Swiss Solvency Test: Preliminary Analysis Field Test 2005

Schweizer Solvenz Test
Test suisse de solvabilité
Proba di solvibilità svizzera
瑞士偿付能力测试

Results of Field Test 2005

The analysis is based on preliminary data from the field test 200 of the SST.

The data has not yet been reviewed in detail and the results are subject to change as more data will be received.

Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Field Test 2005

- approx 15 life, 15 nonlife and 15 health insurers participated in the 2005 field test.
- Some companies have also include their branches into their calculations.
- The field test included all large and most mid-sized Swiss insurers as well as a number of smaller companies.
- The following statistics are based on data from approx 2/3 of field test participants.
- The participants of the fieldtest comprise approx. 93% of the provision in life and approx 85% of premiums in nonlife.

Field Test 2005

- It is a challenge to stay principle-based, since explicit rules are desired by some of those who have to implement the SST.
- The possibility of analyzing the contributions of different risks to required capital are seen as a big advantage in particular for companies not yet using a full internal model
- A risk based solvency framework entails close cooperation and communication of different sections within insurance companies
- Substantial simplification are not perceived to be feasible if explanatory power of SST is to be kept
- Solvency 1 (statutory view) and SST are not yet compatible → Solvency 1 will have to be made more consistent so as not to send out conflicting signals
- Modelling of participations and contingent risk and capital transfer solutions will be challenging
- The quality of SST reports was often excellent

Impressions from the Industry

Some have a somewhat reluctant attitude:

- *SST will favour large companies that have already sophisticated risk-based management systems in place …'*
- *'Small companies without internal model will be punished by the Standard Approach of SST…'*
- *'SST may call for a complete overhaul of risk management …'*
- *'Technical implementation can become a problem …'*
- *'… transparency and fair values will further increase the volatility of earnings …'*
- *'… complexity of internal models will allow companies to game the system …'*
- *'SST leads to complexity where simplicity is required …'*
- *'SST will increase the minimum Solvency level …'*

We would like to thank Andreas Kull (Ernst&Young) for the permission to use this slide

Impressions from the Industry

Some see it in a positive light:

- *'...facilitates more efficient use of risk capital ...'*
- *'Facilitates company wide risk culture and dialogue...'*
- *'... will reward companies that have a comprehensive risk management in place...'*
- *'... internal models are an excellent management tool and can be a competitive advantage...'*
- *‚Rating dependent premiums will gain acceptance.'*
- *'Increased transparency in the insurance sector may reduce cost of capital for the sector as a whole...'*
- *'... will lead to increased transparency in an insurer's financial strength/weakness...'*
- *'... is an effective regulatory instrument to prevent insolvencies...'*

We would like to thank Andreas Kull (Ernst&Young) for the permission to use this slide

Impressions from the Industry

Implementation of the SST for small to midsized companies:

„Wir haben diesen Sommer viel gelernt über unser Versicherungsgeschäft und über die Bedeutung von einzelnen Zahlen. Es gab viele Diskussionen über Kennziffern usw. welche zu einem Wissensaufbau in unserer Geschäftsführung führten und dazu beitragen werden, dass wir die Gesellschaft mit noch besseren Entscheidungsgrundlagen führen können. Die Ergebnisse aus dem SST-Testlauf nutzen wir auch für Diskussionen mit dem Verwaltungsrat (es gibt eine zusätzliche Sicht auf den Vermögensstand und den Geschäftsverlauf). Ich bin überzeugt, dass der SST die Führung von unserer Gesellschaft zukünftig unterstützen wird. Die Aufsicht lieferte uns dementsprechend ein weit ausgebautes Führungshilfsmittel.“

Comment by Martin Rastetter from the ‘Metzgerversicherung’ a small-to-midsized nonlife company with approx CHF 160 Mio tech. provisions

Days of work used approximately:

Initially:	Internal: 40-50 days,	External: 15-20 days
Afterwards:	Internal: 15-20 days,	External: 10-15 days

Impressions from the Industry

Implementation of the SST for large companies:

"Die Winterthur Gruppe unterstützt grundsätzlich die Einführung des Swiss Solvency Test. Im Gegensatz zum heute gültigen Solvenzregime gibt der Swiss Solvency Test ein präziseres Bild über die Risikoexposition einer Versicherungsgesellschaft. Das ist im Interesse der Versicherten und der Versicherer. Das Risk Management der Winterthur arbeitet intern schon seit einigen Jahren mit vergleichbaren Risikomodellen und hat seine Erfahrungen in den SST eingebracht. Im Rahmen von Solvency II entwickelt sich in der EU ein vergleichbares Solvenzregime. Wichtig ist, dass der schweizerische Versicherungsregulator den Versicherungsgesellschaften eine angemessene Übergangsfrist bei der Erfüllung der neuen Anforderungen einräumt, und die Entwicklungen im Rahmen von Solvency II bei der weiteren Ausgestaltung des SST angemessen berücksichtigt."

Joachim Oechslin

Chief Risk Officer Winterthur Group

Impressions from the Industry

Implementation of the SST for midsized companies:

"For our risk and investment strategy we need to be able to quantify the cash flow structure and the risk bearing capacity of our portfolios. For this the SST is a good (although in many aspects still to be modified and enhanced) basis. In addition, we can use the SST to test capital requirements for alternative investment strategies. As we have not yet an equally well suited internal model, the SST is for us of great benefit. We see it as an integral part within our ALM process."

Comment by René Bühler from the "National Versicherung", a mid-sized insurance group.

Days of work used approximately:

Initially:	Internal:	220 days for life, 170 days for nonlife
Afterwards:	Internal:	~180 days for life, 150 days for nonlife

Field Test 2005

- Market risk is often dominating (50%-80%)
- The market value margin is between 10%-40% of target capital rsp. 1%-8% of best-estimate provisions
- Diversification Effect between Insurance and Market Risk: between -5% and -30%
- Effect of Scenarios on ES[RBC]: Between 5% and 50%
  - Seems too high and some scenarios will be adjusted
- 'Market consistent value of assets / Statutory value of assets': between 90% and 120% but in most cases market consistent value is higher than statutory
- 'Market consistent value of liabilities / Statutory value of liabilities': between 70% and 100%
  - While SCR/Target Capital requirement is in many cases higher than statutory capital requirement, the economic solvency ratio can be better or worse than the statutory solvency ratio (Solvency 1), since economic capital is in most cases substantially higher than statutory capital

Principles vs Rules

Principles work:

Example: The requirement for the SST report was to send to the supervisor a report detailing the assumptions, calculations, simplifications etc. such that a knowledgeable 3rd person can understand the result

Result: The overwhelming majority of reports were of excellent quality

Requiring adherence to principles often leads to better quality and better company specific results than fixed rules which tend to foster a climate where execution mainly deals with pure compliance

Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Work Load

Result of the Field test: Total Work Load in Person Months (PM)

	Initally for Fieldtest	Subsequently
Small Companies	1-2 PM	< 1 PM
Small to Mid-Sized Companies	2 - 3 PM	< 2 PM
Mid-Sized Companies	9 - 15 PM	4 - 8 PM
Large Companies, Groups	12 - 24 PM	< 12 PM

Split for field test on average:

- 20% - 30% for internal education, communication
- 30% - 40% for developing valuation methodology, preperational work (data, IT),...
- 20% - 30% for actual calculation

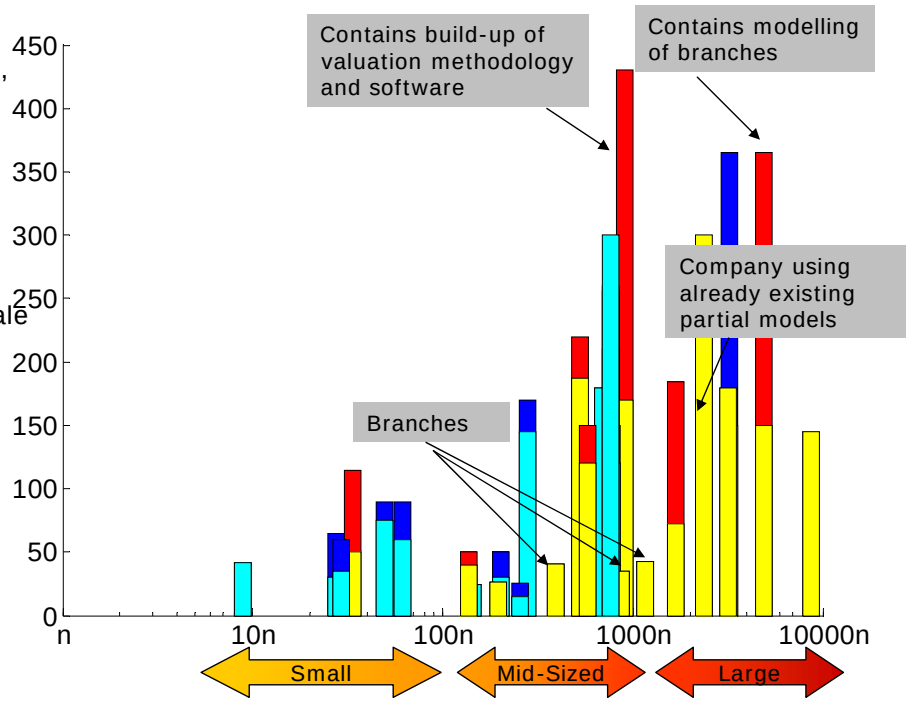
Based on initial feedback from a part of the field test participant

Work Load

Total workload for life and nonlife companies, split into work for field test 2005 (initial) and estimates for work for SST during later years

Y-axis: person days of work

X-axis: logarithmic scale for size of company (assets)



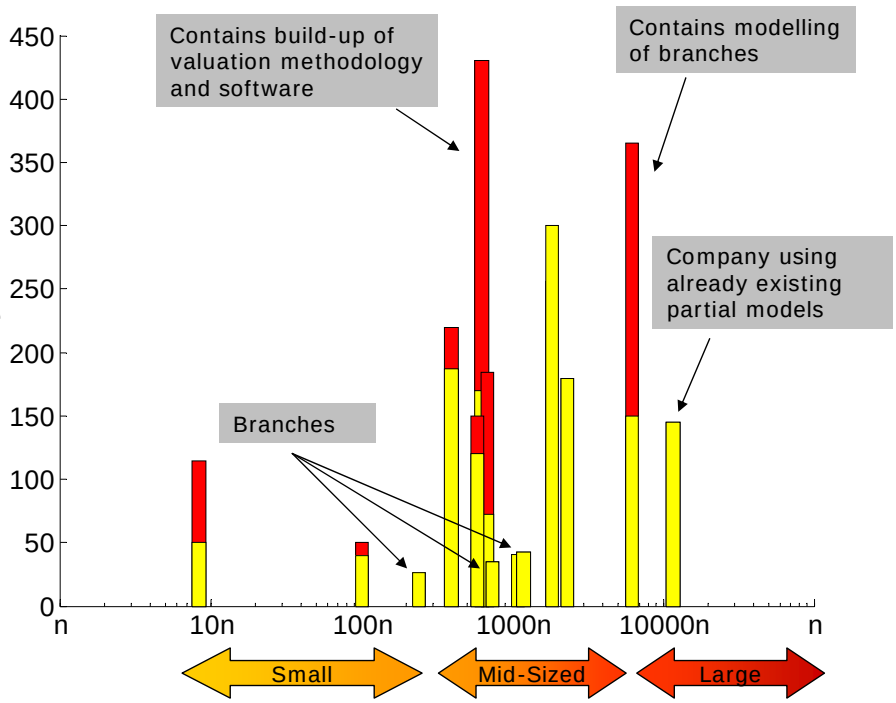
Life initial
Life later
Nonlife initial
Nonlife later

Work Load: Life

Total workload for life companies, split into work for field test 2005 (initial) and estimates for work for SST during later years

Y-axis: person days of work

X-axis: logarithmic scale for size of company (assets)



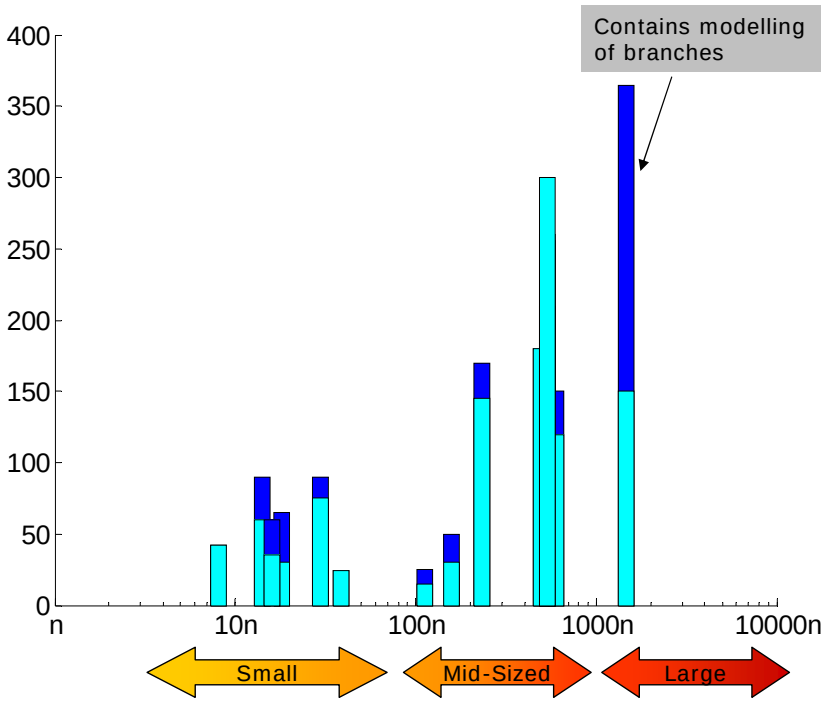
Life initial
Life later

Work Load: P&C

Total workload for nonlife companies, split into work for field test 2005 (initial) and estimates for work for SST during later years

Y-axis: person days of work

X-axis: logarithmic scale for size of company (assets)

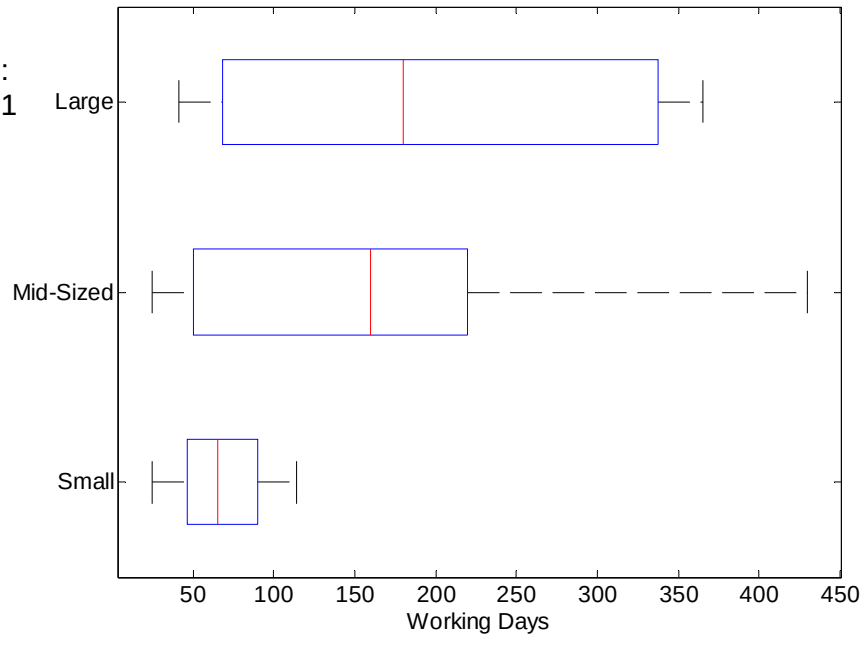


Work Load

Small companies: assets < CHF 1 bn

Mid-sized companies: assets between CHF 1 bn and CHF 10 bn

Large Companies: Assets > CHF 10 bn



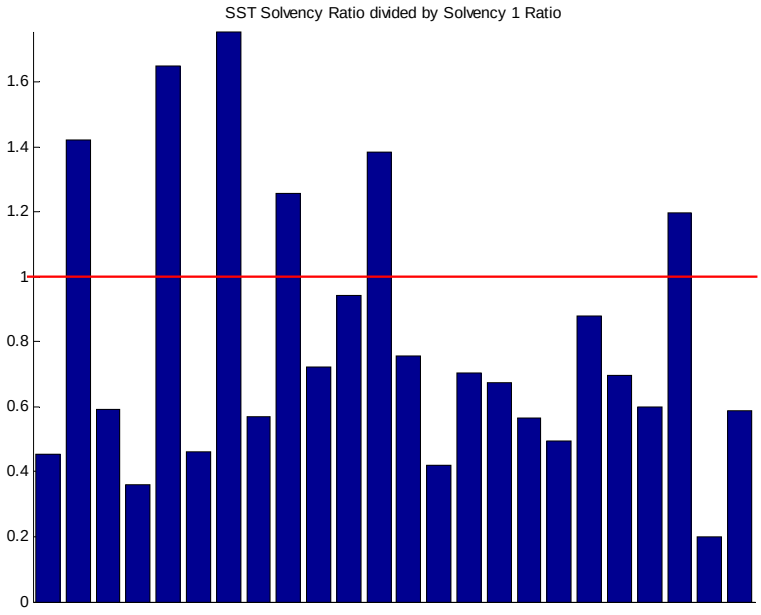
Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Solvency Ratios

The following graph shows a comparison of the SST solvency ratio with the statutory solvency ratio. A value larger than 1 means that the SST solvency ratio is higher than the statutory solvency ratio.

A value larger than 1 does not imply that a company does not satisfy either statutory or SST solvency but only that the SST solvency ratio is higher than statutory solvency ratio



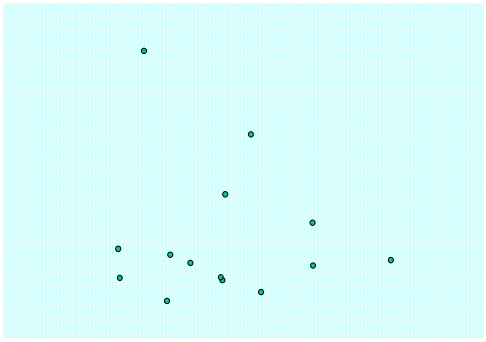
The bars denote ratios for a randomized mix of a randomized sample of life and nonlife companies of field test participants

Solvency Ratios

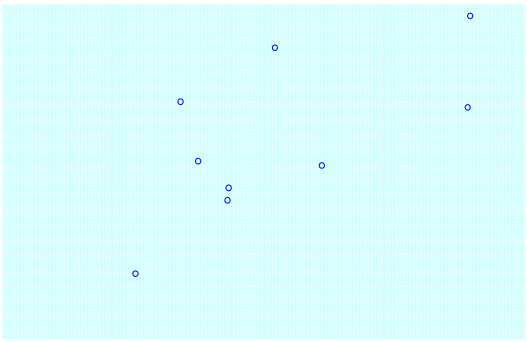
The Statutory Solvency Ratio is only a weak predictor for the SST Solvency Ratio

For nonlife companies, Spearman's Rank Correlation is approx 0 and for life companies Spearman's Rank Correlation is approx 0. 5

Nonlife



Life



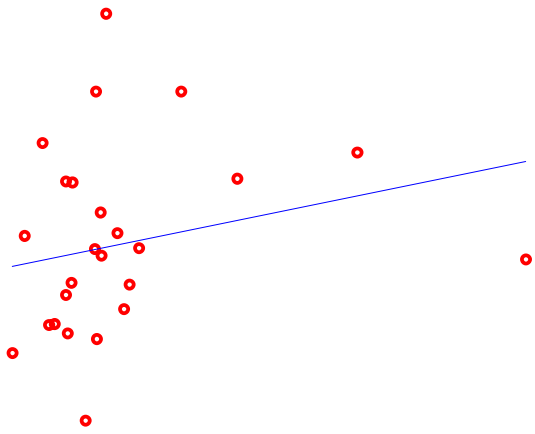
Solvency Measures

The Statutory Solvency Ratio is only a weak predictor for the SST Solvency Ratio

X-axis: Solvency 1 Ratio

Y-axis: SST Solvency Ratio

Correlation for nonlife companies: weakly negative, for life companies approx. 0.4



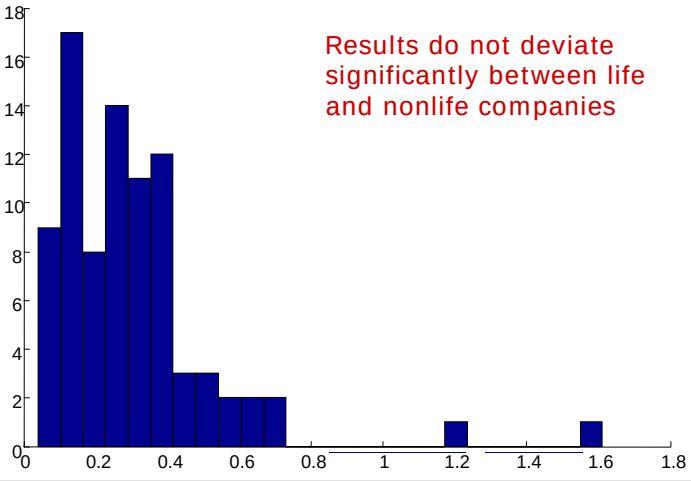
Volatility of SST Solvency Ratio

Is economic solvency more volatile than Solvency 1?

Sample: Solvency 1 ratios of approx. 100 life and nonlife companies over the last 5 years

- The average standard deviation of the change of the Solvency 1 ratio over the 5 year mean is approx 30%
- 1/3 of the companies had at least one yearly change of Solvency 1 ration in excess of 50% during the last 4 years
- 10% of the companies had at least two years, where the Solvency 1 ratio changed by more than 50% during the last 4 years
- For approx half of the companies is the minimal Solvency 1 ratio during the last 5 year less than half of the maximal Solvency 1 ratio.
- For 10% of the companies is the minimal solvency 1 ratio during the last 5 year less than 25% of the maximal solvency 1 ratio.

Histogram of the standard deviation of the change of solvency 1 ratios around the 5 year mean



Results do not deviate significantly between life and nonlife companies

Contents

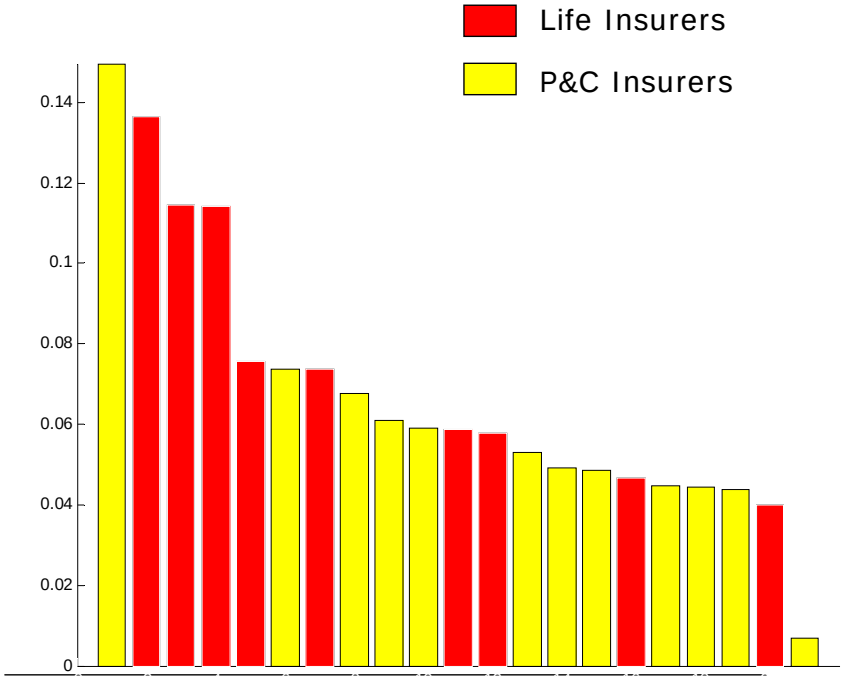
- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

ES vs VaR

The following graph shows for a selection of companies how much the 99% Expected Shortfall exceeds the 99.5% VaR.

On weighted average, 99% Expected Shortfall is approx. 10% higher than the 99.5% VaR

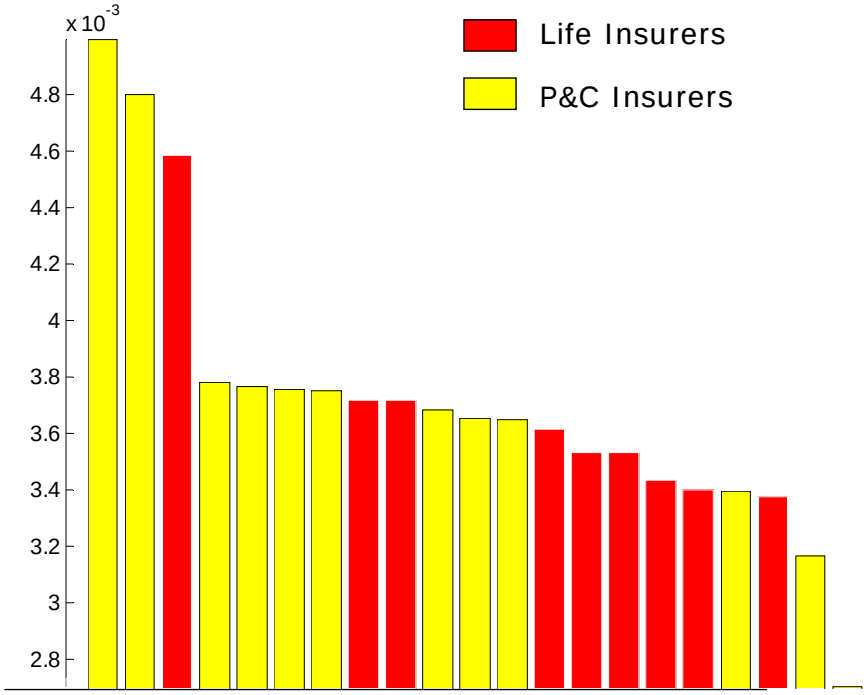
For P&C companies the weighted average excess is 13%, for life companies approx. 9%



ES vs VaR

The following graph shows for a selection of companies the Value at Risk equivalent of the 99% Expected Shortfall. A value of 4*10^(-3) means that the 99% Expected Shortfall corresponds to a 99.6% VaR

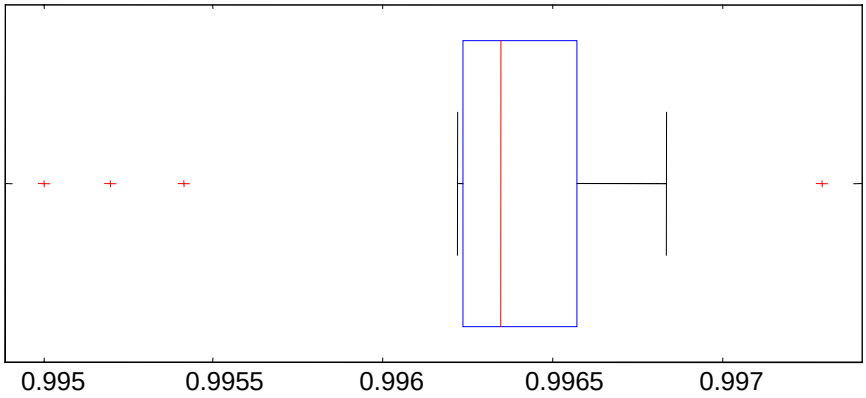
The maximum is 99.7% VaR, the minimum is 99.5% VaR, the median is 99.63% VaR



ES vs VaR

The boxplot shows the Value at Risk equivalents of the 99% Expected Shortfall. For 3 companies, the SST risk measures corresponds to a Value at Risk on a confidence level very near 99.5%. The maximal difference is one company where the Expected Shortfall corresponds to 99.73%.

The median VaR equivalent is 99.63%



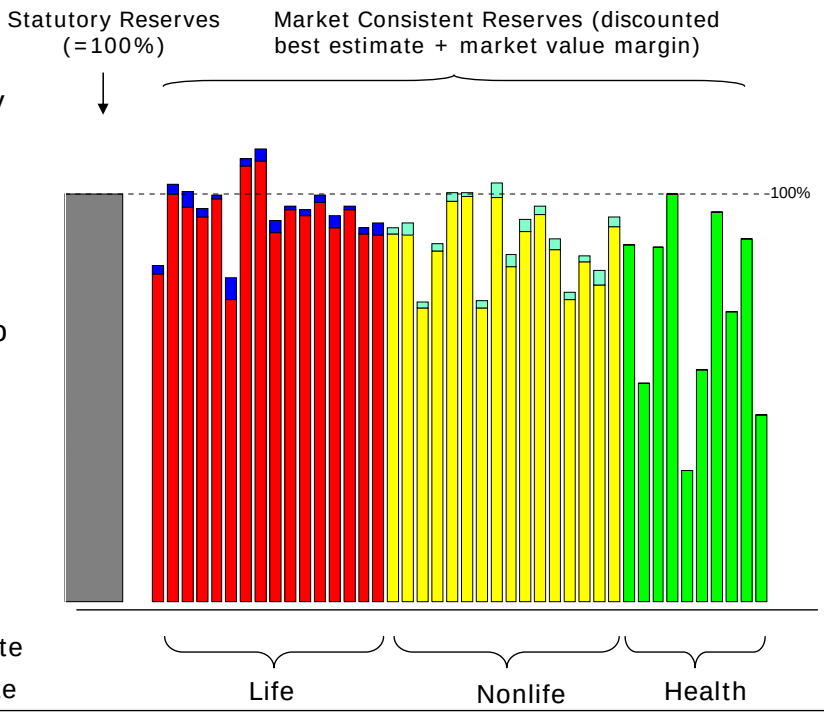
Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Valuation Liabilities

The following graph shows how market consistent liabilities compare to statutory liabilities.

In most cases, market consistent valuation releases substantial amounts of hidden reserves to risk bearing capital

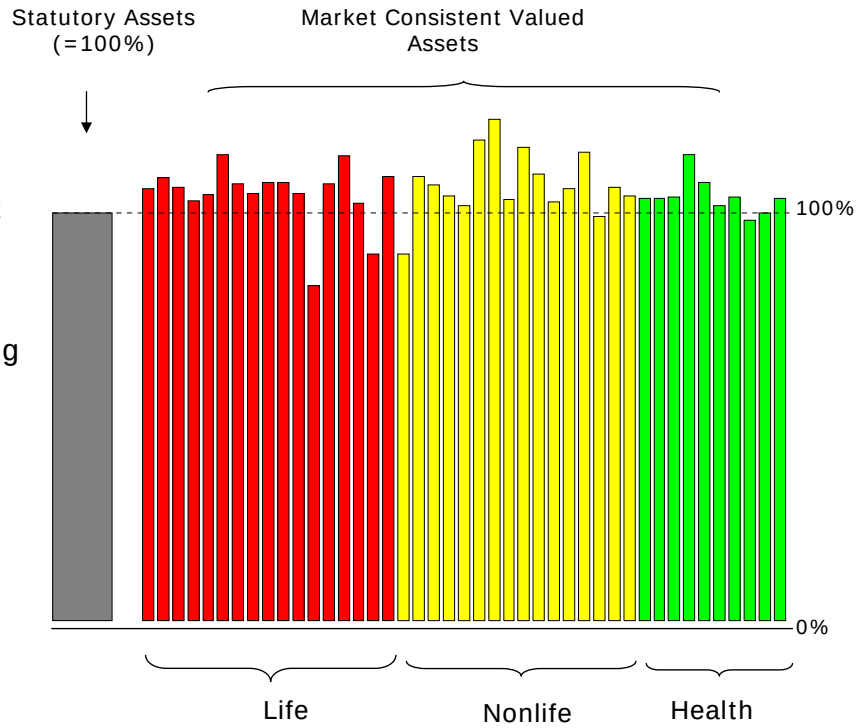


- Life MVM
- Life Best Estimate
- Nonlife MVM
- Nonlife Best Estimate
- Health Best Estimate

Valuation Assets

The following graph shows how market consistent assets compare to statutory assets.

In most cases, market consistent valuation releases substantial amounts of hidden reserves to risk bearing capital



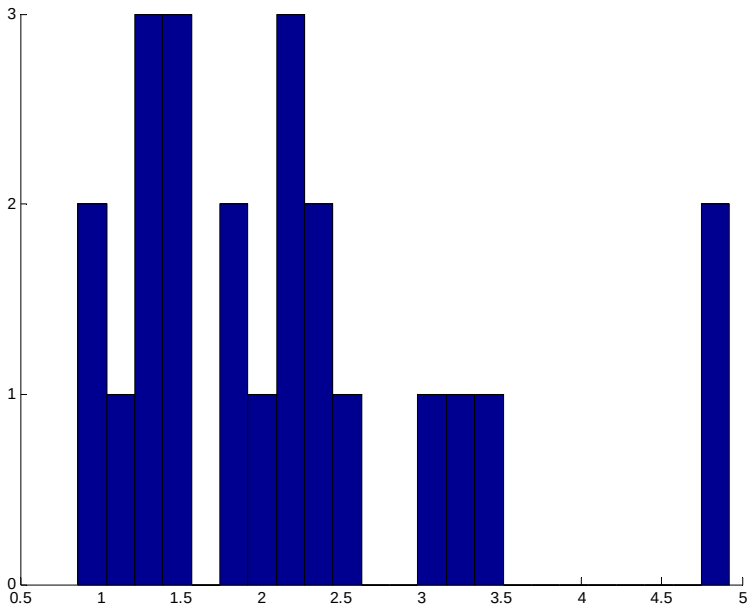
- Life
- Nonlife
- Health

Risk Bearing Capital

The graph shows the comparison between economic risk bearing capital and Solvency 1 risk bearing capital (with outlier removal).

Most companies have substantially more risk bearing capital available under an economic framework

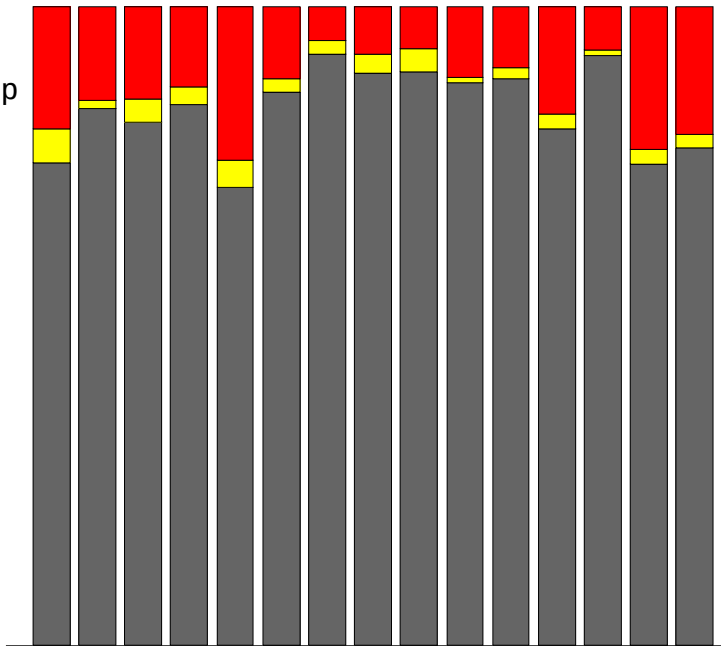
On average risk bearing capital increases by approx. a factor 2



Best Estimate, MVM, SCR

The relationship between best estimate, market value margin and target capital

The figure shows the relationship between the best estimate of liabilities, the market value margin and the 1-year risk capital (ES) for a random selection of companies. The actual values were furthermore randomized by multiplication with a random number near 1. The relative comparison is however representative



ES (1 Year Risk Capital)

Market Value Margin

Best Estimate

Contents

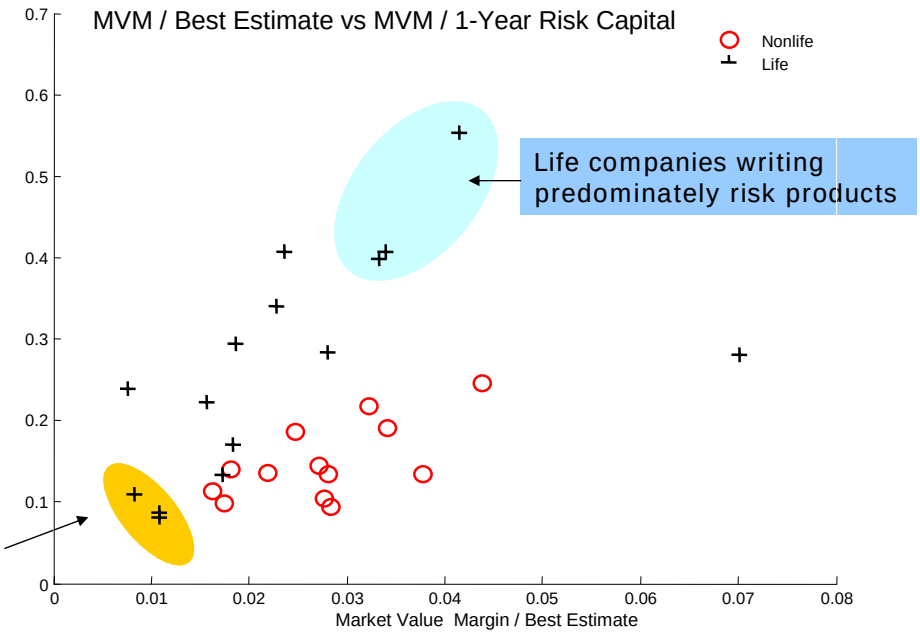
- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Market Value Margin

Market Value Margin / Best Estimate vs Market Value Margin / ES[RBC], based on provisional data of Field Test 2005

X-axis: MVM divided by best estimate of liabilities

Y-axis: MVM divided by 1-year risk capital (SCR)



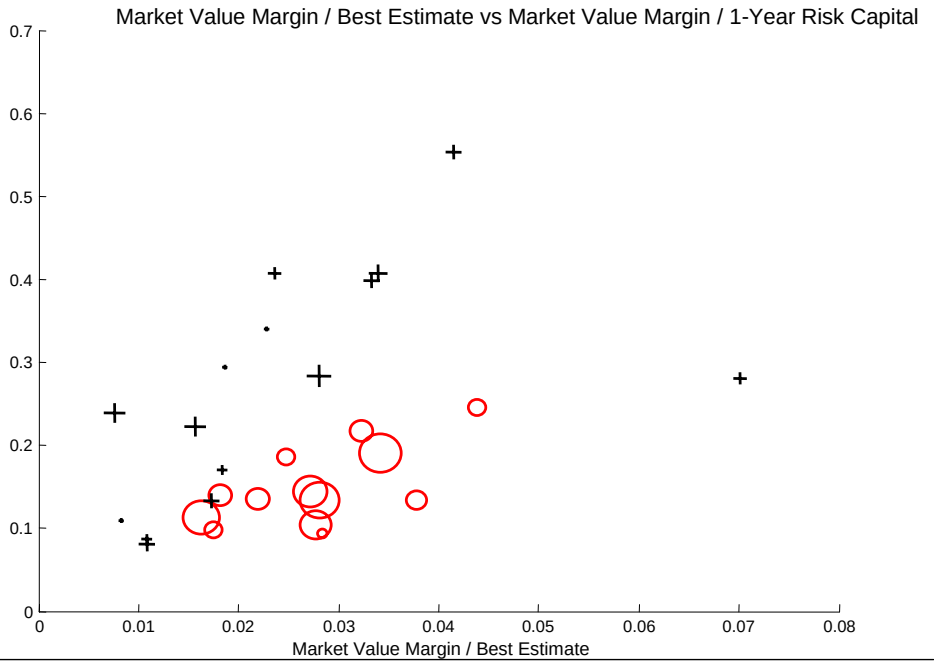
Market Value Margin

Market Value Margin / Best Estimate vs Market Value Margin / ES[RBC], based on provisional data of Field Test 2005

Size of markers corresponds to required 1 year risk capital

X-axis: MVM divided by best estimate of liabilities

Y-axis: MVM divided by 1-year risk capital (SCR)

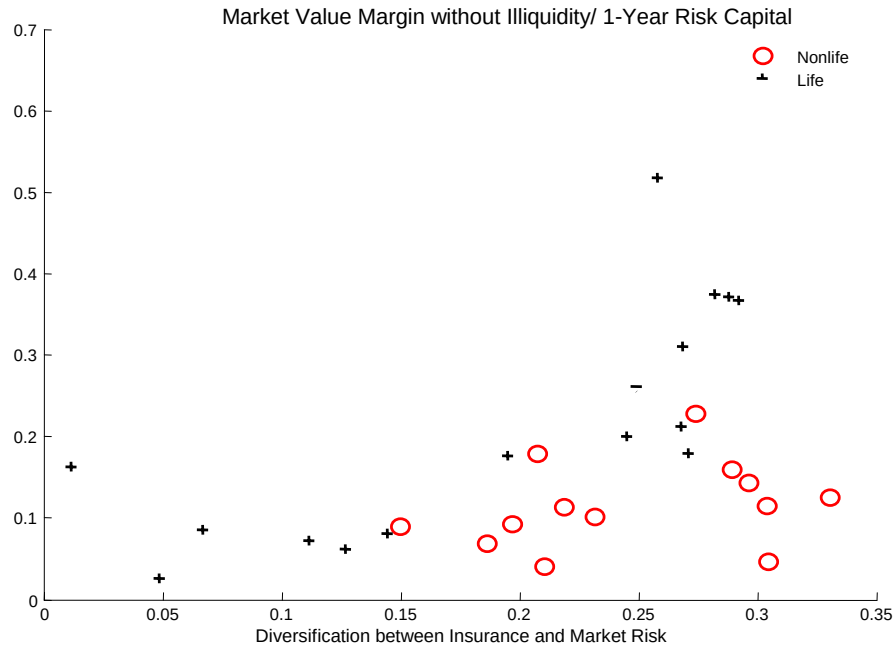


Market Value Margin

Diversification vs Market Value Margin / ES[RBC], based on provisional data of Field Test 2005

X-axis: Diversification between insurance and market risk

Y-axis: market value margin divided by 1-year risk capital



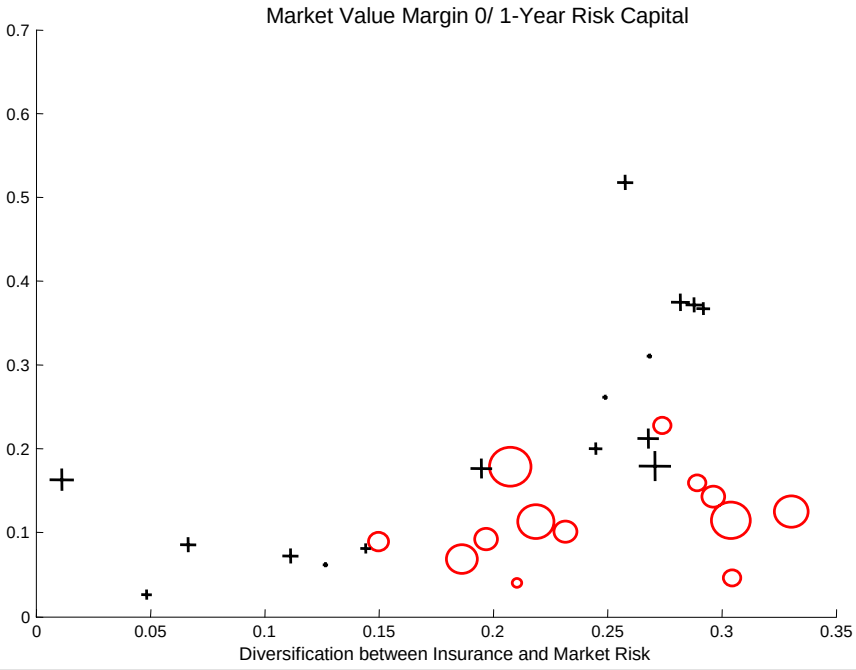
Market Value Margin

Diversification vs Market Value Margin / ES[RBC], based on provisional data of Field Test 2005

Size of markers corresponds to required 1 year risk capital

X-axis: Diversification between insurance and market risk

Y-axis: market value margin divided by 1-year risk capital



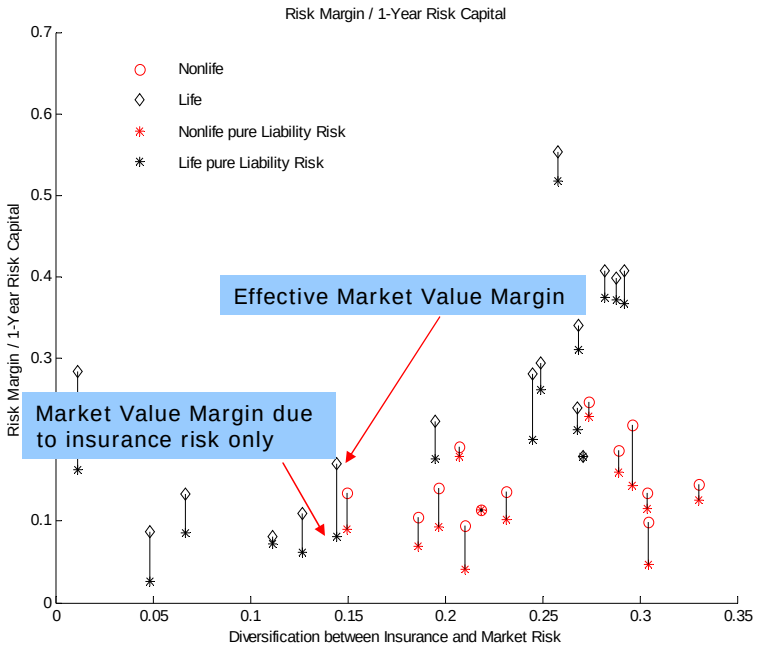
MVM: Effect of Illiquidity of Assets

The following graph shows a comparison of the actual market value margins which include the effect of illiquidity of assets with (theoretical) market value margins where assets are assumed to be completely liquid and where convergence to the optimal replicating asset portfolio were instantaneous

For some companies a substantial reduction of the MVM could be achieved by going over to a more liquid asset portfolio

Overall, the illiquidity of assets increases the MVM by approx. 25%

Diversification vs Market Value Margin / ES[RBC], based on provisional data of Field Test 2005



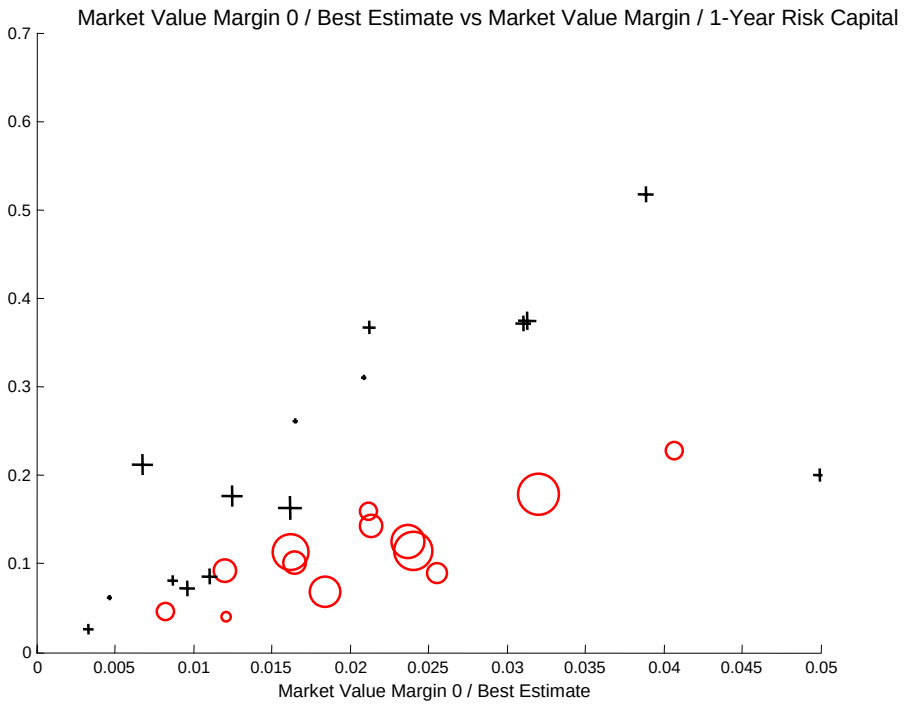
MVM: Effect of Illiquidity of Assets

The following graph shows the market value margin based purely on insurance risk.

The size of the markers depends on the amount of required 1-year risk capital

X-axis: MVM divided by best estimate of liabilities

Y-axis: MVM divided by 1-year risk capital



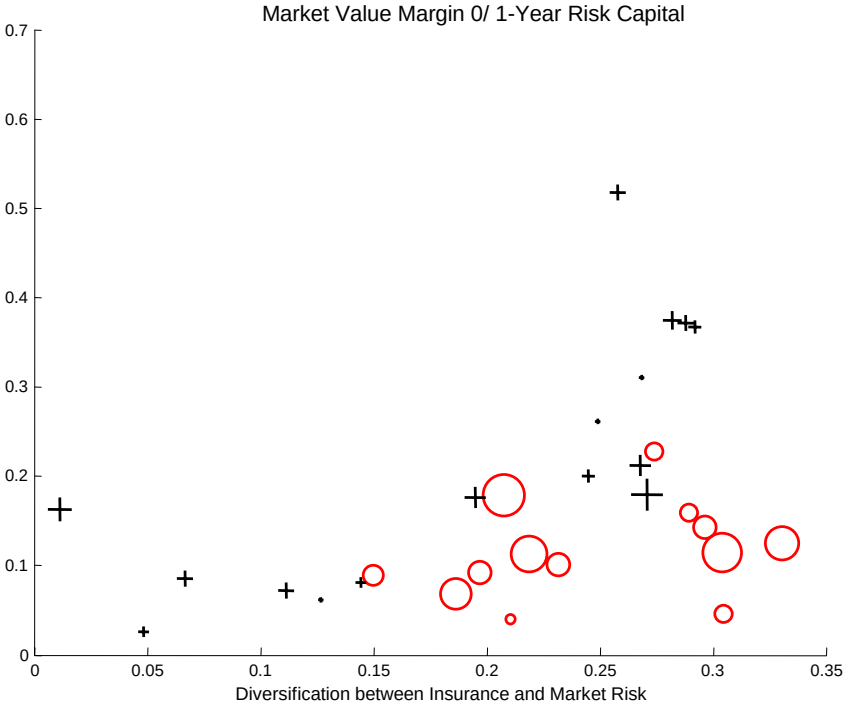
MVM: Effect of Illiquidity of Assets

The following graph shows the market value margin based purely on insurance risk.

The size of the markers depends on the amount of required 1-year risk capital

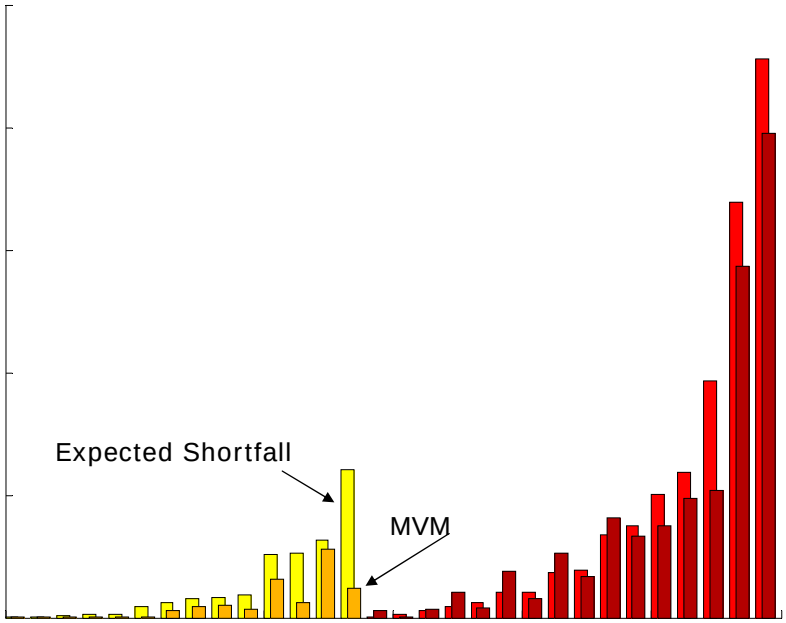
X-axis: Diversification between insurance and market risk

Y-axis: market value margin divided by 1-year risk capital



MVM vs ES

The graph shows a comparison of the MVM and expected shortfall due to insurance risk. The expected shortfall has a confidence level of 99%.

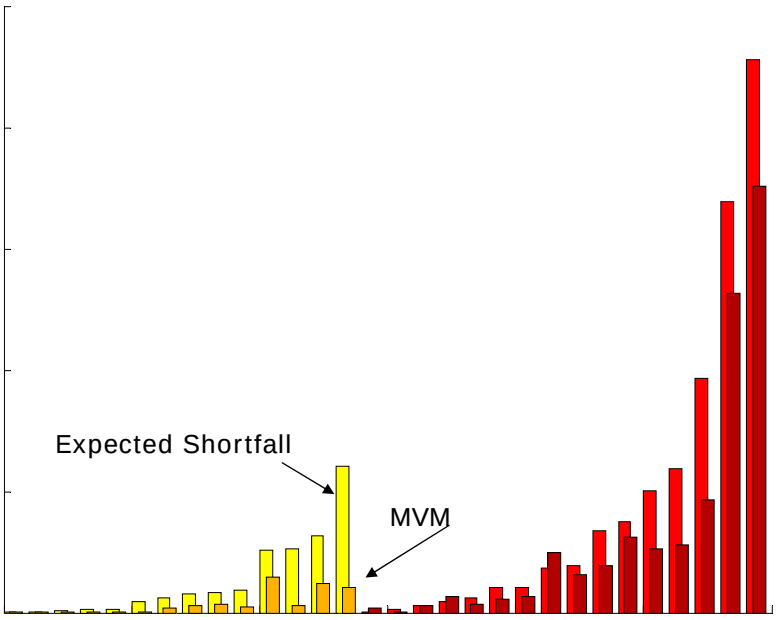


Life Insurers

P&C Insurers

MVM without Liquidity vs ES

The graph shows a comparison of the MVM without liquidity and expected shortfall due to insurance risk. The expected shortfall has a confidence level of 99%.



Life Insurers

P&C Insurers

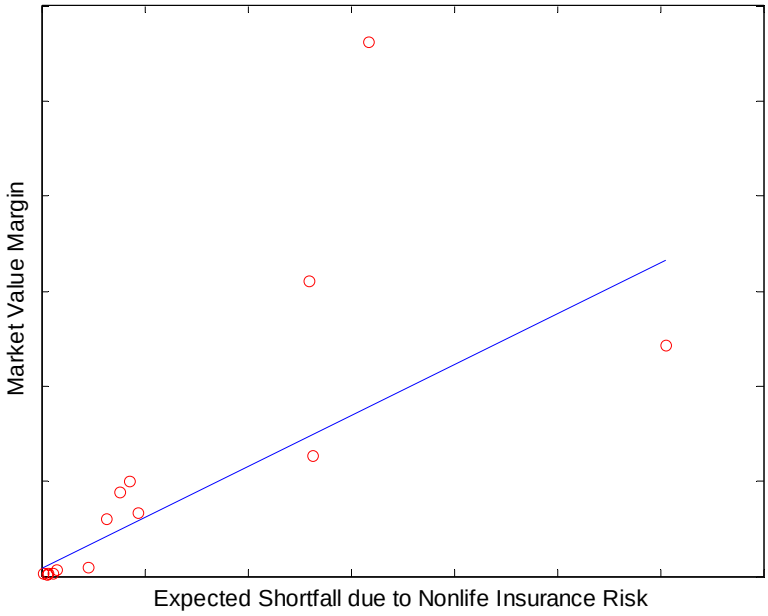
MVM vs ES: Nonlife

The graph shows a comparison of the MVM and expected shortfall due to insurance risk for nonlife companies. The expected shortfall has a confidence level of 99%.

The robust linear fit between ES and the MVM is:

MVM=CHF 4.4 Mio + 0.267*ES

The linear correlation is 0.711



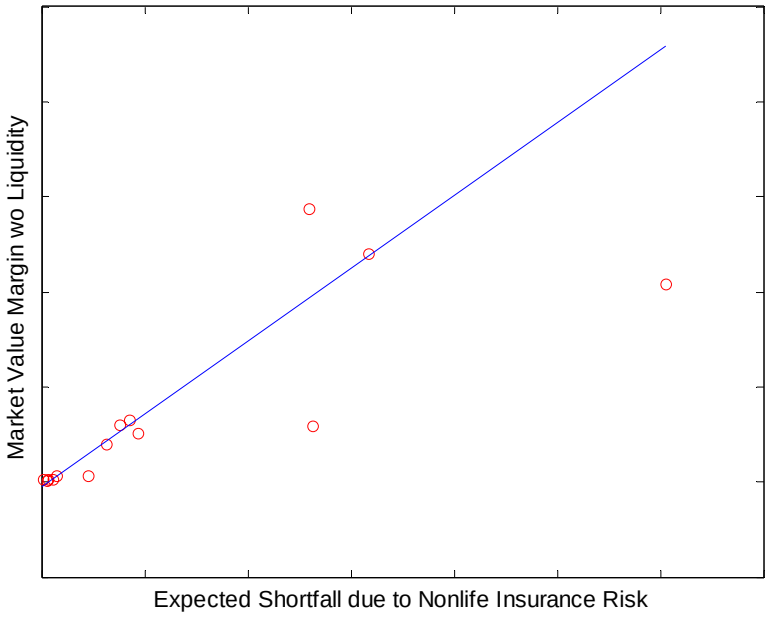
MVM without Liquidity vs ES: Nonlife

The graph shows a comparison of the MVM and expected shortfall due to insurance risk for nonlife companies. The expected shortfall has a confidence level of 99%.

The robust linear fit between ES and the MVM is:

MVM=- CHF 2.6 Mio + 0.383*ES

The linear correlation is 0.8



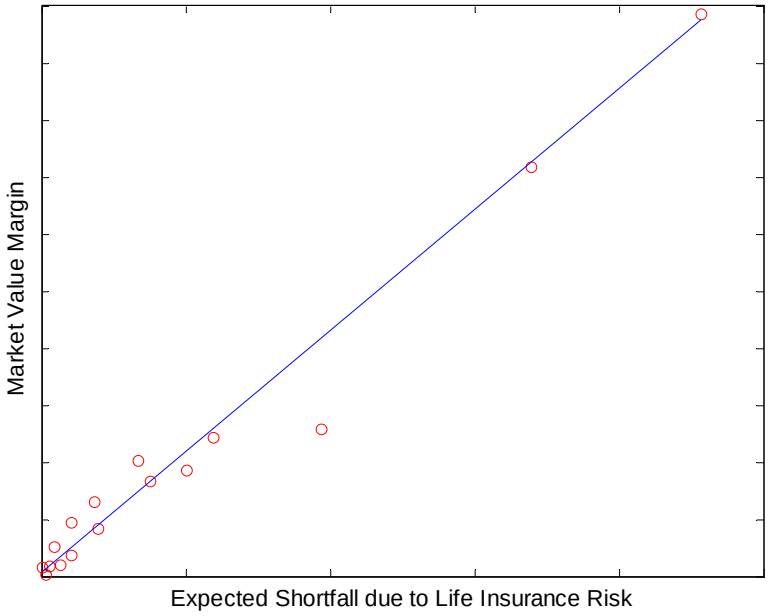
MVM vs ES: Life

The graph shows a comparison of the MVM and expected shortfall due to insurance risk for life companies. The expected shortfall has a confidence level of 99%.

The robust linear fit between ES and the MVM is:

MVM=CHF 15.6 Mio + 0.848*ES

The linear correlation is 0.985



MVM without Liquidity vs ES: Life

The graph shows a comparison of the MVM and expected shortfall due to insurance risk for life companies. The expected shortfall has a confidence level of 99%.

The robust linear fit between ES and the MVM is:

MVM=- CHF 0.3 Mio + 0.771*ES

The linear correlation is 0.984

Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

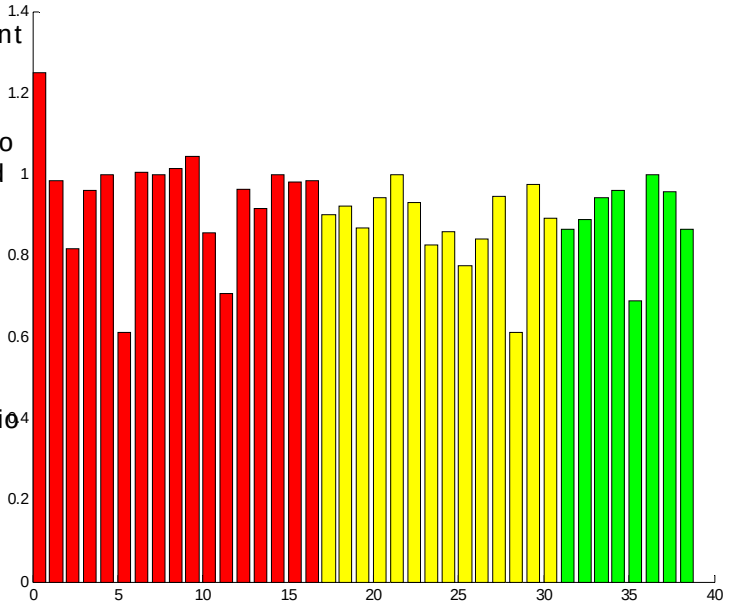
Expected Returns

Effect on the SST solvency ratio of expected financial and technical result during the current year.

The y-axis shows the SST solvency ratio without taking into account expected results divided by the SST solvency ratio with expected result

For life company the average ratio is 95%, for nonlife companies 88%, for health companies 90%

For life company the median ratio is 98%, for nonlife companies 90%, for health companies 92%



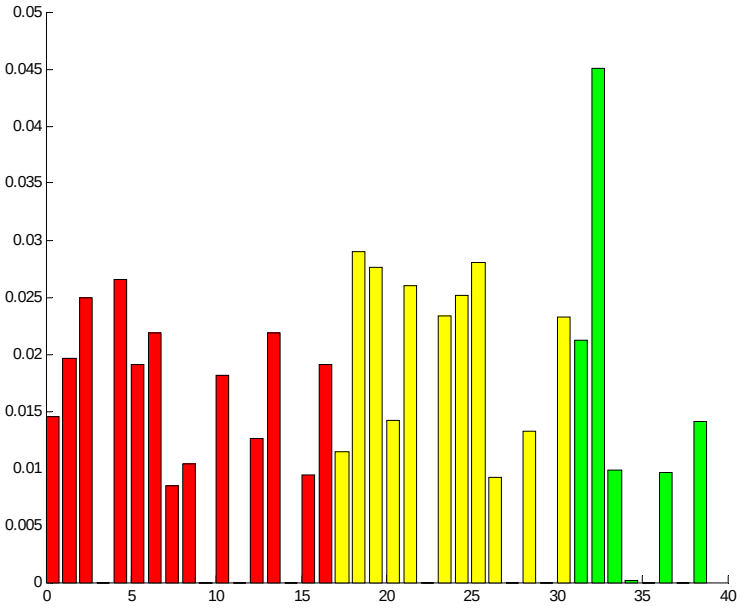
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Expected financial results (above risk free) divided by the market value of total assets



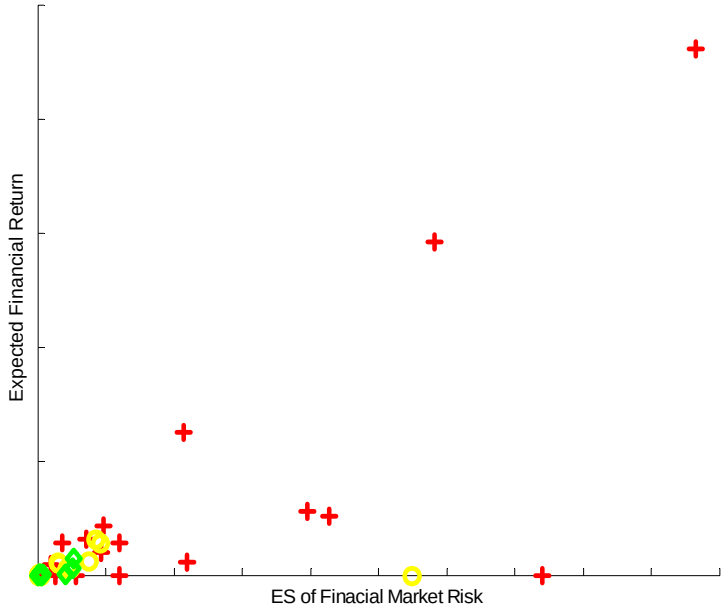
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Expected shortfall of financial market risk vs expected financial result above risk free



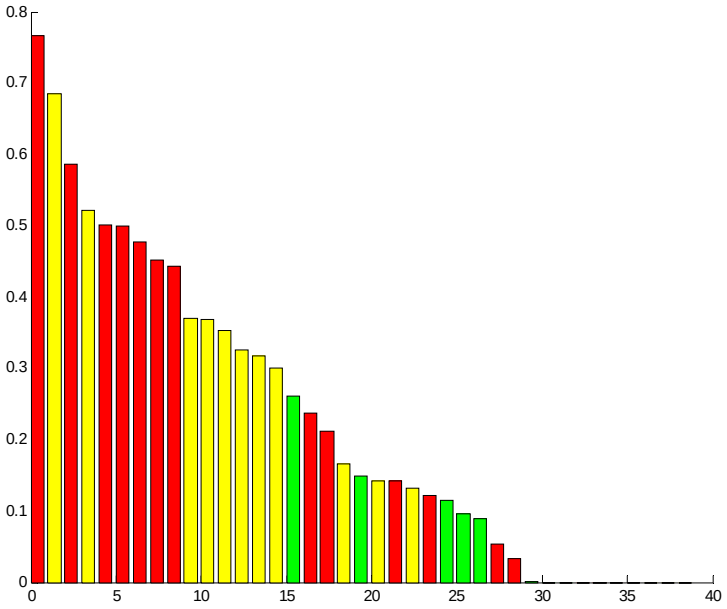
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Ratio of Expected Financial Result above risk free rate divided by Expected Shortfall of Financial Market Risk



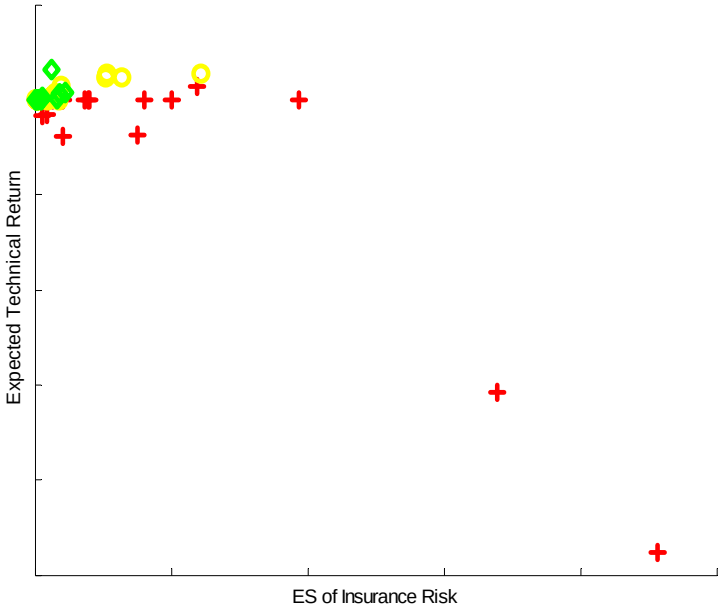
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Expected shortfall of insurance risk vs expected technical result



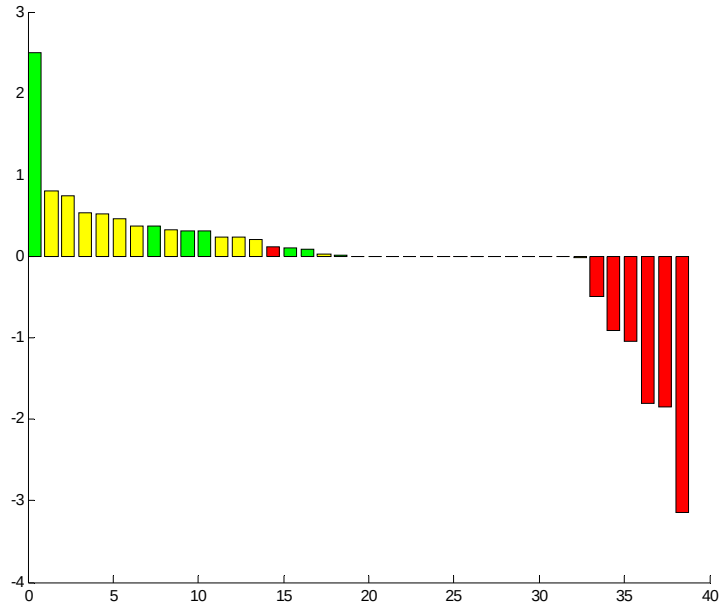
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Ratio of Expected Insurance Result divided by Expected Shortfall of Insurance Risk



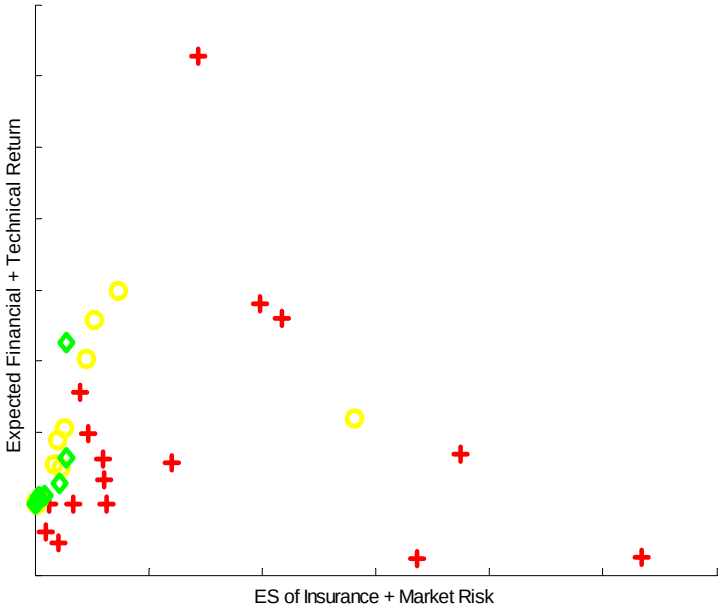
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Expected shortfall of insurance and market risk vs. expected financial above risk free + technical result



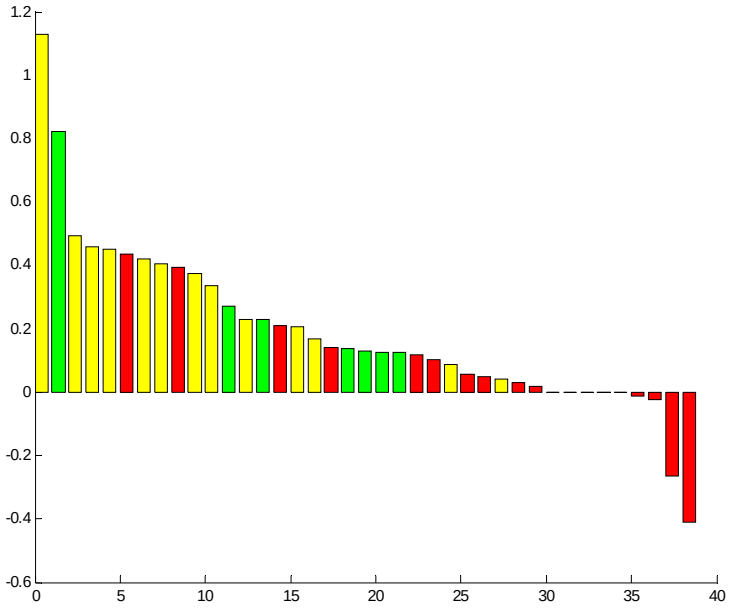
Life Insurers

P&C Insurers

Health Insurers

Expected Returns

Ratio of Expected Insurance + Financial Market Result divided by Expected Shortfall of Insurance and Market Risk



Life Insurers

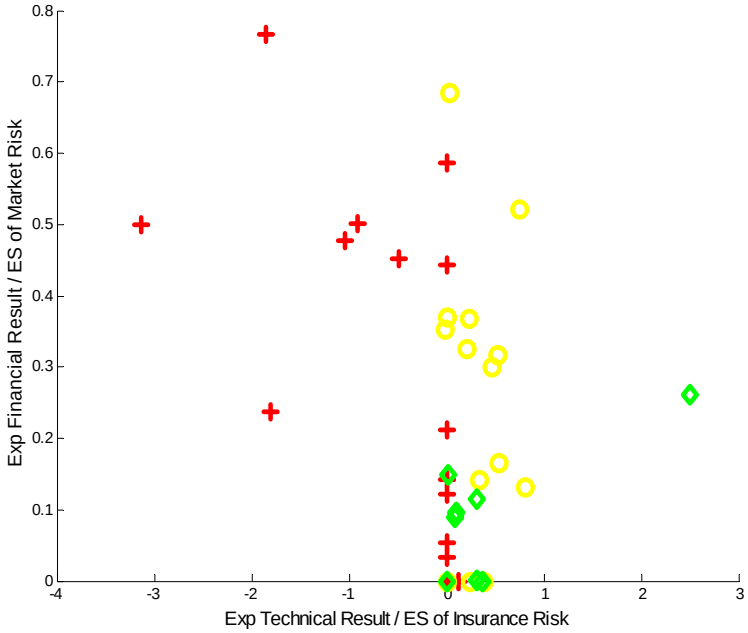
P&C Insurers

Health Insurers

Expected Returns

X-Axis: Expected Technical Result divided by Expected Shortfall of Insurance Risk

Y-Axis: Expected Financial Result above risk free divided by Expected Shortfall of Market Risk



Life Insurers

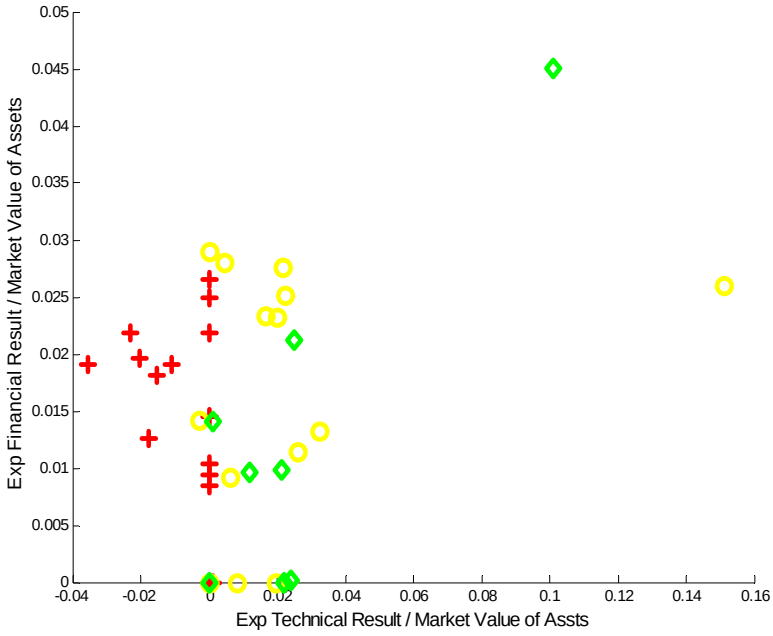
P&C Insurers

Health Insurers

Expected Returns

X-Axis: Expected Technical Result divided by Market Value of Assets

Y-Axis: Expected Financial Result above risk free rate divided by Market Value of Assets



Life Insurers

P&C Insurers

Health Insurers

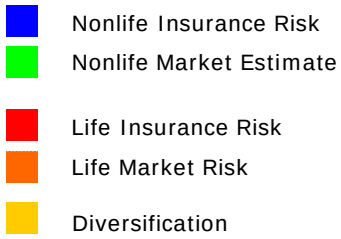
Contents

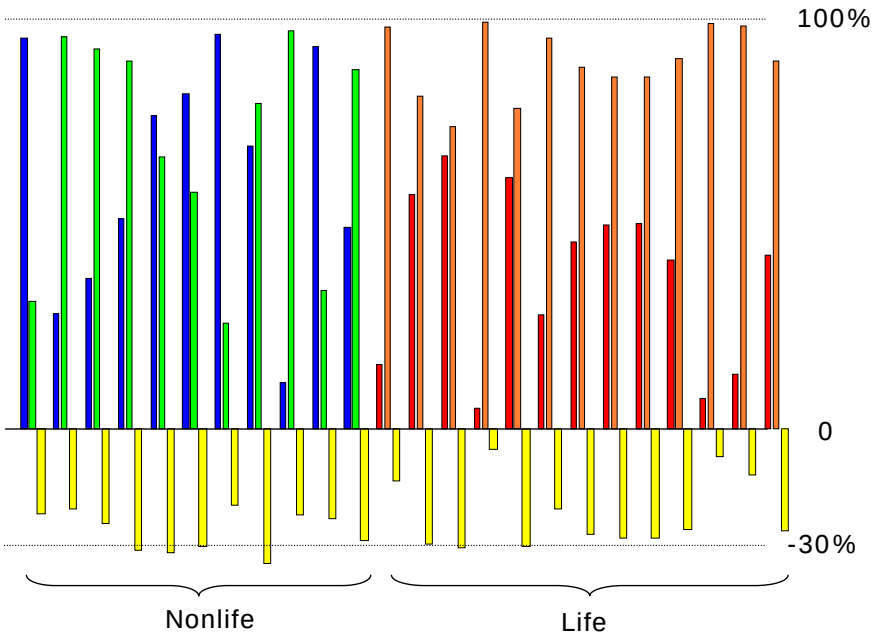
- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Diversification

Diversification between Market and Insurance Risk

The figure shows the 1 year risk capital due to market and insurance risk (normalized with total 1 year capital requirement) and diversification

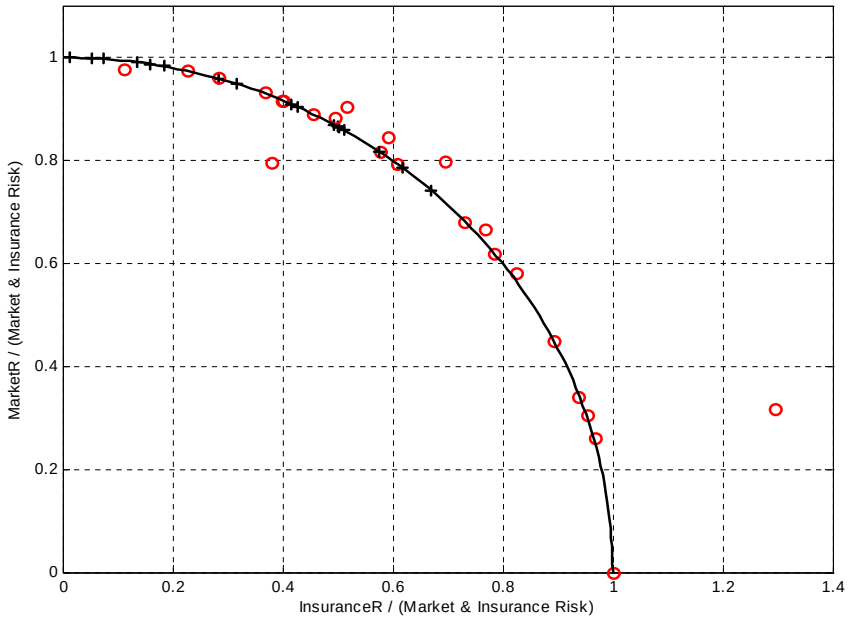




Diversification

Diversification between Market and Insurance Risk

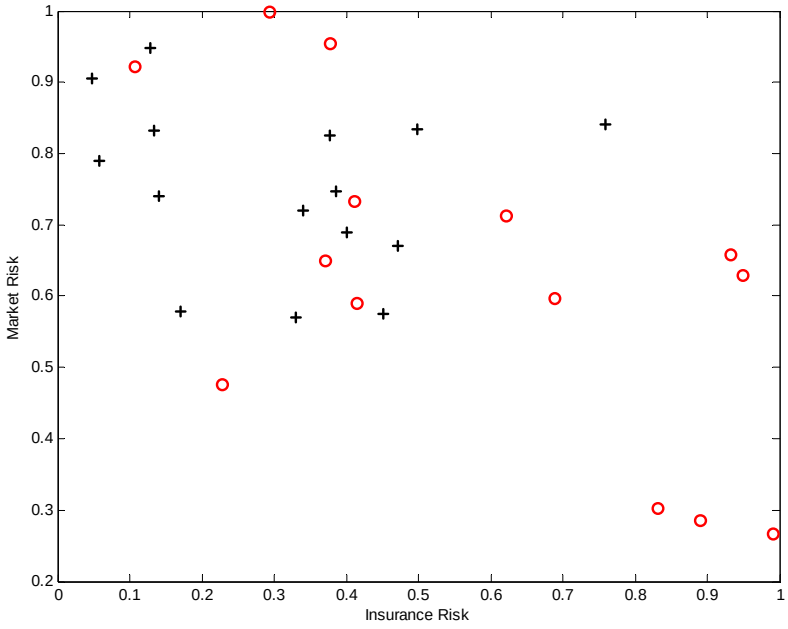
The figure shows the 1 year risk capital due to market and insurance risk (normalized with total 1 year capital requirement) and diversification



Diversification

Diversification between Market and Insurance Risk

The figure shows the 1 year risk capital due to market and insurance risk (normalized with total 1 year capital requirement) and diversification



Diversification: Market Risk

Diversification between different market risk factors:

		CHF	EUR	USD	GBP	Spreads	FX	Shares	Real Estate
	CHF	0.00	0.68	0.15	0.01	0.67	0.27	1.00	0.80
	EUR	0.68	0.00	0.03	0.00	0.56	0.20	0.44	0.30
	USD	0.15	0.03	0.00	0.00	0.17	0.10	0.13	0.10
	GBP	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00
	Spreads	0.67	0.56	0.17	0.01	0.00	0.26	0.60	0.71
	FX	0.27	0.20	0.10	0.01	0.26	0.00	0.18	0.23
	Shares	1.00	0.44	0.13	0.01	0.60	0.18	0.00	0.33
	Real Estate	0.80	0.30	0.10	0.00	0.71	0.23	0.33	0.00
	Others	0.10	0.11	0.07	0.00	0.00	0.01	0.00	0.12

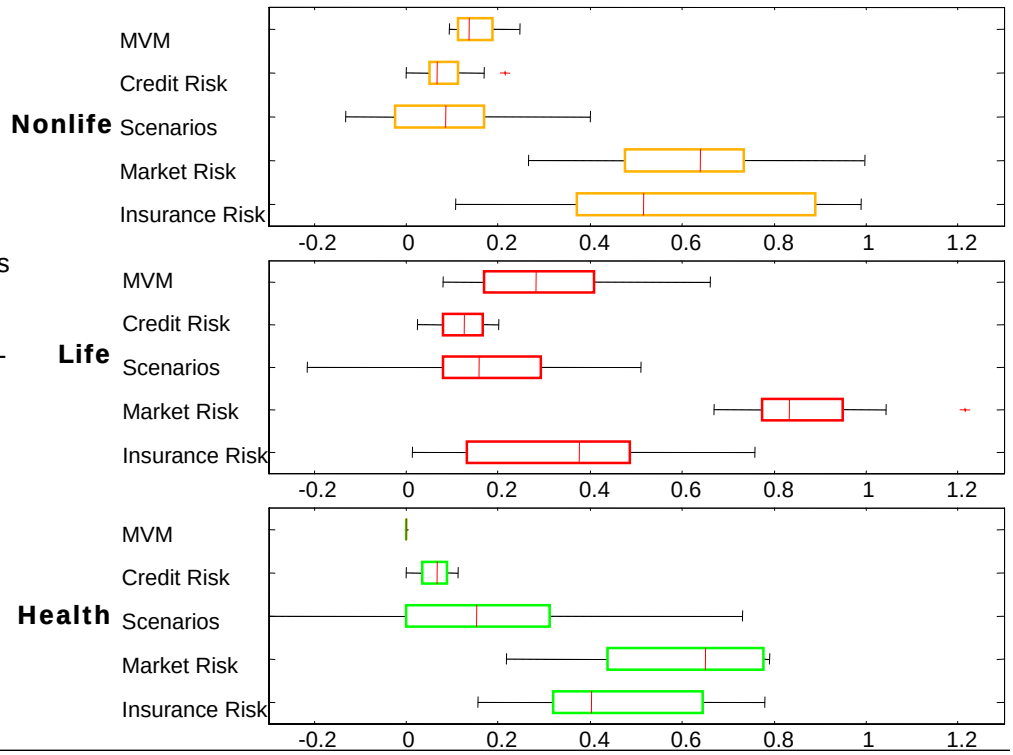
Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Components of Target Capital

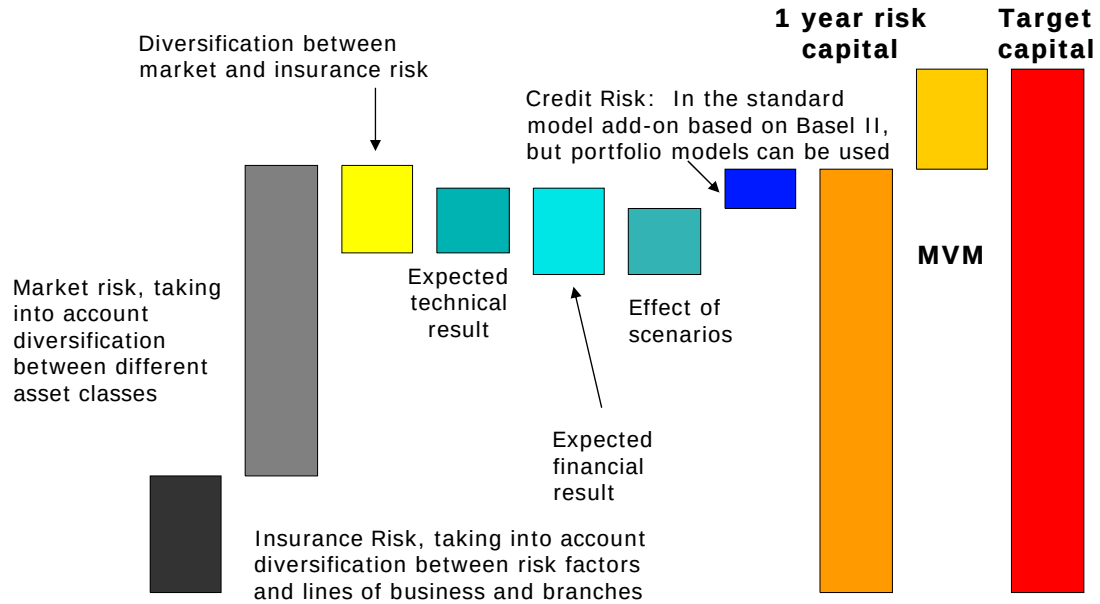
The boxplots show how the different components of target capital differ between companies.

The x-axis shows the value of the components divided by the 1-year risk capital



Components of Target Capital: Life

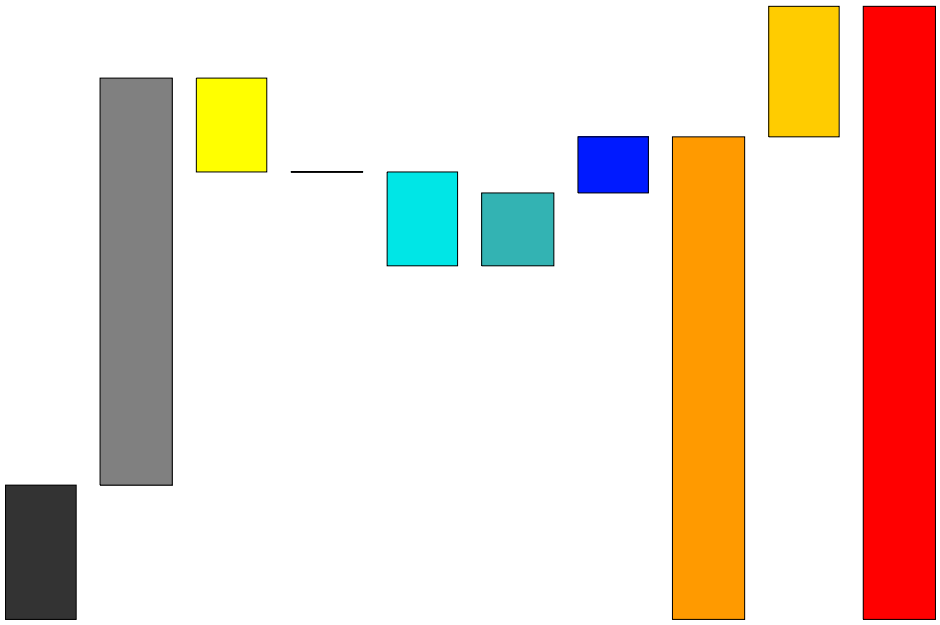
Components of Target Capital for Life Companies:



Relative length of bars correspond approximately to actual average values

Components of Target Capital: Life

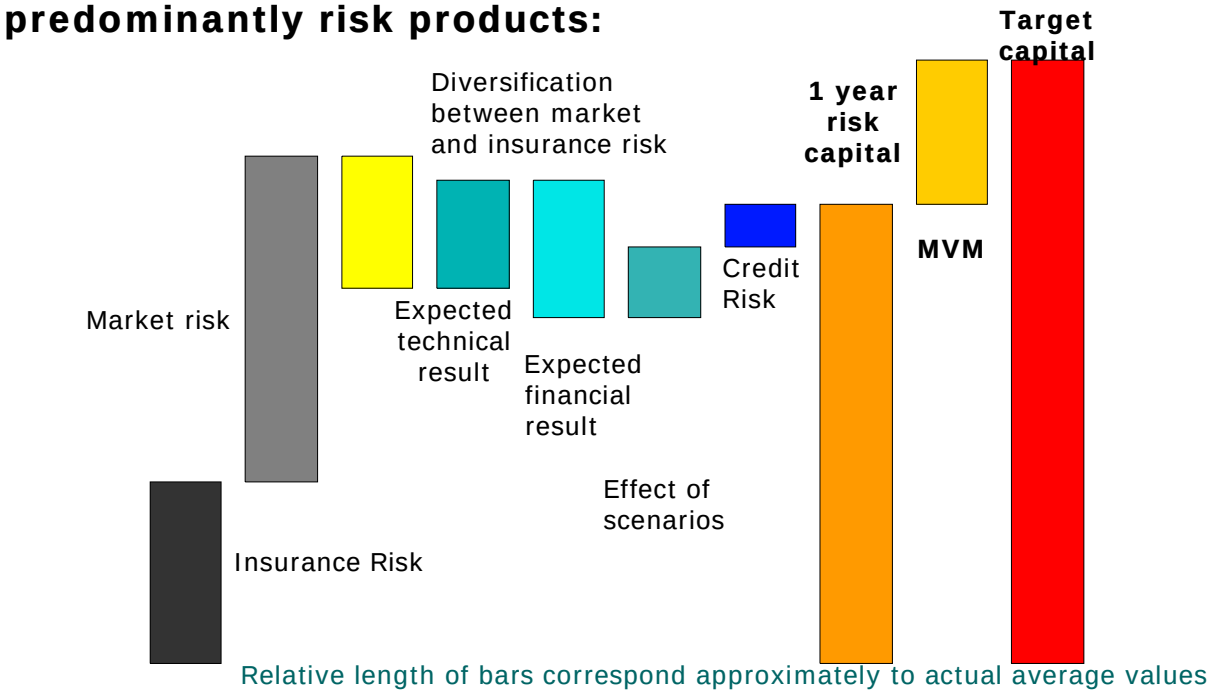
Components of Target Capital for Life Companies:



Relative length of bars correspond approximately to actual median values

Components of Target Capital: Life Risk

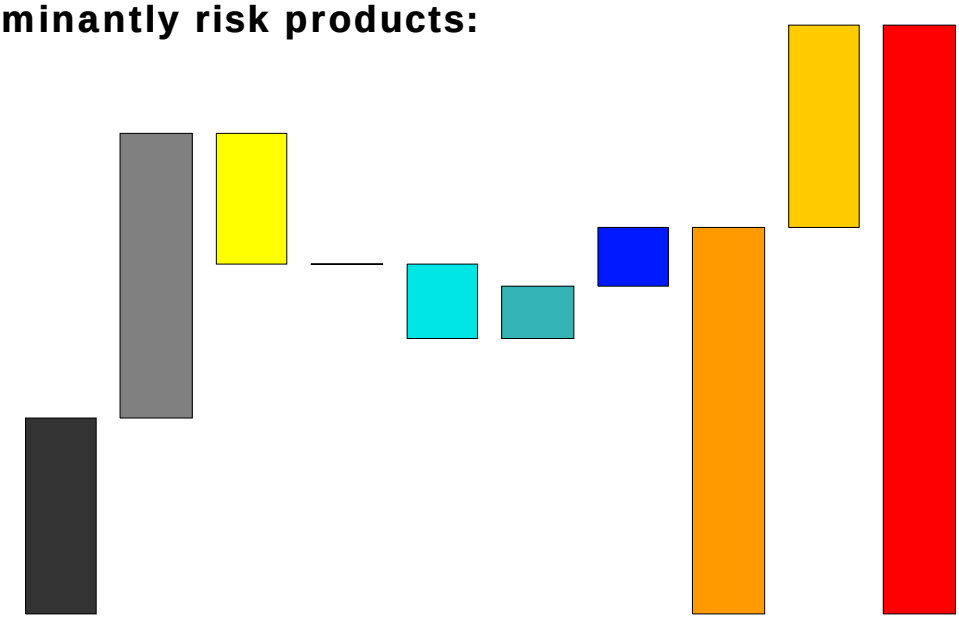
Components of Target Capital for Life Companies writing predominantly risk products:



Relative length of bars correspond approximately to actual average values

Components of Target Capital: Life Risk

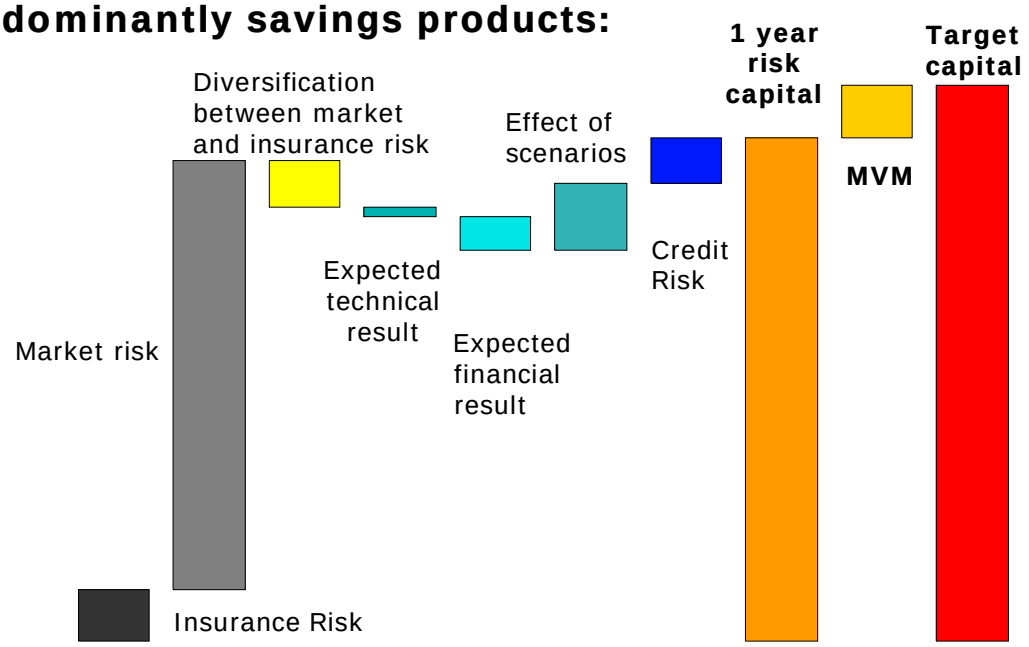
Components of Target Capital for Life Companies writing predominantly risk products:



Relative length of bars correspond approximately to actual median values

Components of Target Capital: Life Savings

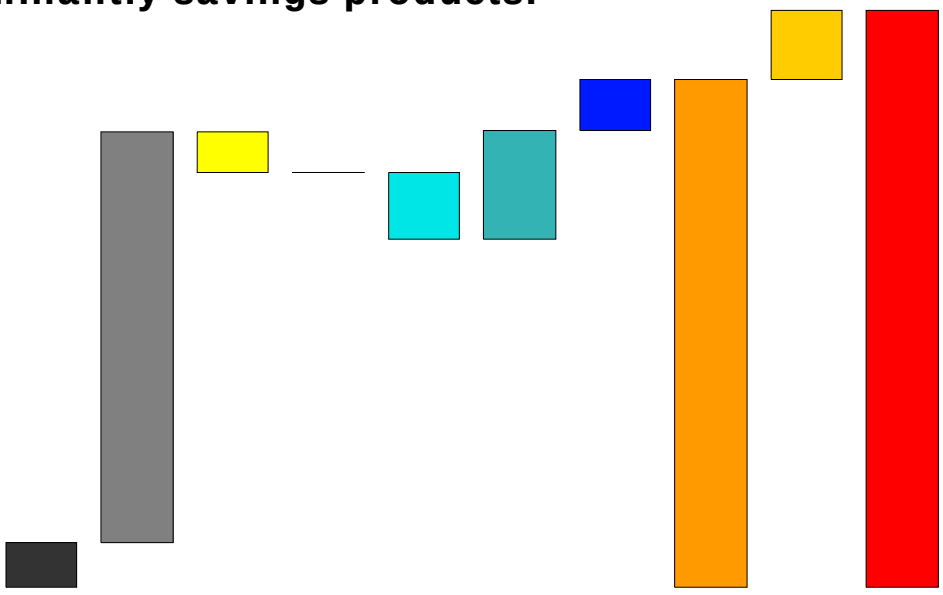
Components of Target Capital for Life Companies writing predominantly savings products:



Relative length of bars correspond approximately to actual average values

Components of Target Capital: Life Savings

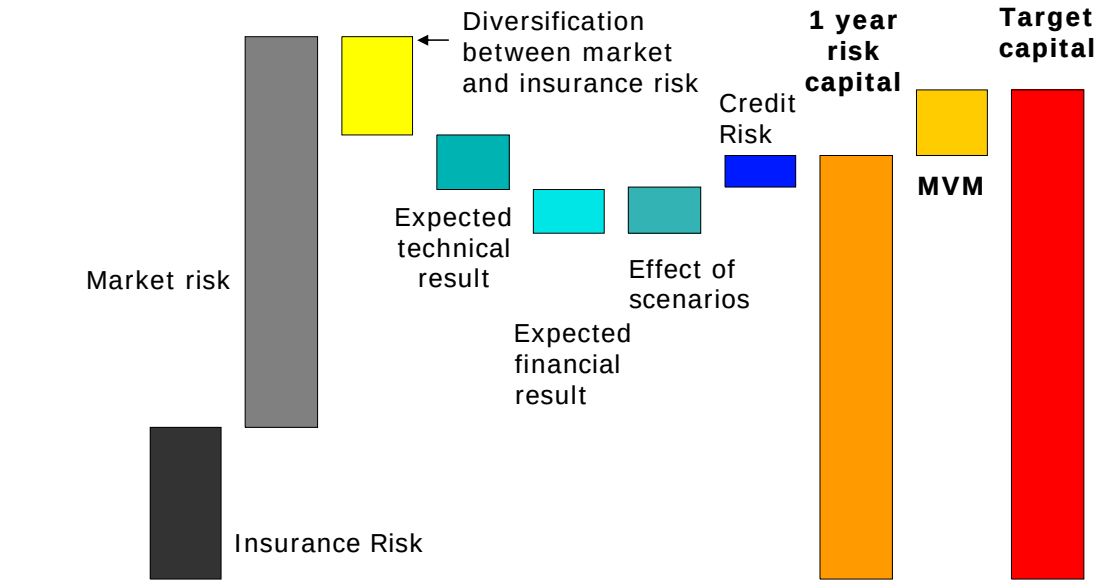
Components of Target Capital for Life Companies writing predominantly savings products:



Relative length of bars correspond approximately to actual median values

Components of Target Capital: P&C

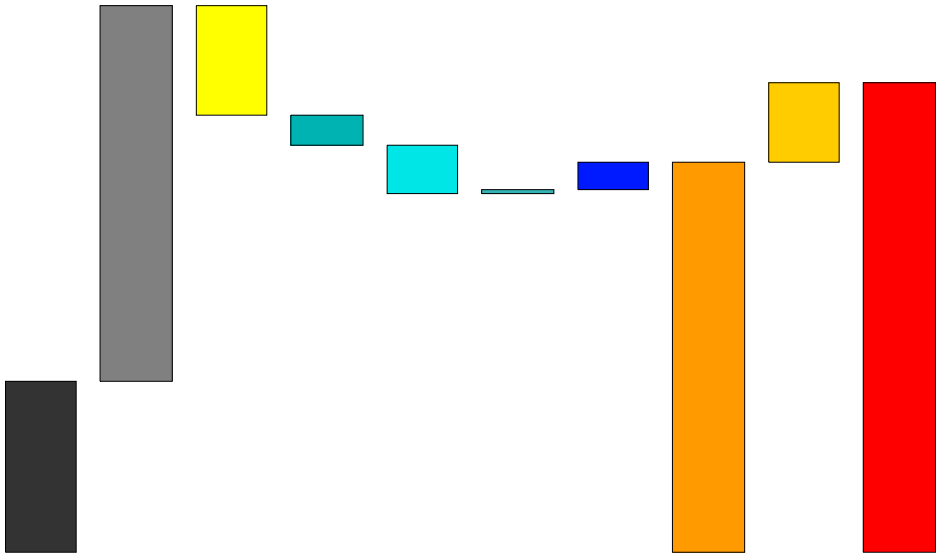
Components of Target Capital for P&C Companies:



Relative length of bars correspond approximately to actual average values

Components of Target Capital: P&C

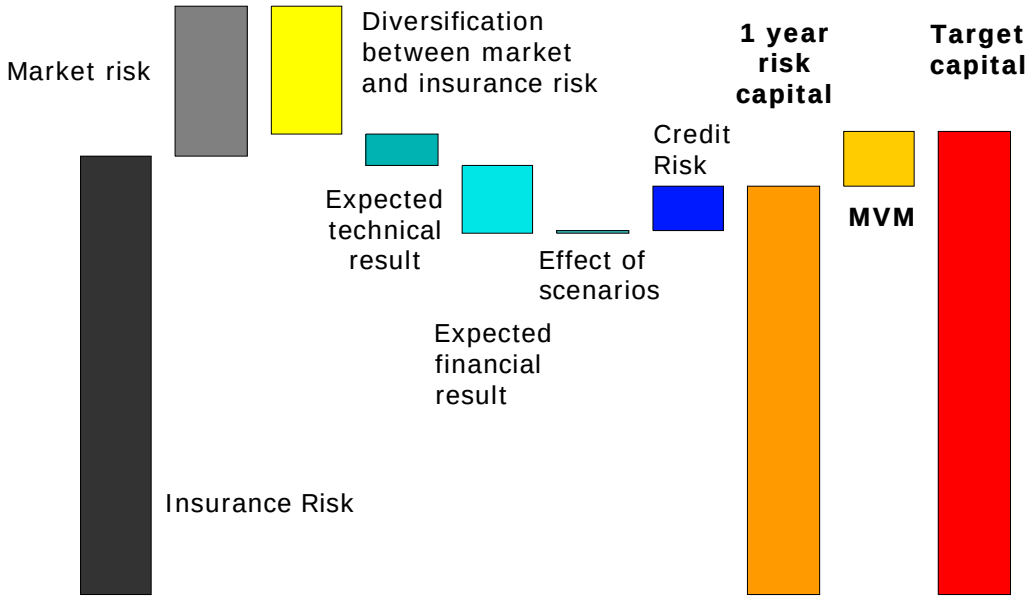
Components of Target Capital for P&C Companies:



Relative length of bars correspond approximately to actual median values

Components of Target Capital: Small P&C

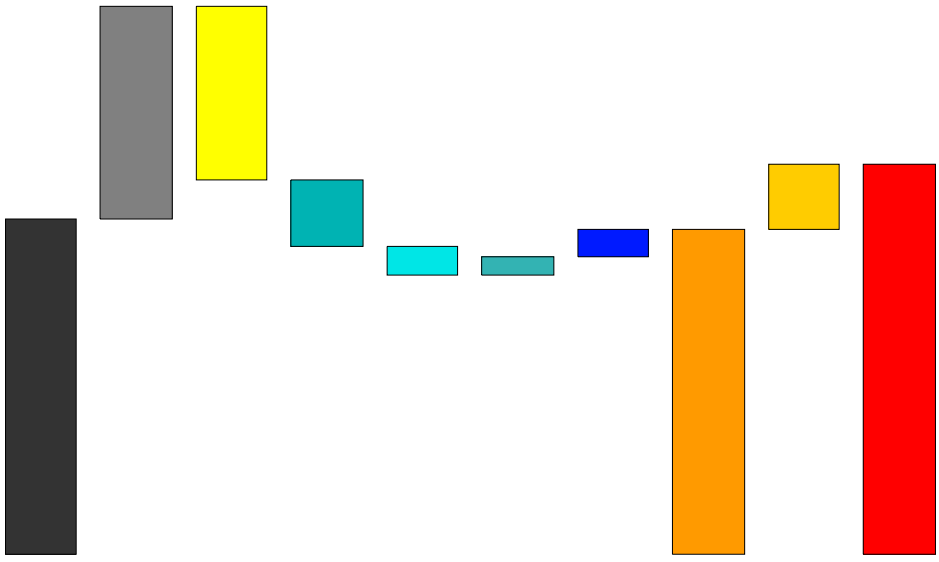
Components of Target Capital for Small P&C Companies:



Relative length of bars correspond approximately to actual average values

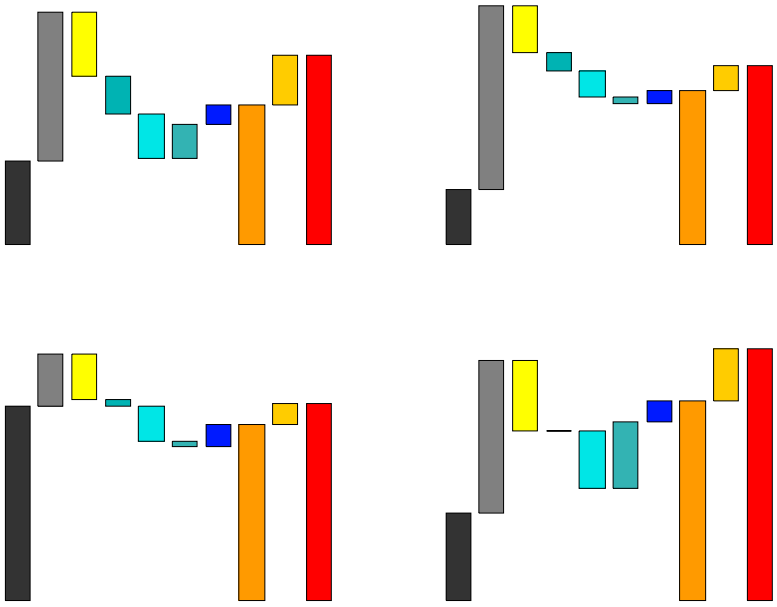
Components of Target Capital: Small P&C

Components of Target Capital for Small P&C Companies:



Relative length of bars correspond approximately to actual median values

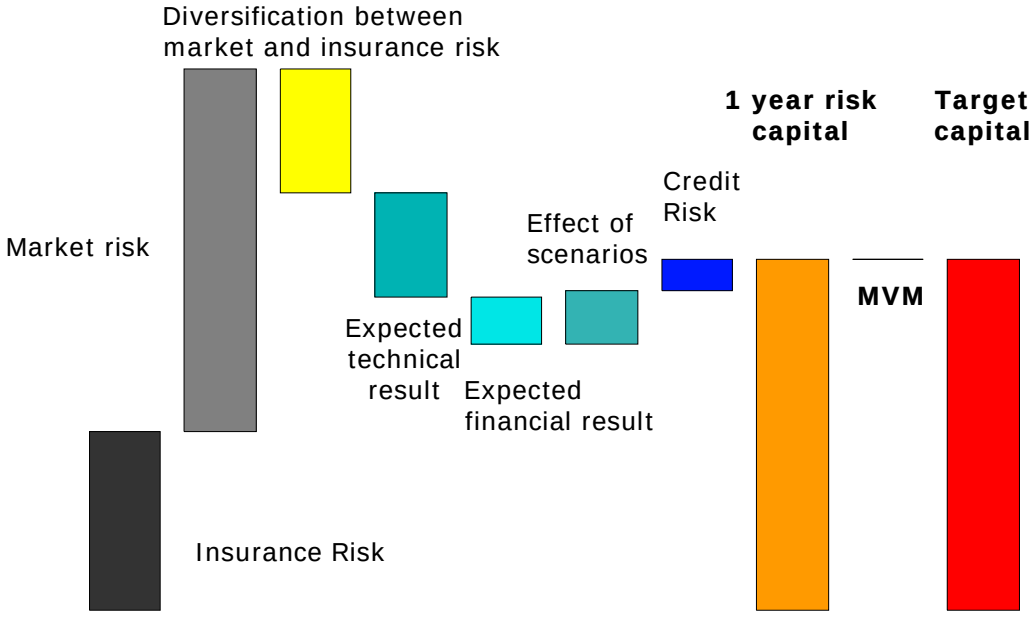
Components of Target Capital: Nonlife



Random selection of four nonlife companies

Components of Target Capital: Health

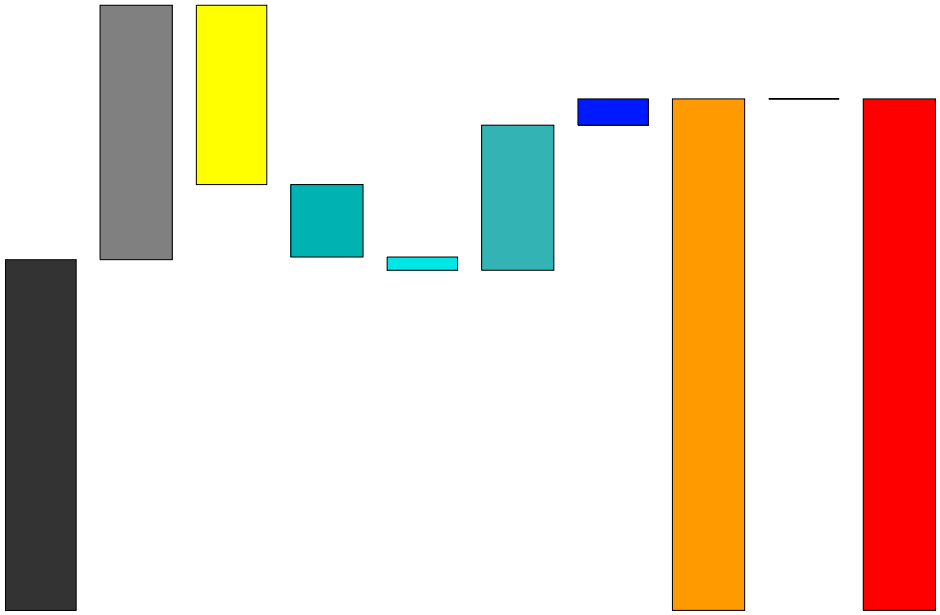
Components of Target Capital for Health Companies:



Relative length of bars correspond approximately to actual average values

Components of Target Capital: Health

Components of Target Capital for Health Companies:



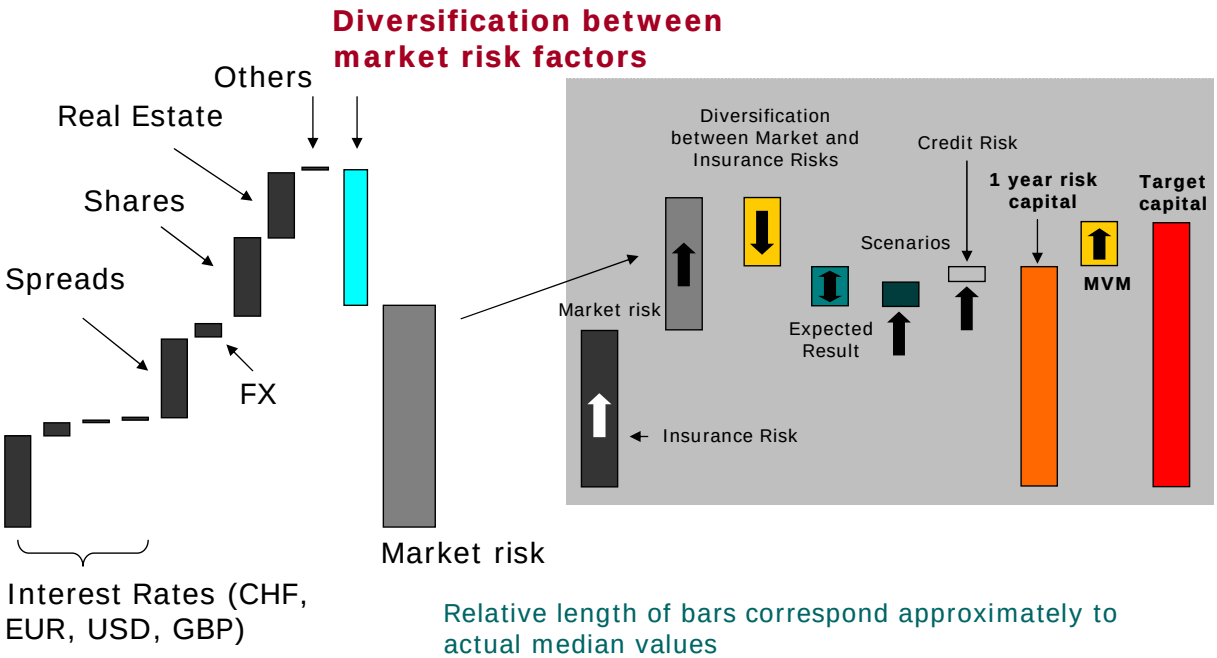
Relative length of bars correspond approximately to actual median values

Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Market Risk

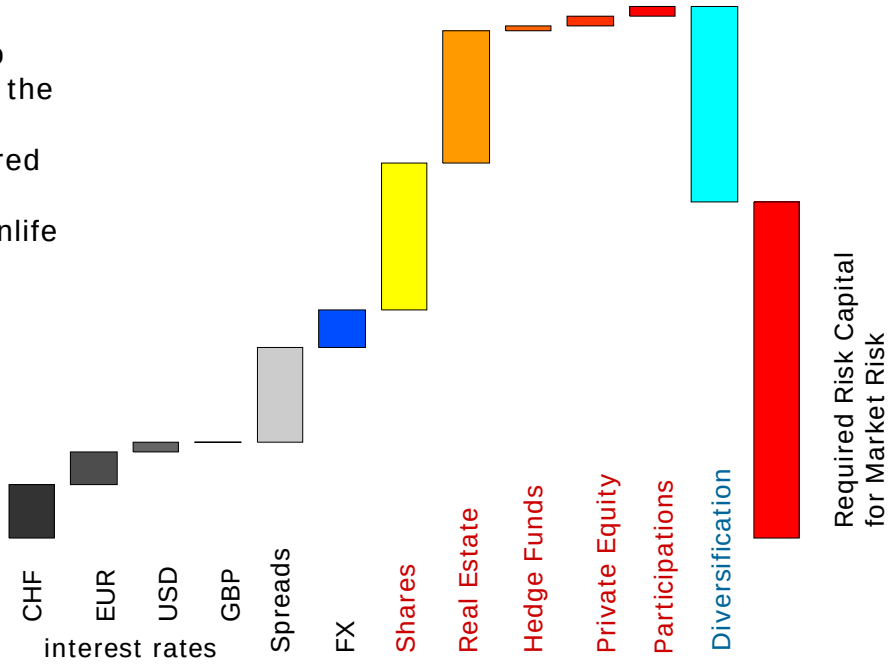
Diversification effect between different asset classes



Relative length of bars correspond approximately to actual median values

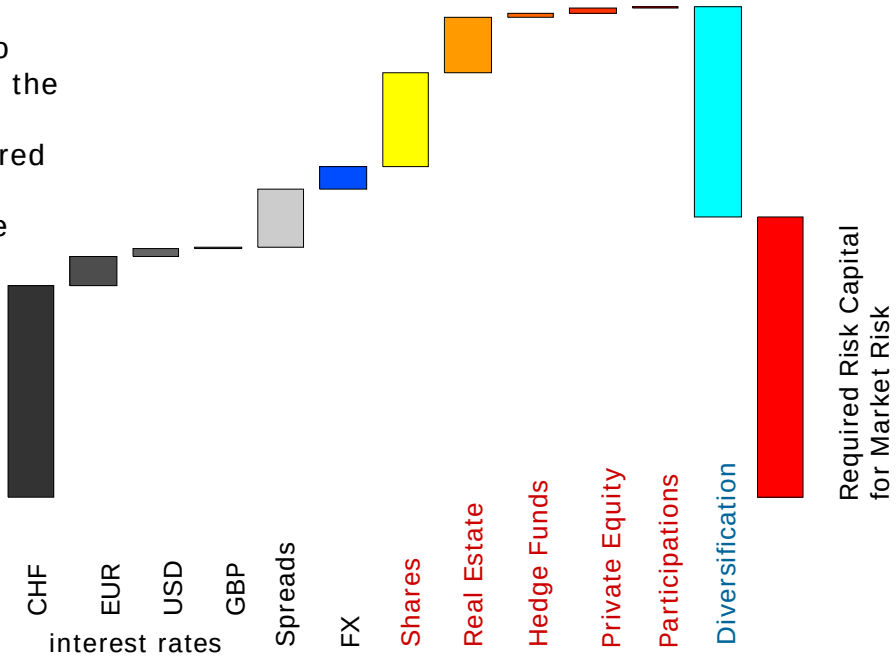
Market Risk P&C

The figure shows the average contributions to market risks of the different risk factors, measured by Expected Shortfall for nonlife companies.



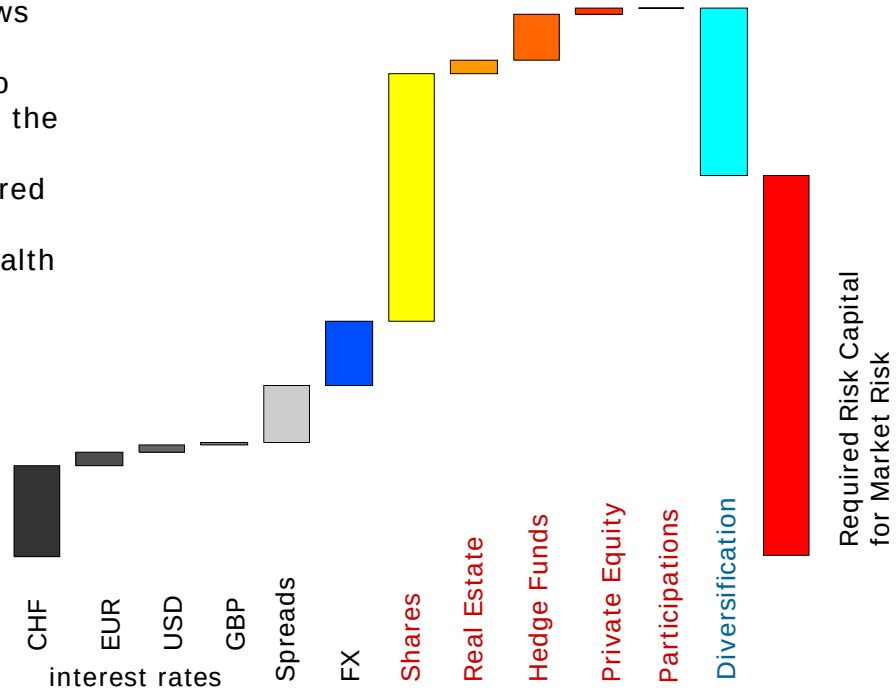
Market Risk Life

The figure shows the average contributions to market risks of the different risk factors, measured by Expected Shortfall for life companies.



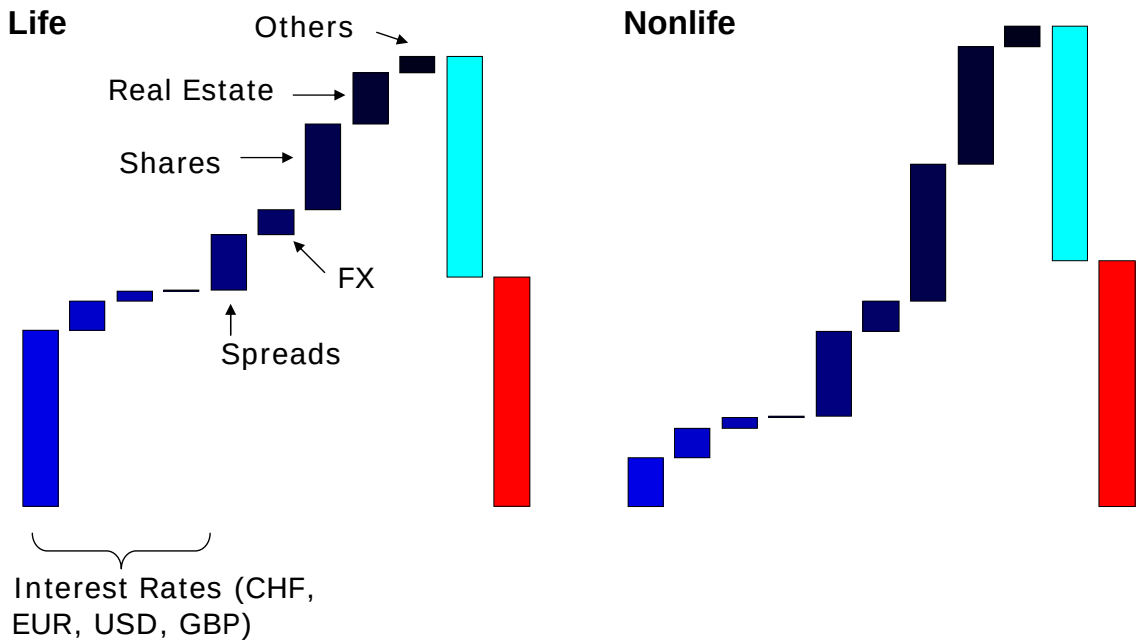
Market Risk Health

The figure shows the average contributions to market risks of the different risk factors, measured by Expected Shortfall for health companies.



Market Risk

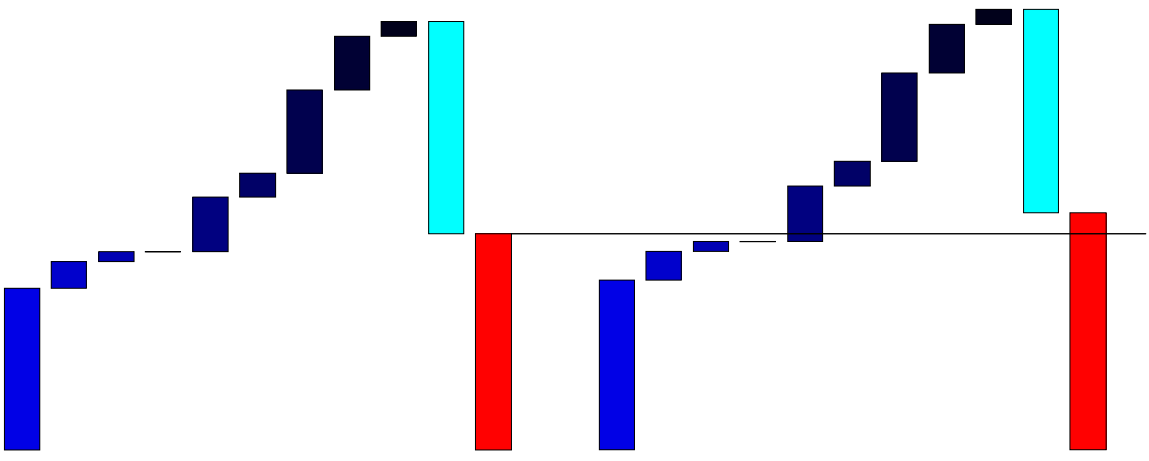
Contributions to market risk of different risk factors:



Market Risk

Sensitivity of market risk to the correlation matrix.

The first graph shows calculations using standard correlation matrix between market risk factors. The second figure shows a correlation matrix where correlations are always rounded to the next highest multiple of 0.25



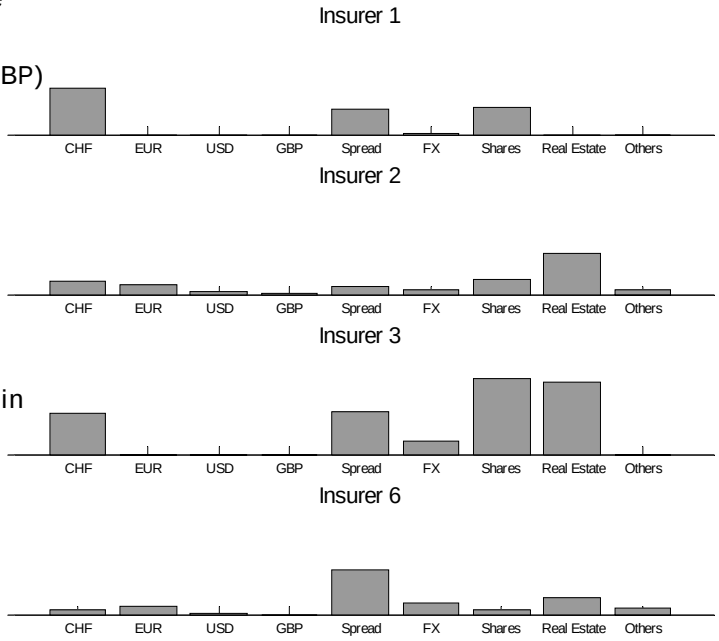
Results of Field Tests: Sensitivities

Relative influence of stand-alone market risk factors:

- Interest rates (CHF,EUR,USD,GBP)
- Spreads
- FX
- Shares
- Real Estate
- Others

Shown are standard deviations (in arbitrary units)

Correlations between above risk factors not taken into account



Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

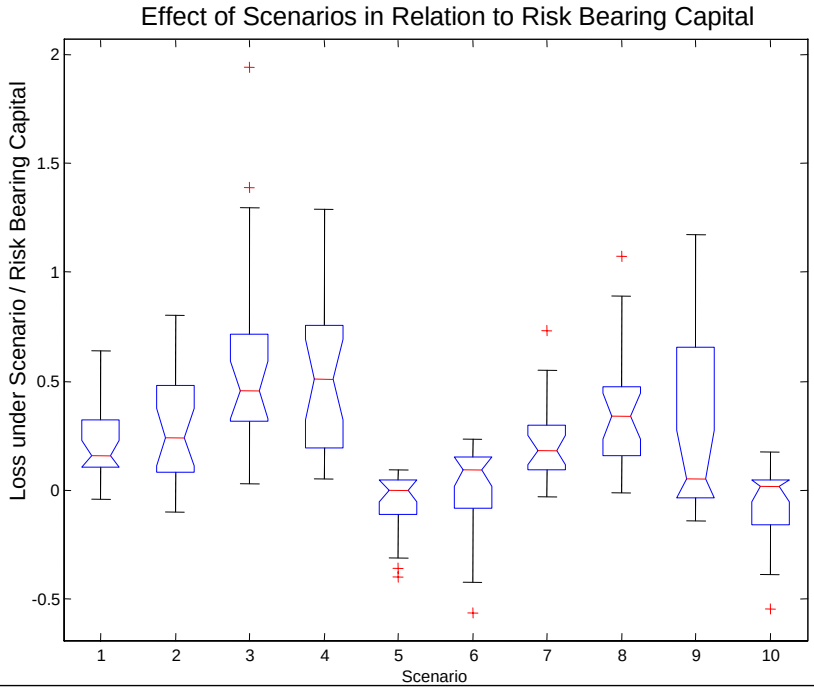
Scenarios:

Effect of Scenarios Expressed as Fraction of RBC

Historical Scenarios defined via simultaneous stresses of risk factors. Scenarios are calculated automatically within spread-sheet

1: Equity Drop -50%
2: Real Estate Crash 1987
3: Crash 1987*
4: Nikkei Crash 1990*
5: European FX Crisis 1992
6: US i.r. crisis 1992
7: Russia Crisis/LTCM 1998
8: Crash 2000/2001
9: Global Deflation
10:Longevity

* Scenarios likely need to be adjusted as effect seems too high

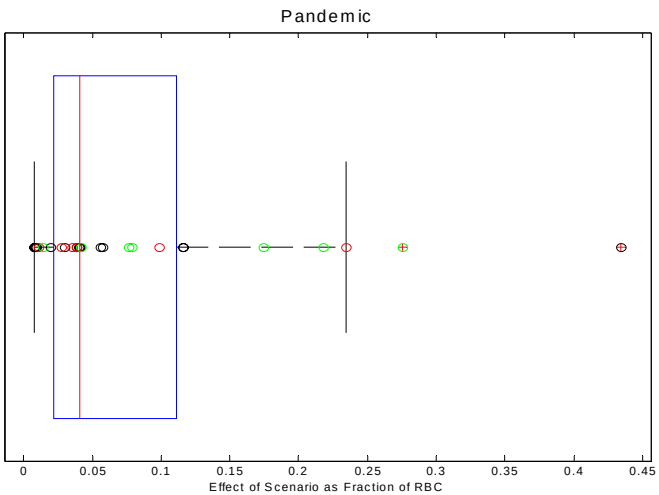


Scenarios: Pandemic

Effect of Pandemic Scenario Expressed as Fraction of RBC

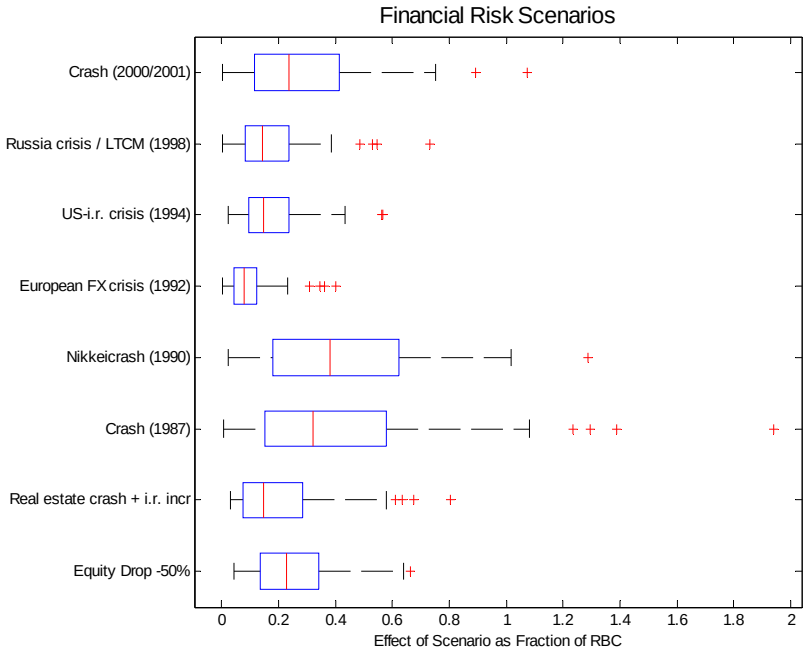
One outlier where the effect of the Pandmic scenario was the loss of 3 times risk bearing capital was removed

- Life Insurers
- P&C Insurers
- Health Insurers



Scenarios: Historical Market Risk

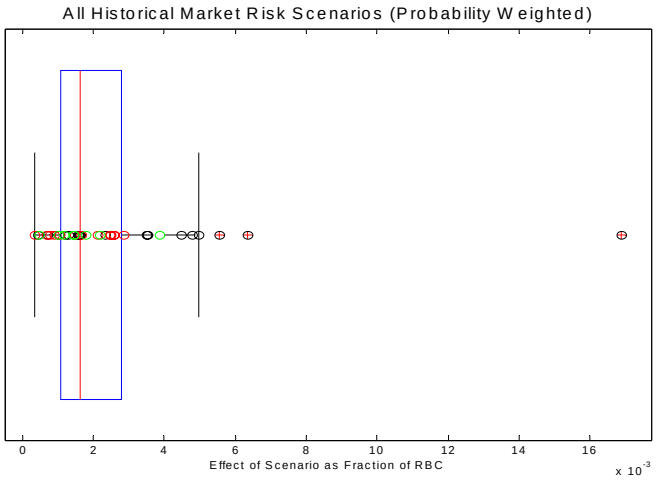
Effect of historical market risk scenarios expressed as fraction of RBC



Scenarios: Historical Market Risk

Effect of Historical Market Risk Scenarios Expressed as Fraction of RBC

All historical market risk scenarios are added and weighted with their probability (P=0.001). The evaluated loss is expressed as fraction of the risk bearing capital

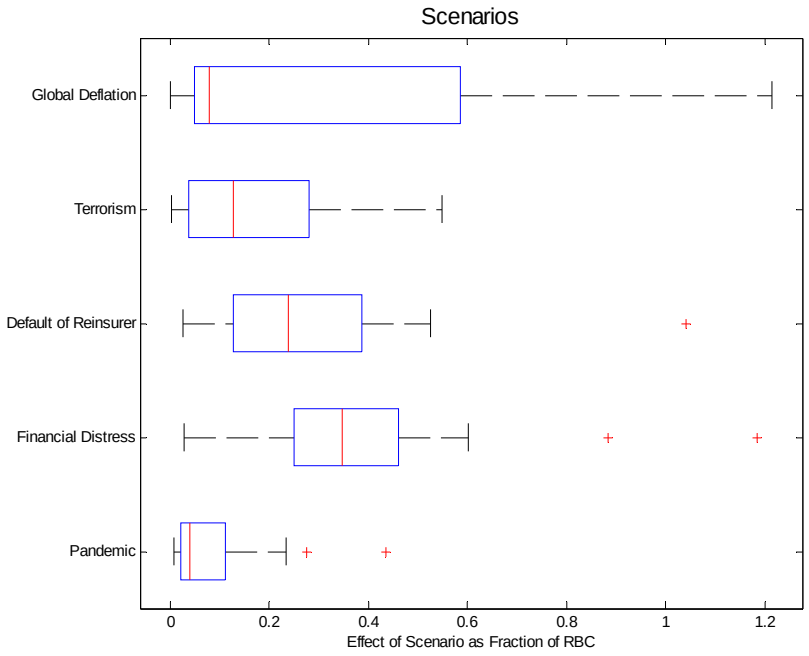


- Life Insurers
- P&C Insurers
- Health Insurers

Scenarios: General

Effect of general scenarios expressed as fraction of RBC

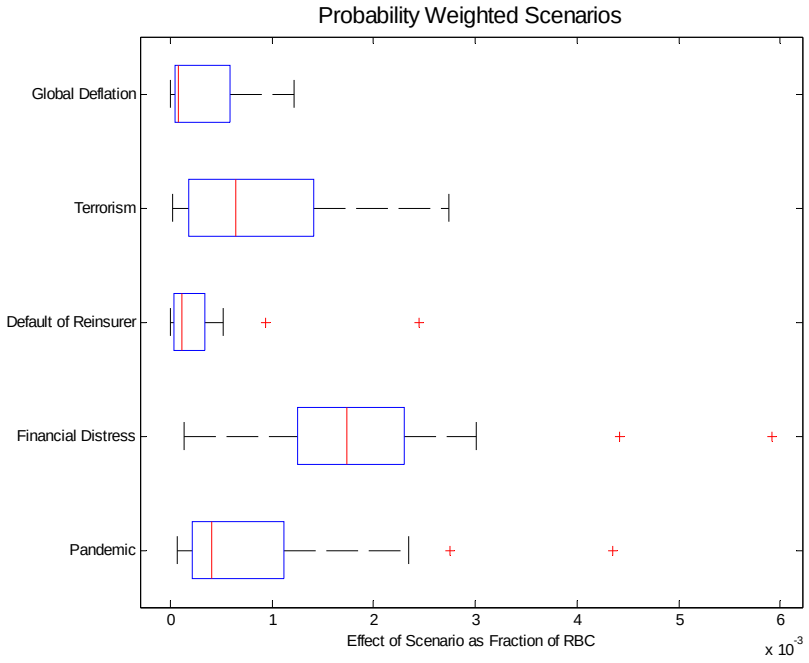
The following scenarios had to be calculated by all companies and are not specific to life, P&C or health insurers



Scenarios: General Probability Weighted

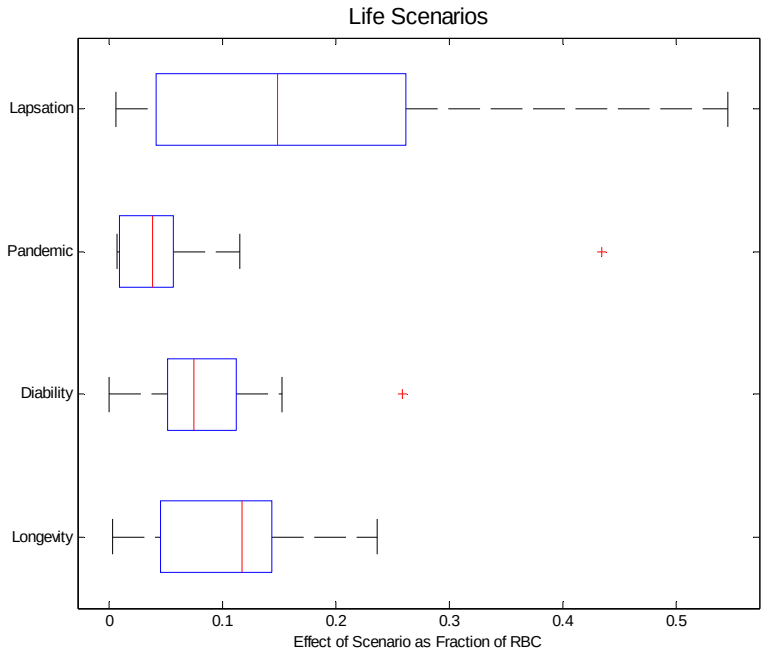
Effect of general scenarios expressed as fraction of RBC, weighted with probability of occurrence

The following scenarios had to be calculated by all companies and are not specific to life, P&C or health insurers



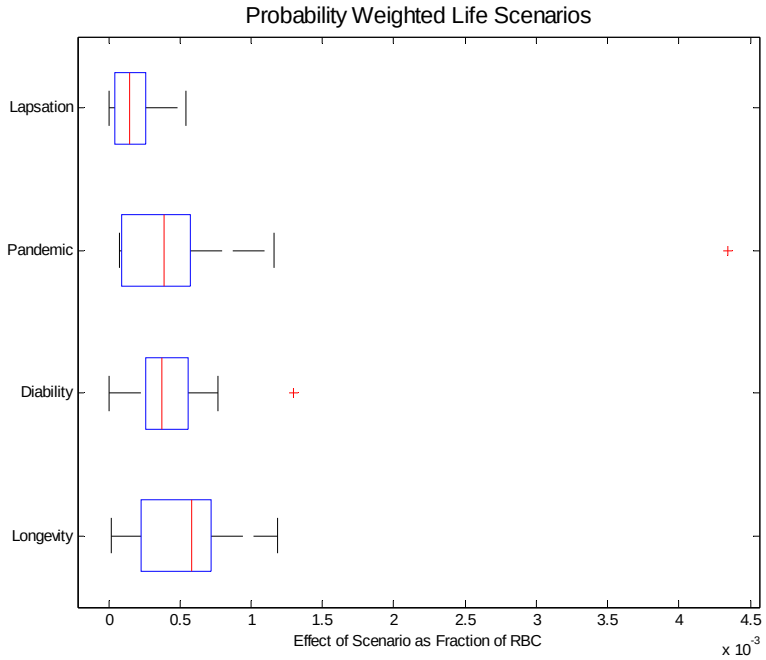
Scenarios: Life

Effect of life insurance specific scenarios expressed as fraction of RBC



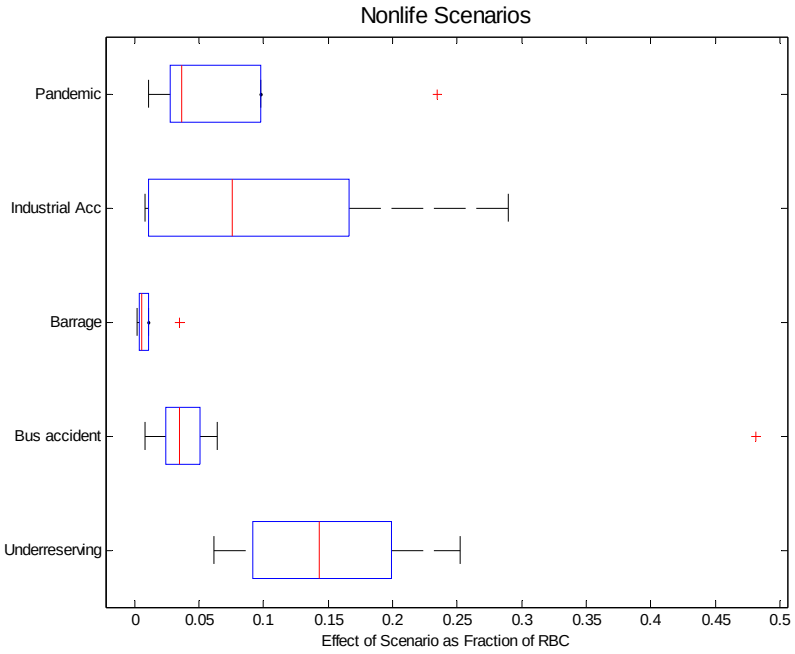
Scenarios: Life Probability Weighted

Effect of life insurance specific scenarios expressed as fraction of RBC, weighted with probability of occurrence



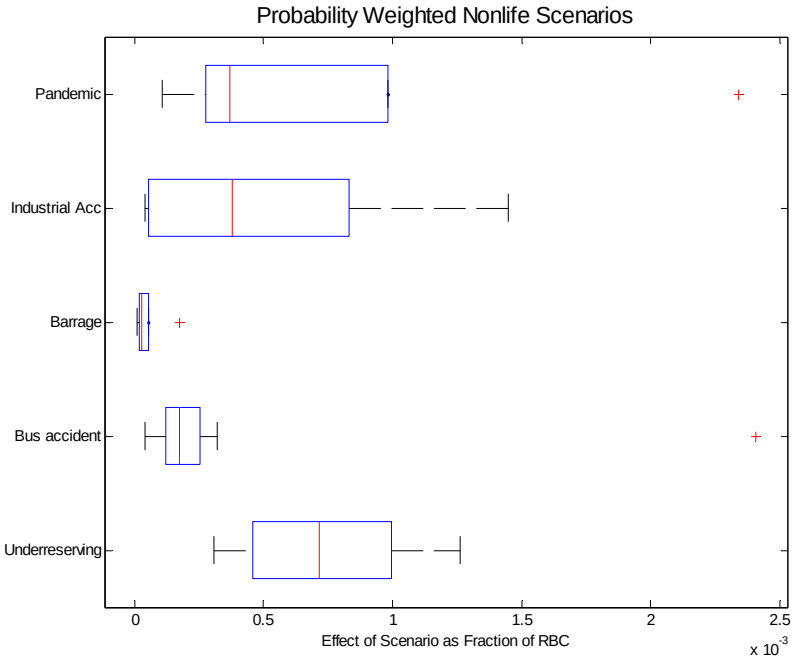
Scenarios: Nonlife

Effect of e nonlife insurance specific scenarios expressed as fraction of RBC



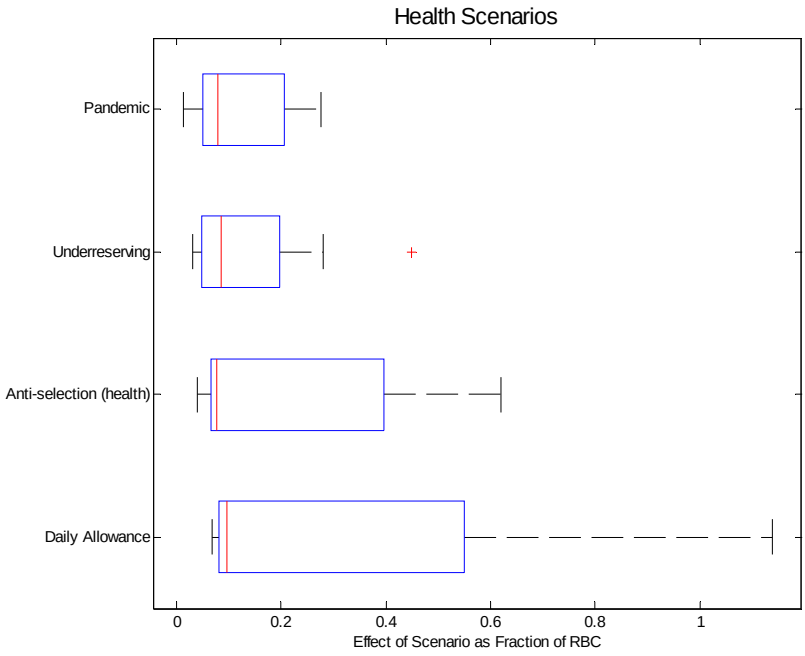
Scenarios: Nonlife Probability Weighted

Effect of nonlife insurance specific scenarios expressed as fraction of RBC, weighted with probability of occurrence



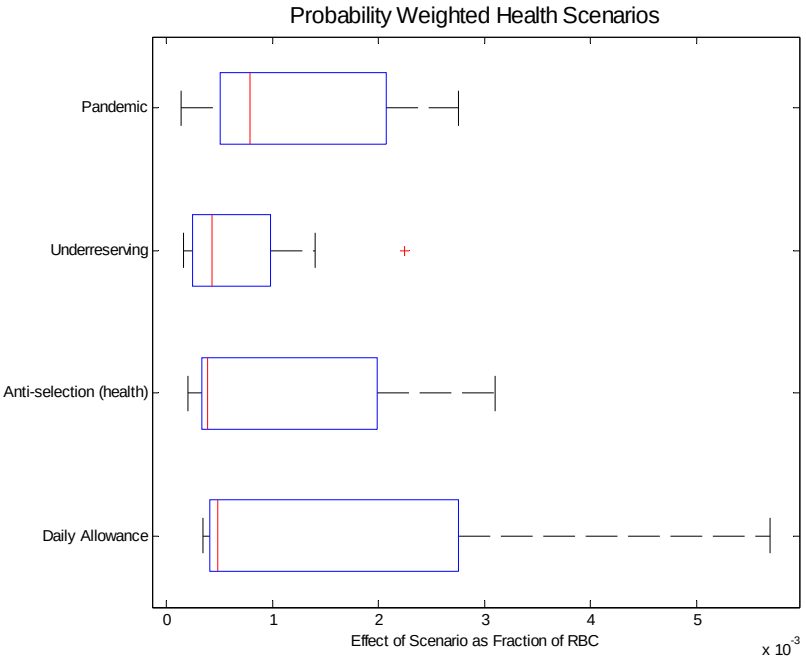
Scenarios: Health

Effect of health insurance specific scenarios expressed as fraction of RBC



Scenarios: Health Probability Weighted

Effect of health insurance specific scenarios expressed as fraction of RBC, weighted with probability of occurrence



Scenarios: Default of Reinsurers

To model the effect of the default of reinsurers on the capital requirement for cedants within a simple regulatory model is a hard problem

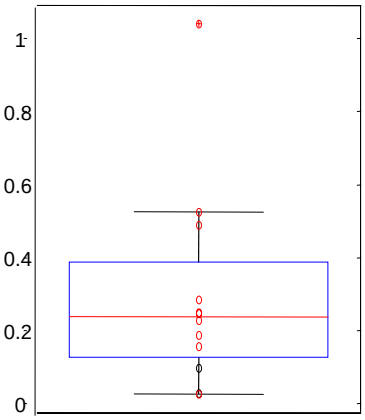
Assumption for the SST Standard Model:

- All reinsurers default together
- The probability of this event is given by the default probability of the reinsurer to which most business is ceded

-> The loss at default is too conservative and the probability of event is likely to low

If a company wants a more risk-specific modelling of the effect of the default of a reinsurer, an internal model has to be used

Effect of Reinsurance Scenarios in Relation to Risk Bearing Capital



Effect of Scenario as Fraction of RBC

Scenarios: Default of Reinsurers

Under the scenario a company has to quantify the risk that:

- Loss of expected payments of a reinsurer for already incurred claims
- Loss due to the default of a reinsurer simultaneously with a large claim

The loss under the scenario is equal to:

- The maximum of
  - Expected Shortfall of the large claim distributions gross less Expected Shortfall of the large claims distribution net → Takes into account the risk that the reinsurer defaults simultaneously with a large claim
  - Scenario 1 (gross) less Scenario 1 (net)
  - ...
  - Scenario n (gross) less Scenario n (net) → Takes into account the risk that the reinsurer defaults simultaneously with a catastrophe
- + Reinsurance premium for XL for normal claims → Loss of reinsurance premium
- + Claim reserves (gross) less Claim reserves (net) → Takes into account the risk of loss of future payments from a reinsurer for already incurred claims

Probability of the scenario: Default probability of the reinsurer to which most business is ceded (according to premium)

Scenarios: Default of Reinsurers

Effect of credit risk of reinsurers on capital requirements:

- Adds between 0.02% and 8% to required capital depending on business ceded and reinsurers default probability (using Expected Shortfall)
- If VaR is used as risk measure for capital requirements, the effect of the credit risk of reinsurers is between 0.02% and 3.5%.

Scenarios: Company Specific

A number of companies defined company specific scenarios for the field test 2005

Market Risk Scenarios

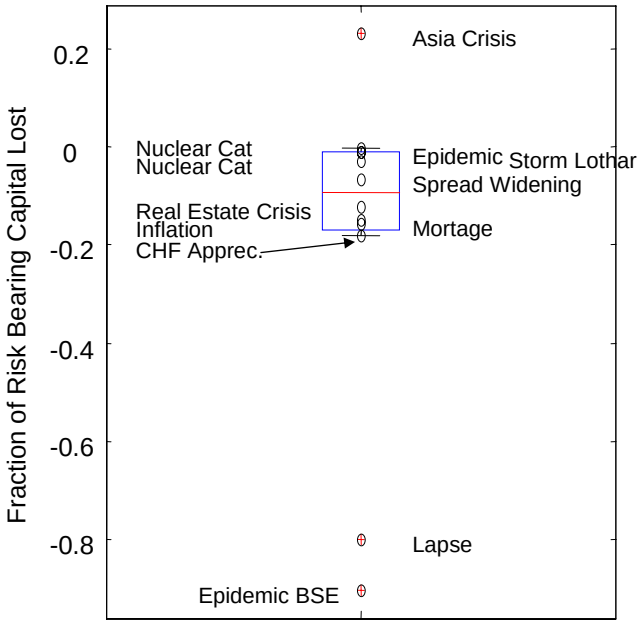
- Real Estate (2): increase in i.r. by 100 bp, decrease in value of real estate, P=0.1%
- Asia Crisis 1997/1998: P=0.1%
- Inflation: global decrease in i.r., annuity option = 80%, administration cost = +25%, P=0.1%
- CHF Appreciation vs. EUR, USD, GBP, JPY of 25%, P=0.1%
- Lapsation Scenario: Increas in i.r., increase in lapse for actives, P=0.5%

Insurance Risk Scenarios

- Epidemics (2): BSE or others, global increase in mortality and morbidity for all ages also in future, P=5%
- Nuclear Catastrophes (2): P=0.1% and P=0.5%
- Storm Lothar, P=0.5%
- Earthquake Basel
- Fire in Old City

Scenarios: Company Specific

The boxplot shows the effect of company specific scenarios expressed of the fraction of risk bearing capital lost if the scenario were to occur

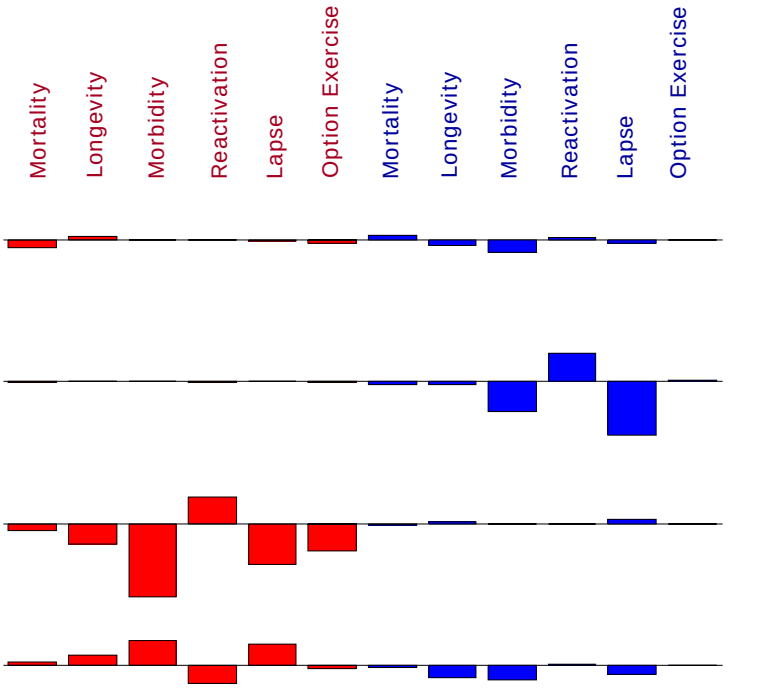


Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Results of Field Tests: Sensitivities

Sensitivities of life companies to different insurance risk factors, expressed as fraction of risk bearing capital (normalized with the volatility of risk factors)



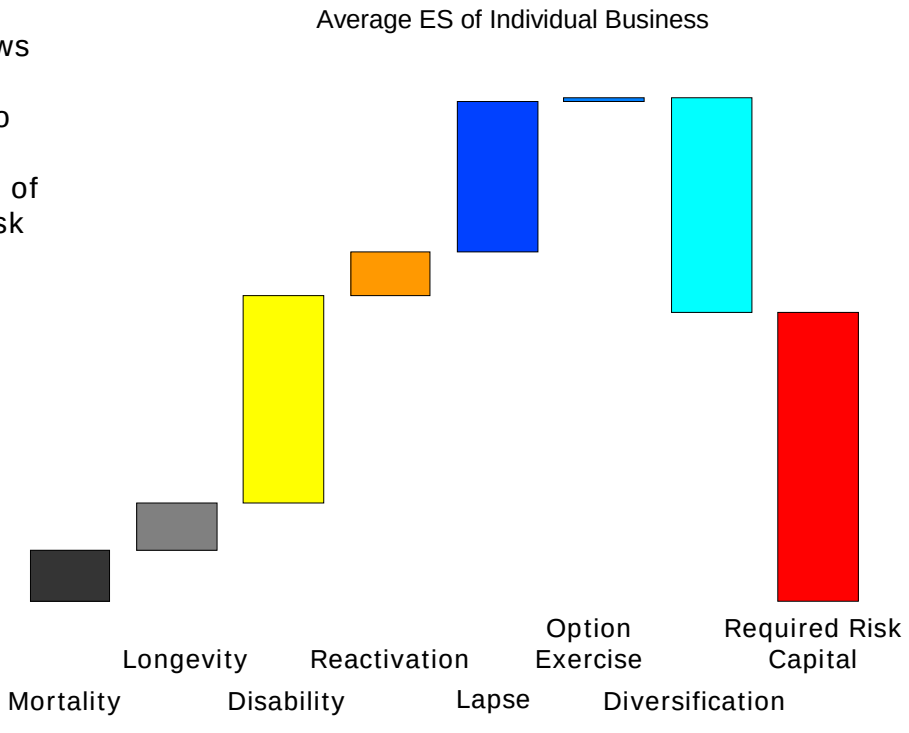
Individual Business

Group Business

Example shows 4 different life companies

Results of Field Tests: Life Sensitivities

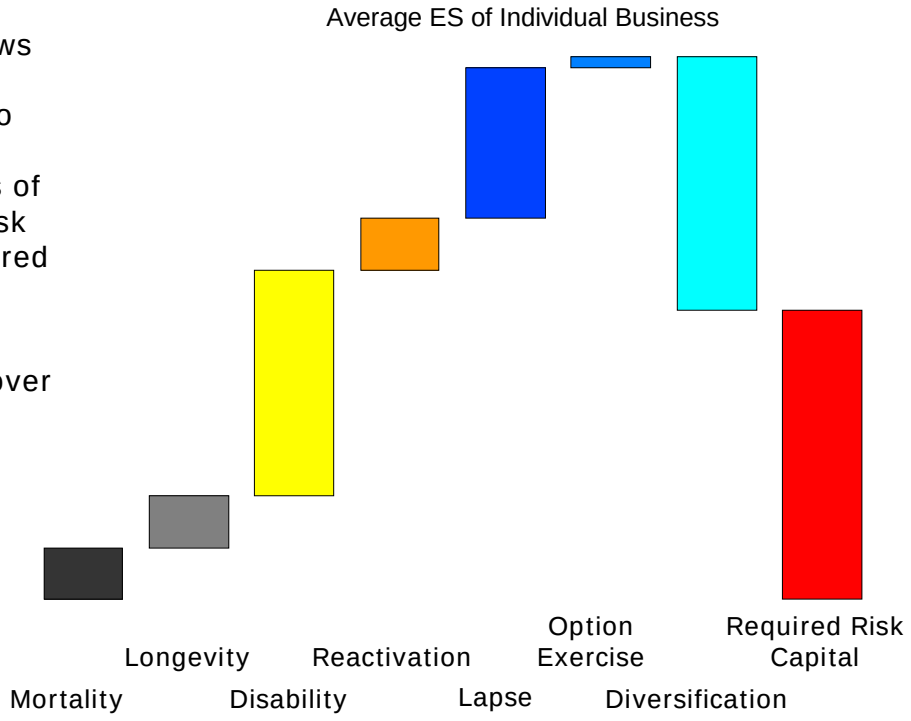
The figure shows the average contributions to individual life insurance risks of the different risk factors , measured by Expected Shortfall.



Results of Field Tests: Life Sensitivities

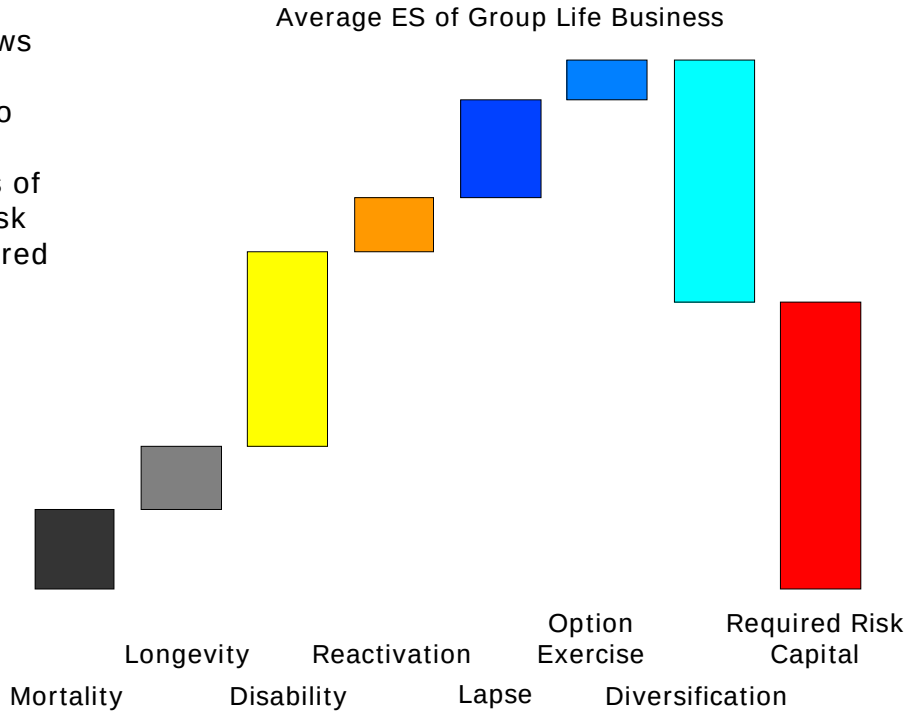
The figure shows the average contributions to individual life insurance risks of the different risk factors, measured by Expected Shortfall.

Average take over all Expected Shortfalls > 0



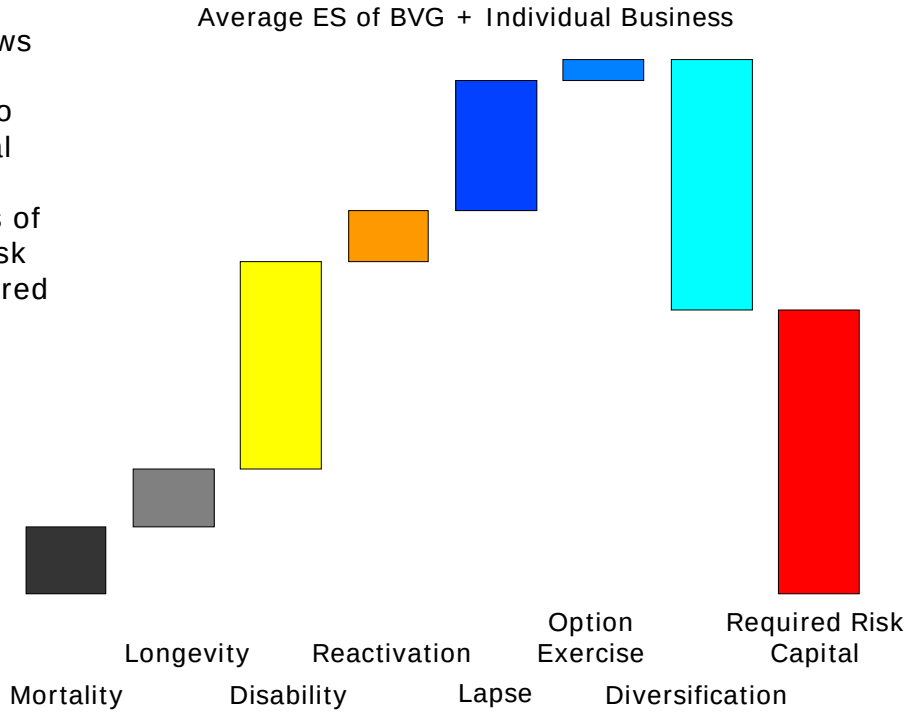
Results of Field Tests: Life Sensitivities

The figure shows the average contributions to group life insurance risks of the different risk factors, measured by Expected Shortfall.



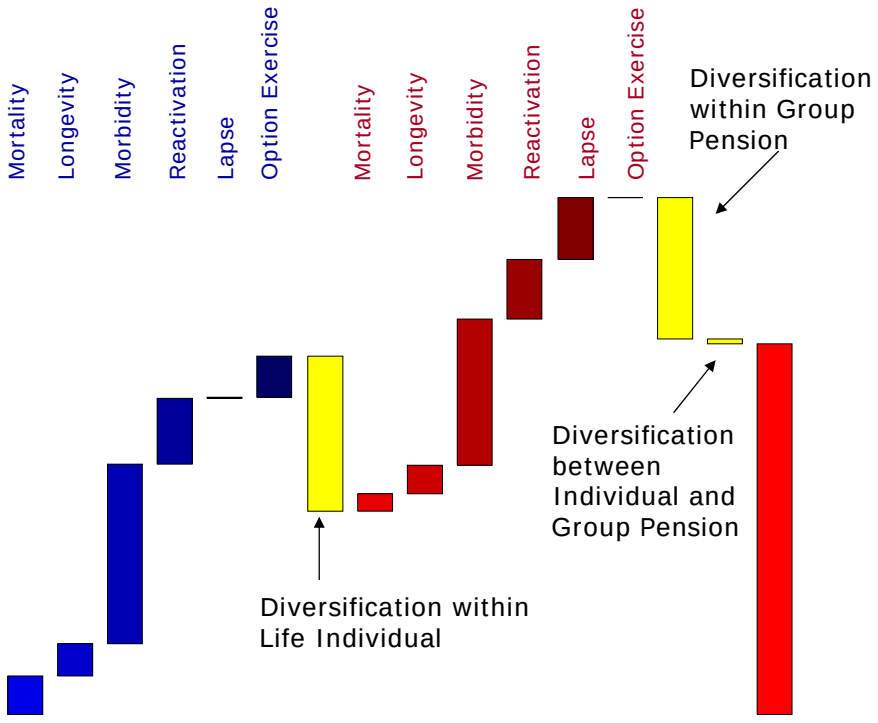
Results of Field Tests: Life Sensitivities

The figure shows the average contributions to total (individual and group) life insurance risks of the different risk factors, measured by Expected Shortfall.



Results of Field Tests: Life Sensitivities

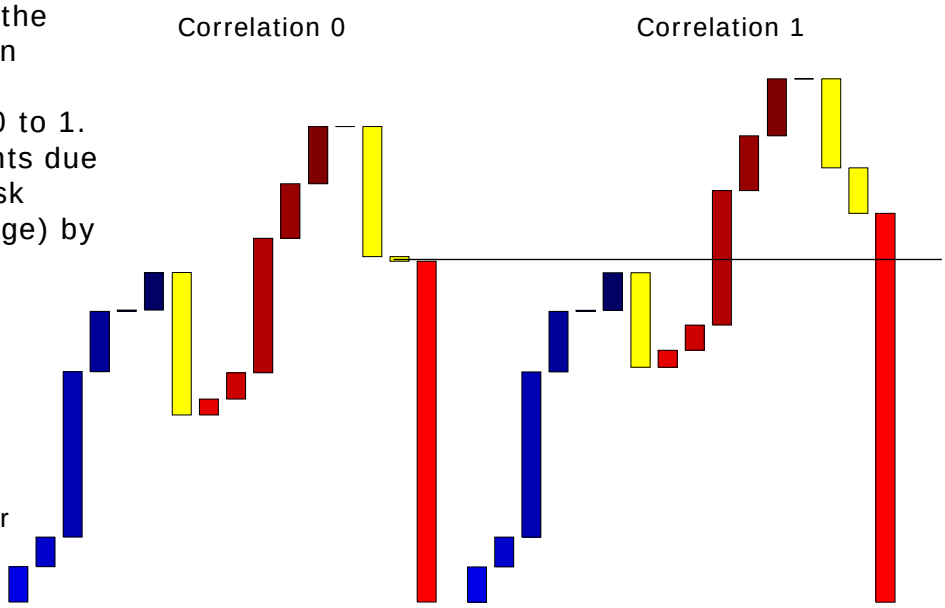
The figure shows the stand alone capital requirements for the life insurance risk factors and the diversification effect



Results of Field Tests: Life Sensitivities

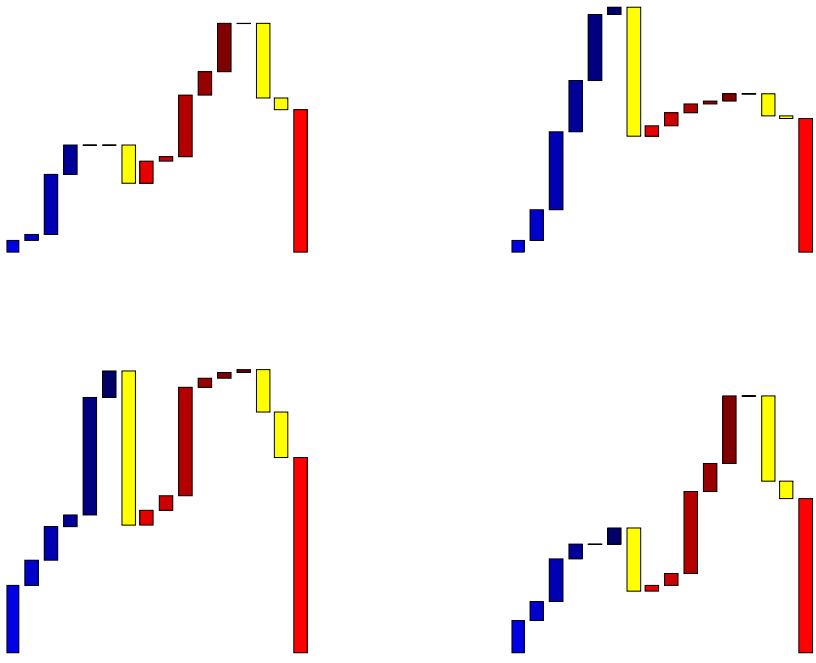
The figure shows the effect of changing the correlation between morbidity and reactivation from 0 to 1. Capital requirements due to life insurance risk increase (on average) by 10%

Morbidity is relatively dominant due to the fact that an increase in morbidity is negative for all companies while other risk factors can be positive or negative, depending on the business model



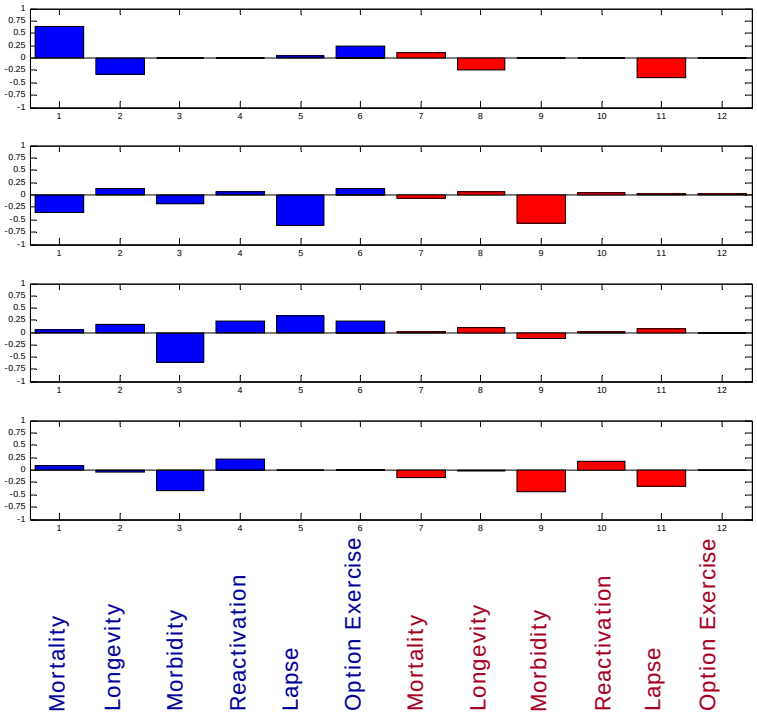
Results of Field Tests: Life Sensitivities

Composition of life insurance capital requirement for four randomly selected companies showing diversification within individual and group business and between individual and group business



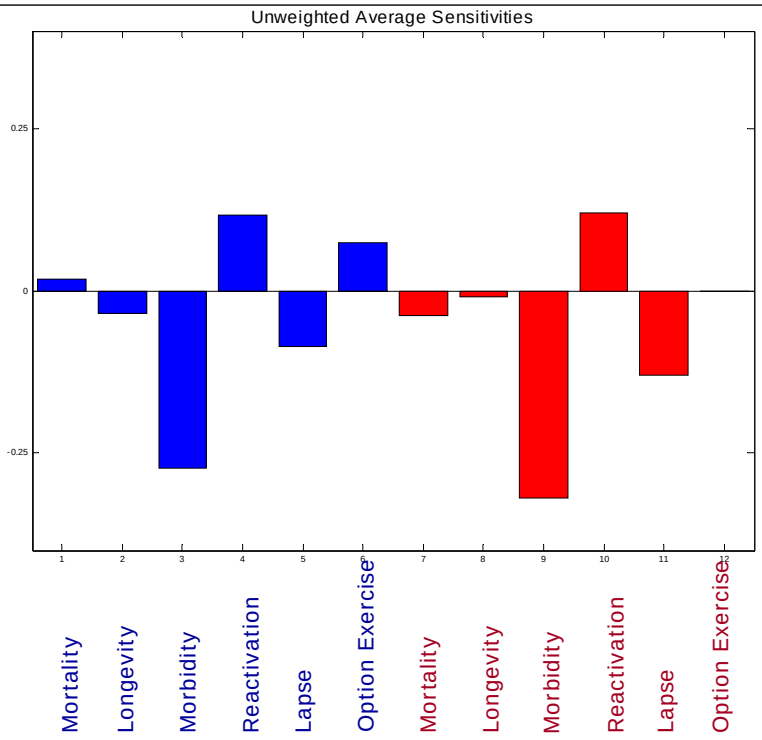
Results of Field Tests: Life Sensitivities

Sensitivities w.r.t. life insurance risk factors expressed as volatility weighted sensitivity divided by total insurance risk capital requirement for four randomly selected life companies



Results of Field Tests: Life Sensitivities

Unweighted average sensitivities w.r.t. life insurance risk factors expressed as volatility weighted sensitivity divided by total insurance risk capital requirement

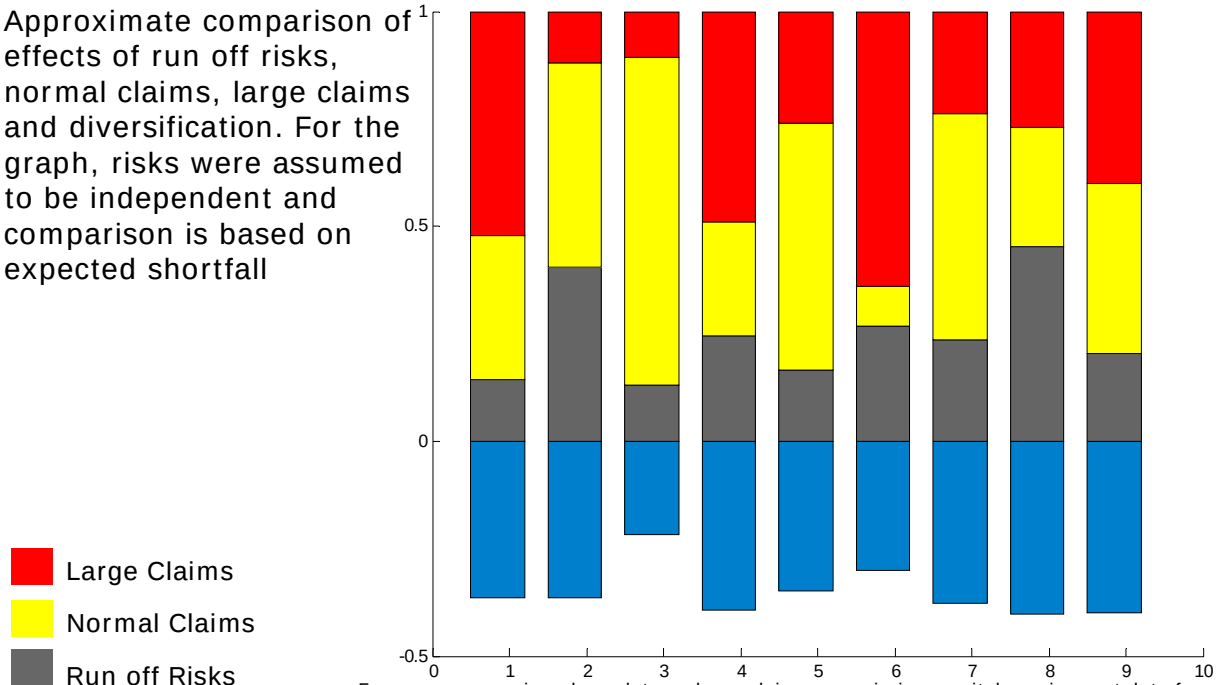


Contents

- Qualitative Results
- Workload
- Comparisons Solvency 1 and SST Solvency Ratio
- Comparison Expected Shortfall and VaR
- Hidden Reserves, Risk Bearing Capital
- Market Value Margin
- Expected Returns
- Diversification
- Components of Target Capital
- Market Risk
- Scenarios
- Life Sensitivities
- Non Life

Results of Field Tests: Nonlife Risks

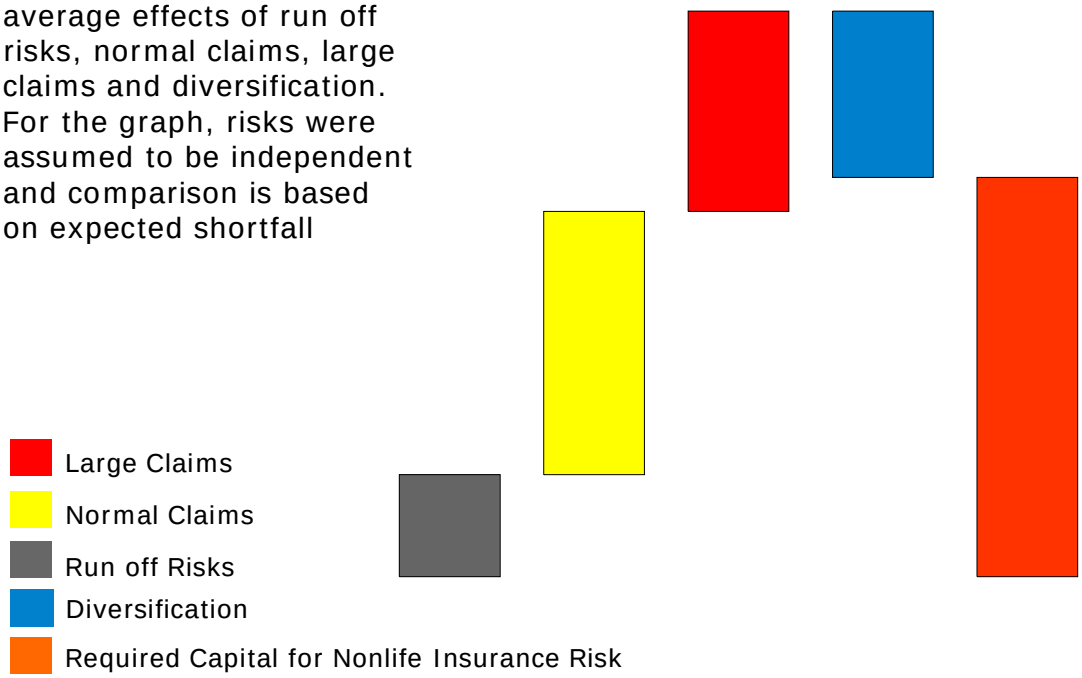
Approximate comparison of effects of run off risks, normal claims, large claims and diversification. For the graph, risks were assumed to be independent and comparison is based on expected shortfall



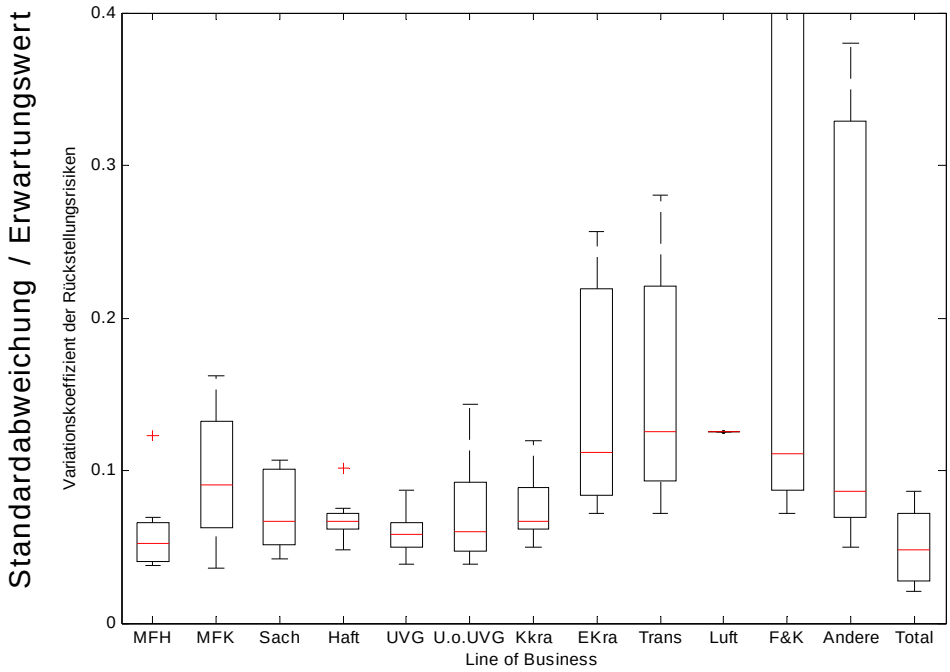
For some companies where data on large claims was missing, capital requirement data for large claims was generated by assuming that large are normally distributed and using the square root formula to calculate the standard deviation

Results of Field Tests: Nonlife Risks

Approximate comparison of average effects of run off risks, normal claims, large claims and diversification. For the graph, risks were assumed to be independent and comparison is based on expected shortfall

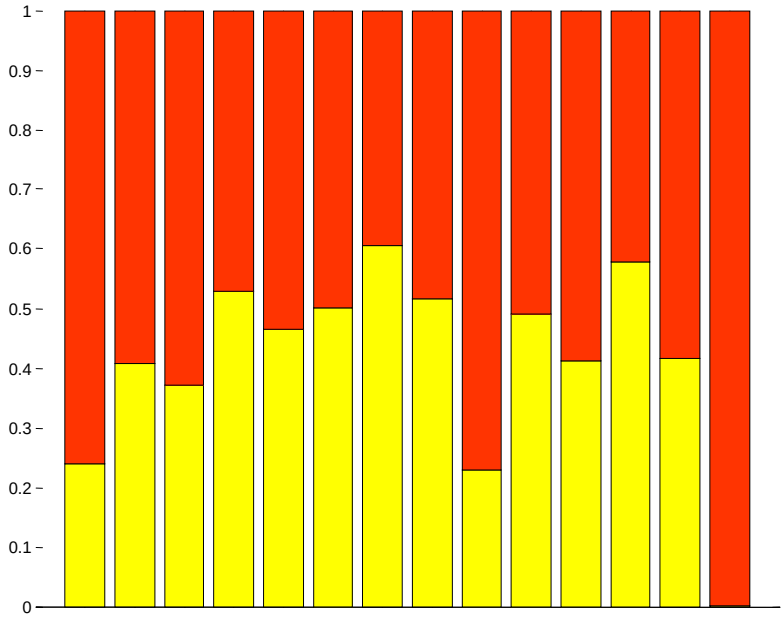


Runoff Risk: Standard-Deviation per LoB



Results of Field Tests: Run-off Risks (P&C)

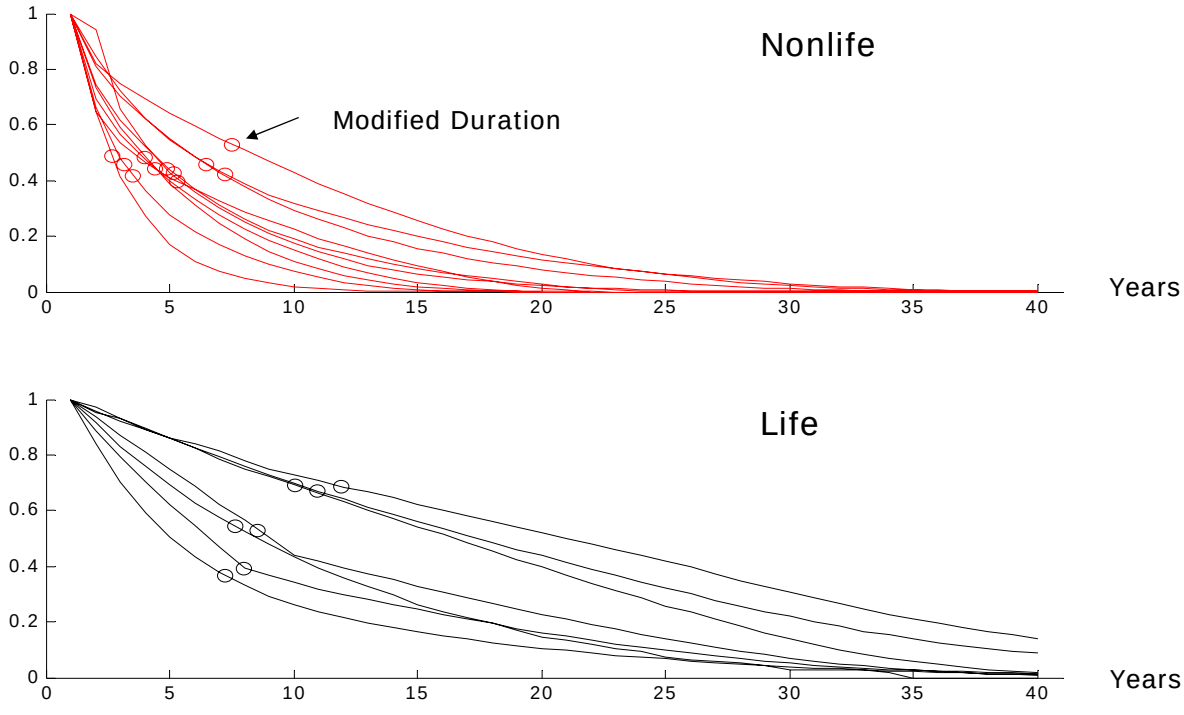
Split between parameter and stochastic risk for normal claims for a selection of participants



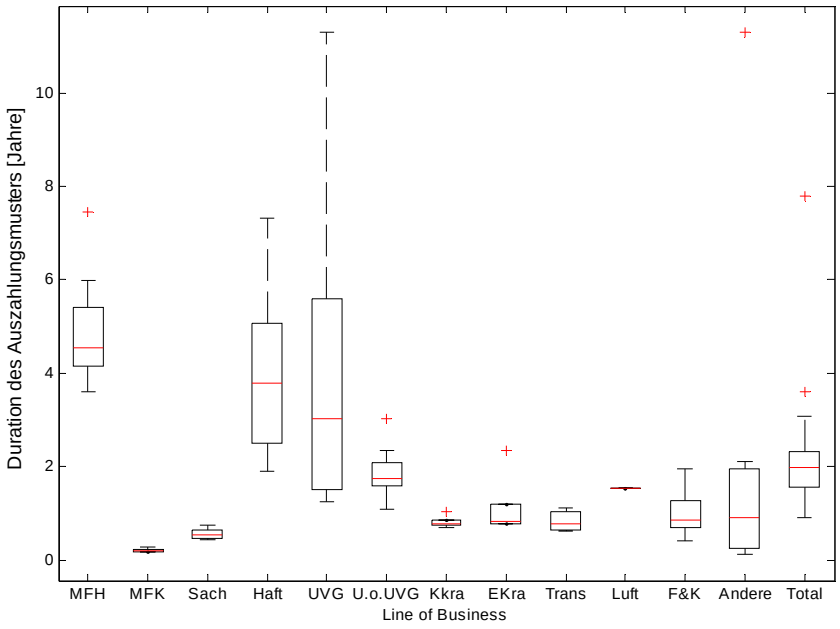
Parameter Risk

Stochastic Risk

Run-off Patterns (P&C)

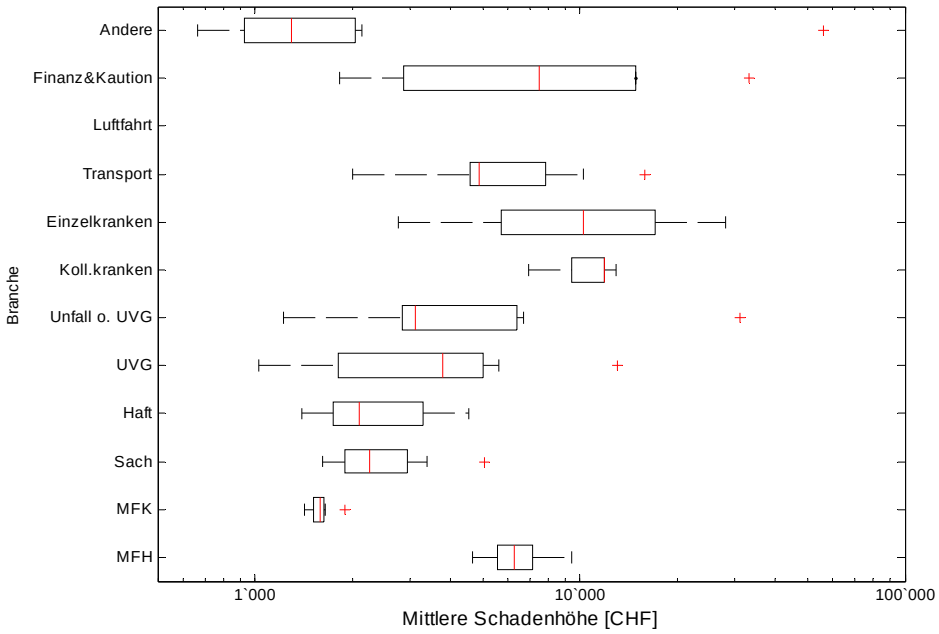


Macauly-Duration of NL Payout Patterns



Average Claim Size per NL Line of Business

Average claim size per Line of Business on a logarithmic scale



Risks in Attritional Claims

Relative standard deviation of attritional (i.e. normal or small) claims per line of business.