practice, this means:***

- Linking board-level discussions to operational guidelines for staff across the enterprise.
- **Emphasis has shifted** away from regulation towards providing impact to the bottom-line.
- By applying a suitably weighted risk appetite structure across divisions, management can quickly and accurately identify emerging risks and opportunities.

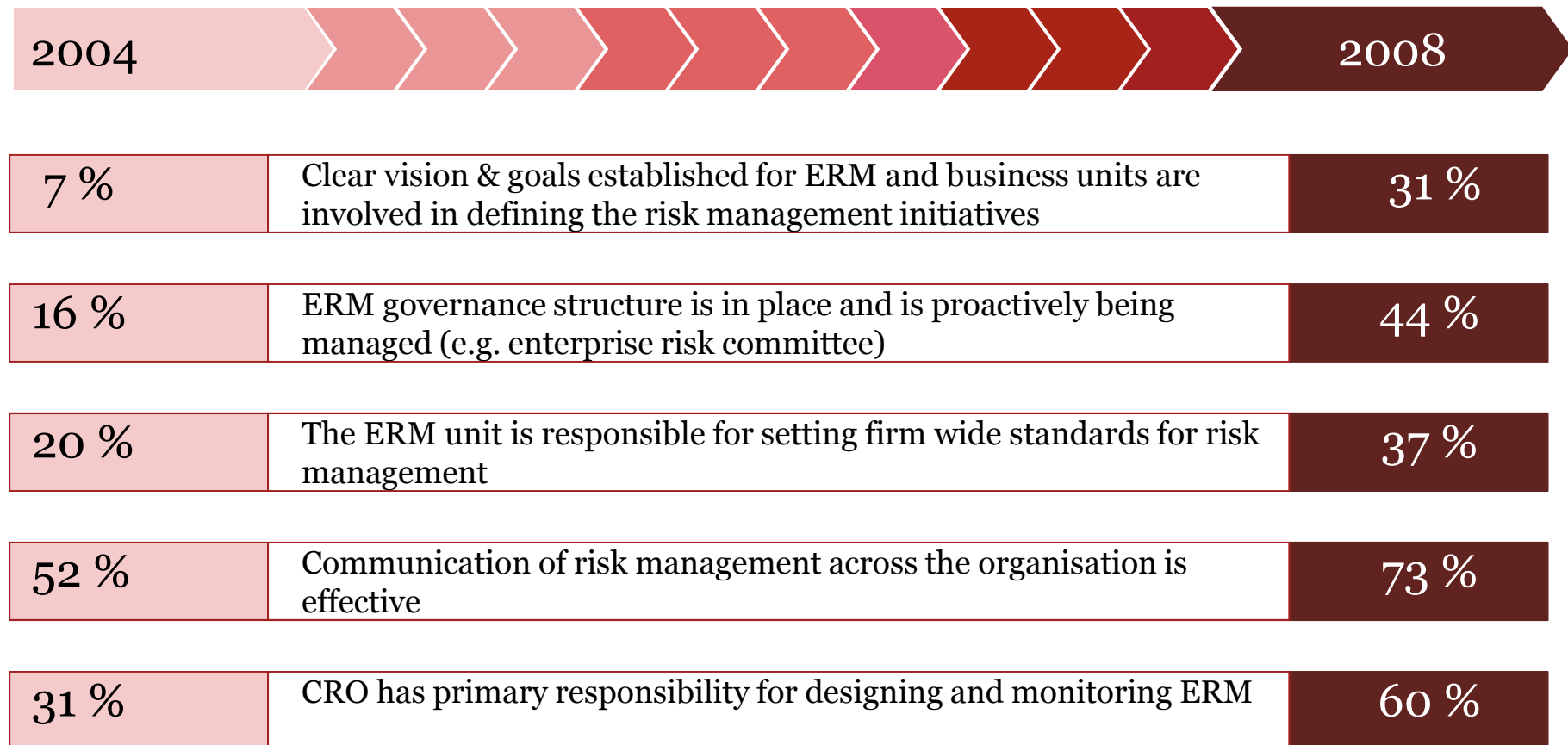
# Evolution of ERM

*Although it is self-evident that insurance and risk management are closely related, it is only in recent years that the concept of ERM has been taken on by an increasing number of insurers seeking to improve their management practices and the operating performance of their businesses.*



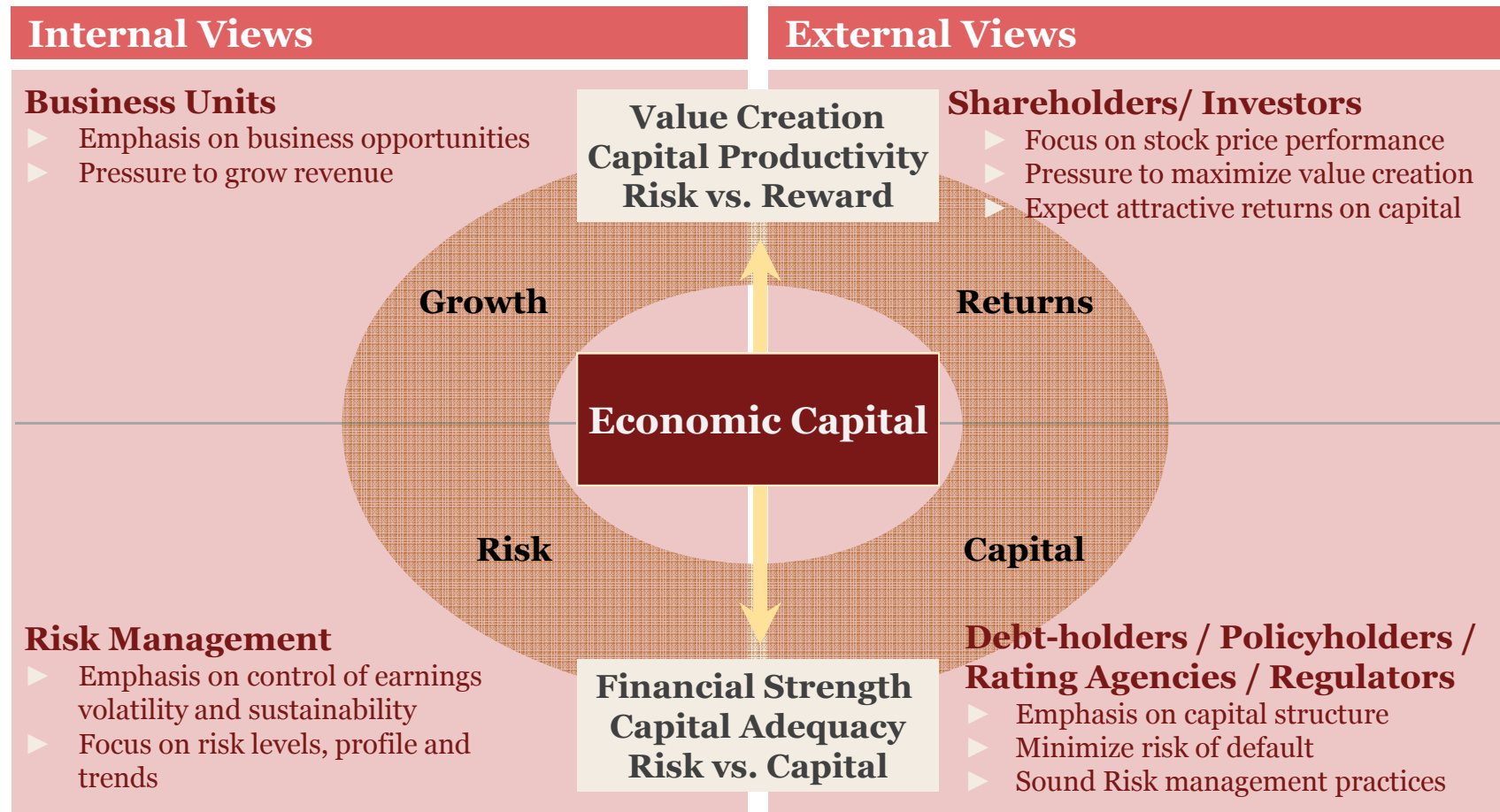
***ERM today: regarded as a practical & appropriate response & solution to manage risk in complex & interdependent markets.***

## *How far have we come?*

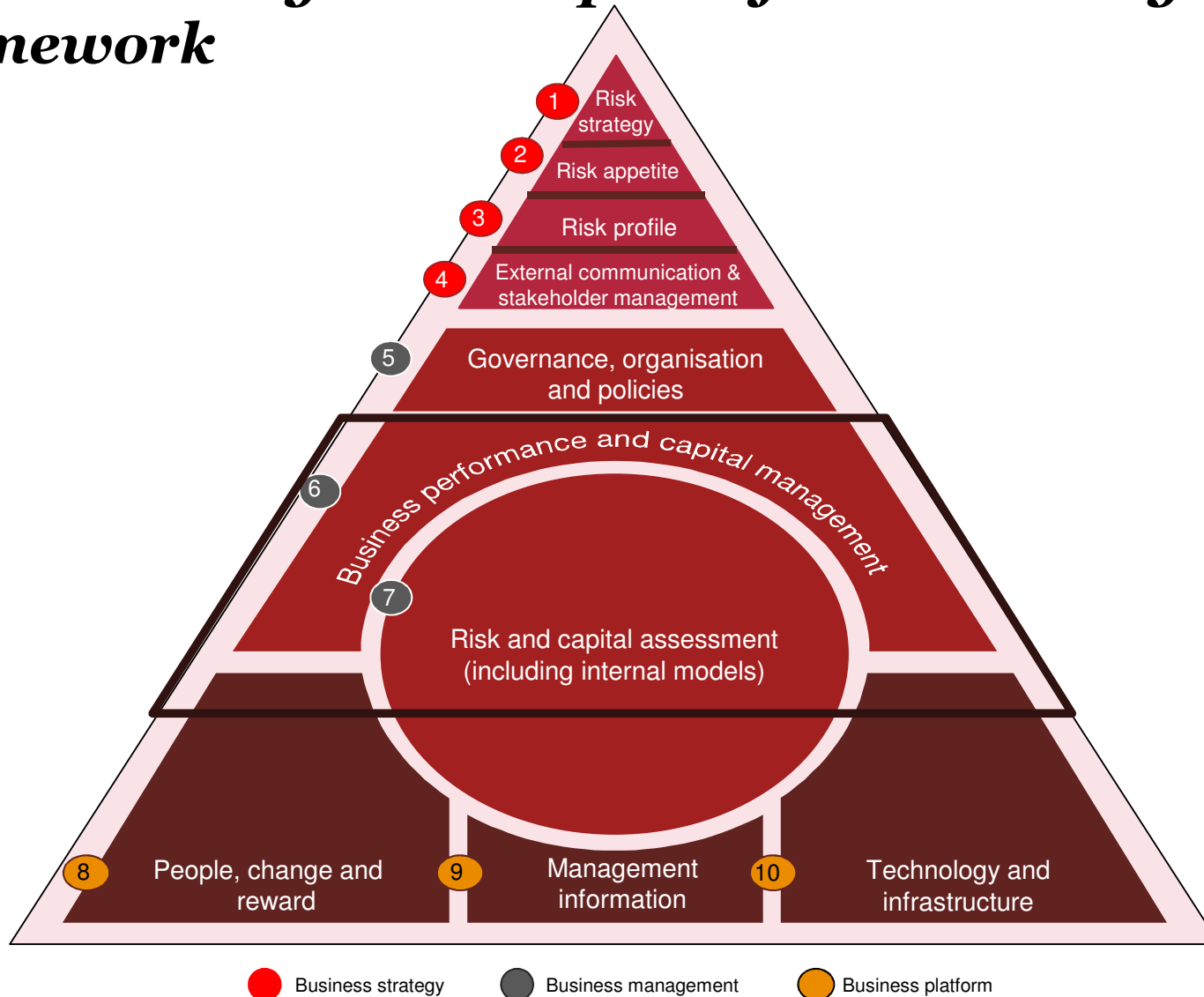


Source: PwC Global ERM Surveys 2004 and 2008

# *ERM helps Board of Directors, CEOs and senior managers to balance diverse interests of internal and external stakeholders*

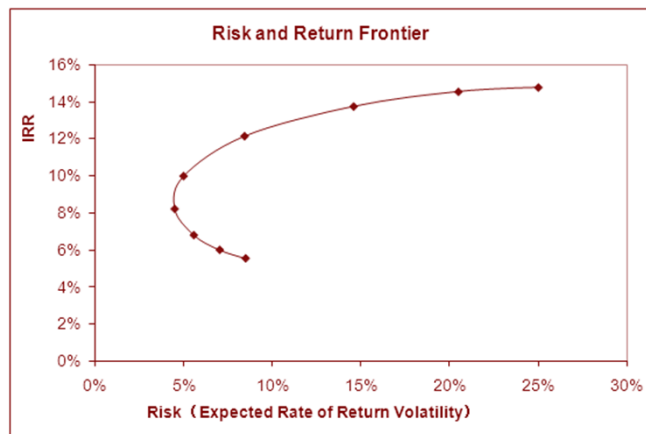


# *Capital management is part of a risk management framework*

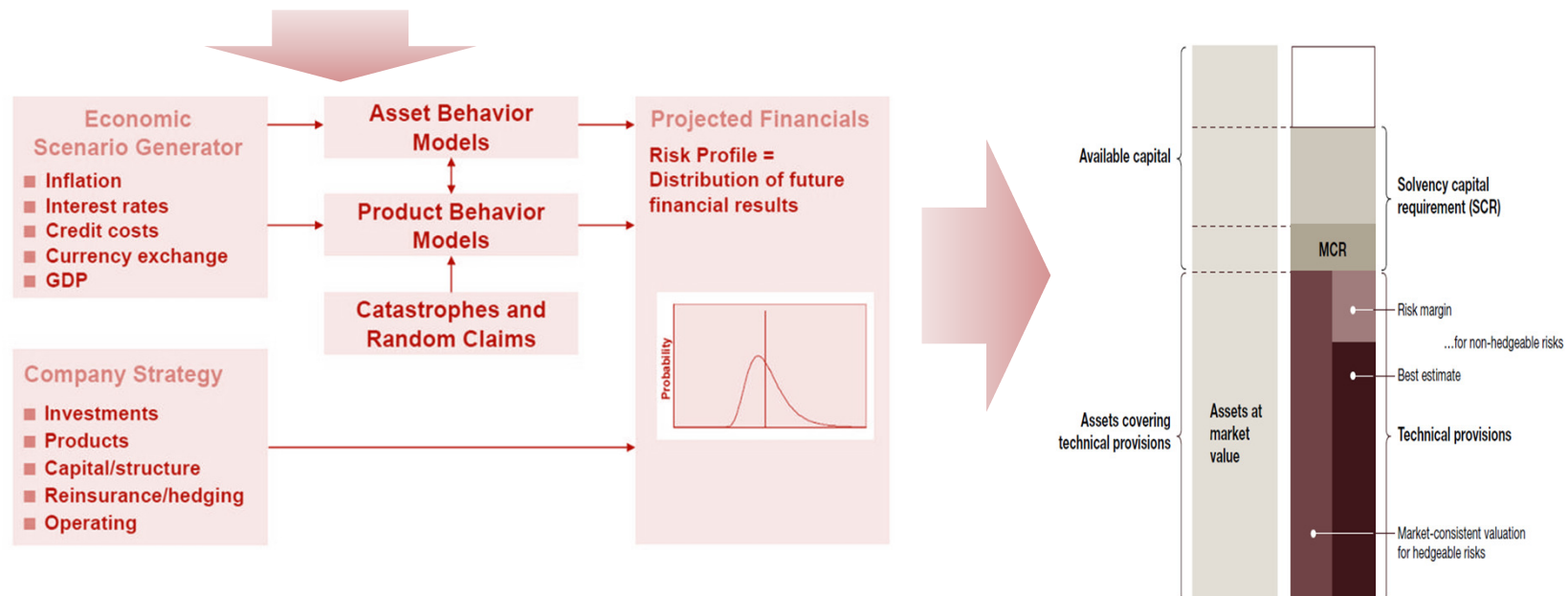




# Risk strategy



- Understand regulators and rating agencies' requirements on solvency capital and effective ERM frameworks.
- Optimize the level of capital being deployed and the target RAROC for the portfolio.



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# ***Risk appetite***

- Risk appetite is an expression of the willingness / capacity of an organisation to tolerate exposure to risk to achieve its strategic objectives.
- Risk appetite is typically set by the Board, but it should reflect investors' aspirations and regulatory requirements.
- Setting risk appetite is a subjective process which balances the expected returns that can be generated by taking risks and the corresponding potential for loss.
- Risk appetite frameworks provide management with a holistic perspective of balancing risk and reward.
- Defining a pragmatic and quantitative risk appetite framework is the focus of significant investment for financial services firms.

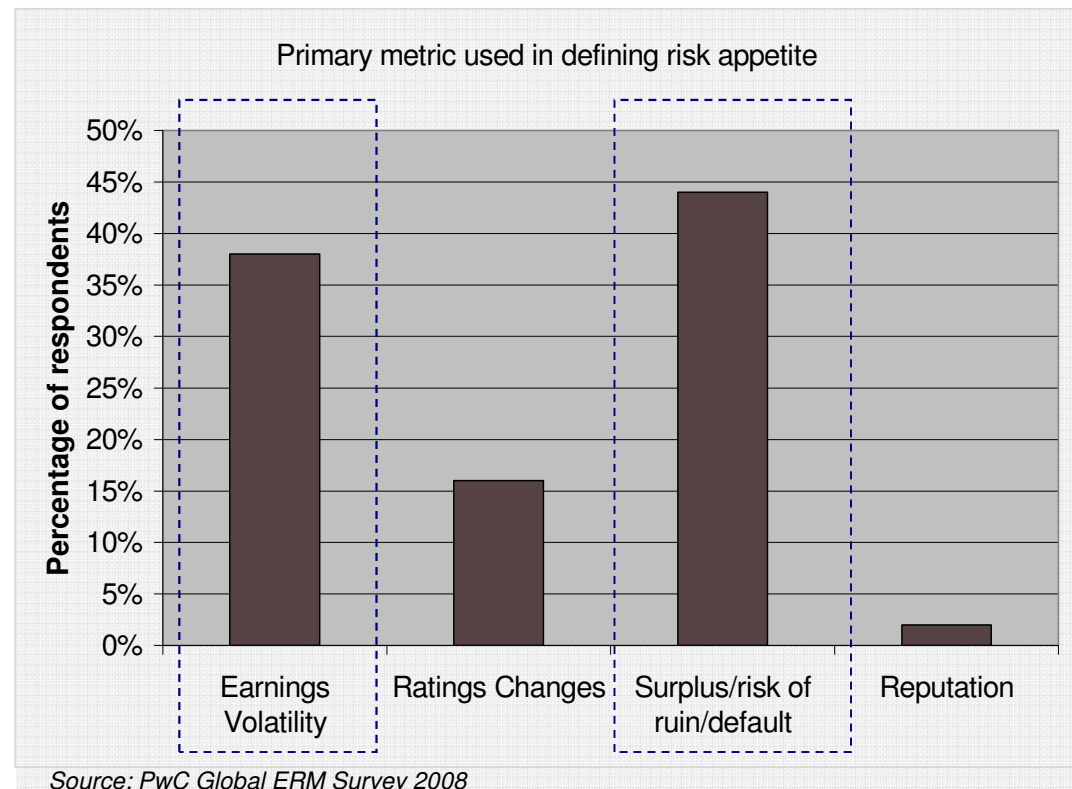
# Measurements of setting risk appetite

➤ Measurements of risk appetites naturally link to corporate strategic goals such as:

- Optimally manage the company's capital
- Eliminate risks that threaten solvency/viability
- Manage earning volatility
- Establish public reputation

- u The metrics that drive risk appetite are primarily surplus/risk of ruin/default and earnings volatility.
- u These measures both largely involve the finance department, indicating the need for alignment between the finance and risk management units.
- u In contrast to rating changes or reputation, the highlighted metrics have the benefit of being objective and timely.
- u However, surveyed also showed that companies lack confidence of their ability using surplus / risk of ruin.

PwC



# *Example of a risk appetite statement*

Metric	Indicator
<b>Quantitative</b>	
Earnings volatility	No more than 5% chance of being unable to pay our forecast dividend (i.e. we expect to pay our dividend in 19 out of 20 years). Do not deliver below market consensus earnings forecast for the Group and each of its Divisions by more than 20%
Return on equity	Target return on equity is 12%
Ultimate gross aggregate losses	% variance from planned accident year loss ratio
Credit rating	AA- (S&P probability of default 0.03%)
<b>Qualitative</b>	
Ability to sustain growth	Track systems constraints, process delays, management stretch
Insufficient business risk	Track rationale for acceptance/rejection of projects/new product approval
<b>Zero tolerance</b>	
Regulatory risk	No instances of flagrant breaches, fines or adverse headlines
Governance	No breach of delegated authorities

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# ***Economic Capital***

*Management's best estimate of capital required to operate “prudently” and “efficiently”*

- u Risk-based capital is required to protect firms from insolvency from severe **unexpected** losses.
- u The amount of capital needed is dependent on the firm's risk appetite and the confidence level applied.
- u The safer a firm wants to be (e.g. the higher its desired credit rating), the more capital it requires – **BUT** capital is not the only effective mitigant.
- u Economic capital needs to support growth as well as protect in periods of stress.
- u Economic capital represents the quantification of risk at a given **confidence level**.

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# *Methods for calculating Economic Capital*

## **ALM approach**

Net impact of risk on economic value of asset and liabilities

One year time horizon

## **Desired percentile VAR or tVAR**

99% / 99.5%

## **Multivariate stochastic models**

Correlation matrices

## **Risk being covered**

Market

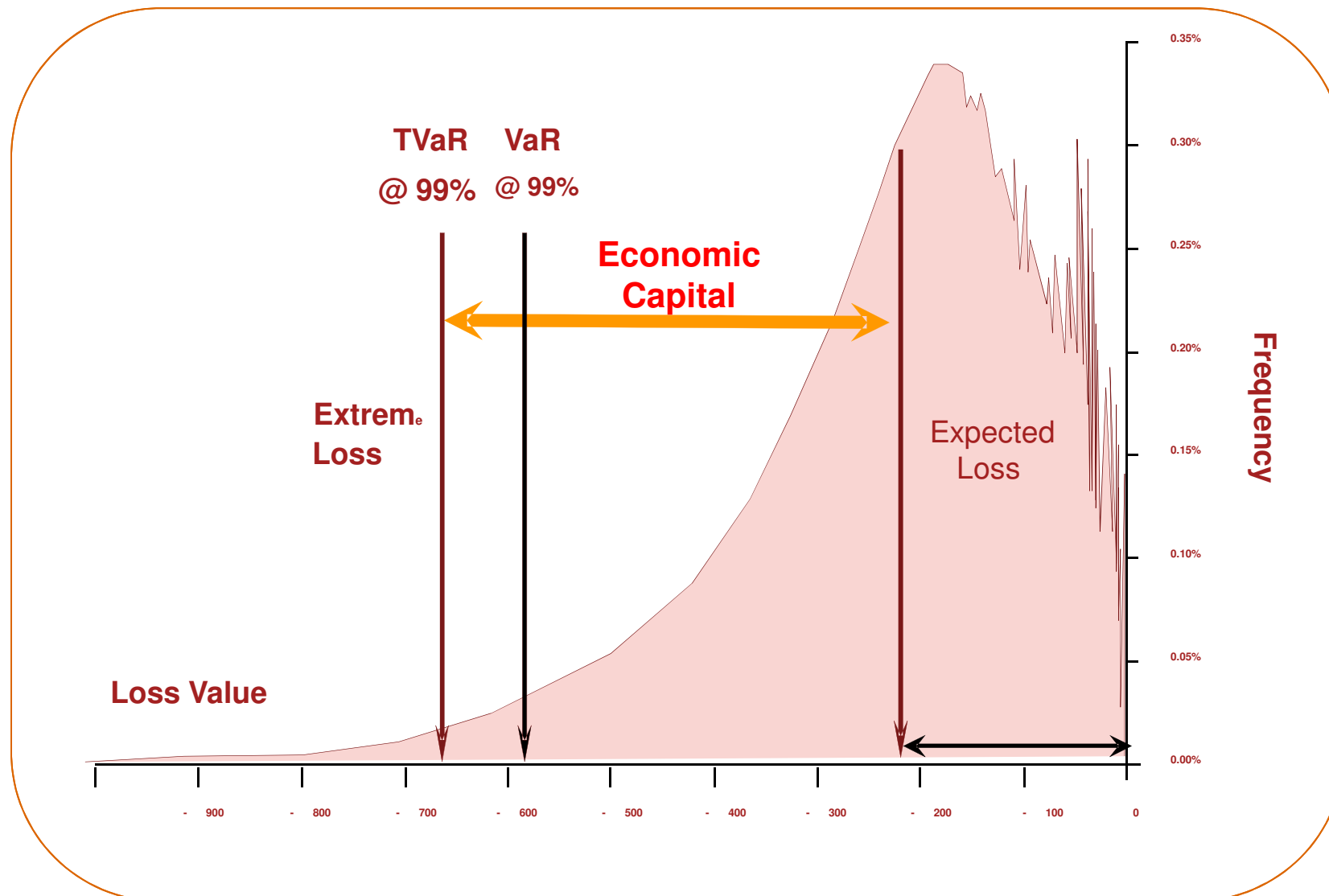
Insurance

Credit

Liquidity

Operational

# Risk analytics and modeling

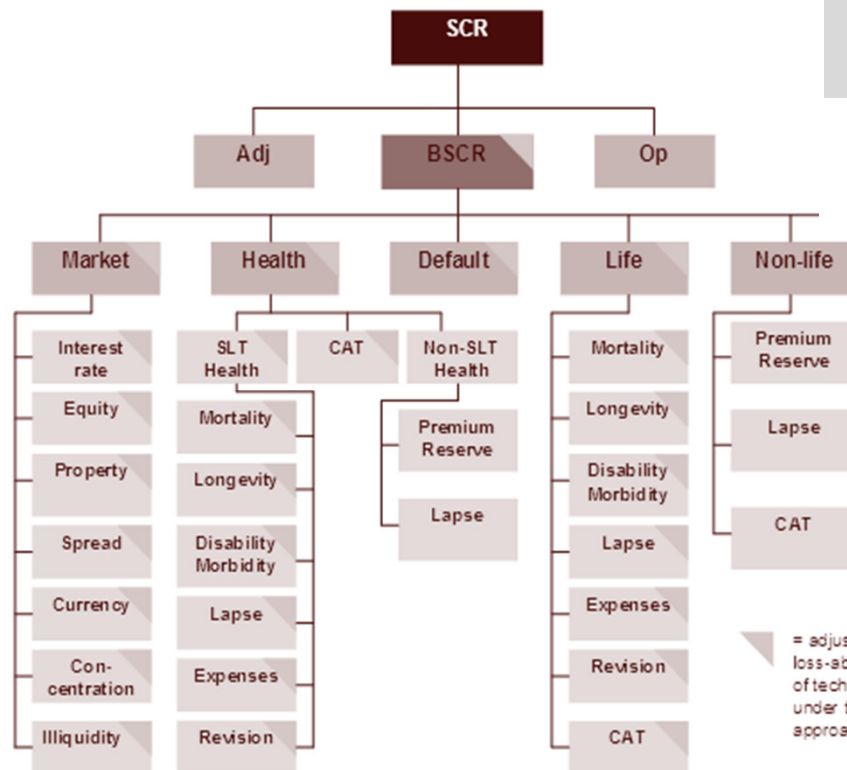
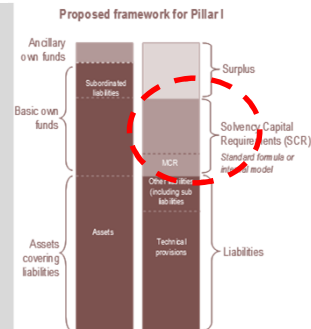


# Example: Framework of Solvency II

The standard formula calculation is divided into modules as follows :

$$SCR = BSCR - Adj + SCROp$$

- Basic Solvency Capital Requirement BSCR,
- Capital requirement for operational risk SCROp,
- Adjustment for the loss-absorbing capacity of technical provisions and deferred taxes



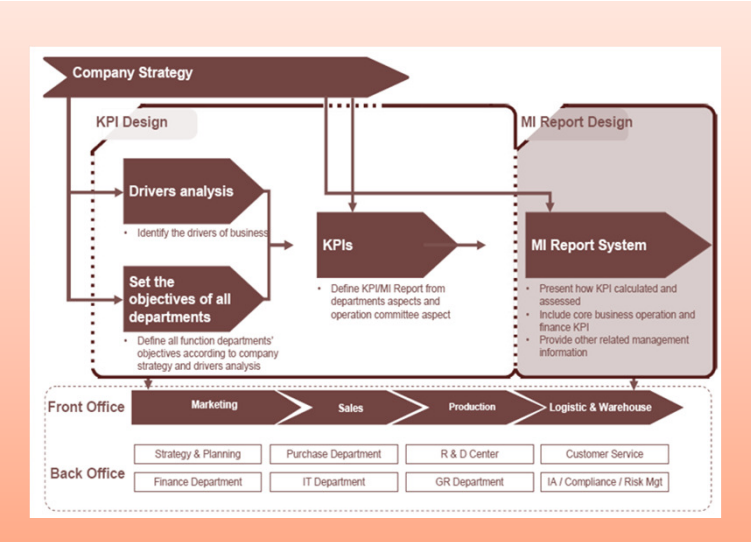
$$BSCR = \sqrt{\sum_{ij} Corr_{ij} \times SCR_i \times SCR_j} + SCR_{Intangibles}$$

	Market	Default	Life	Health	Non-life
Market	1	0.25	0.25	0.25	0.25
Default	0.25	1	0.25	0.25	0.5
Life	0.25	0.25	1	0.25	0
Health	0.25	0.25	0.25	1	0
Non-life	0.25	0.5	0	0	1

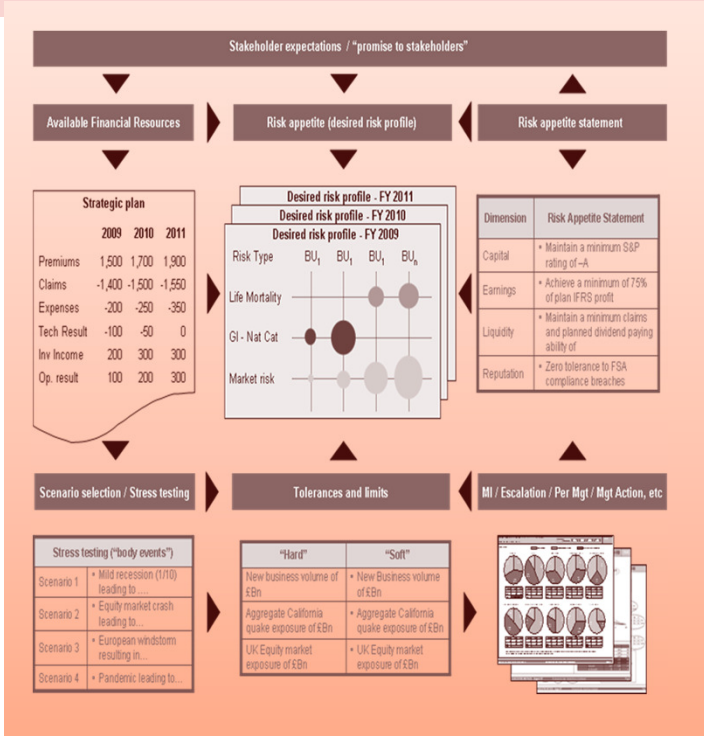
= adjustment for the loss-absorbing capacity of technical provisions under the modular approach



## *Data management and reporting*



- Management information system is fundamental
- IT infrastructure and data quality of risk models and risk metrics all need to be integrated



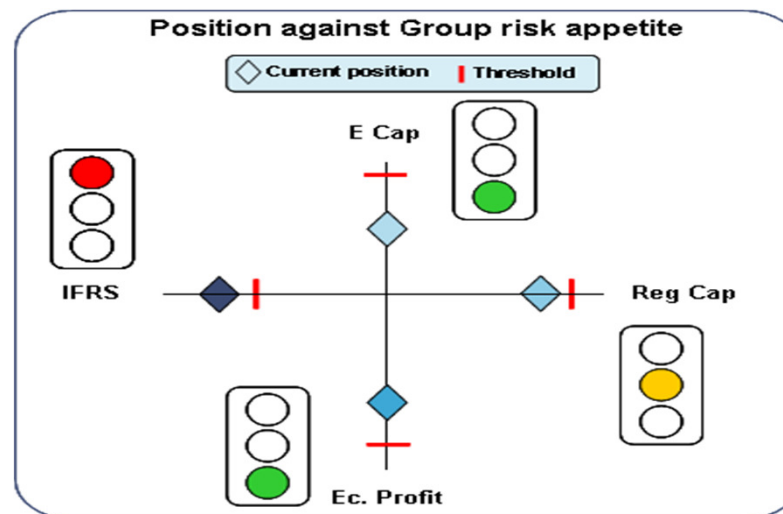
# Risk appetite, process and profile

## Group Risk Appetite Statement

Dimension	Risk Appetite Statement
Capital	• Maintain a minimum S&P rating of A+ within a 1/250 confidence interval
Earnings	• Achieve a minimum of 75% of plan IFRS profit nine years out of ten
Liquidity	• Maintain a minimum claims and planned dividend paying ability
Reputation	• Zero tolerance to regulatory compliance breaches

## BU level risk limits and thresholds

	"Hard"	"Soft"
• New Business volume :	$\$X_H$	$\$X_S$
• Aggregate exposure to catastrophes :	$\$Y_H$	$\$Y_S$
• Equity market exposure :	$\$Z_H$	$\$Z_S$



# ***What is covered in external communications?***



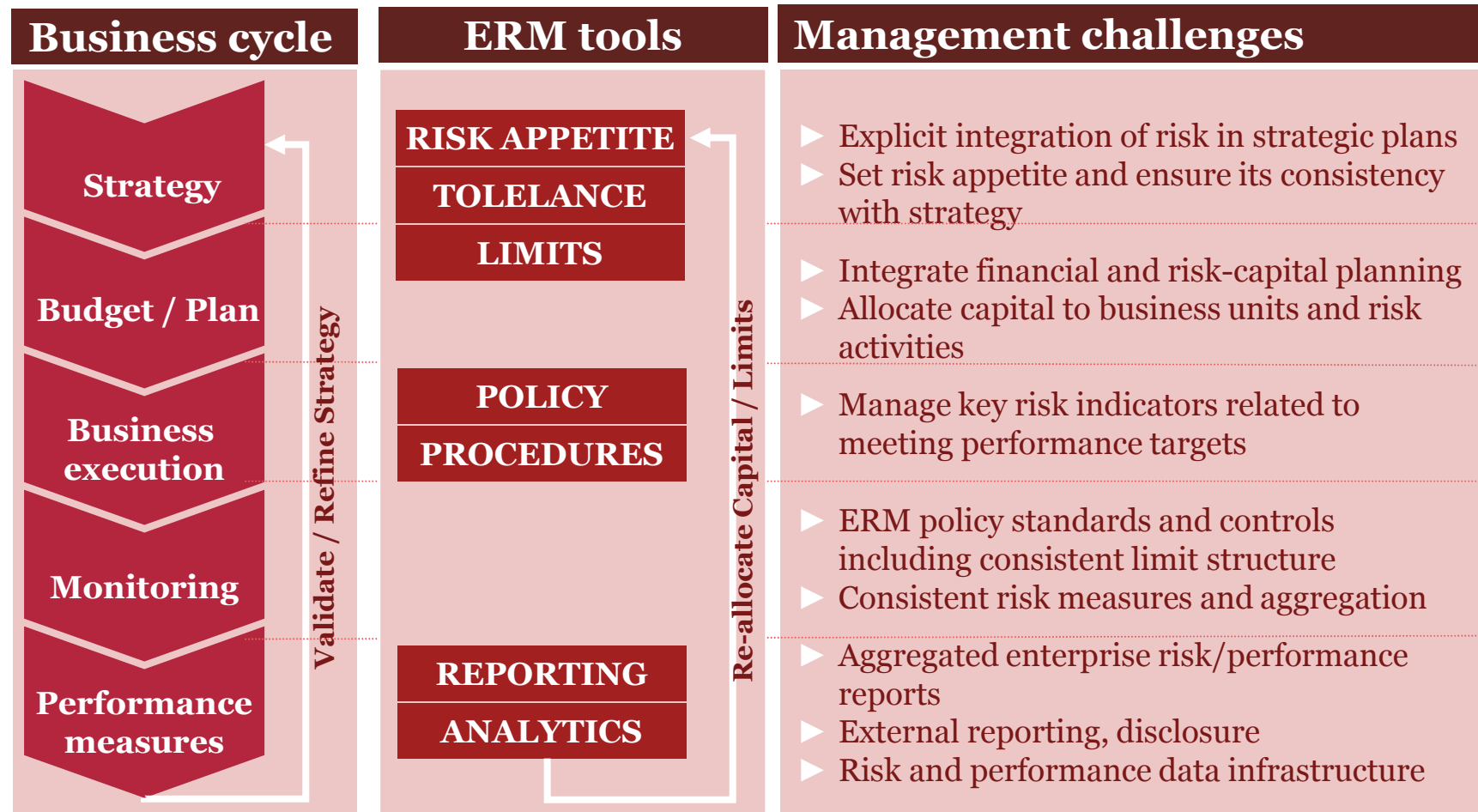
## **What is included?**

- Risk and capital disclosures to the market and rating agencies, both qualitative and quantitative, including linkages with other reporting bases (IFRS, EEV/MCEV).
- Solvency II communications to the Regulator (e.g. Report to Supervision, Solvency and Financial Condition Report, Annual Returns).

## **Drivers for change:**

- Increased pressure from the market to report on risk and capital, especially solvency position, risk appetite, risk& return expectations and how risks are managed.
- Constant challenge for the market to present an integrated and coherent view of the company and articulate this in a simple way – Solvency II just adds another dimension.
- Lack of trust and understanding of the industry by the market – better transparency is required
- No surprises culture is also being driven internally
- Data may not currently be available to report in the way companies want to present information or how analysts want it
- Specific Solvency II disclosure requirements

# *ERM in business cycle*



**Relating strategy, objectives, appetite and tolerance is required to effectively manage risk in a strategy setting**

# *The implementation process*

## Design

- Business case
- Selection of approach, methodologies and models
- Policy and framework development
- Management awareness
- High level programme plan/roadmap

2 - 4 months

## Build

- Risk appetite
- Technical guidance
- Model selection
- Process design
  - Strategy → budgeting → performance reporting
  - Risk adjusted performance measures
  - External communication plan
- Prototype economic capital model
- IT and data architecture
- Capital planning
- Integration plan
  - Compensation

3 - 12 months

## Integrate

- Embed in management processes
  - Strategic planning and budgeting
  - Performance measurement
  - Data quality
  - Pricing
  - Portfolio management
  - Compensation
  - External communication
- Internal communication and change management
- Benefits realisation

6 - 24 months

## Validate

- Benchmarking against best practice
- Model validation
- Solvency II compliance assessment
- Data quality review
- IT architecture assessment

On-going

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# ***SE Asia: The Earning-At-Risk Model***

## **Client's needs:**

- Company T, an airline company in SE Asia, needs to understand the volatility of its earnings in the next two years.

## **Our approach**

1. An Earning-At-Risk Model is built. Six selected risks are assessed and modelled by use of historical data, Company T's expert opinion and PwC's experience.
2. The risks are integrated in Company T's financial forecast through 'stochastic modelling': Definition of ranges of outcomes and the associated probabilities.
3. All technical assumptions are made in line with market practice.
4. Ten thousand (10,000) scenarios for the risks are simulated through 'Monte Carlo simulations'.
5. Effects of the 10,000 risk scenarios are measured on EBITDA and Net Profit.

# SE Asia: Building an Earning-at-Risk Model

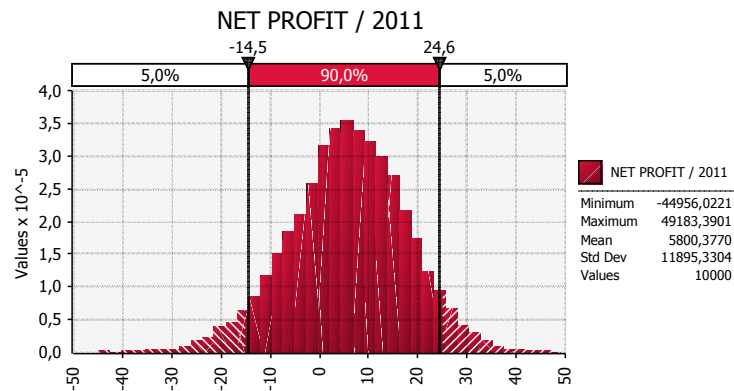
## Earning-at-risk simulation 2011

### Risk Drivers

Risks	Business and financial assumptions	Modelling assumption	Sources	Sensitivity
Jet fuel price	<ul style="list-style-type: none"> <li>Expected price in the future is the latest observed spot-price in the market.</li> <li>Market-volatility set at 34% - equal to the long term volatility in the market.</li> <li>Limits in potential yearly changes -75% to +100%</li> <li>100% of changes in fuel prices are on average transferred to surcharges.</li> <li>This varies by a standard-deviation of 25% due to lags in surcharge-price changes</li> <li>Demand sensitivity to price changes: -25% (10% increase in price decreases demand by 2.5%)</li> <li>45% of exposure is on a rolling basis hedged 0.5 year forward by use of forwards/futures. No transaction costs assumed</li> </ul>	<ul style="list-style-type: none"> <li>Changes in jet fuel prices are normally distributed consistent with normal practice</li> <li>Surcharge efficiency varies by a normal distribution around 100% with a standard-deviation of 25%</li> </ul>	<ul style="list-style-type: none"> <li>Market data (A)</li> <li>Interview w. Marketing</li> <li>Phone conversation with Finance (Hedging policy)</li> <li>Fuel Surcharge data (H)</li> </ul>	High
Under-performance of fleet	<ul style="list-style-type: none"> <li>Worst case loss of market share is 3%-points (2010: 1%-point)</li> <li>Base case loss of market share is 0%</li> <li>Best case gain of market share is 1%-points (2010: 0.5%-point)</li> <li>Risk assumed not to impact mail and freight revenues</li> </ul>	<ul style="list-style-type: none"> <li>Market share changes are triangular distributed</li> </ul>	<ul style="list-style-type: none"> <li>Historical loss of market share (B)</li> <li>Interview w. Planning</li> <li>Interview w. Marketing</li> <li>PwC recommendation</li> </ul>	Medium
External crisis	<ul style="list-style-type: none"> <li>Likelihood of external crisis is set at 33%</li> <li>Worst case change in market growth is -15%-points (2010: -10%-point)</li> <li>Base case change in market growth is 0%-points</li> <li>Best case change in market growth is 3%-points</li> <li>Best case gain of market share is 1%-points (2010: 0.5%-point)</li> <li>Risk assumed not to impact mail and freight revenues</li> <li>In case of no crisis an additional 2%-point increase in market growth is assumed</li> <li>There is a rebound factor of 100% which means that a year after a crisis the market grows with an additional amount equal to the percentage point market-growth-reduction in the crisis year</li> </ul>	<ul style="list-style-type: none"> <li>Likelihood is binomial distributed</li> <li>Market growth changes are triangular distributed</li> </ul>	<ul style="list-style-type: none"> <li>Historical frequency of external crises (C)</li> <li>Historical market growth changes in (non) crisis years (B)</li> <li>Interview w. Planning</li> <li>PwC recommendation</li> </ul>	L, Medium, Low

Assumptions

Simulation Model

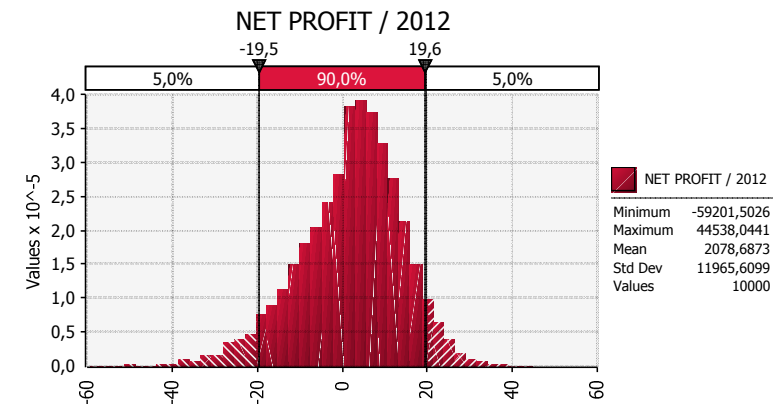


Net profit in 2011 is expected to vary by approx. +/- 20 USD at 90% confidence level

## Earning-at-risk simulation 2012

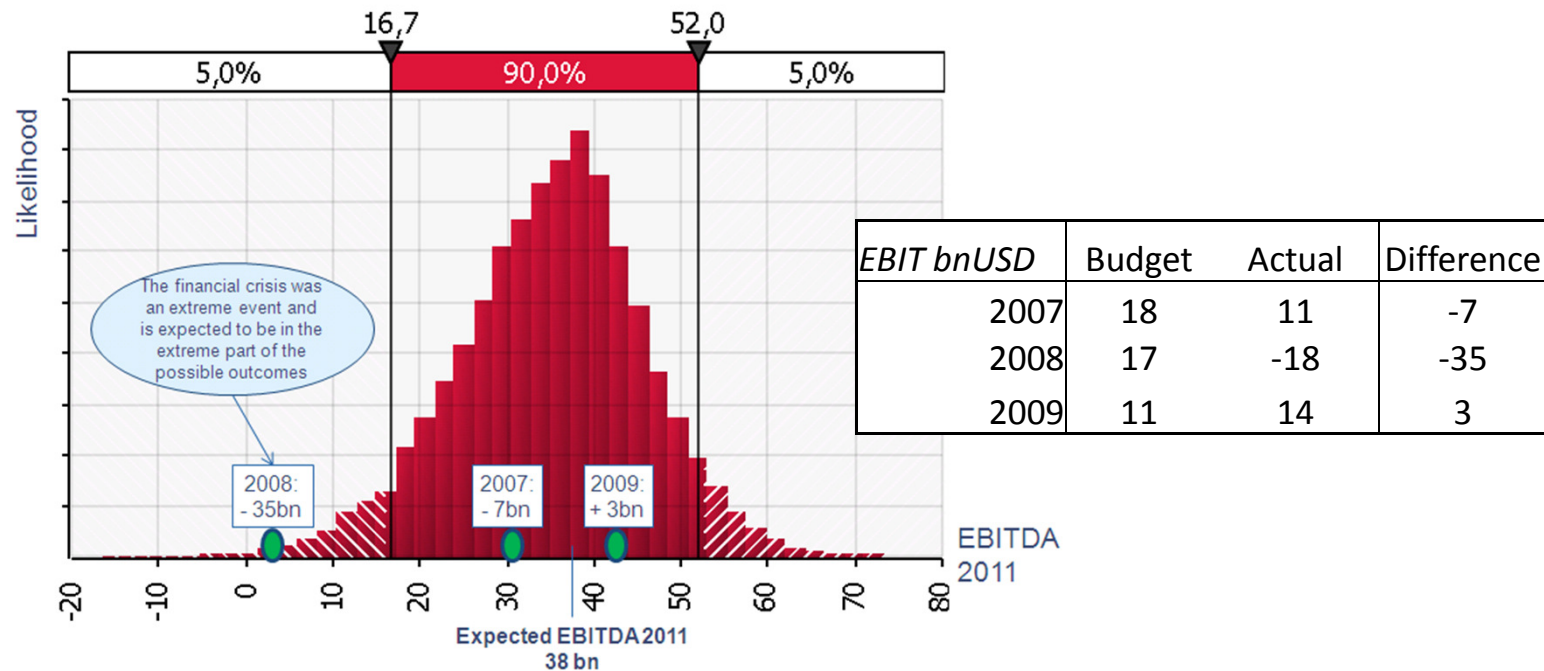
### Risk Drivers

Risks	Business and financial assumptions	Modelling assumption	Sources	Sensitivity
Accident	<ul style="list-style-type: none"> <li>Likelihood of accident is set at 0.5%</li> <li>Worst case change in market share is set at -5%-points (2010: -2%ip)</li> <li>Base case change in market share is set at -1%-points (2010: -1%ip)</li> <li>Best case change in market share is set at 0%ip</li> <li>Risk assumed not to impact mail, freight revenues or costs (most costs are insured and the deductible is less than 0.1 mUSD)</li> </ul>	<ul style="list-style-type: none"> <li>Likelihood is Poisson distributed</li> <li>Market share changes are triangular distributed</li> </ul>	<ul style="list-style-type: none"> <li>Historical frequency of accidents (D)</li> <li>Interview w. Marketing</li> <li>Interview w. Safety department</li> <li>PwC recommendation</li> </ul>	Low
Interest rate	<ul style="list-style-type: none"> <li>Expected rate is calculated by taking the implicit ratio of interest expenses and interest bearing capital in the P&amp;L forecast</li> <li>Market-volatility set at 1.3%-points</li> <li>60% of debt is floating, 40% fixed</li> <li>Changes in interest rates will only impact interest expense (interest income is insignificant)</li> </ul>	<ul style="list-style-type: none"> <li>Interest rates are log-normally distributed consistent with normal practice</li> </ul>	<ul style="list-style-type: none"> <li>Historical data (E)</li> <li>PwC recommendation</li> </ul>	Low
FX	<ul style="list-style-type: none"> <li>Expected long term losses/gains on FX is zero</li> <li>Yearly volatility in losses/gains are 5 bnBaht. (Two of last four years losses have been larger than 4 bnBaht. But volatility in most important trading currencies is only 5-10% (10% of EBITDA is 4 bnBaht)</li> </ul>	<ul style="list-style-type: none"> <li>FX gains / losses are normally-distributed</li> </ul>	<ul style="list-style-type: none"> <li>Last four years of FX losses/gains (F)</li> <li>Historical volatility in FX (G)</li> <li>PwC recommendation</li> </ul>	Medium
All risks	<ul style="list-style-type: none"> <li>Baseline is TC's latest financial forecast. We understand that latest market development means that earnings 2010 is expected to be improved by 8 bnBaht compared to the forecast</li> <li>Changes in revenues lead to immediate 10% relative changes in fuel costs and personnel costs (overtime)</li> <li>Correlations between risks are assumed equal to zero</li> <li>Tax expense in 2011 and 2012 is expected to vary with profit before tax but minimum zero. Tax in 2010 is assumed equal to zero</li> </ul>	<ul style="list-style-type: none"> <li>PwC recommendation</li> <li>Interview w. Planning</li> <li>Experience shows that correlations usually are small</li> <li>The correlation between FX Gains/Losses and Jet fuel costs is potentially not equal to zero. However the sensitivity of overall results to changes in the correlation has been tested and proven to be low.</li> </ul>		Low



Net profit in 2012 is expected to vary by approx. +/- 22 bn USD at 90% confidence level

## SE Asia: Model sanity check

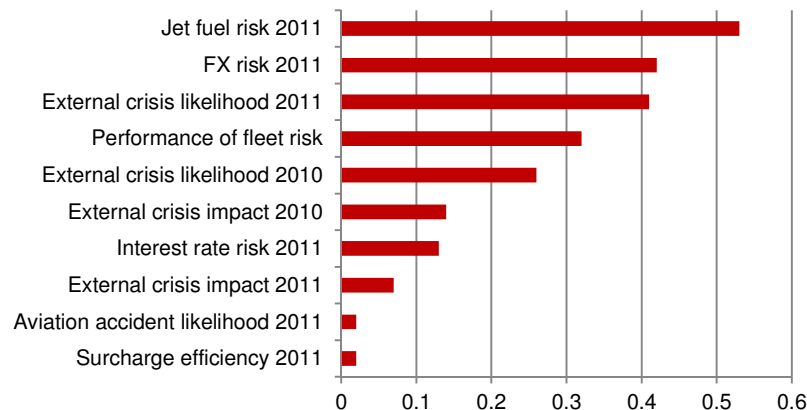


**The expected variance of earnings is in line with historical differences between budgets and actual**



# ***SE Asia: Risks indentified in the model***

**Tornado diagram: Variability of Net Profit 2011 to risks**



The 'tornado diagram' shows the covariance between the individual risks and the total portfolio risk. This indicates:

- The relative importance of the risks
- Sensitivity of the portfolio results to changes in assumptions

Risks	Earnings@Risk	Risk share
External crisis risk	14	38%
Jet fuel price risk	13	35%
FX risk	8	22%
Underperformance of fleet risk	7	19%
Interest rate risk	3	8%
Aviation accident risk	0	0%
Sum of individual risks	37	100%
Diversification effects	-14	-
Total portfolio risk	23	-

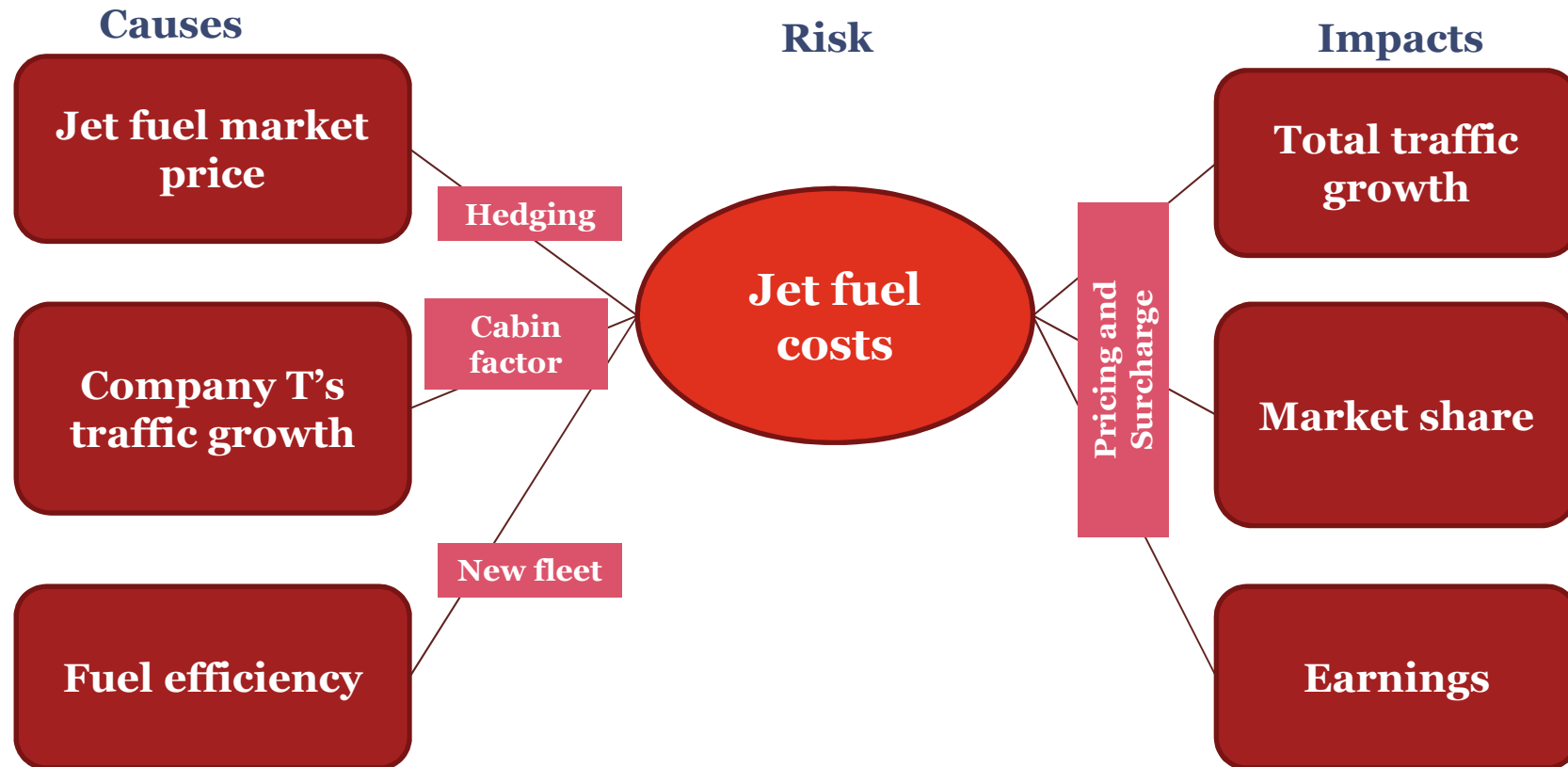
Earnings-at-Risk is measured as the difference in Net Profit in 2011 between the average result of simulations and the 5%-scenario for each risk holding other risks constant.

**The main contribution of risk to the total portfolio comes from jet fuel price risk, FX and extreme events**

# ***SE Asia: Risk mitigation***

## ***Example – Jet fuel costs***

Cause-effect relationships and mitigates of jet fuel price risk



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# ***Current status across the industry***

## **Risk, value and capital management is not new**

- Many of the larger insurance organisations have been using risk, value and capital management frameworks for some time now.

## **What is new is the need to...**

- Improve on existing frameworks (embedding, widen buy-in and usage, tackle the “which metric do I use across multiple business segments challenge”, link to compensation, etc.).
- Extend to those that have yet to convert (medium and smaller sized companies).

## **Drivers for change**

- Risk-based capital (RBC)/ Solvency II
- Scarcity of capital
- Shareholder / Analyst scrutiny
- MAS – Guidelines Risk Management Practices for Insurance Business – Core activities , November 2007.

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## ***Barriers remain and there is much work to do for most companies***

### **ERM's integration into risk decision-making is limited**

- Despite progress at the top, firm wide understanding of ERM typically remains limited.
- Despite clearly defined risk appetites, alignment of these and key business decisions is often limited.

### **ERM effectiveness is often hindered by poor risk information**

- Risk data quality and risk model usability remain large issues

### **Poor use of ERM to control risks and realise opportunities**

- While most insurers have a process to identify emerging risks, few are confident that it is functioning effectively.
- Most companies do not have a process to align their assessment of new opportunities with their risk appetite.

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Case study

Implementation

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# ***Thank you***

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