



Operational Risk Scenario Analysis

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Operational Risk - 'Tail Events'



Operational Risk - Scenario Analysis

- Operational Risk - Definition
- Solvency II
- Role of Scenarios in Risk Management
- Role of Scenarios in Risk Quantification (VaR)
- Summary

- Operational risk means the risk of loss arising from inadequate or failed **internal processes**, **personnel** or **systems**, or from **external events**
- Operational risk shall **include legal risks** and **exclude** risks arising from **strategic decisions**, as well as **reputation risks**
- The capital requirement for operational risk shall reflect operational risks to the extent they are not already reflected in the risk modules.

SOLVENCY II DIRECTIVE, 25 November 2009

Solvency II

Operational risk is the risk of loss arising **from inadequate or failed internal processes, people, systems or external events.**

Operational risk also **includes legal risks.**

Reputation risks and risks arising from strategic decisions do not count as operational risks.

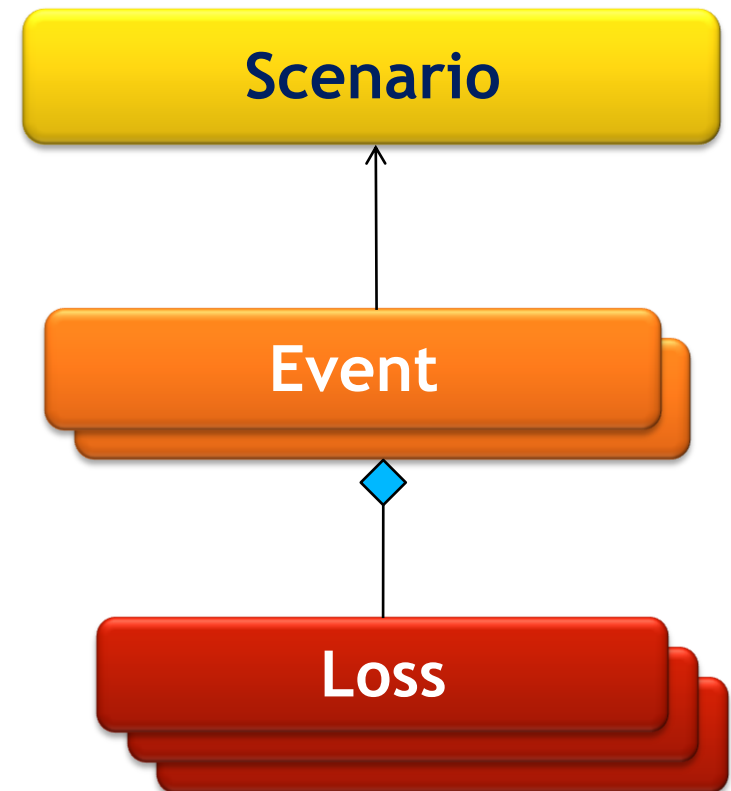
Basel II

Operational risk is defined as the risk of loss resulting **from inadequate or failed internal processes, people and systems or from external events.**

This definition **includes legal risk,** but excludes strategic and reputation risk.

- **Internal Fraud** - Unauthorized activity, theft and fraud
- **External Fraud** - theft of information, hacking damage, third-party theft and forgery
- **Employment Practices and Workplace Safety** - discrimination, workers compensation, employee health and safety
- **Clients, Products, & Business Practice** - market manipulation, antitrust, improper trade, product defects, fiduciary breaches, account churning
- **Damage to Physical Assets** - natural disasters, terrorism, vandalism
- **Business Disruption & Systems Failures** - utility disruptions, software failures, hardware failures
- **Execution, Delivery, & Process Management** - data entry errors, accounting errors, failed mandatory reporting, negligent loss of client assets

- **Scenario** - Class of Operational Events
- **Event** - An *operational risk event* is an incident leading to the actual outcome(s) of a business process to differ from the *expected outcome(s)*, due to *inadequate or failed processes*, people and systems, or due to external facts or circumstances (ORX).
- **Loss** - An *operational risk loss* is a negative impact on the earnings or equity value of the firm due to an operational risk event (ORX).



Risk of loss arising from inadequate or failed internal processes, personnel or systems, or from external events



Solvency II

Pillar I

Technical Provisions

MCR
(Minimal Capital Requirement)

SCR
(Solvency Capital Requirement)

Pillar II

Corporate Governance

Principles for internal control and risk management

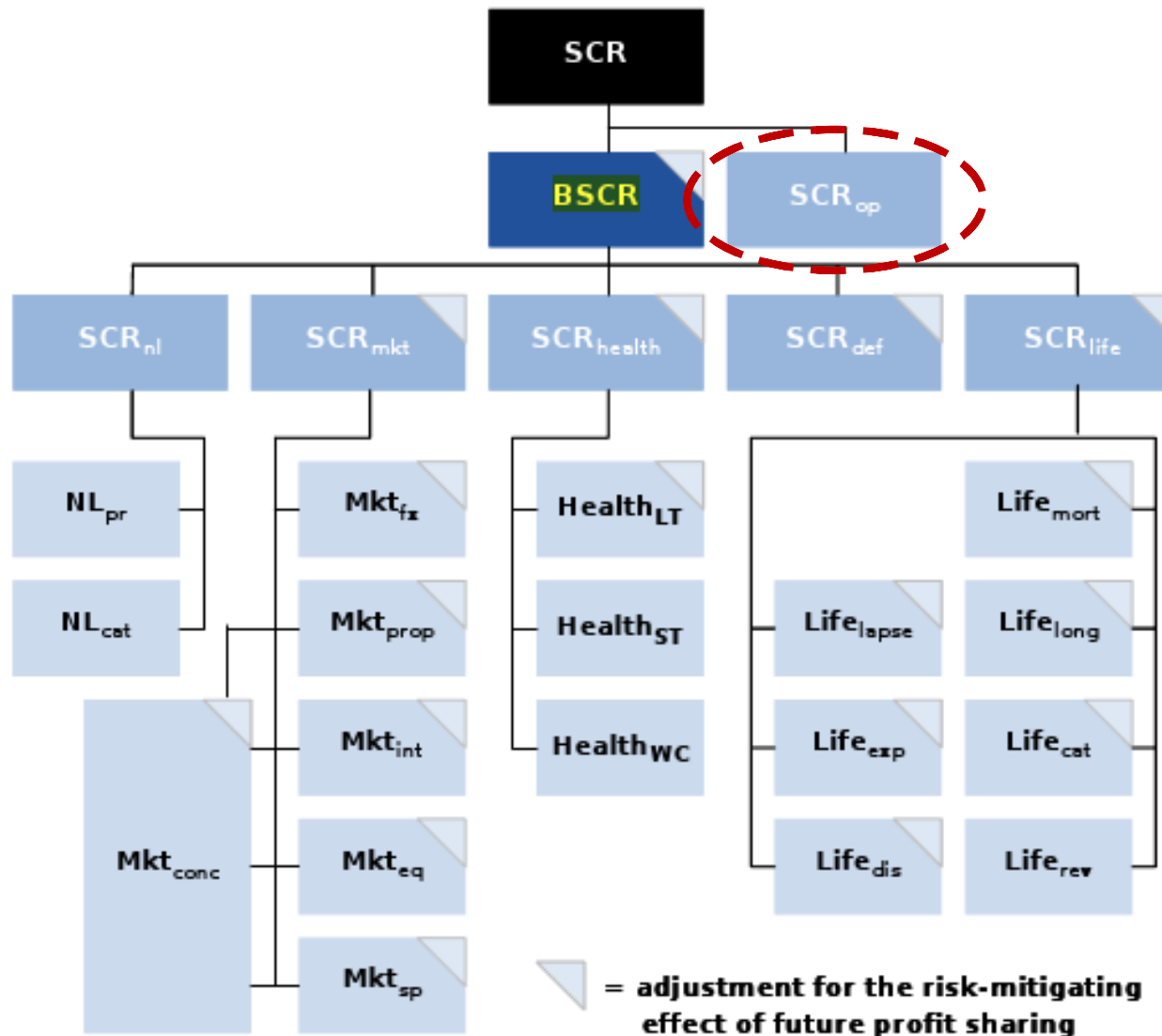
ORSA
(Own Risk and Solvency Assessment)

Pillar III

Reporting

Market Discipline

SCR (Solvency Capital Requirement): Standard Formula



QIS4 -Technical Specifications

QIS4 - Operational Risk

Standard Method SCR

$$SCR_{op} = \min \{ 0.30 \cdot BSCR; OP_{lnul} \} + 0.25 \cdot Exp_{ul}$$

$$OP_{nlul} = \max \left\{ \begin{array}{l} 0.03 \cdot (Earn_{life} - Earn_{life-ul}) + 0.02 \cdot Earn_{nl} + 0.02 \cdot Earn_h; \\ 0.003 \cdot (TP_{life} - TP_{life-ul}) + 0.02 \cdot TP_{nl} + 0.002 \cdot TP_h \end{array} \right\}$$

TP_{life} = Total life insurance technical provisions (gross of reinsurance)

$TP_{life-ul}$ = Total life insurance technical provisions for unit-linked business (gross of reinsurance)

TP_{nl} = Total non-life insurance technical provisions (gross of reinsurance)

TP_h = Total health insurance technical provisions (gross of reinsurance)

$Earn_{life}$ = Total earned life premium (gross of reinsurance)

$Earn_{life-ul}$ = Total earned life premium for unit-linked business (gross of reinsurance)

$Earn_h$ = Total earned health insurance premium (gross of reinsurance)

$Earn_{nl}$ = Total earned non-life premium (gross of reinsurance)

Exp_{ul} = Amount of annual expenses (gross of reinsurance) incurred in respect of unit-linked business

$BSCR$ = The basic SCR

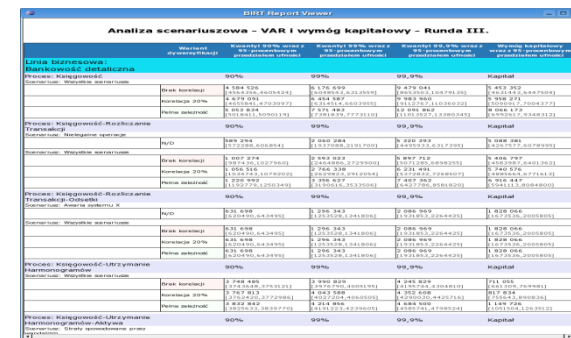
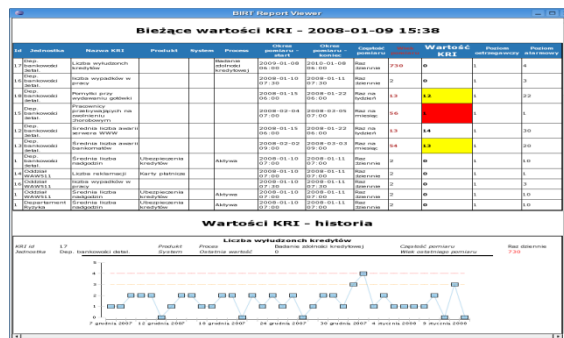
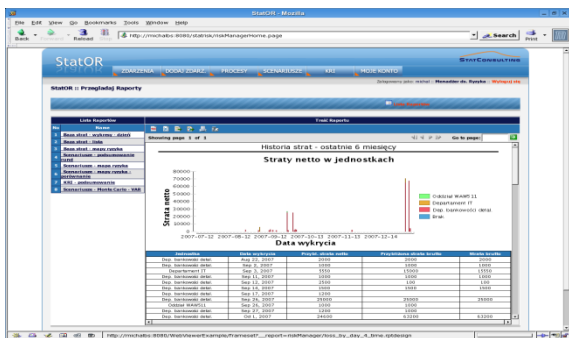
Źródło: QIS4

Operational Risk Management

Loss Database

KRI

Scenario Analysis

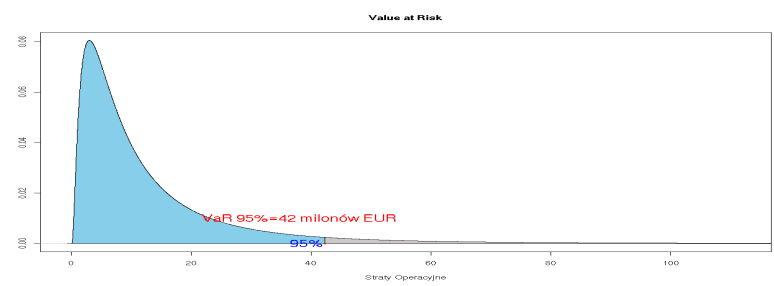


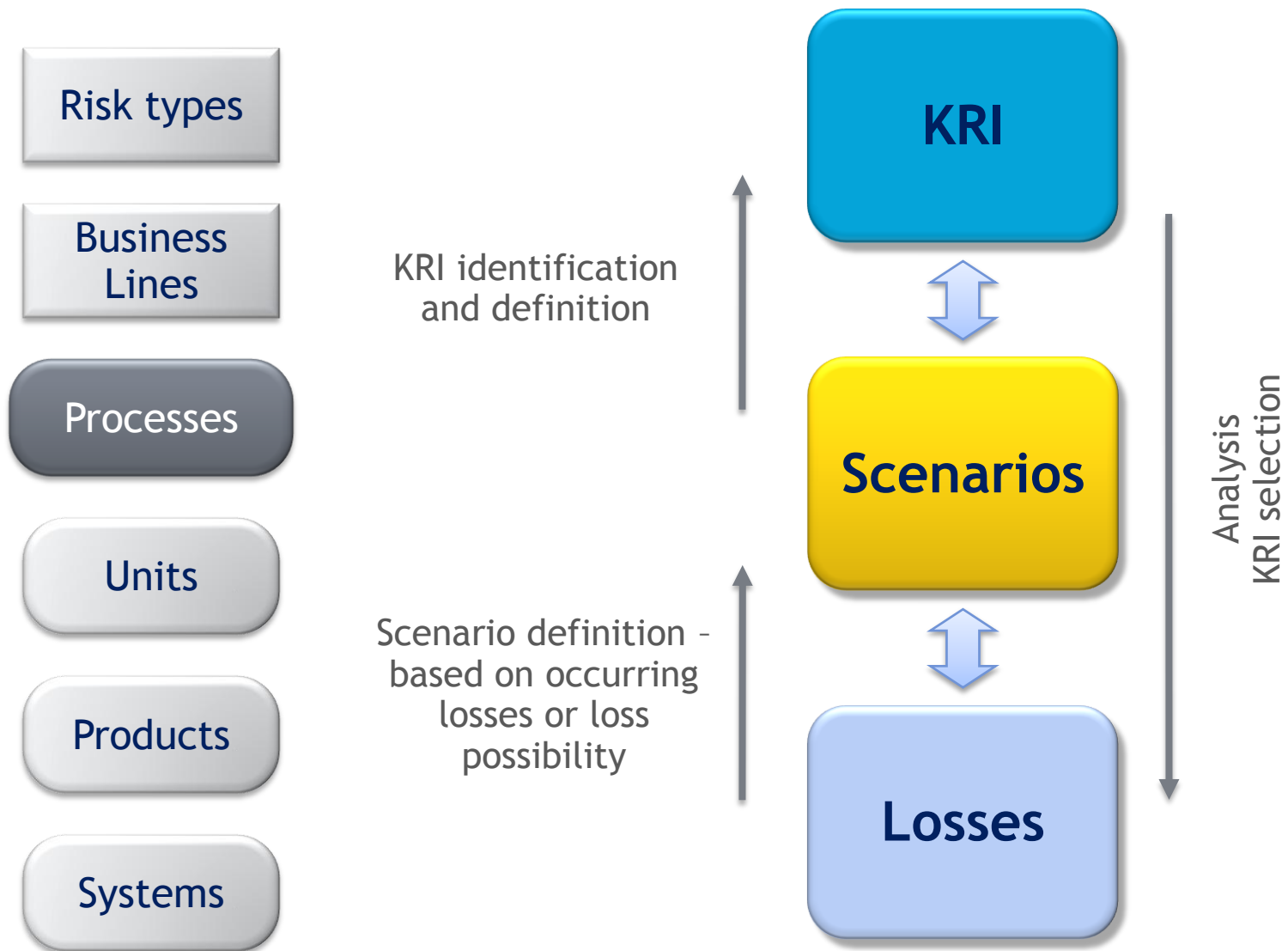
History

Now

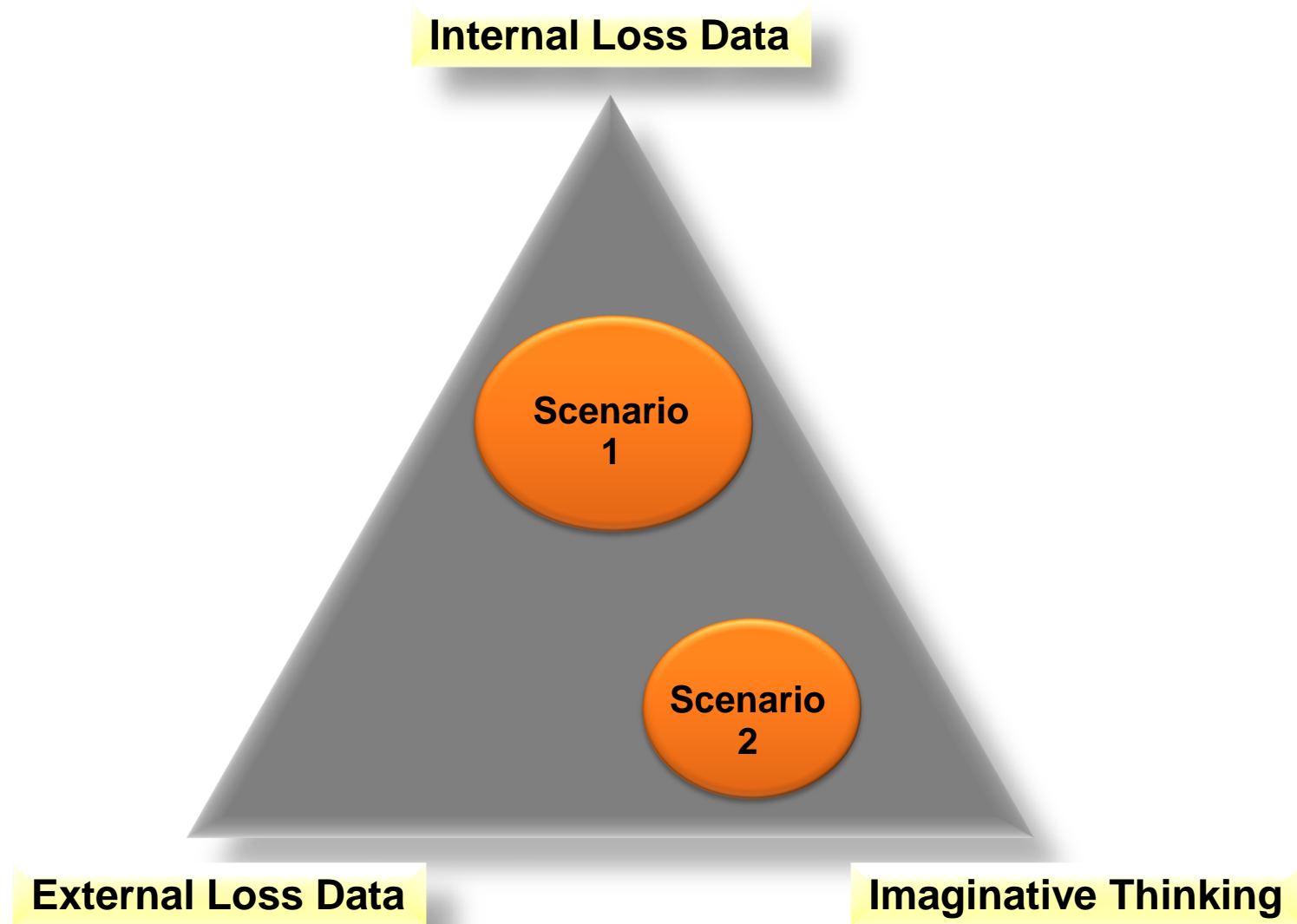
Future

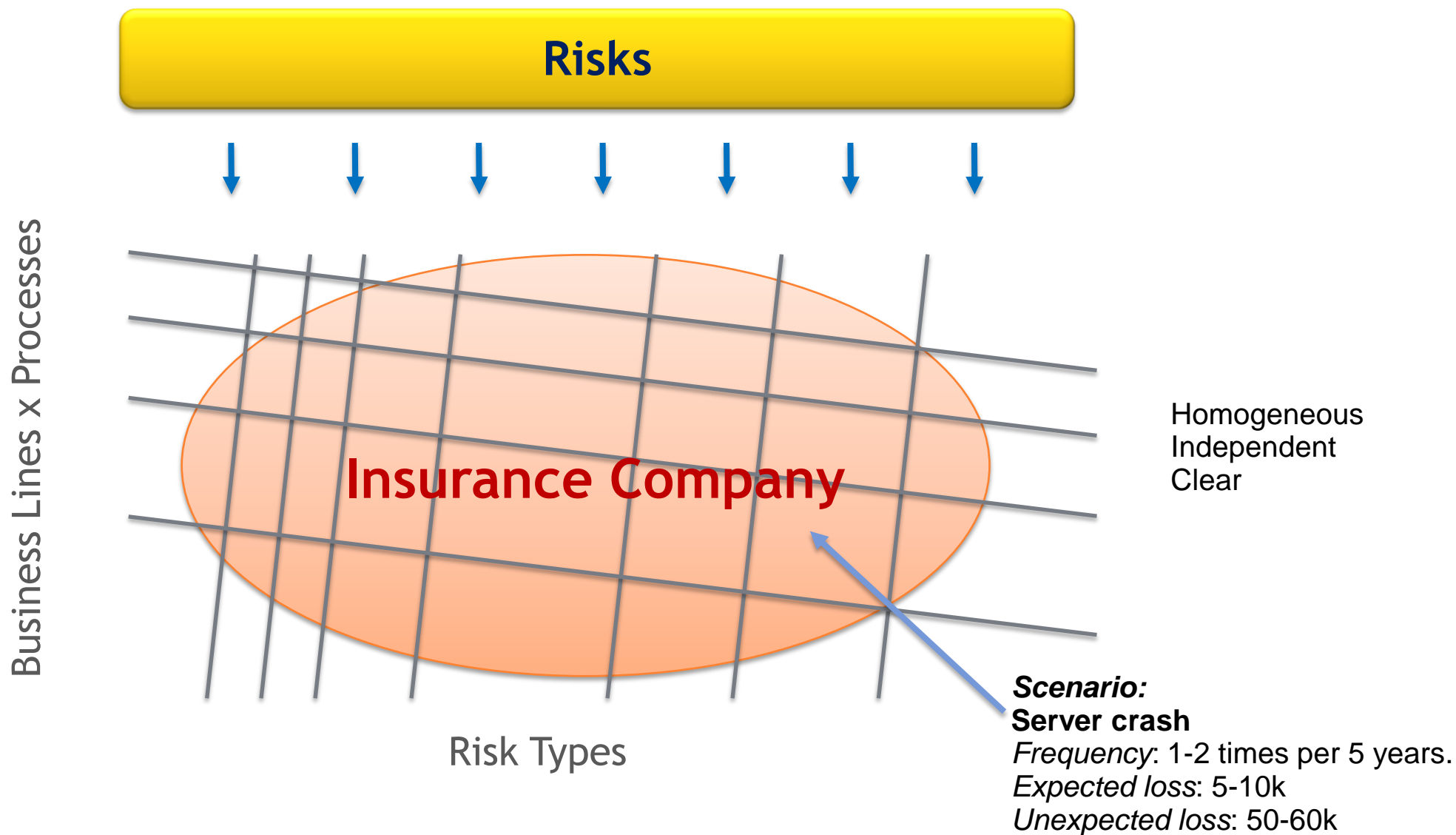
Precise qualitative and quantitative operational risk assessment





- Once an year, owners of the processes are collecting operational scenarios
- Every scenario describes the possibility of occurrence of operational loss.
- Scenarios besides description have the following properties
 - Risk type, line of business, process, business unit
 - Risk control level, possible enhancements in risk control level
 - Business continuity plans
- Quantitative information
 - Frequency
 - Severity

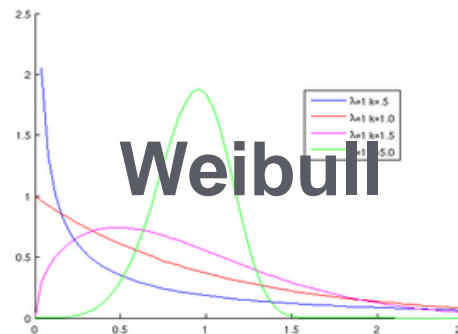
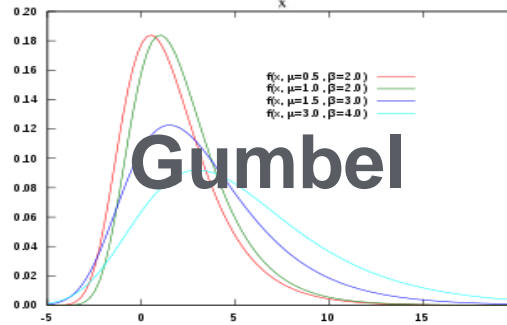
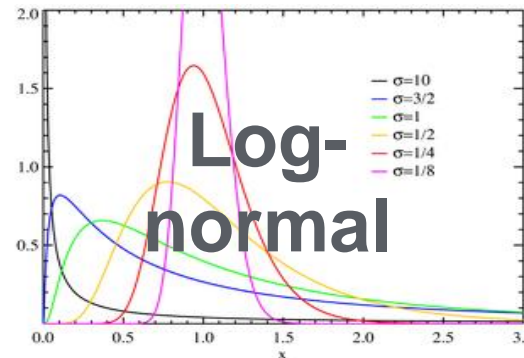




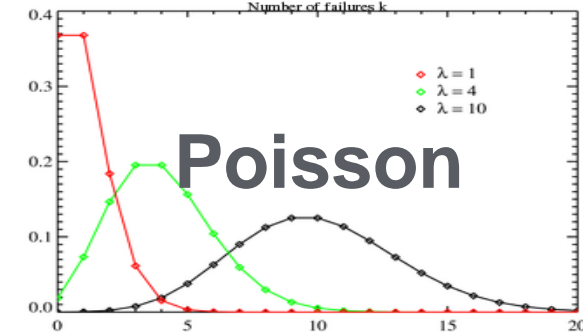
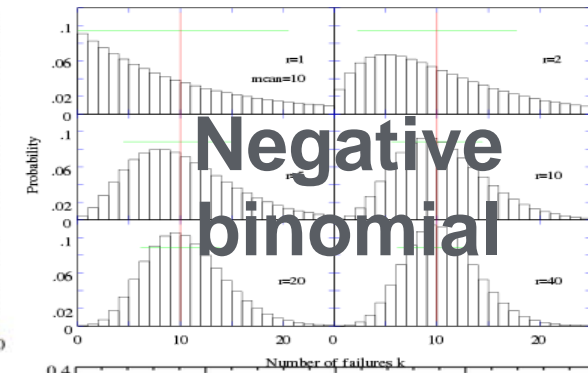
Field	Value
Line of business:	Ubezpieczenia majątkowe
Process:	Zarządzanie sprzedażą online
Business unit:	
Risk type:	Oszustwa zewnętrzne
Product:	-
System:	E-Sales
Scenario:	Włamanie do systemu i kradzież danych
Risk control level:	Nieakceptowalny
Enhancements in risk control:	Wprowadzenie dodatkowych zabezpieczeń i procedur
Connected KRIs:	Rotacja pracowników w dziale IT, ...
<i>Quantitative information:</i>	
Occurrence frequency:	1-2 / 5 lat
Severity (median):	30 000 - 40 000
Stress severity:	100 000 - 300 000
(Maximum severity):	
Events/Losses list:	...

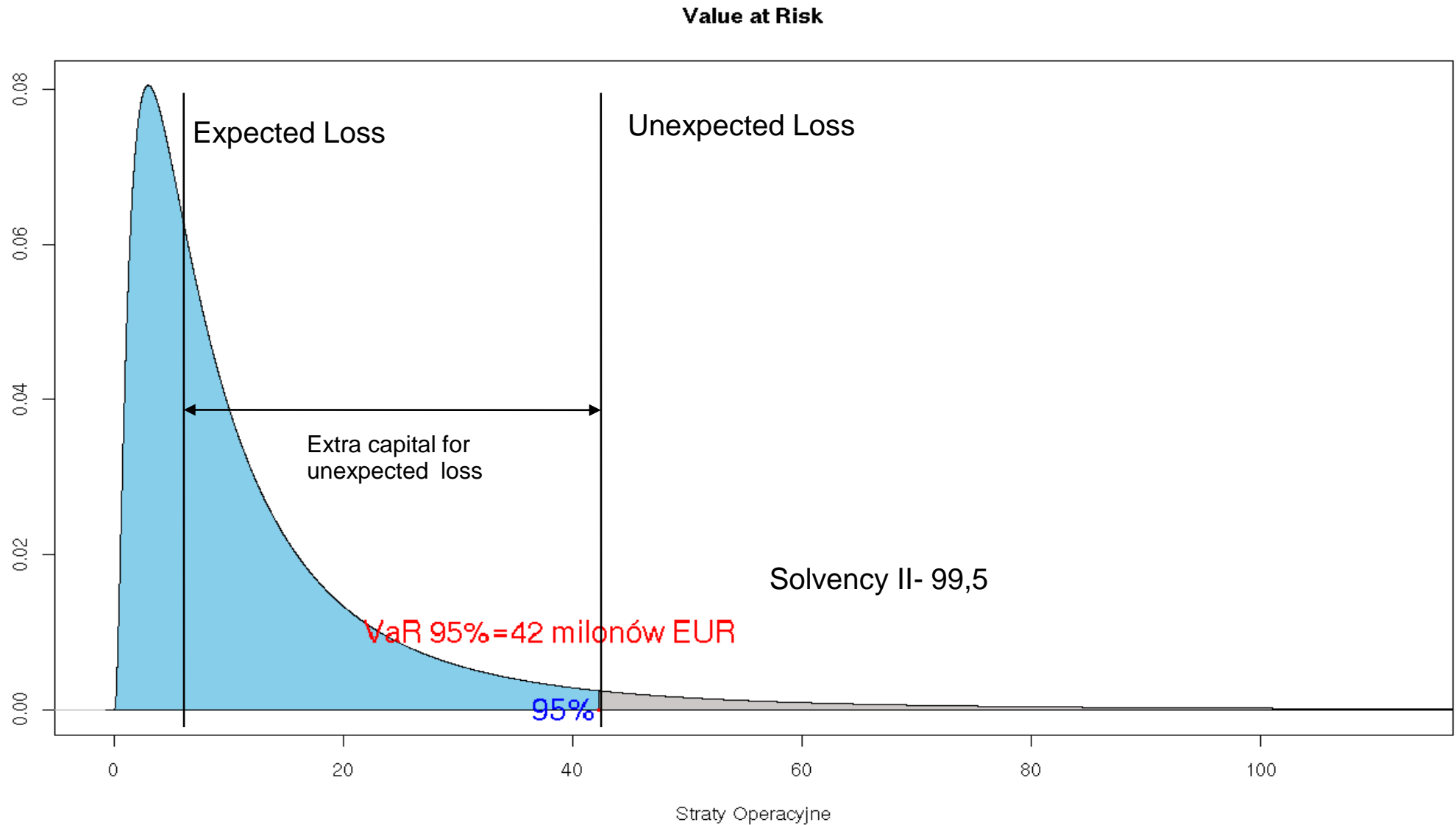
- Frequency, Severity distributions
- Comparison with collected loss data
- Aggregation, diversification
- **Result:** Aggregated operational risk loss distribution with decomposition

Severity



Frequency



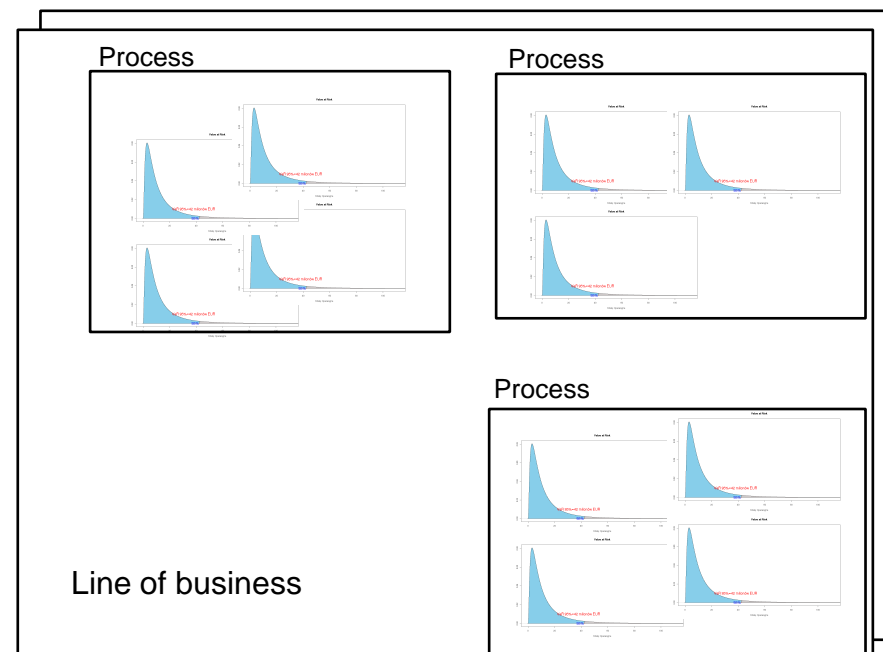


Scenario Analysis - VaR aggregation

BIRT Report Viewer

Analiza scenariuszowa - VAR i wymóg kapitałowy - Runda III.

Wariant dywersyfikacji	Kwantyl 90% wraz z 95-procentowym przedziałem ufności	Kwantyl 99% wraz z 95-procentowym przedziałem ufności	Kwantyl 99,9% wraz z 95-procentowym przedziałem ufności	Wymóg kapitałowy wraz z 95-procentowym przedziałem ufności
Linia biznesowa:				
Bankowość detaliczna				
Proces: Księgowość				
Scenariusz: Wszystkie scenariusze				
	90%	99%	99,9%	Kapitał
Brak korelacji	4 584 526 [4564356,4605424]	6 176 699 [6048543,6313559]	9 479 041 [8653503,10479135]	5 453 352 [4631443,6447504]
Korelacja 20%	4 679 091 [4655841,4703097]	6 454 587 [6314514,6603955]	9 983 960 [9112767,11036032]	5 958 271 [5090917,7004377]
Pełna zależność	5 053 834 [5018411,5090119]	7 571 483 [7381839,7773110]	12 091 862 [11013527,13380345]	8 066 173 [6992617,9348312]
Proces: Księgowość-Rozliczanie Transakcji				
Scenariusz: Nielegalne operacje				
	90%	99%	99,9%	Kapitał
N/D	589 294 [572288,606854]	2 060 284 [1937088,2191700]	5 320 393 [4495933,6317395]	5 088 381 [4267577,6078995]
Scenariusz: Wszystkie scenariusze				
Brak korelacji	1 007 274 [987436,1027960]	2 593 023 [2464886,2729900]	5 897 712 [5071285,6898255]	5 406 797 [4583987,6401362]
Korelacja 20%	1 056 516 [1034743,1079202]	2 766 338 [2629823,2912054]	6 231 491 [5372832,7268507]	5 740 576 [4885664,6771613]
Pełna zależność	1 220 992 [1192779,1250349]	3 356 627 [3190616,3533506]	7 407 362 [6427786,8581820]	6 916 447 [5941113,8084800]
Proces: Księgowość-Rozliczanie Transakcji-Odsetki				
Scenariusz: Awaria systemu X				
	90%	99%	99,9%	Kapitał
N/D	631 698 [620490,643495]	1 296 343 [1253528,1341806]	2 086 969 [1931853,2264425]	1 828 066 [1673536,2005805]
Scenariusz: Wszystkie scenariusze				
Brak korelacji	631 698 [620490,643495]	1 296 343 [1253528,1341806]	2 086 969 [1931853,2264425]	1 828 066 [1673536,2005805]
Korelacja 20%	631 698 [620490,643495]	1 296 343 [1253528,1341806]	2 086 969 [1931853,2264425]	1 828 066 [1673536,2005805]
Pełna zależność	631 698 [620490,643495]	1 296 343 [1253528,1341806]	2 086 969 [1931853,2264425]	1 828 066 [1673536,2005805]
Proces: Księgowość-Utrzymanie Harmonogramów				
Scenariusz: Wszystkie scenariusze				
	90%	99%	99,9%	Kapitał
Brak korelacji	3 748 485 [3743648,3753121]	3 990 829 [3976790,4005195]	4 245 829 [4195744,4304810]	711 055 [661309,769981]
Korelacja 20%	3 767 813 [3762420,3772986]	4 043 588 [4027204,4060505]	4 352 608 [4290030,4425716]	817 834 [755643,890836]
Pełna zależność	3 832 842 [3825633,3839770]	4 214 856 [4191223,4239605]	4 684 500 [4585741,4798524]	1 149 726 [1051504,1263512]
Proces: Księgowość-Utrzymanie Harmonogramów-Aktywa				
Scenariusz: Straty spowodowane przez wandalizm				
	90%	99%	99,9%	Kapitał

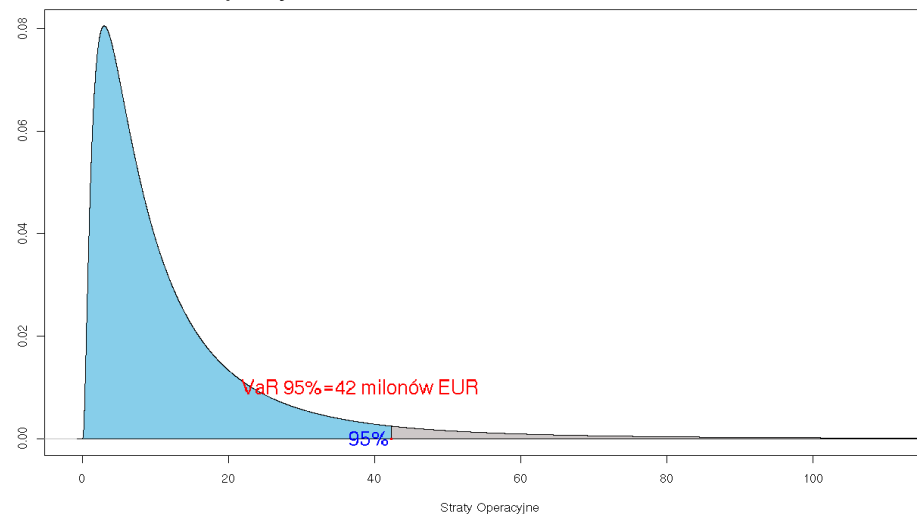


Line of business

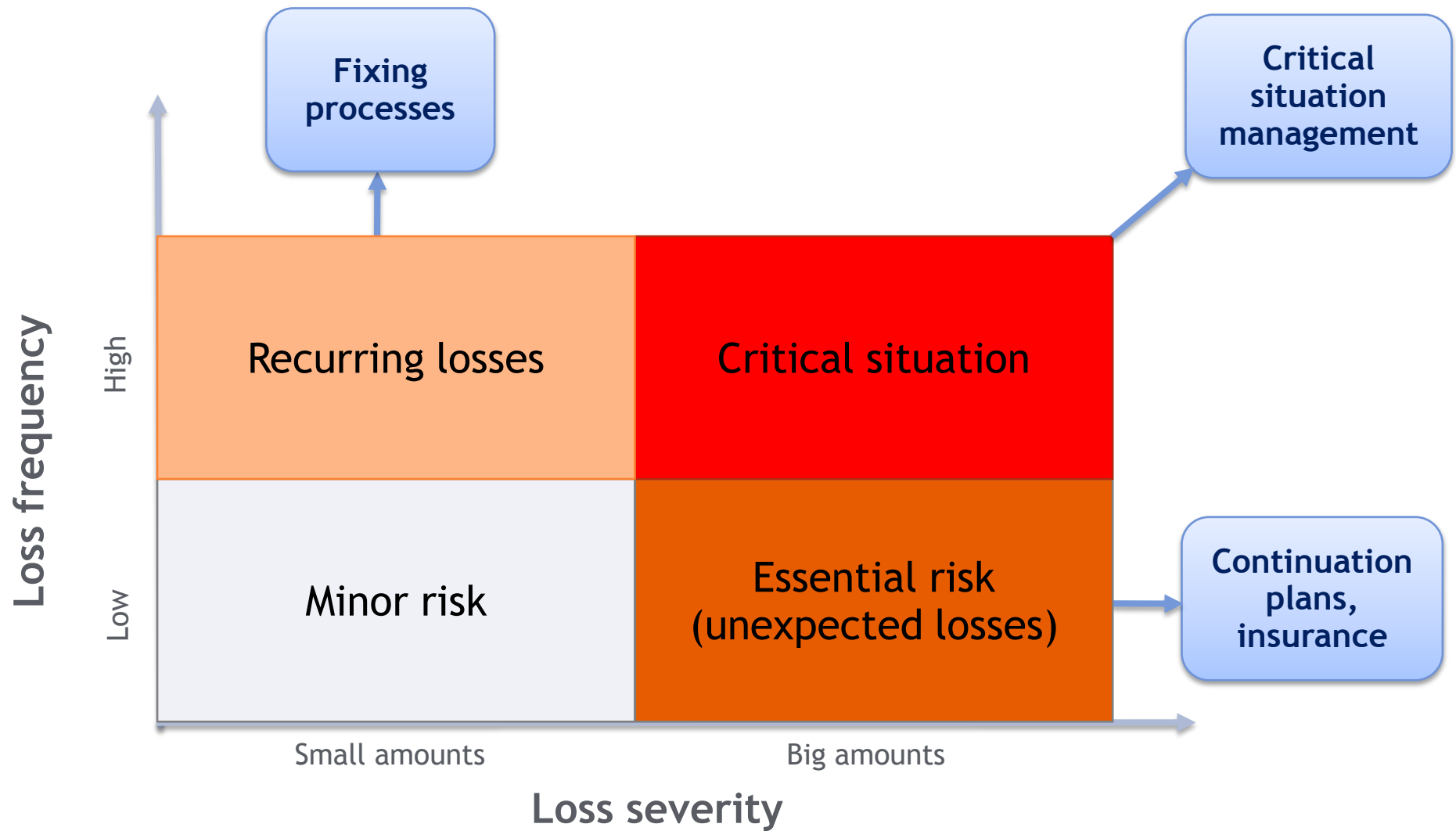


Whole company

Value at Risk



Scenario Analysis - Risk Maps



Scenario Analysis

- Advantages
 - Forward looking
 - Collected loss data can be used as a valuable support
 - Allows you to implement **risk controls prior** to the loss occurrence
 - Allows **risk quantification** - VaR method
 - Allows **risk sources identification** (for example VaR drill-down)
 - Allows to present risk on **risk maps**

- Disadvantages
 - Labor-intensity - smaller in subsequent rounds - big proportion of the scenarios remains unchanged



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