

Track: Result analysis and reporting



PillarOne Conference, Brussels, April, 2

Norbert Kuschel, PhD, Munich Re
Stefan Kunz, Intuitive Collaboration



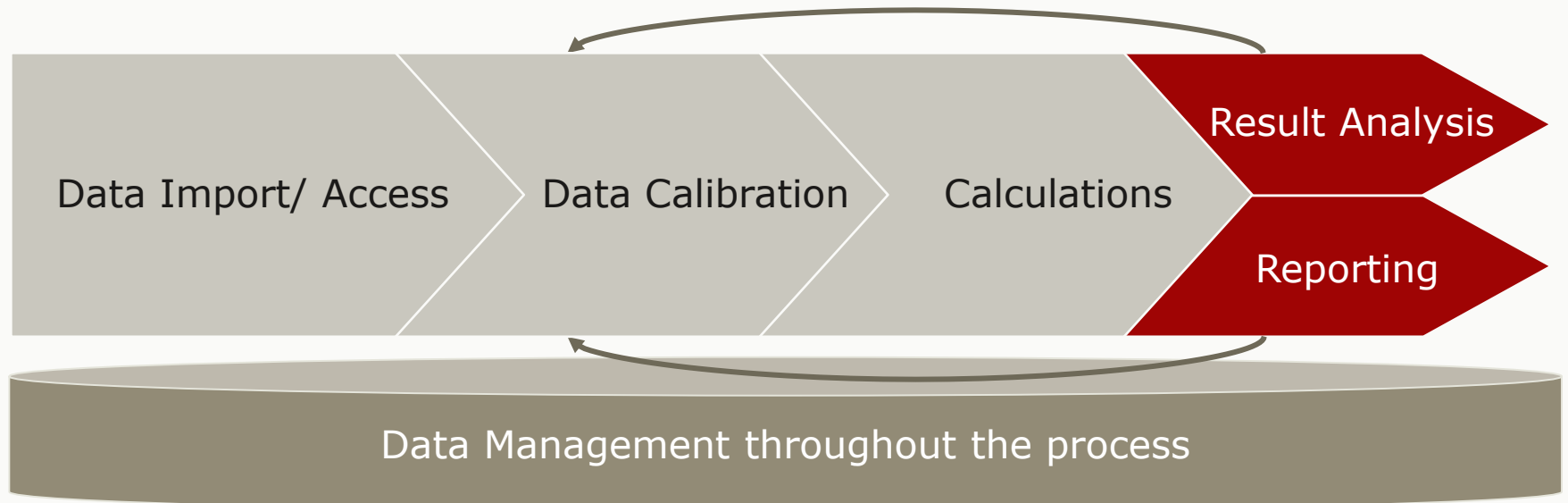
- 1 Challenges in result analysis and reporting
- 2 Solvency II case study using RiskAnalytics:
Capital EAGLE
- 3 Current possibilities in PillarOne Reserving
and RiskAnalytics
- 4 Problems to Solve: Interaction Zone

1 Challenges in result analysis and reporting

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4 Problems to Solve: Interaction Zone



- Result analysis: interactive exploration of results by freely composing charts and tables
- Reporting: presentation of results in a fixed templates and defined output media (pdf, xls, html) containing charts and tables
- Result analysis and reporting may show the necessity for a recalibration

- Motivation – reduce operational risk and boring work

“Two spreadsheets with 15,000 cells were used to project Numbers were rounded off to whole dollars. But the inflation multiplier, which should have been 1.06, became 1.
→ underestimated by \$36 million”

“It was literally a cut-and-paste error in an Excel spreadsheet that we did not detect when we did our final sorting ...
→ financial loss \$24 million”

- Goals
 - spend your time on result analysis and not on “arranging” results
 - auditability and process integration

1. Enable team work

- Data calibration and result analysis is normally done in a team.
- A solution should therefore highly support team work.
- Multi-user and concurrent access is essential.

2. Smooth integration

- Focus on real actuarial work which shouldn't consist of copy and paste data.
- Based on broadly used database integration.

3. Avoid lock-ins

- Look for a generic solution independent of operating system, database and reporting product.

- Where do we need interactive result exploration?
 - drill down, slice and dice
 - charts, tables
- Where do we need customization of fixed reporting templates?
- What combination/arrangement of key figures is required?

- Discuss typical elements of
 - CRO report
 - chief actuary report
 - use cases for result analysis

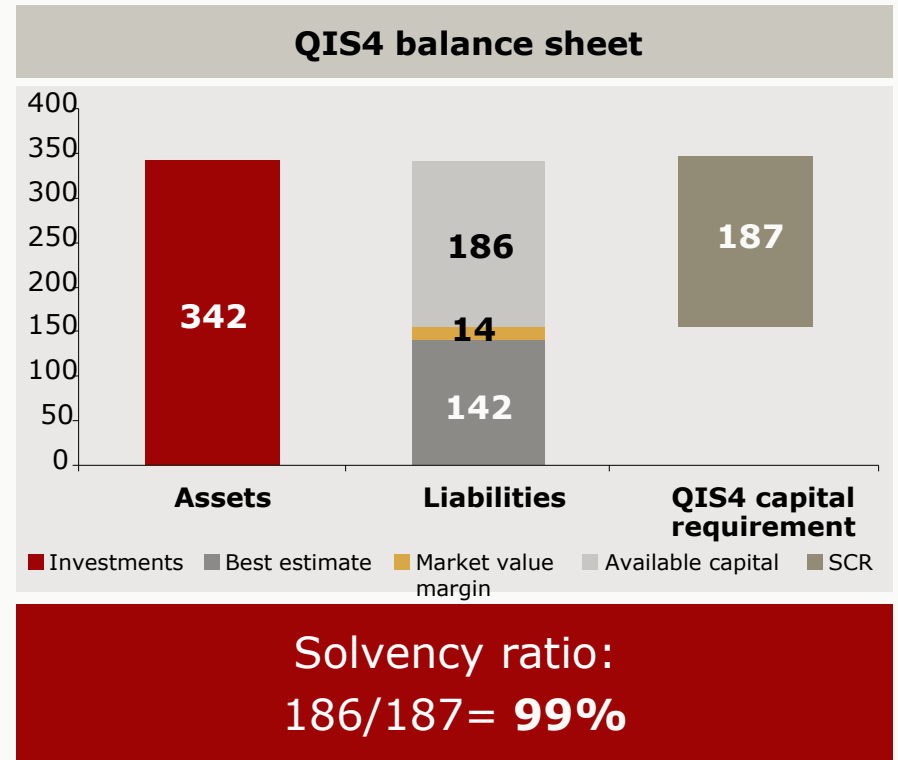
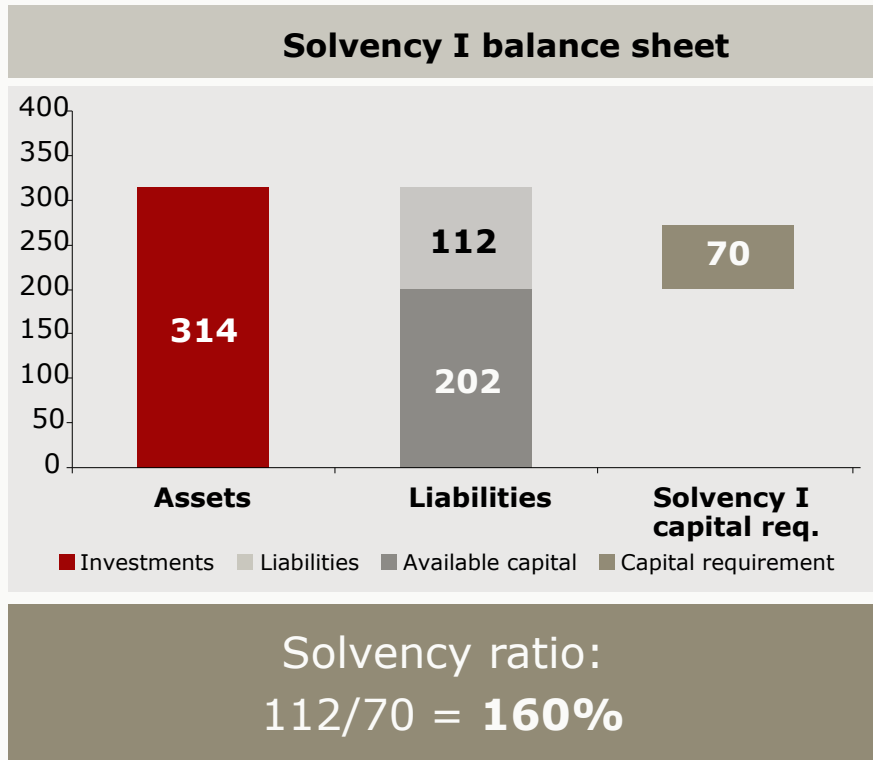
1 Challenges in result analysis and reporting

**2 Solvency II case study using RiskAnalytics:
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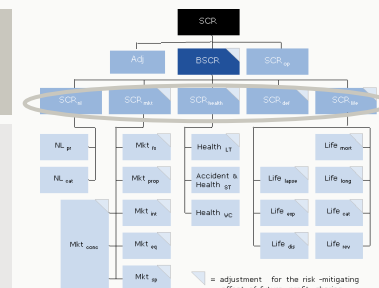
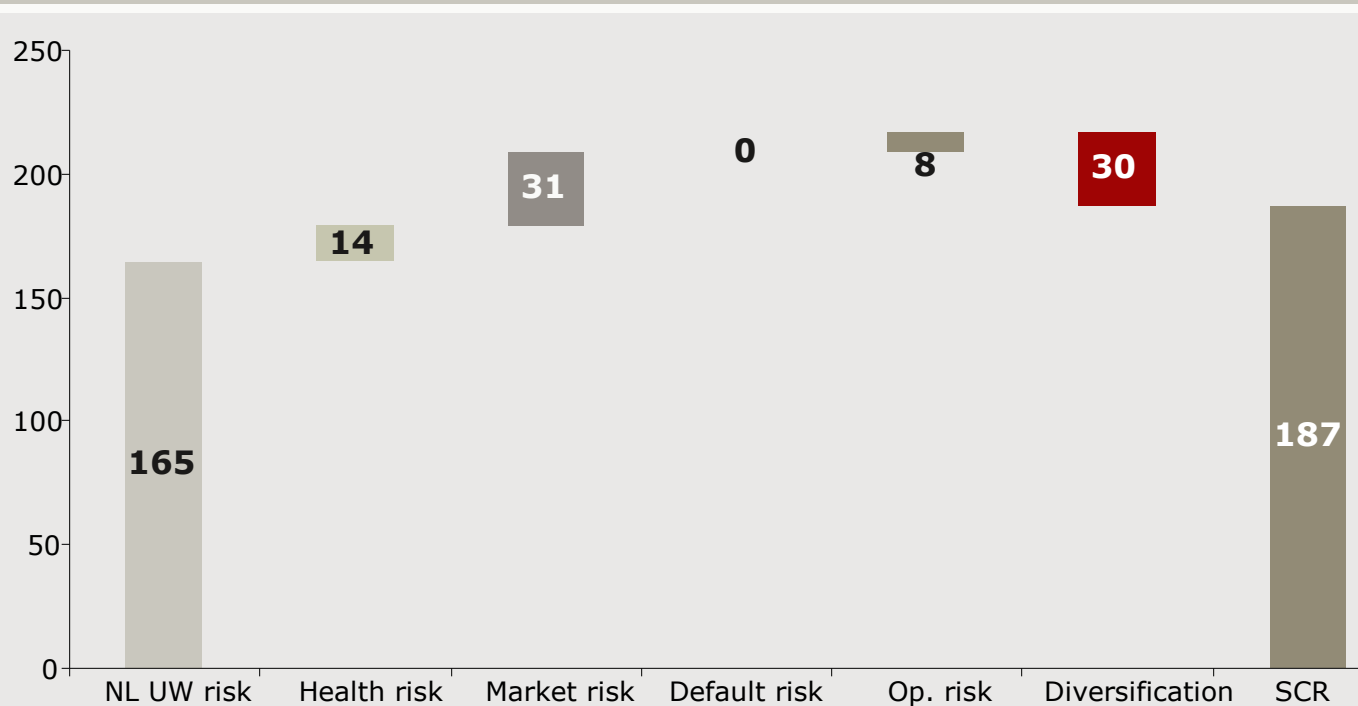
4 Problems to Solve: Interaction Zone

The move to an economic balance sheet



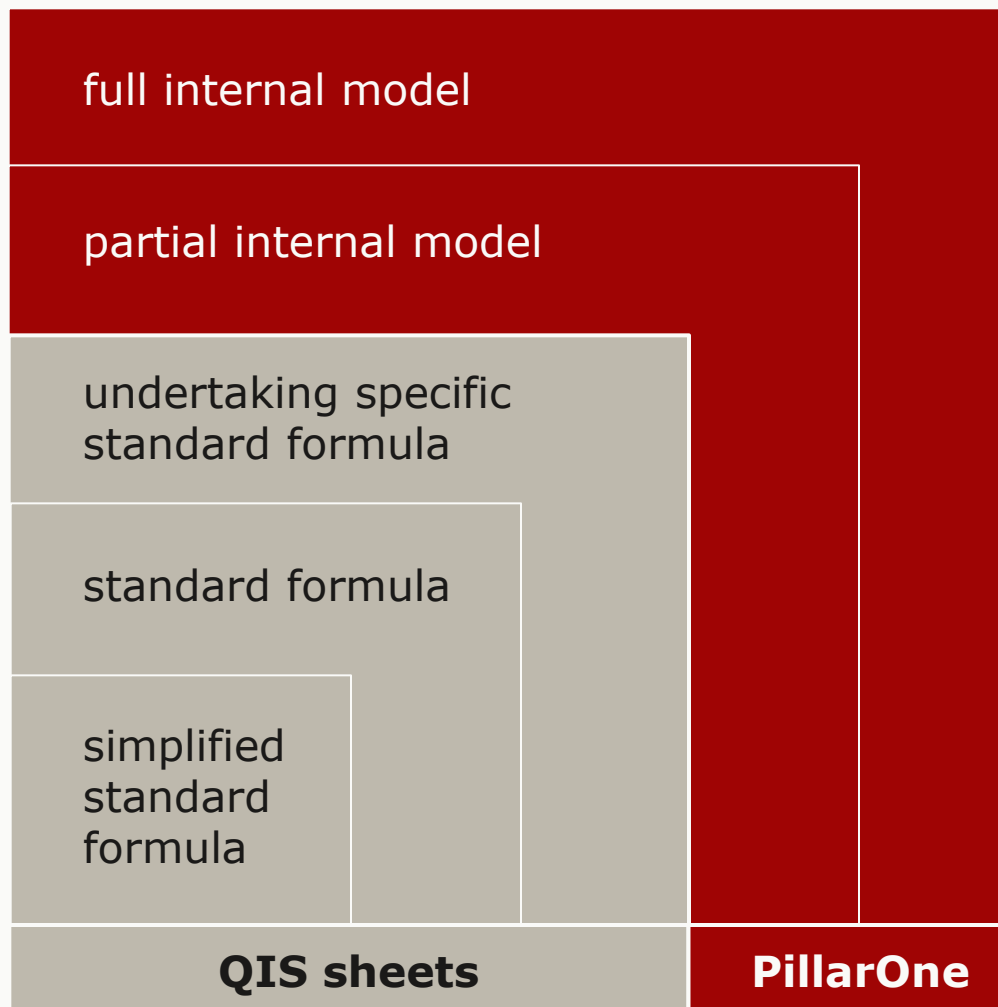
Capital EAGLE's QIS4 study (2)

QIS4 risk capital (SCR) before reinsurance

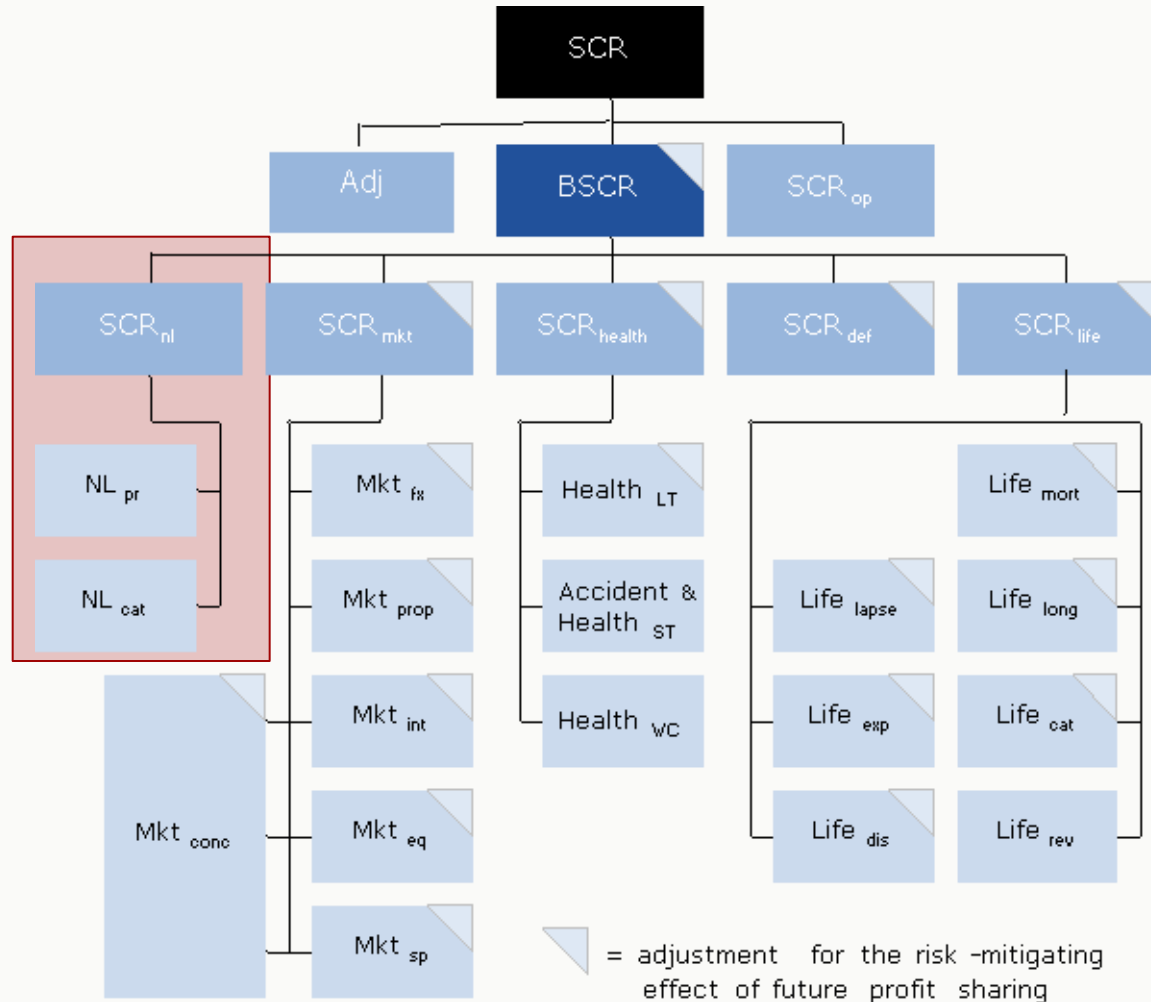


Underwriting risk is by far the main driver of the poor solvency situation

The standard formula and internal models



Impact of reinsurance in the QIS



Source: QIS4 Technical Specifications

Impact of reinsurance

Capital EAGLE's Reinsurance programmes

Various reinsurance programmes for Capital EAGLE

Peak risk cover (PeakRisk)

- Pure non-proportional covers with high first loss retentions

Pure non-proportional cover (NP)

- Pure non-proportional covers with low first loss retentions

MTPL quota share and NP cover (MTPL50+NP)

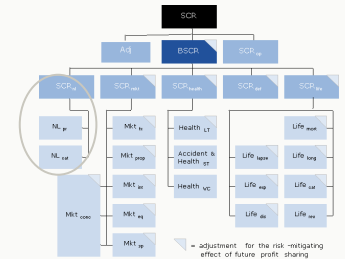
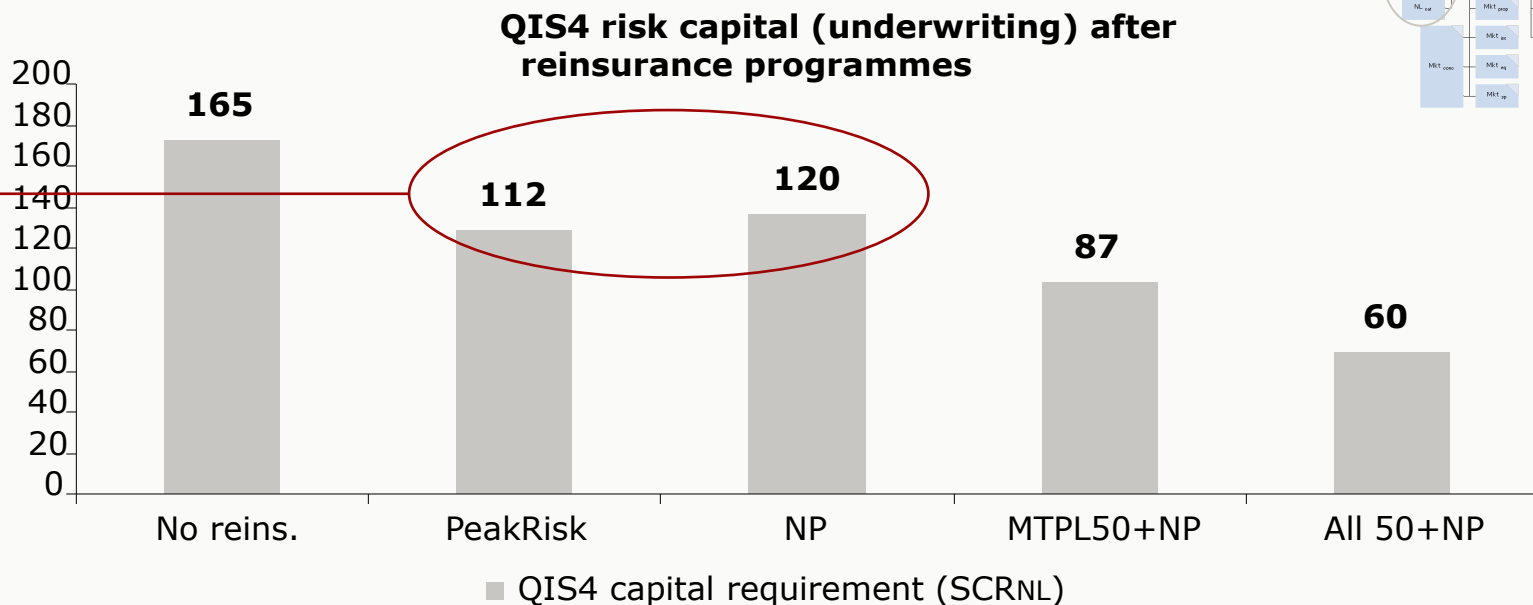
- Quota share in motor third party liability to improve diversification and non-proportional cover of the retention with a low first loss retention
- Pure non-proportional cover with low first loss retentions in the other classes

Quota shares and NP cover (All50+NP)

- Quota shares in all classes
- Non-proportional reinsurance cover for retention

Impact of reinsurance on Capital EAGLE's risk capital (QIS4)

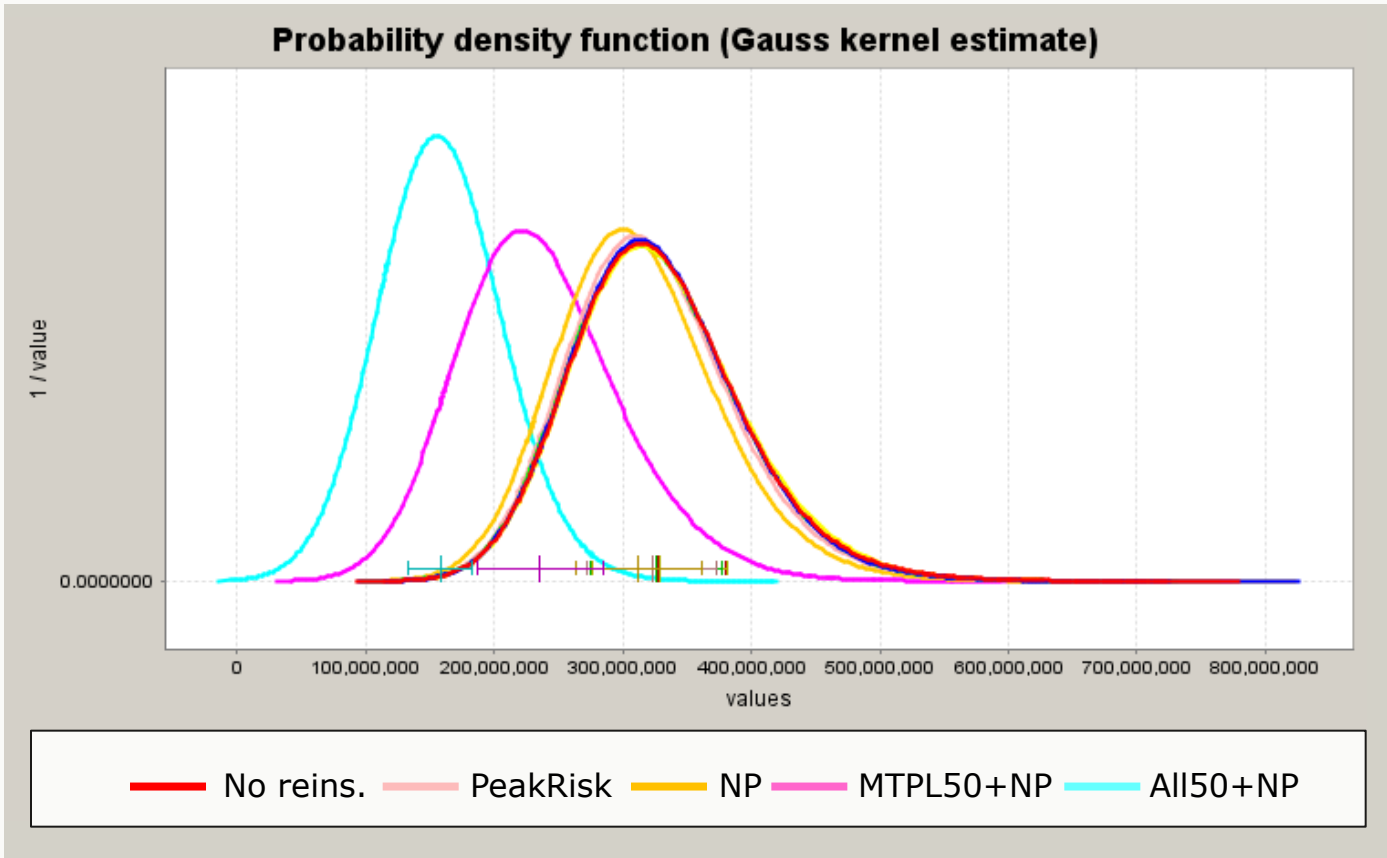
In comparison with the PeakRisk programme, the NP programme improves the risk situation, but underwriting risk capital is higher



- Reinsurance can improve the capital situation in the QIS4 model
- The required solvency level can therefore be achieved and managed
- The limitation on recognition of reinsurance in the model makes its use for capital management purposes more difficult

Impact of reinsurance on Capital EAGLE's risk capital (partial model)

Comparison of effect on risk of the four reinsurance programmes



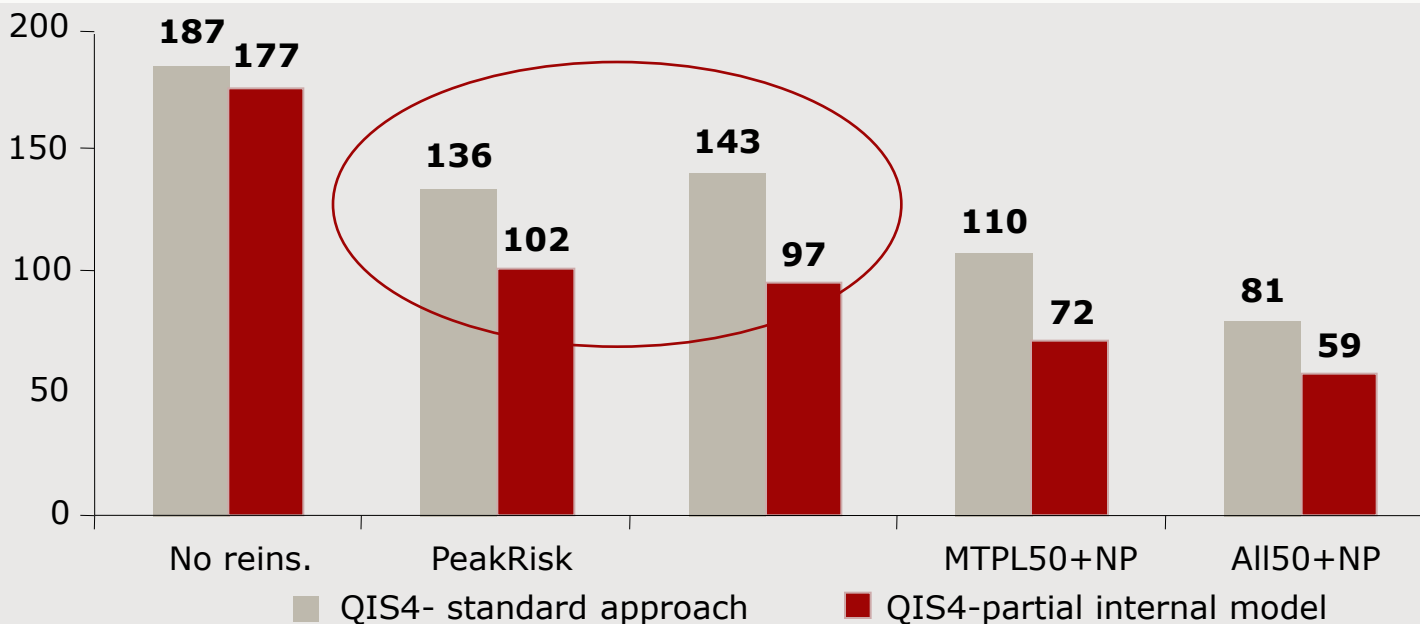
Risk capital

No reinsurance:	€133m
PeakRisk:	€53m
NP:	€49m
MTPL50 + NP:	€36m
All50 + NP:	€24m

Impact of reinsurance

Comparison of reinsurance effects (1)

Risk capital



Stochastic modelling produces more plausible results

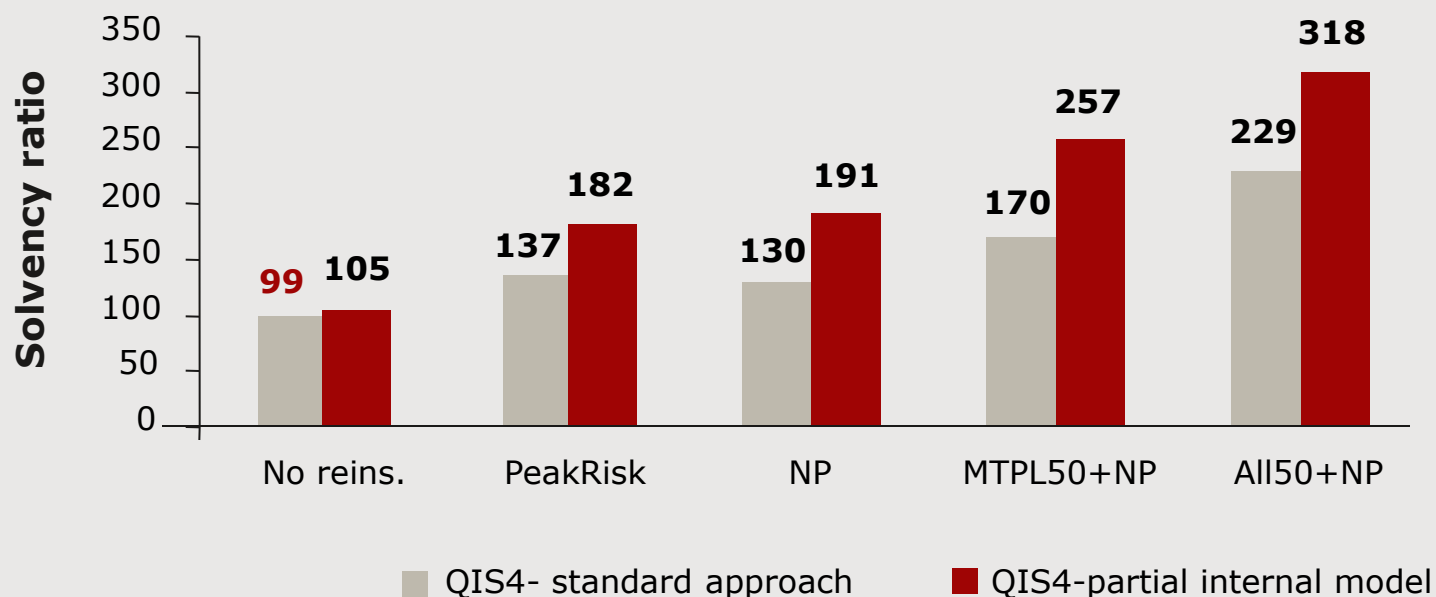
"All Models are wrong!"

George E. P. Box (*british statistician, * 1919*)

Impact of reinsurance

Comparison of reinsurance effects (2)


Changing the solvency ratio using reinsurance programmes



By efficient use of reinsurance, we can be even stronger than we were, without the need for a capital increase and even under Solvency II the company will still merit the name "Capital EAGLE"!

Summary of the comparative analysis

- Quantitative models help provide a better holistic view of an insurance company's risk situation
- An important factor is the effect of reinsurance on underwriting risk
- A standard model often fails to depict underwriting properly because of the heterogeneity of insurance portfolios
- This shortcoming is further aggravated by the availability of tailor-made reinsurance solutions



Due to the complexity of individual business models, quantitative (partial) internal models will be needed

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- Both applications may be run in a standalone or in server mode on Windows, Mac and *nix. Parameters and result data can be kept in any common database like MS SQL, mysql, db2, MaxDB (SAP), Oracle.
- Reserving
 - Diagnostics
 - Comments
- RiskAnalytics
 - Flexible result analysis on aggregate and iteration data
 - One example report created with JasperReports. Any product can be used that can be connected to a database.
 - External evaluation connecting your statistical tool to the database

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Problems to Solve: Interaction Zone

Challenges in result analysis and reporting



- Discuss typical result exploration steps/processes
- What are the most difficult or time consuming elements in the reporting process?
- User groups of result exploration and reporting

Thank you for your attention.



Norbert Kuschel, PhD, Munich Re
Stefan Kunz, Intuitive Collaboration



Appendix 1

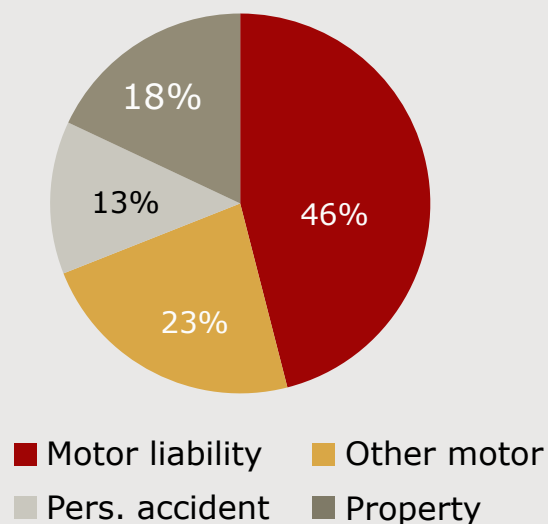


Capital EAGLE and stochastic modells



Underwriting figures for Capital EAGLE

sample company's portfolio



Total premium: €413m

Motor liability €189m

Other motor €97m

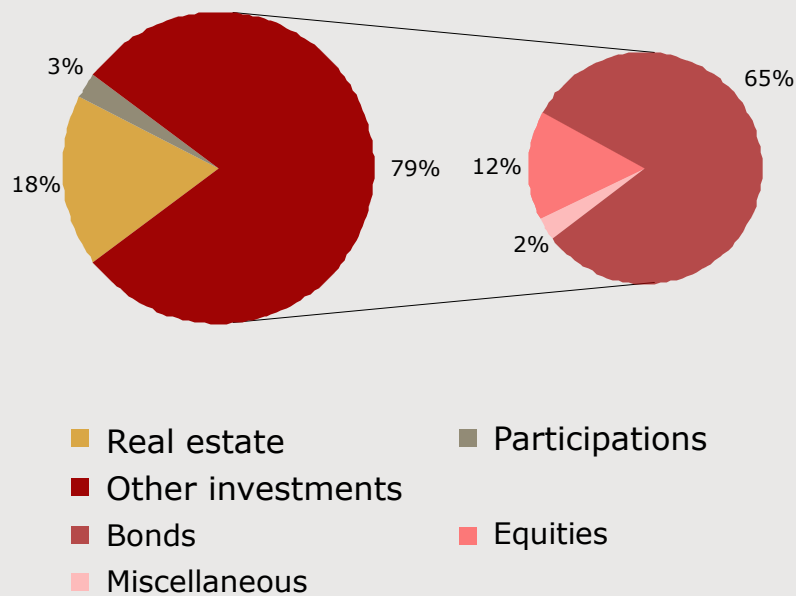
Personal accident €54m

Property €73m

Combined ratio: 99.95%

Investment structure of Capital EAGLE

Investment structure



Investments: €314m

Real estate €56m

Participations €9m

Other €249m

 of which equities: €38m

 of which bonds €204m

% invested in equities: 12.1 %

A brief description of Calital EAGLE (A3)

Capital EAGLE's balance sheet

Assets: €314m

Real estate €56m

Participations €9m

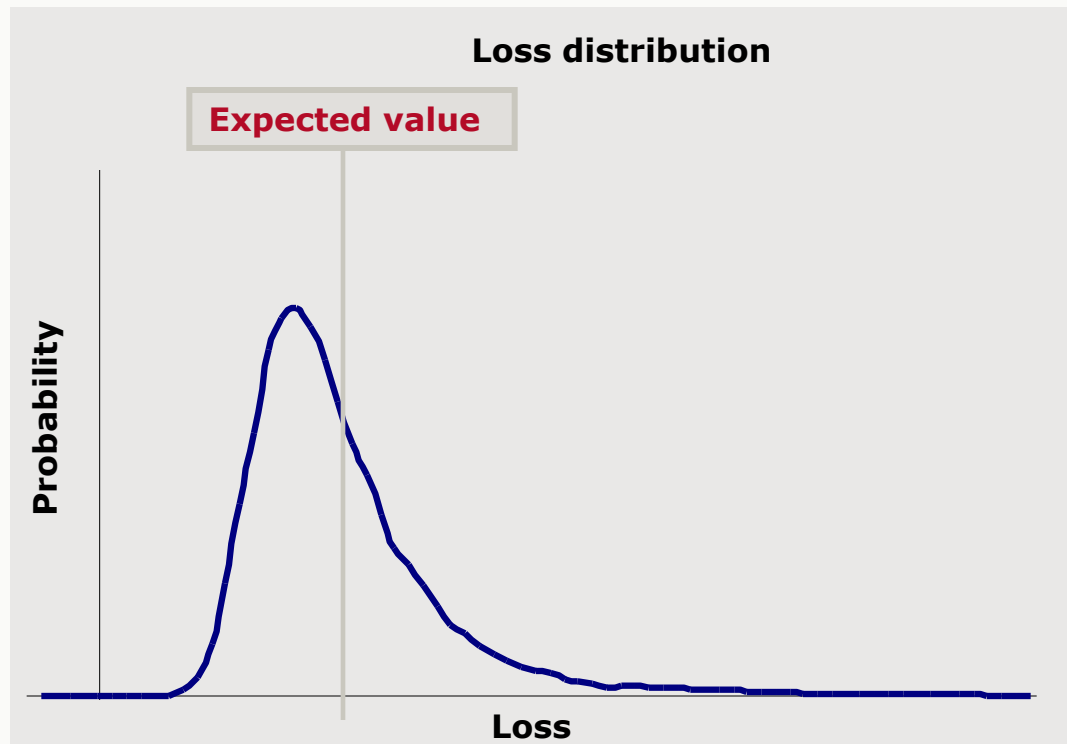
Other €249m

Equity & liabilities: €314m

Equity €112m

Liabilities €202m

Generation of a loss distribution for our sample company



Loss distribution:

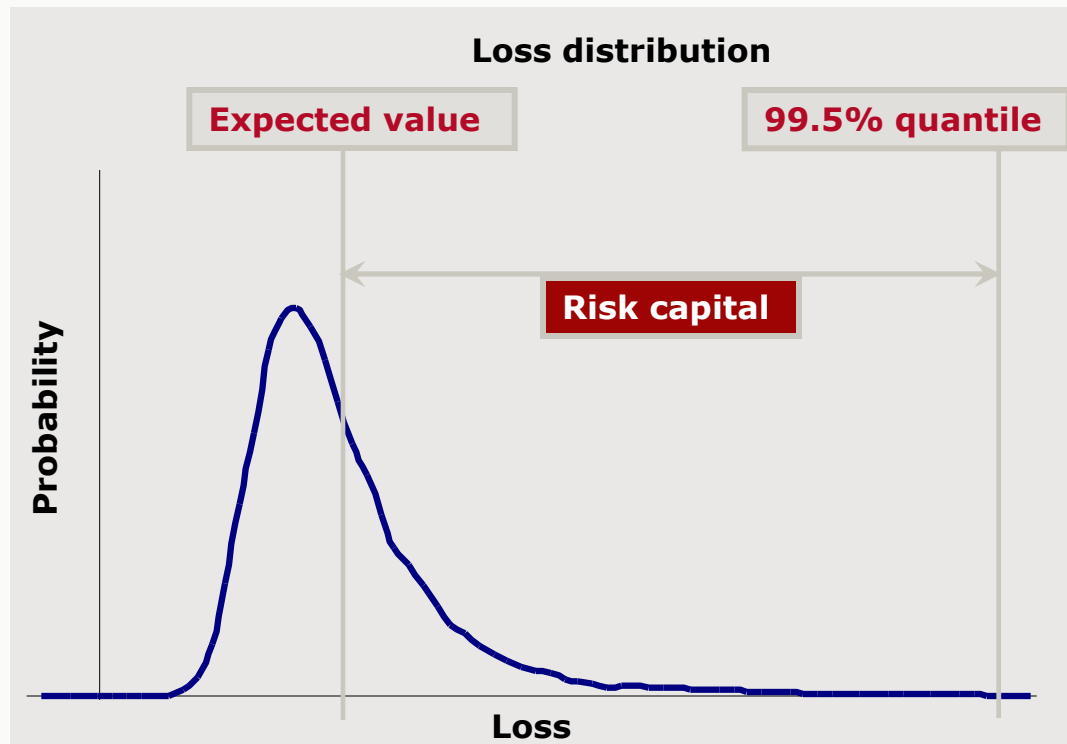
Generated by multiple calculations of the stochastic model (total claims)

Expected value:

The average result derived from the multiple running of the model

The loss distribution is derived from multiple runs of the loss simulation in our model.

Definition of risk capital (according to the QIS)



99.5% quantile:

Value exceeded in one out of 200 cases
(if losses are divided into 200 equal parts, the 99.5% quantile is the threshold value of the 200th part)

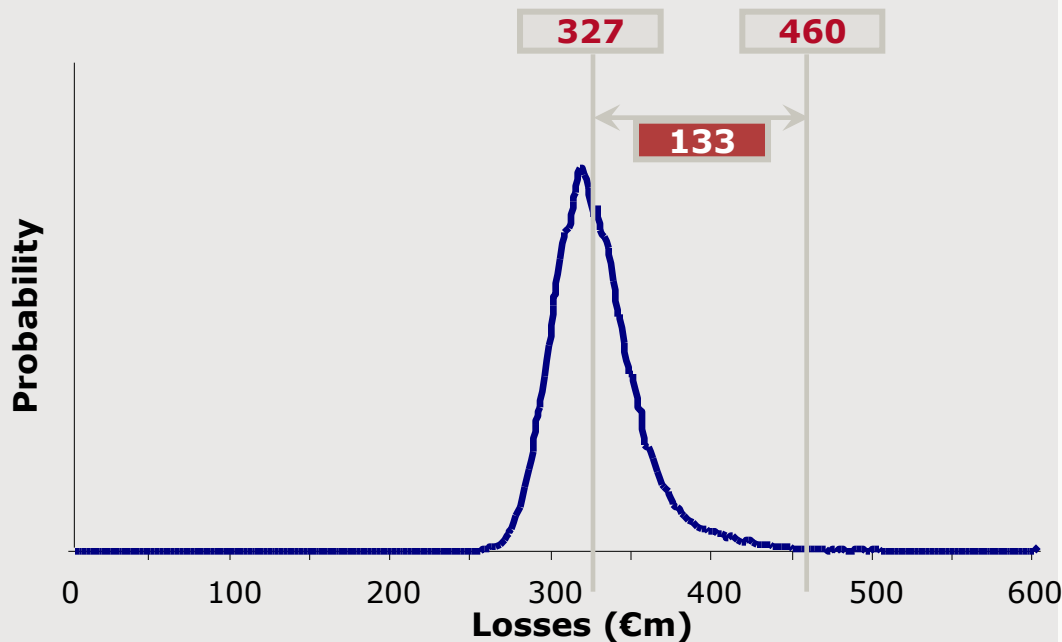
Risk capital:

In this model the difference between the 99.5% quantile and the expected value

Definition: The risk capital is the deviation of the 99.5% quantile from the expected value.

Underwriting risk capital for new and existing business

Aggregate loss distribution (gross)



Overall loss distribution

Expected value:
€327m

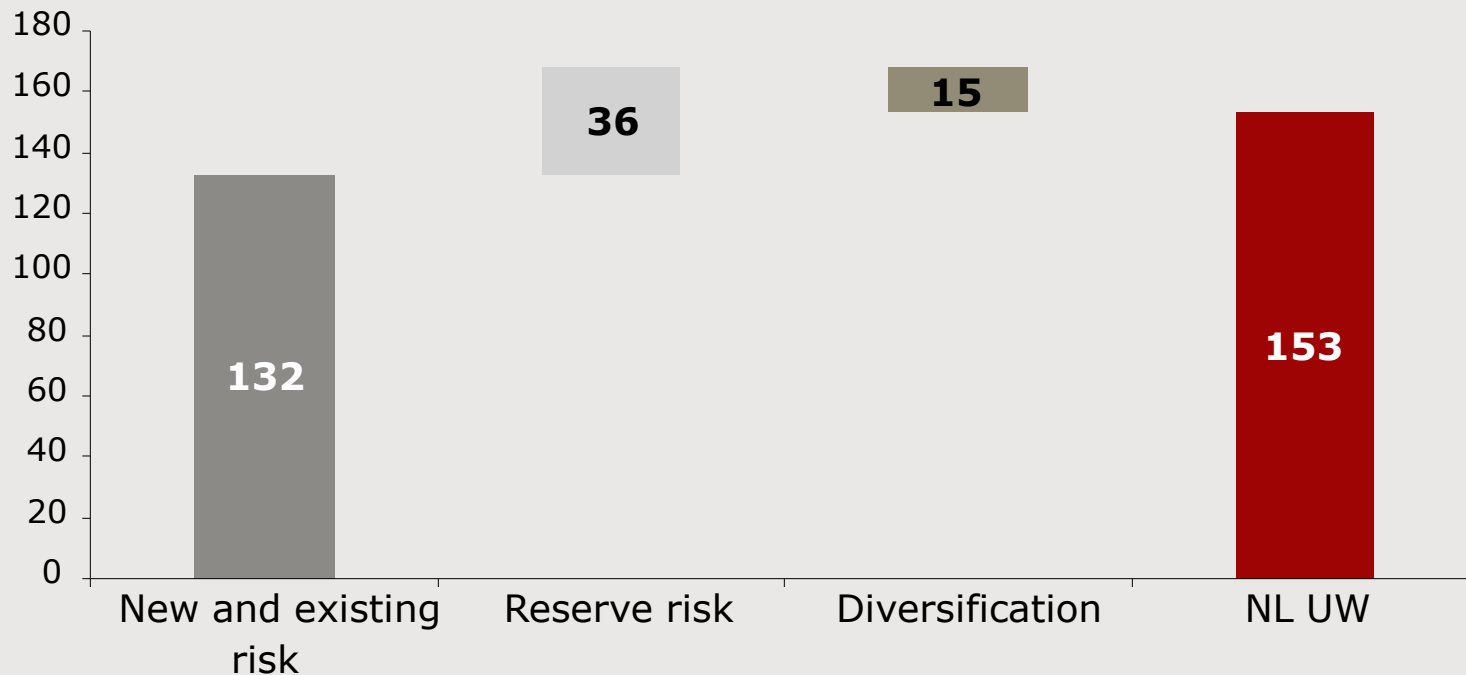
99.5% quantile:
€460m

Risk capital:
€133m = €(460-327)m

According to the model chosen and the risk definition described,
Capital EGALE's risk capital is €133m

Comparison of the effects produced using the stochastic model: Underwriting risk capital

NonLife Underwriting Kapital (SCR) Partial modell



Stochastic modelling of underwriting significantly reduces the regulatory risk capital requirement

Comparison of the effects produced using the stochastic model: Capital requirement (SCR)

Partial model (SCR) without Reinsurance



By modelling underwriting stochastically,
the regulatory risk capital requirement can be reduced by €10m

Appendix 2



PillarOne Reserving and PillarOne RiskAnalytics



Reserving: Commenting Functionality

Haftpflicht - Detail

Claims paid

Navigation
Kommentare

0.00 0 .000 kumulativ

	12	24	36	48	60	72	84	96	108
1999	71'378.00	95'226.00	100'960.00	104'068.00	105'810.00	107'177.00	108'059.00	108'851.00	109'560.0
2000	73'275.00	96'461.00	101'395.00	104'490.00	106'235.00	107'839.00	109'021.00	110'398.00	111'432.0
2001	75'121.00	98'108.00	103'305.00	106'022.00	107'540.00	108'951.00	109'792.00	110'650.00	
2002	74'202.00	96'544.00	100'089.00	102'525.00	103'674.00	104'874.00	105'405.00		
2003	79'175.00	103'976.00	111'192.00	114'787.00	116'793.00	118'551.00			
2004	78'035.00	101'887.00	107'989.00	111'302.00	113'610.00				
2005	84'960.00	113'640.00	120'443.00	124'110.00					
2006	83'475.00	109'828.00	114'727.00						
2007	78'934.00	106'142.00							

Ort	Kommentar	Zeitstempel	Benutzer	Bezeichner
Claims paid [3;2]	large multiplicative residual -2.32	18.03.2009 07:37	Diagnostic	[Diagnostics: large multiplicative residual]
Claims paid [4;2]	large multiplicative residual 2.02	18.03.2009 07:37	Diagnostic	[Diagnostics: large multiplicative residual]
Claims paid [8;1]	large multiplicative residual 2.35	18.03.2009 07:37	Diagnostic	[Diagnostics: large multiplicative residual]
Claims paid [-2;9]	Diagnostik: Chain Ladder Diagonalen Sensitivität - 11.00%	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Sensitivität]
Claims paid [-2;9]	Diagnostics: Chain Ladder forecast error (std dev) -6.45	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Vorhersage Fehler]
Claims paid [-2;8]	Diagnostics: Chain Ladder forecast error (std dev) -4.64	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Vorhersage Fehler]
Claims paid [-2;7]	Diagnostics: Chain Ladder forecast error (std dev) -5.57	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Vorhersage Fehler]
Claims paid [-2;6]	Diagnostics: Chain Ladder forecast error (std dev) -4.43	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Vorhersage Fehler]
Claims paid [-2;5]	Diagnostics: Chain Ladder forecast error (std dev) -2.88	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Vorhersage Fehler]
Claims paid [-2;4]	Diagnostik: Chain Ladder forecast error (std dev) -3.87	18.03.2009 07:37	Diagnostic	[Diagnostik: Chain Ladder Vorhersage Fehler]

Risk Analytics: Statistical Figures



Risk Analytics - CapitalEagle

File Window Help

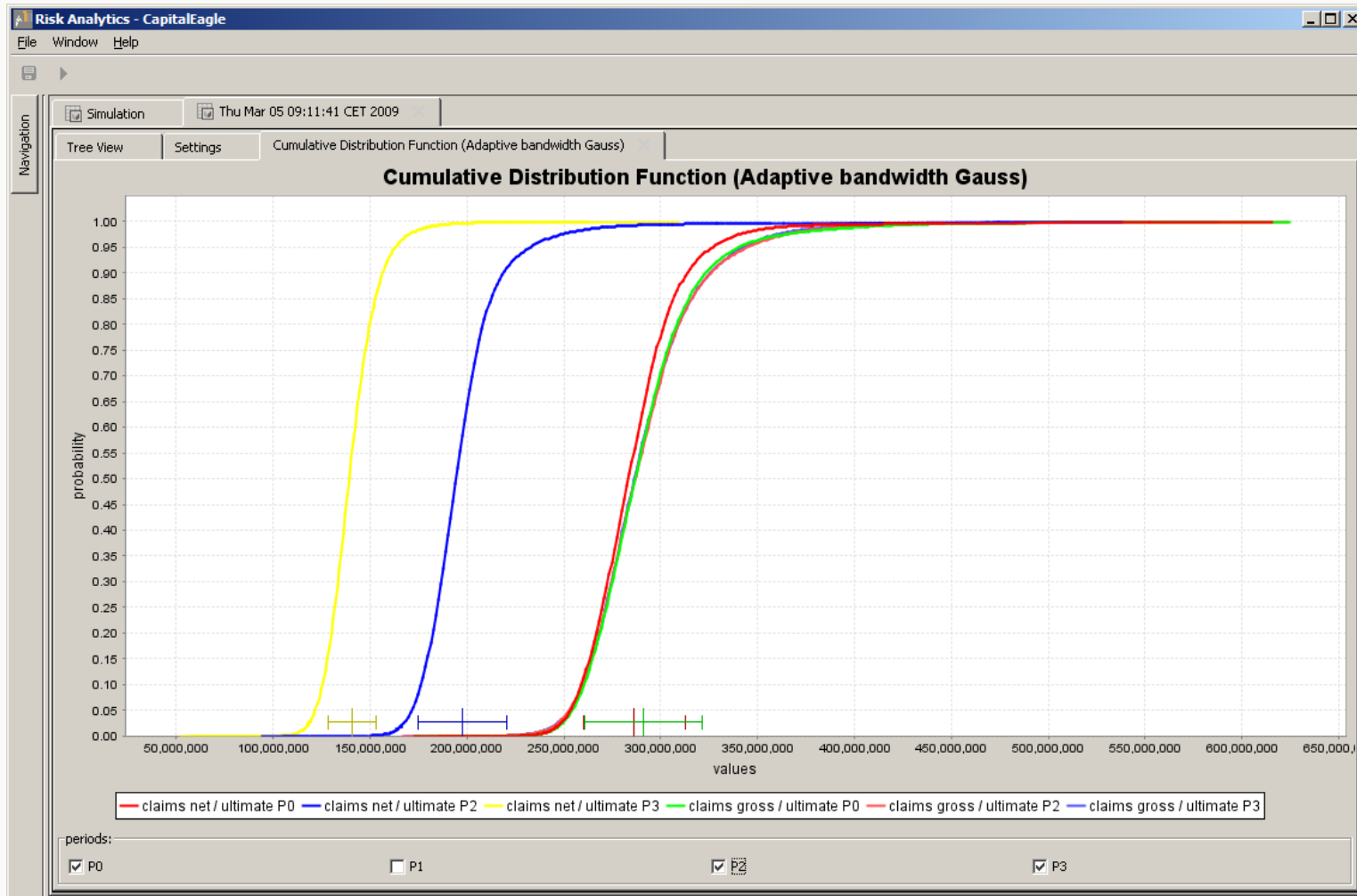
Simulation Thu Mar 05 09:11:41 CET 2009

Tree View Settings

Min
 Max
 StdDev
 add 99.9 %
 Percentile
 VaR
 TVaR
 1
 Single Iteration

<All>

Name	Mean P0	Mean P1	Mean P2	Mean P3	99.9 VaR P0	99.9 VaR P1	99.9 VaR P2
capital eagle							
[-] summary							
[-] claims aggregator							
[-] claims ceded							
[-] ultimate	4,938,908.89	14,062,586.22	93,779,964.19	150,236,472.68	97,163,451.15	115,519,527.05	110,384,496.44
[-] claims gross							
[-] ultimate	291,227,523.14	291,149,413.90	291,391,853.16	290,817,280.20	219,727,889.31	279,210,680.36	266,668,121.77
[-] claims net							
[-] ultimate	286,288,614.25	277,086,827.67	197,611,888.97	140,580,807.52	224,657,257.00	282,100,474.22	271,259,202.36
[-] property							
[-] claims generator							
[-] attritional severity claims generator							
[-] claims							
[-] ultimate	5,092,231.35	4,731,259.82	4,738,085.02	4,895,407.30	21,261,274.21	24,352,487.92	23,003,217.23
[-] e q generator							
[-] claims							
[-] ultimate	207,089.07	215,707.35	180,234.02	129,341.70	21,086,993.63	17,619,659.12	16,955,123.36
[-] flood generator							
[-] claims							
[-] ultimate	558,600.34	649,973.95	648,807.34	813,345.91	29,007,027.16	28,916,253.26	28,971,560.24
[-] single claims generator							
[-] claims							
[-] ultimate	1,910,160.88	1,880,102.93	1,884,403.58	1,868,542.81	2,235,178.19	2,169,290.94	2,728,421.62
[-] storm generator							
[-] claims							
[-] ultimate	8,858,144.23	9,181,848.66	8,164,849.20	8,947,041.89	255,816,663.12	275,133,700.15	262,124,150.94
[-] ri program							
[-] claims gross							
[-] ultimate	16,626,225.86	16,658,892.71	15,616,379.15	16,653,679.61	254,936,278.64	275,069,900.10	268,911,555.32
[-] claims net							
[-] ultimate	16,626,225.86	16,658,892.71	15,616,379.15	8,326,839.81	254,936,278.64	275,069,900.10	268,911,555.32
[-] personal accident							



Risk Analytics: Iteration Data



Risk Analytics - CapitalEagle

File Window Help

Simulation Thu Mar 05 09:11:41 CET 2009

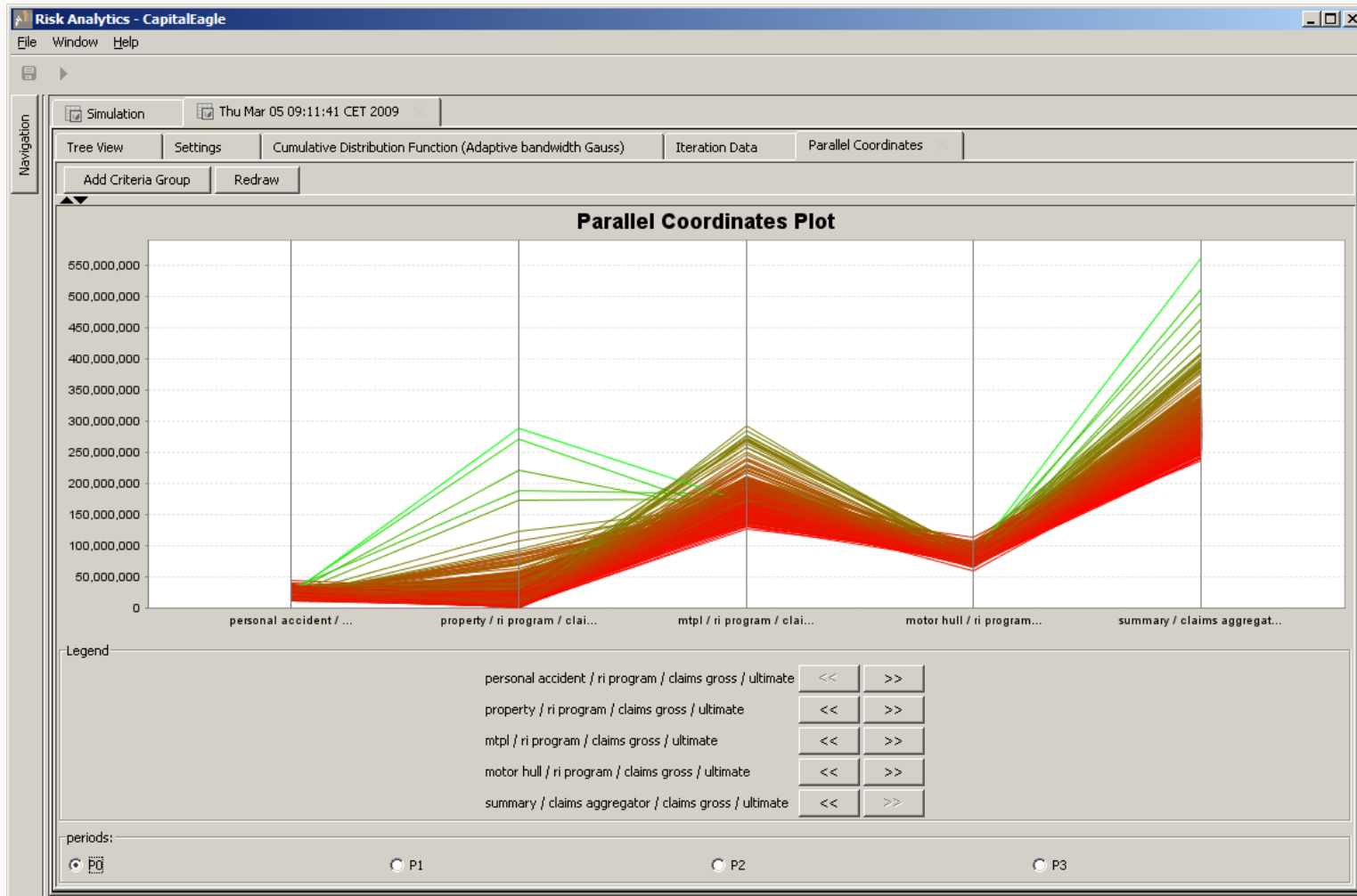
Tree View Settings

Min
 Max
 StdDev
 add 99.9 %
 Percentile
 VaR
 TVaR
 1
 Single Iteration

<All>

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summary							
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claims ceded							
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claims gross							
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claims net							
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property							
claims generator							
attritional severity claims generator							
claims							
ultimate	5,092,231.35	4,731,259.82	4,738,085.02	4,895,407.30	21,261,274.21	24,352,487.92	23,003,217.23
e q generator							
claims							
ultimate	207,089.07	215,707.35	180,234.02	129,341.70	21,086,993.63	17,619,659.12	16,955,123.36
flood generator							
claims							
ultimate	558,600.34	649,973.95	648,807.34	813,345.91	29,007,027.16	28,916,253.26	28,971,560.24
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claims							
ultimate	1,910,160.88	1,880,102.93	1,884,403.58	1,868,542.81	2,235,178.19	2,169,290.94	2,728,421.62
storm generator							
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ultimate	16,626,225.86	16,658,892.71	15,616,379.15	8,326,839.81	254,936,278.64	275,069,900.10	268,911,555.32
personal accident							

Risk Analytics: Parallel Coordinates



Result Table in Database

MySQL Query Browser - Connection: root@localhost:3306 / p1rat

File Edit View Query Script Tools Window MySQL Enterprise Help

Go back Next Refresh `SELECT * FROM single_value_result s;` Execute Stop

Resultset 1

id	version	iteration	path	period	simulation_run_id	value	class
1	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	5935499.2895...	
2	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	1306951.1146...	
3	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	1000348.3572...	
4	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	1635803.4697...	
5	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	1787140.0566...	
6	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	4494824.4769...	
7	0	0	CapitalEagle.mtpl.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	3635721.5754...	
8	0	0	CapitalEagle.mtpl.subClaimsGenerator.subAttritionalClaimsGenerator.outClaims:ultimate	0	1	185712664.99...	
9	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	5935499.2895...	
10	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	1306951.1146...	
11	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	1000348.3572...	
12	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	1635803.4697...	
13	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	1787140.0566...	
14	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	4494824.4769...	
15	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	3635721.5754...	
16	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsGross:ultimate	0	1	185712664.99...	
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20	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsNet:ultimate	0	1	1635803.4697...	
21	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsNet:ultimate	0	1	1787140.0566...	
22	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsNet:ultimate	0	1	4494824.4769...	
23	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsNet:ultimate	0	1	3635721.5754...	
24	0	0	CapitalEagle.mtpl.subRIProgram.outClaimsNet:ultimate	0	1	185712664.99...	
25	0	0	CapitalEagle.motorHull.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	0	
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27	0	0	CapitalEagle.motorHull.subRIProgram.outClaimsGross:ultimate	0	1	0	
28	0	0	CapitalEagle.motorHull.subRIProgram.outClaimsGross:ultimate	0	1	76163238.868...	
29	0	0	CapitalEagle.motorHull.subRIProgram.outClaimsNet:ultimate	0	1	0	
30	0	0	CapitalEagle.motorHull.subRIProgram.outClaimsNet:ultimate	0	1	76163238.868...	
31	0	0	CapitalEagle.personalAccident.subClaimsGenerator.subSingleClaimsGenerator.outClaims:ultimate	0	1	0	
32	0	0	CapitalEagle.personalAccident.subClaimsGenerator.subAttritionalClaimsGenerator.outClaims:ultimate	0	1	21503145.899...	
33	0	0	CapitalEagle.personalAccident.subRIProgram.outClaimsGross:ultimate	0	1	0	
34	0	0	CapitalEagle.personalAccident.subRIProgram.outClaimsGross:ultimate	0	1	21503145.899...	
35	0	0	CapitalEagle.personalAccident.subRIProgram.outClaimsNet:ultimate	0	1	0	

382026 rows fetched in 4.5512s (0.0021s)

Schemata Bookmarks History

- confluencedb
- controllingdb
- information_schema
- jradb
- mysql
- p1rat**
 - config_object_holder
 - double_parameter
 - enum_parameter
 - integer_parameter
 - model_structuredao
 - modeldao
 - multi_dimensional_parameter
 - multi_dimensional_parameter_1
 - multi_dimensional_parameter_2
 - parameter
 - parameter_entry
 - parameter_object_parameter
 - parameterization_parameter
 - parameterizationdao
 - simulation_run
 - simulation_templatedao
 - single_value_result
 - string_parameter
- servbudget

Syntax Functions Params Trx

- Data Definition Statements
- Data Manipulation Statements
- MySQL Utility Statements
- MySQL Transactional and Locking ...
- Database Administration Statements
- Replication Statements
- SQL Syntax for Prepared Statements