World-wide Trends in Scenario Analysis

Bank of Japan

Tokyo, July 2006

What is a "scenario"?

- A scenario may be defined as an outline, description or model of a sequence of unexpected or adverse events.

  - Scenarios vary in detail according to the level of the organisation at which they are researched and focussed, but are generally made up of similar components.

  - Scenarios are described using event types and may detail the causes and potential impacts of the event, should it actually crystallise.

  - Scenarios may also include a causal analysis, along with expected direct and indirect impacts, particularly those of a reputational nature.
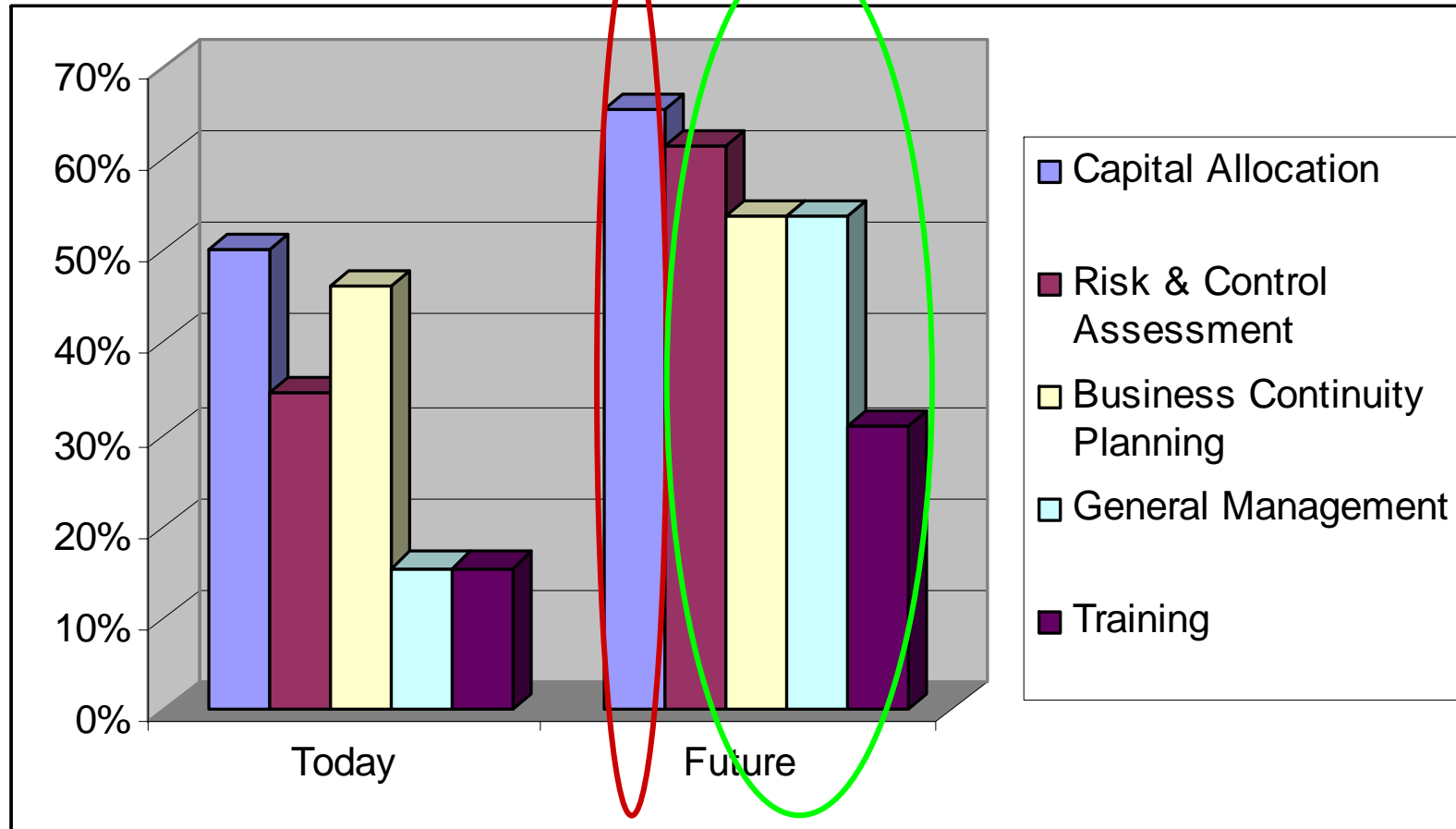
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Multitude of players

Basel II Project

Risk Management

BCM Team

AML

SoX

Six Sigma Team

Management

Internal Audit

KYC

Compliance

BPR Team

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Uses for Scenarios

Source : RiskBusiness survey of 36 firms in scenario workshops during 2005

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Uses for Scenarios

- ## Management:
  - Evaluation of exposure to risks and/or effectiveness of controls under specific conditions
    - General risk management
    - Supporting risk and control assessment
  - Risk Transfer/Mitigation
  - Crisis and Business Continuity Management
  - Training and Education

- ## Measurement:
  - Calculation of Economic or Regulatory Capital Requirements
    - Economic Capital (99.9% confidence level, 1 year time horizon – $UL_{99.9}$))
    - Expected Loss
    - Unexpected Loss for worst 1 year in 10 (UL_{10})

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The role of Scenarios

- The firm should clearly articulate the purpose behind its Scenario Analysis program and create a schedule for the different forms to be employed:

    - Risk evaluation and mitigation
    - Business continuity management
    - Training and education

- Need to clearly differentiate between Scenario Analysis and Risk and Control Assessments

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Scenario Analysis versus RCSA

- ## Scenario Analysis:
  - Understand a specific risk in sufficient detail to enable management to be properly prepared to deal with the event
  - Focus is end-to-end processing
  - Assumes risks identified, explores what else could go wrong from then
  - Explores root cause of loss event
  - "How would we respond?"

- ## RCSA:
  - Objective is identification of the high level risks associated with a specific unit, division or product area
  - Focus on individual process
  - Risks are identified and briefly described
  - May not have associated root cause analysis
  - "What are we exposed to?"

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Developing Scenarios

- Four primary approaches:
  - Loss Data-driven approach – use internal and public loss data to identify possible scenarios
  - Risk-driven approach – evaluate actual potential risks and select a range on severity
  - Control-driven approach – evaluate existing controls and measure impact of failure
  - Expert Opinion-driven approach – brainstorm possible "worst-case" situations which the business will have to deal with

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Using the four approaches

- In reality, risk and control approaches are the same, loss data and expert opinion approaches are similar – different between two groups is focus

- Can be viewed as top down (losses/expert opinion) vs bottom up (individual risk/control view)

- Advocate a hybrid of all four approaches

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Scenario Analysis for Management

- ## Outputs:
    - Assessment of management response
    - Identified corrective actions
    - Anticipated loss, deemed maximum loss and ancillary impacts (reputation, etc)
    - Trend over time of management effectiveness
    - Training proxy for experience and expertise in managing the unexpected or adverse event

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Scenario Analysis for Measurement

- Outputs:
  - Economic Capital (99.9% confidence level, 1 year time horizon)
  - Expected Loss
  - Unexpected Loss for worst 1 year in 10 (UL_{10})
  - Other percentiles of the loss distribution where necessary

  - Effects of insurance on capital (for cost/benefit analysis)
  - Effects of each scenario on capital (for management / mitigation project focus)

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Measurement Uses - Summary

- Primary objective is to get data points – frequency & severity

- Takes time to create, but then easy to maintain & analyse

- Program tends to be run centrally for whole enterprise

- Scenarios for capital are necessarily focused at the tail of the distribution
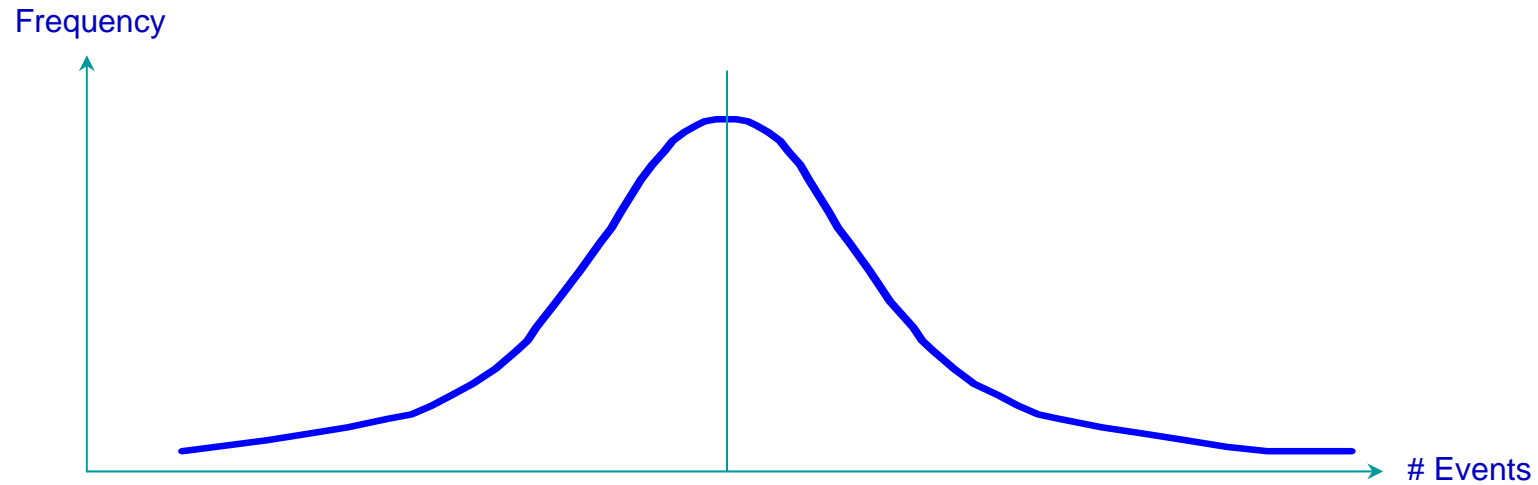
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Measurement Uses - Summary

- ## Standardised scenarios could:

  - Reduce the time to develop this type of program,

  - Ensure coverage of all key risks,

  - Identify and address correlation between scenarios, and

  - Minimise internal conflicts of interest in estimating impacts (due to capital allocation mechanism) by providing detailed descriptions of the likely impacts (in non-financial terms)

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Aspects to the Exposure Distribution

Frequency

Events

The Number of Events

Frequency

Severity

The Impact/Severity of Events

and

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Create Unique Loss Distribution

Frequency
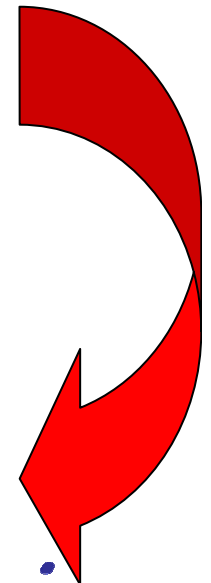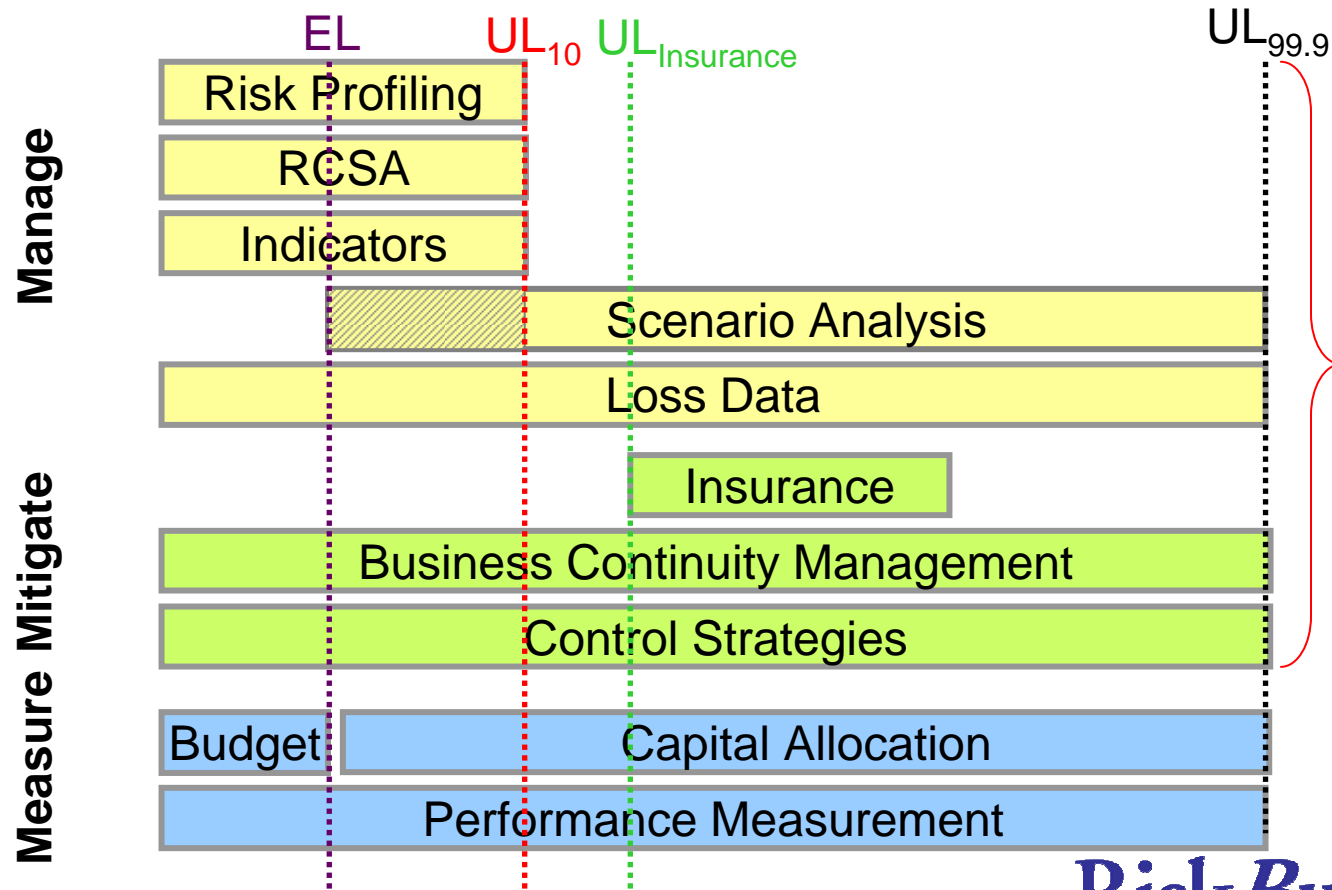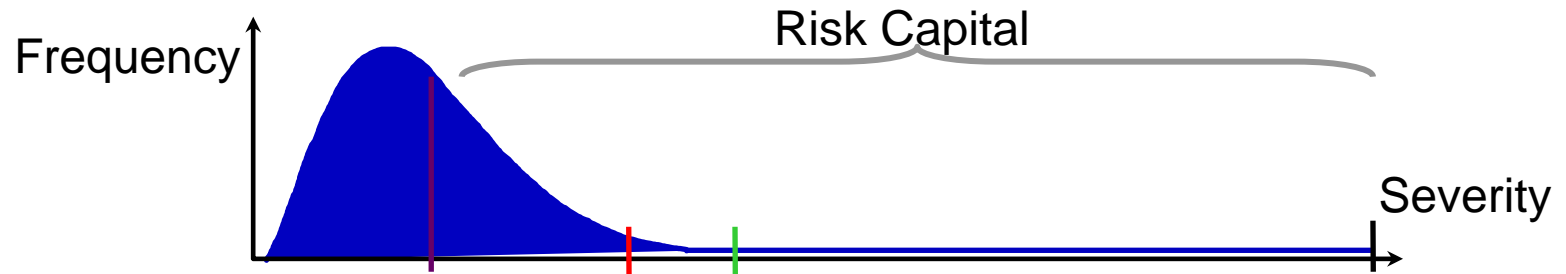
Aggregate Loss

EL

$UL_{99.9, 1yr}$
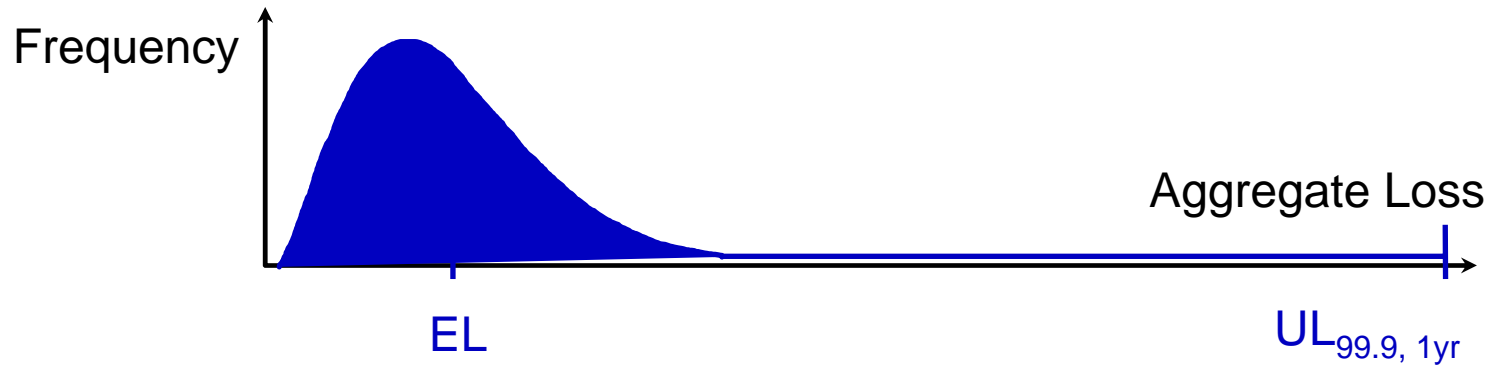
- The shape of the distribution is totally dependent on the business profile (determined from the risk profile) of the firm – the unique blend of strategy, culture, geographic sphere and business objectives create the distribution

- Only scenarios can reasonably represent this uniqueness in a risk/capital measurement model
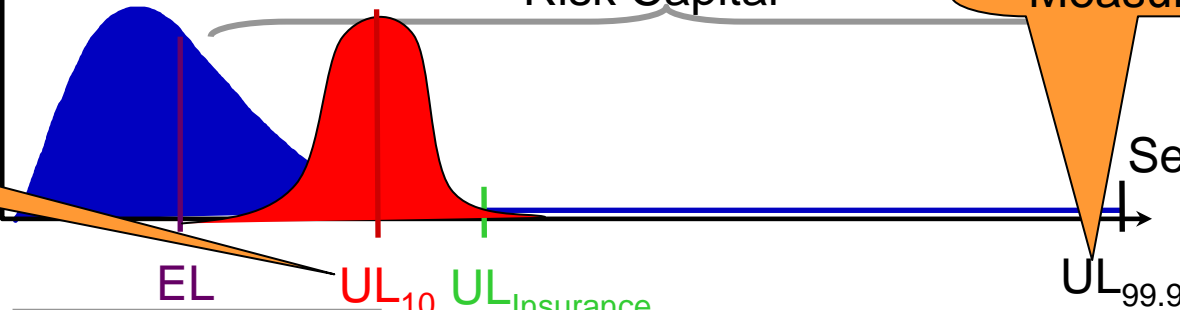
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Risk Tools

Frequency

Risk Capital

Severity

EL UL_{10} $UL_{Insurance}$ $UL_{99.9}$

Manage
- Risk Profiling
- RCSA
- Indicators
- Scenario Analysis
- Loss Data

Measure Mitigate
- Insurance
- Business Continuity Management
- Control Strategies
- Budget | Capital Allocation
- Performance Measurement

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Measures of Risk

Scenarios for Measurement

Scenarios for Management

Frequency

Risk Capital

Severity

EL UL_{10} $UL_{Insurance}$ $UL_{99.9}$

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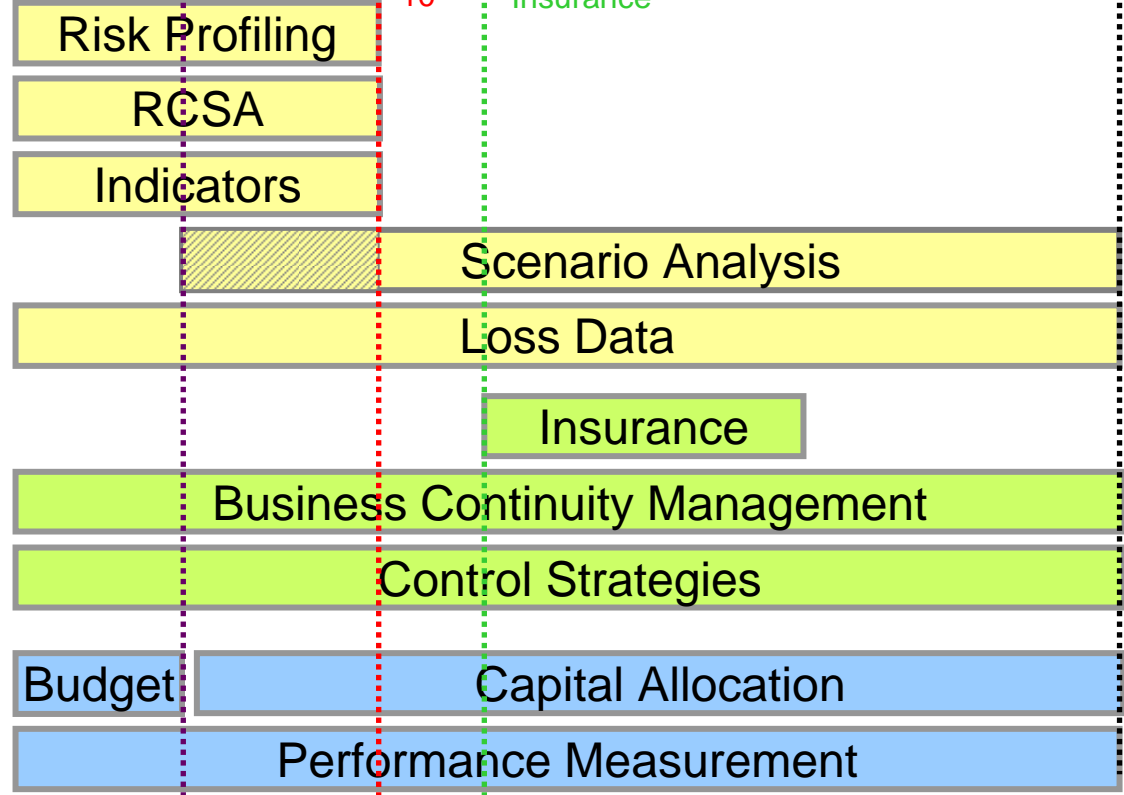
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Risk Profiling

- A process by which a firm develops a view of its exposure to a specific type of risk or to an aggregation of different risks.

- Requires:

  - Multiple inputs, including loss data, indicators and qualitative assessments

  - A methodology to correlate the inputs and develop a weighted output

  - A dynamic mechanism to monitor the changes in exposure over time

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Developing the risk profile
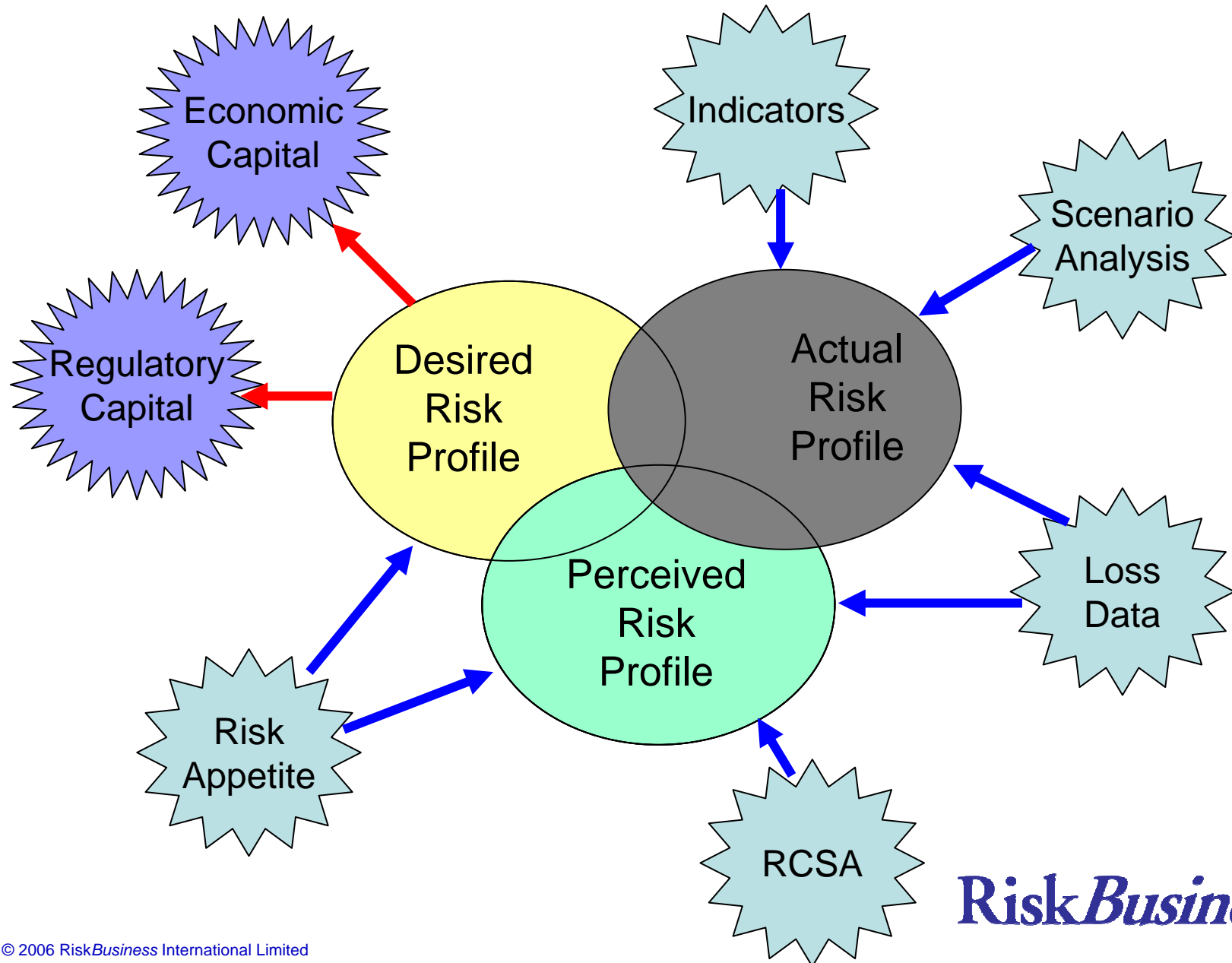
Establishing a risk profile at UL_{10}

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Column headers (grouped):

Processing Risks: Human Processing Error; Data Management; Reporting and Disclosure; Infrastructure and Systems; Fiduciary

Conduct Risks: Improper Practices; Unauthorised Market Activity; Internal Fraud and Theft; Diversity and Discrimination; Employee Relations

External Risks: Safe Environment; Natural Disaster and Accident; Willful Damage; Hacking and Disruption; External Fraud and Theft

Row labels:

Origination
- Product or Service Development and Suitability
- Customer Relationship Management
- Credit Review or Approval
- Models and Methodologies
- Research

Execution
- Advisory Services
- Custom or Structured Transaction Requirements
- Pricing and Quotations
- Limits and Facility Checking
- Instruction Management

Processing and Ops
- Transaction Capture, Fees Capture and Record Update
- Confirm, Affirm, Matching and Documentation
- Reference Data Creation and Maintenance
- Transaction Maintenance and Administration
- Interest Calculation and Application
- Client or Customer Statements, Valuation and Reporting
- Internal Valuation
- Trust and Fiduciary Administration
- Collateral, Margins and/or Netting
- Payment, Settlement and Collection
- Custody and Actions
- Asset Maturity and Disposals
- Reconciliation and Resolution
- Workouts and Credit Recoveries
- Cash Management
- Transaction Accounting

Business Continuity
- Planning, Training, Testing, Execution

Technology
- Development, Implementation & Project Management
- Infrastructure, Networks & Maintenance
- IT Security
- Disaster Recovery

Finance
- Budgeting
- Management Accounting
- Financial Reporting
- Taxation
- Regulatory Reporting

Oversight
- Policy, Surveillance and Monitoring
- Legal Advisory
- Litigation Management
- Audit and Investigation

Human Resources
- Recruitment and Training
- Appraisal, Promotion and Termination
- Renumeration, Expenses and Payroll

Corporate Services
- Physical Security
- Property and Facilities Management
- Insurance and Recoveries
- Vendor, Service Provider and Partner Management

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- Financial impact over 10-year horizon (excluding reputational risk and forgone revenue)
 - **High**
    - 9 – > $1,000 million
    - 8 – > $300 million and < $1,000 million
    - 7 – > $100 million and < $300 million
  - **Moderate**
    - 6 – > $30 million and < $100 million
    - 5 – > $10 million and <$30 million
    - 4 – > $3 million and < $ 10 million
  - **Low**
    - 3 – > $1 million and < $3 million
    - 2 - > $300 thousand and < $1 million
    - 1 – Financial impact < $300 thousand
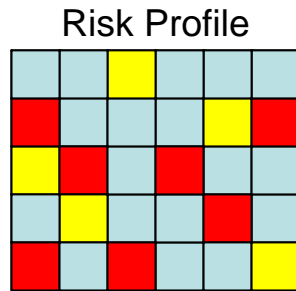
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Using Scenarios

- Most firms started with a pure Loss Distribution Approach (LDA) for economic/ regulatory capital, some started with Scenario Based Approach (SBA) due to a lack of data, many are now converging onto a Hybrid Measurement Approach (HMA), including both LDA and SBA concepts

16%

32%

40%

12%

- LDA
- SBA
- Hybrid
- Non-AMA
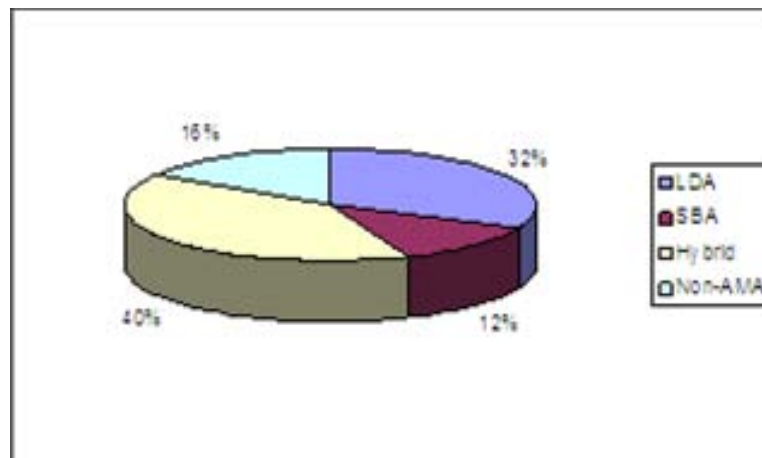
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Overview of SBA/HMA Model

Risk Profile | Loss History | Expert Opinion | Indicators | *Raw Information*

11.2002	2,330
12.2002	3,230
....	.....
05.2004	4,240

1

Parameter Sets

(λ, μ, σ) (λ, μ, σ) ... (λ, μ, σ) *Input*
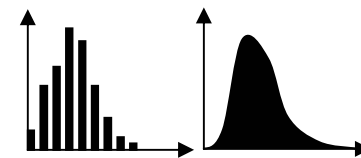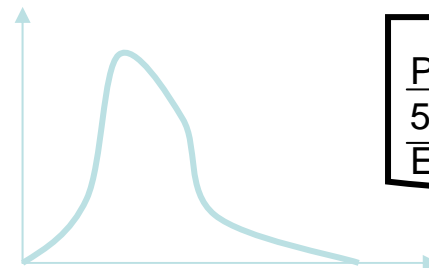
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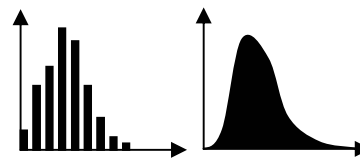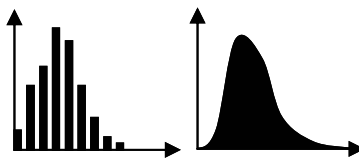
Risk Types   *Model*

...

3

Aggregate Loss Distribution

Percentiles
50% , 90%, 95%, 99.5%, 99.9%
EL, UL10,…

Output

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SBA/HMA v LDA

- A SBA/HMA can be more acceptable to business management for capital calculation purposes, particularly in the hypothesised event of a large loss followed by a dramatic improvement in controls

    - An LDA model would predict a large increase in capital, although qualitative adjustments could bring this down.

    - An SBA/HMA model would incorporate the qualitative adjustment into the discussion with business management, and provide increased transparency around the capital allocation process.

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SBA/HMA v LDA

- Loss data provides management with an immediate incentive to make changes to prevent reoccurrence of similar events, whereas use of scenarios can enhance the engagement of management in developing a more strategic forward view for investment budgeting purposes over the medium term, even in the absence of specific losses to the firm.

- LDA will always suffer from a lack of data, even when artificially enhanced using external or consortium data - which cannot realistically be tailored to a firm's unique profile by simple scaling

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SBA/HMA v LDA

- Some organisations believe that loss data is more objective as a measure of risk, and therefore a basis for risk capital calculation

- Others believe that the context dependency, and the fact that history tends not to repeat itself, particularly if controls are improved, actually destroyed some of the value that loss data purports to offer

- Most agree that risk capital is only part of the risk manager's toolkit, and that scenarios are a more holistic way of viewing risk, with value both for unexpected losses in the tail of the loss distribution, and risk management in the body

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HMA - the future "best practice"?

- An HMA model can leverage the best of both approaches:

  - Internal data can be used to develop the body of the loss distribution, and data generated from scenario analysis can be used to fill any gaps in this data, as well as to drive modelling of the tail of the distribution

  - Loss data can be used to determine loss frequency and scenario data to determine loss severity – the theory being that management may have relatively better insight on potential impacts

  - Hybrid approaches can be expected to increase the engagement of management in proactively managing risk, while at the same time enhancing the level of objectivity associated with the model

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Outstanding Issues

- Lack of "best practice"

- Need for standardised scenarios or a scenario library

- Suitable methods to convert actual external loss events into reliable scenarios

- How best to "benchmark" HMA models against each other or benchmark firm's responses to scenarios against each other

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Current Risk*Business* Activities

- Scenarios:
  - Development of a Scenario Library:
    - Set of standardised scenarios
    - Methodology for developing, assessing and measuring scenarios
    - Set of granular events which can be chained to create scenarios
    - Facility to benchmark scenario parameters
  - Scenario Analysis Frameworks, including scenario typing taxonomy
  - Benchmarking HMA and SBA models
- KRI Benchmarking with RMA
- Loss Data Consortium support

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Questions?

- For more information on scenario analysis, benchmarking scenarios or operational risk in general, visit:

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