CEIOPS

Committee of European Insurance and Occupational Pensions Supervisors

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QIS4 background document: Calibration of SCR and MCR.

Purpose of the document

1. The paper has been prepared by CEIOPS as a background document to the QIS4 technical specifications that are currently under consultation by the European Commission.

2. The first part gives an overview of the calibration of the SCR risk modules in QIS4 compared to QIS3.
   The second part of the paper explains the MCR calibration of the linear approach that will be tested in QIS4.

Calibration of the SCR: Calibration of the underwriting risk and market risk

3. In the short time span between the publication of the QIS3 results and the drafting of the QIS4 specifications, attention was paid to the industry's QIS3 feed-back regarding the calibration of the SCR formula, but being globally pleased with the QIS3 calibration, CEIOPS decided not to substantially challenge the QIS3 calibration.
   As a consequence, the April 2007 QIS calibration paper[1] should still be used as a reference calibration paper for QIS4, but for transparency, we would like to highlight the areas where, often in answer to QIS3 feed-back, we have changed the calibration.

4. The paper will discuss the differences in calibration between QIS3 and QIS4 of following risk modules and sub-modules:

   Life underwriting risk: Lapse risk, Life catastrophe risk.

   Non-Life underwriting risk: Number of historic years, Line of business standard deviations, Geographical diversification, NL Cat Layer 1.

   Health underwriting risk: Accident & health Short Term, Health Workers compensation.

   Market Risk: Concentration risk.

   Counterparty default: Counterparty default.

[1] See CEIOPS website: QIS3 Calibration of the underwriting risk, market risk and MCR, April 2007 at http://www.ceiops.eu/media/files/consultations/QIS/QIS3/QIS3CalibrationPapers.pdf and QIS3 Calibration of the credit risk at http://www.ceiops.eu/media/files/consultations/QIS/QIS3/CEIOPS-FSC-23-07Calibrationofcreditrisk.pdf.

Life underwriting risk

Lapse risk

Reference in QIS3: I.3.158 to I.3.163
Reference in QIS 4: TS.XI.E

5. In QIS3, lapse risk was covered in two sub-modules.

- In the life lapse sub-module, the risk of misestimating lapse rates or of a permanent change in these rates was analysed in two scenarios: (1) a 50% increase in rates and (2) a combined scenario of an increase in absolute terms of 3% for policies where this is an adverse event and a 50% reduction in rates for the remaining policies.
- Additionally, in the life CAT module a mass lapse scenario affecting 75% of those linked policies where a lapse would cause a loss for the undertaking was assessed.

6. Some aspects of this approach were criticised by QIS3 participants: The 75% shock in the CAT module was considered to be too high. And participants identified a potential for double counting as the risk of increase in lapse rates is covered by two sub-modules. Moreover, a simplification of the approach was asked for.

7. In response to this feedback, the following changes were made:

- The 75% shock of the mass lapse scenario was reduced to 30%. The new calibration is an expert estimate based on past mass lapse events in the German life insurance market. The scope of application of the shock was extended from linked policies to all policies.
- In order to avoid double counting, only the more adverse of the mass lapse shock and the scenario of permanent 50% increase in lapse rates is used to determine the capital charge.[2]
- The scenario component of an increase in absolute terms of 3% was removed for reasons of simplification.

Life catastrophe risk

Reference in QIS3: I.3.175 to I.3.184
Reference in QIS 4: TS.XI.H

8. The QIS4 calibration of the mortality and disability catastrophe risk is unchanged compared to QIS3. The capital charge is calculated as 1.5 ‰ of the capital at risk. The calibration is supported by a recent study of Swiss

[2] The rationale of the calibration of the 50% risk factor can be found in the paper "Calibration of the Enhanced Capital Requirement for with-profit life insurers" of the UK Financial Services Authority (www.fsa.gov.uk/pubs/policy/04_16/ww_report.pdf).

Reinsurance Company.[3] Based on an epidemiological model, for a pandemic with a level of severity expected once every 200 years, the excess mortality within an insurance portfolio is estimated to be between 1 and 1.5 deaths per 1000 lives in most developed countries.

Non-Life underwriting risk

Number of historic years

Reference in QIS3: I.3.230
Reference in QIS 4: TS.XIII.B.13

9. Thanks to the work done by working groups on Best Estimate at national level and by the Groupe Consultatif, a recognition of a differentiation regarding the number of historic years between the various non-life lines of business could be introduced in the QIS4 specification.
The table in TS.XIII.B.13 has been designed using the recommendations from the "Work Group report on the Best Estimate in Non Life insurance" (Published by "ACAM", November 21 2007), pages 15 to 29.

Line of business standard deviations

Reference in QIS3: I.3.242 to I.3.244
Reference in QIS 4: TS.XIII.B.23 and TS.XIII.B.25

10. Following feedback from QIS3, the factors used within the SCR non-life underwriting risk module were adjusted to better reflect the relative and overall riskiness of different lines of business. Based on the QIS3 calibration of premium risk in the German market[4] , the recalibration reflects information collected through QIS3 on internal models, the results from current regulatory regimes and other market information from several Members States (UK, PT, NL). Results from over (46) firms were used to recalibrate the factors.

Geographical diversification

New in QIS 4
Reference in QIS 4: TS.XIII.B.28 to TS.XIII.B.30

[3] Cf. www.swissre.com/resources/bbab850046606bf6b89cfd276a9800c6-SHAN-753GRL_Pandemic%20influenza.pdf.
[4] Cf. QIS3 calibration papers (Calibration of the underwriting risk, market risk and MCR), p. 11-23.

11. During the QIS 3 exercise, CEIOPS has received comments suggesting that the proposed geographical diversification for groups, which was based on the location of the entities' headquarters, was not enough risk sensitive. It has also been highlighted that an entity operating in different countries with branches or under the Freedom to Provide Services regime should also benefit from geographical diversification.

12. Consequently, CEIOPS has revised the structure of geographical diversification and extended it to solo entities. In QIS 4, geographical diversification is calculated with a distribution index (Herfindahl) based on the location of risks (for premiums and reserves) for each line of business (except for credit and suretyship and miscellaneous).

13. The diversification benefit has been capped to 25% for the concerned lines of business. That cap seems to be reasonable for the standard formula considering the limited number of data gathered by CEIOPS on well diversified groups during the QIS 3 process.

14. Nevertheless, regarding geographical diversification, CEIOPS' thinking is still under discussion and at an early stage. Therefore CEIOPS invites comments on the suitability and practicability of the proposed approach.

NL Cat Layer 1

New in QIS 4
Reference in QIS 4: TS.XIII.C.3 to TS.XIII.C.6

15. Following QIS3 feedback, many firms expressed the view that the methodology for calculating the NL CAT module produced results that were inconsistent with their own assessment of risk. The layer one formulae were configured on the basis of QIS3 returns and benchmarked against market practice for a range of more than 20 insurers under the UK FSA supervision to ensure a reasonable calibration.

Health underwriting risk

16. Insurers in various countries writing "Accident & health" and "Workers compensation" types of business found their activities difficult to fit with the QIS3 split of the non-life underwriting module. For this reason, CEIOPS has restructured the Health module for QIS4.
Due to the restructuring of the Health module, we have introduced a 0.25 correlation factor between the SCR NL and the SCR Health in TS.VIII.C.4.

Accident & health Short Term

New in QIS 4
Reference in QIS 4: TS.XII.F

17. Calibration for the new "Accident & health Short Term" sub-module is identical to the calibration used for Line of business 2 and Line of business 3 of the QIS3 non-life underwriting risk specification (I.3.225 to I.3.251).

Health Workers compensation

New in QIS 4
Reference in QIS 4: TS.XII.G

18. *Market-wide factor for premium risk*
The calibration was based on the analysis of historical data from Portugal. It is based on a similar approach to that used for the premium risk in other Non-life LoB's, i.e. it is based on the observation of the volatility of historic loss ratios. These historic loss ratios reflect the volatility of claims falling into the standard non-life type of liabilities category, as well as that of annuities and life assistance liabilities.

19. *Market-wide factor for reserve risk*
The calibration was based on the analysis of historical data from Portugal. The factor was derived from the observation of the impact of applying a stress test to the development pattern of the run-off triangle (claims paid), corresponding to a VaR 99,5% 1-year scenario. The data used comprises only the standard non-life type of liabilities.

20. *Longevity risk*
No specific analysis was made. The same shock was assumed as for the life u/w risk module.

21. *Revision risk*
The calibration procedure is detailed on the QIS3 calibration paper. The only addition was the use of a more granular approach, to derive separate factors for annuities and life assistance liabilities.

22. *Expense risk*
No specific analysis was made. The same shock was assumed as for the life u/w risk module.

Market Risk

Concentration risk

Reference in QIS3: I.3.100 to I.3.113
Reference in QIS 4: TS.IX.G

23. The quadratic formula used in QIS3 is replaced by a linear formula in QIS4.
    Although the main principles of calibration remain the same, the updated calibration paper is included as an annex to the present paper.

Counterparty default

Reference in QIS3: I.3.114 to I.3.126
Reference in QIS4: TS.X

24. The counterparty default risk module follows a factor based approach. In QIS3, the volume measure for this approach was termed replacement cost. The technical specifications gave no detailed definition of this term. This was considered to be a shortcoming by many QIS3 participants. Therefore, the QIS4 Technical Specifications try to provide an explicit instruction on how to estimate the volume measure. In order to align with common terminology, the name of the measure was changed to loss given default (LGD).

25. Usually, the current exposure to the counterparty is not an adequate measure of the loss given default, because the exposure may change over time and a default is much more likely if the exposure is at peak level. In order to assess the potential loss, the SCR standard formula calculations for the underwriting and market modules are used (for reinsurance and derivatives respectively). These calculations try to answer the following question: what is the exposure if the counterparty fails in a one in 200 year event that underlies the SCR calculation? This exposure is determined as the sum of the current exposure and the risk mitigating effect of the reinsurance or derivative that is allowed for in the underwriting or market risk module. This risk mitigating effect is the difference between the gross SCR (which is calculated under the assumption that the reinsurance or derivative is not in place) and the current SCR of the module which allows for the risk mitigating effect.

26. In case of default, typically a part of the exposure can still be collected. In order to allow for this, the above described exposure is multiplied by a factor of 50% to arrive at the loss given default. The factor is an estimate based on the analysis of loss given default in the following studies: Standard & Poor's, Annual 2005 Global Corporate Default Study And Rating Transitions, January 2006, and Fitch Rating, Prism: Favorable Market Feedback and Clarifying Responses – Part 1, September 2006.

Annex: Calibration of the Concentration Risk Module

Description

27. Market risk concentrations present an additional risk to an insurer because of:
    - additional volatility that exists in concentrated asset portfolios; and
    - the additional risk of partial or total permanent losses of value due to the default of an issuer.

28. For the sake of simplicity and consistency, the definition of market risk concentrations is restricted to the risk regarding the accumulation of exposures with the same counterparty. It does not include other types of concentrations (e.g. geographical area, industry sector etc.).

Input

29. Risk exposures in assets need to be grouped according to the counterparties involved.

E_i	=	Net exposure at default to counterparty i
$Assets_{xl}$	=	Amount of total assets excluding those where the policyholder bears the investment risk
$rating_i$	=	external rating of the counterparty i

Output

30. The module delivers the following output:

Mkt_{conc}	=	Capital charge for market concentration risk

Calculation

31. The calculation is performed in three steps: (a) excess exposure, (b) risk concentration charge per 'name', (c) aggregation.

    (a) The excess exposure is calculated as:

$$XS_i = \max\left\{0; \frac{E_i}{Assets_{xl}} - CT\right\},$$

where the concentration threshold CT, depending on the rating of counterparty i, is set as follows:

$rating_i$	CT
AA-AAA	5%
A	5%
BBB	3%
BB or lower	3%

(b) The risk concentration charge per ‘name’ i is calculated as:

$$Conc_i = Assets_{xl} \bullet XS_i \bullet g$$

where XS_i is expressed with reference to the unit (i.e. an excess of exposure i above the threshold of 8%, delivers XS_i = 0.08) and the parameter g , depending on the credit rating of the counterparty, is determined as follows:

$rating_i$	Credit Quality Step	G
AAA	1	0.15
AA		
A	2	0.18
BBB	3	0.30
BB or lower, unrated	4 – 6, -	0.73

(c) The total capital requirement for market risk concentrations is determined assuming independence between the requirements for each counterparty i:

$$Mkt_{conc} = \sqrt{\sum_i Conc_i^2}$$

32. The general goal of this exercise is to provide a workable evidence of the impact that a concentration in a single counterparty may have in the risk profile of a well-diversified portfolio of assets.

33. The methodology applied for this purpose was circulated in advance within CEIOPS Financial Stability Committee (previously responsible for QIS3), and the comments received were considered to improve the method of calibration. This method may be described as follows:

1st. step.- The starting point is the design of a well-diversified portfolio of investments in individual names with the following characteristics:

a) The portfolio has a mix, representative of EU average insurers' portfolios of investments in bonds and equities. The mix proposed is 70% - 30% corresponding bonds – equities respectively (see figure 11A, page 12, Financial Stability Report Conglomerates 2005-2006).

b) Within each of these two groups, a sector-distribution of investments is built, also according to an EU expected average, as follows:

a. Investment in bonds: We have assumed that 25 % of bonds-portfolio is invested in risk-free bonds, and the rest (75 %) is invested in different sectors and ratings as described below.

b. Investment in equities: To the extent that this exercise assumes as starting point a well-diversified portfolio, consequently it should replicate some equity index sufficiently representative and well-known. The selected index is **Eurostoxx 50**, and the period used to record data on prices of each of its element, ranges **from 1993-january-11st until 2006-november-30th**. The length of this period guarantees sufficient historical data to derive VaR 99.5% with a high degree of reliability. Some elements of the selected index have been removed, since their records of data prices are only available for a significantly shorter period than that above mentioned[5].

Description of bonds-portfolio

34. In order to avoid the effect of the change in Macaulay Duration (as the life of the bond expires) and the renewal of the investment[6], and what is more important, to reflect the whole risk belonging to each sector/rating it was decided:

1) Bonds used in the computation are notional bonds, all of them issued at 5% rate and pending 5 years to maturity. At any moment of the simulation each bond maintains these features (which could be accepted as representative average features of the bonds existing in insurance portfolios)

[5] As part of the initial steps of calibration exercise of concentration risk, a complete set of tentative checking-tests was carried out to optimize the design of the method. The outputs of these preliminary calculations may be summarized as follows:

- Dealing with concentration risk requires obviously the use, as starting point, of a sufficiently high number of exposures,
- Nevertheless, as important as the number of different exposures is to guarantee that the selected names reflect a variety of behaviours sufficiently disperse, in such a way that almost all existing and possible equities/bonds fall in the range of behaviours considered
- Under the above assumption, increasing the number of names did not have a significant added value (the outputs were rather similar), while the computational burden increased and the analysis of a higher number of names became less transparent.

[6] This could be seen as being quite arbitrary, because we should have to select again another similar bond to substitute the previous one.

2) To capture and summarize market information about each sector/rating, notional bonds described in point 1) are valued with Bloomberg corporate yield curves, according the corresponding sector/rating. The following table lists these yield curves:

INTEREST RATES DATA	
1	F888 EUR BANK AAA
2	F462 INDS AA+
3	F890 BANK AA
4	F580 UTIL AA
5	F892 BANK A
6	F583 UTIL A
7	F465 INDUS A
8	F898 BANK BBB
9	F625 TELEF A
10	F468 INDUS BBB
11	F469 INDUS BBB-
12	F682 TELEF BBB+
13	F470 INDUS BB

Description of equities portfolio

35. To obtain a well-diversified portfolio, after selecting the components of Eurostoxx 50 mentioned above, other additional names have been added to complete all the buckets of the cross-table resulting from, on one dimension rating categories considered, and on the other dimension economic sectors included in this exercise.

36. Weights for each name in this initial portfolio depend on the following features:

1) When calculating BB concentration risk polynomial: we use names ranged from B to AAA;

2) When calculating BBB, A and AA-AAA concentration risk polynomials: we use the names ranged from BBB to AAA with the relevant adjustment in their initial weight;

3) Besides, the level or quality of diversification of these two starting portfolios has being checked by calculating their ***Herfindal index*** and comparing with their minimum possible value:

$$Herfindal\_Index = \sum_{i=1}^{n} w_i$$

	Eurostoxx 50	Eurostoxx 37	Eurostoxx 34
Herfindal	0,0256	0,0335	0,0349
1/n	0,0200	0,0270	0,0294

37. This table shows in all cases a *Herfindal index* for each portfolio only 0.005 higher than the minimum possible value, which confirms that the selected portfolios are actually well-diversified.

38. Finally, the calibration exercise has calculated the historic 1-year VaR 99.5% of a mixed portfolio (30 % invested in the equities portfolio, and 70 % invested in the bonds portfolio). This measure is calculated twice:

- ❖ Firstly, taking into account all the names and its corresponding yield curves as listed above:

  VaR (99.5 %) = 12.85 %

- ❖ Secondly, excluding BB names and its corresponding yield curve, as listed above.

  VaR (99.5 %) = 10.88 %

- ❖ In both cases, risk-free bonds are priced with the German sovereign curve.

39. As one can appreciate, there is sufficient rationale to calibrate firstly BB polynomial using the whole portfolio and afterwards, in a second step, to calibrate BBB, A and AA-AAA polynomial with a less volatile portfolio. [7]

[7] One has to bear in mind that due their high volatility, considering BB curve and BB-B equities increases (in relative terms) the goodness of the rest of names/ratings.

2nd step- Concentrating exposures in the initial portfolio:

40. First of all, we have established a bijective correspondence between each equity name and one of the interest rates curves above listed, taking into account its sector / rating. This means that when we concentrate the whole portfolio we concentrate at the same time the investment in the selected equity and its correspondent notional bond.

(1) The exercise begins by selecting a concrete name with a certain rating, (i.e. a bank rated AAA) and its correspondent notional bond (Banks AAA). Then, we increase in steps of 1 per cent its total weight in respect of the whole portfolio, obviously reducing simultaneously the participation of the rest of counterparties (to isolate purely the effect of concentration on the selected name).[8]

(2) Increases of concentration levels range from the starting weight up to the starting weight plus 50%, (as above mentioned, using 1% steps). For each level of concentration, we calculate the difference between the historic 1-year VaR 99.5% of the starting portfolio and historic 1-year VaR 99.5% of the resulting concentrated portfolio, and this difference is considered a raw proxy of an eventual concentration charge (it is called *Variation VaR.*)

(3) Points of raw-concentrations charges obtained in the successive increases of concentration for each name are drawn, interpolating a straight line, and then deriving the parameter g.

(4) Thus, for each level of rating *i* we will have:

$$Conc_i = Assets_{xl} \bullet XS_i \bullet g$$

3rd step.- The same procedure is repeated for names rated AA, A, BBB and BB or worse and different sectors.

41. Note that the initial investment in risk-free bonds remains unchanged. Therefore concentration exercise refers to the whole equity portfolio and 75% of the bonds-portfolio.

42. Tables below compare 1-year historical VaR 99’5% for the starting portfolio versus the extreme 1-year historical VaR 99’5% (portfolios with a concentration increase of 71 % above the initial weight). See **Table 2** for

[8] Note that equities and bonds are simply added, without applying the weights contained in par. 5.195 of CEIOPS Consultation Paper 20. This minor and technical change is proposed for various reasons, presented for approval during CEIOPS Pillar I WG meeting held in January 10, and having obtained the necessary agreement.

calculations including BB & B exposures and **Table 3** for calculations excluding such exposures.

Table 2. Calculations including BB & B exposures

	Those who improve	Those who decrease	AAA+AA	A	BBB	WORSE
Mean	2,3784%	-10,7817%	-0,70%	-1,44%	-6,15%	-26,00%
Standard Dev	1,1290%	12,6649%	6,1265%	5,9730%	9,1125%	20,1174%
N			15	12	7	3
Variation Coef	47,4674%	-117,4670%	-870,2377%	-414,3150%	-148,2736%	-77,3748%

Table 3. Calculations excluding BB & B exposures

	Those who improve	Those who decrease	AAA+AA	A	BBB
Mean	1,6138%	-6,8795%	-2,01%	-3,25%	-7,75%
Standard Dev	1,4912%	7,4379%	6,3729%	5,8990%	9,1288%
N			15	12	7
Variation Coef	92,3996%	-108,1159%	-316,6407%	-181,2757%	-117,7904%

43. Once this point has been reached and the graphs obtained have been analysed, the interpolation of a straight line is carried out taking into account the worst-behaved names are. This criterion is necessary to guarantee the consistency of the calibration exercise with the rationale grounding the standard SCR formula, which focus on stressed scenarios.[9]

[9] Due to its own characteristics, the mean VaR for each group of rating (BB, BBB, A and AA-AAA), tends to smooth the risk of concentration, thus understating the corresponding capital charge.

44. See in **figure 1** the selected lines and the interpolated one for AA-AAA rating (the last one). Each line means the *Variation VaR* when the portfolio increases the concentration in each equity and its corresponding AA bond.

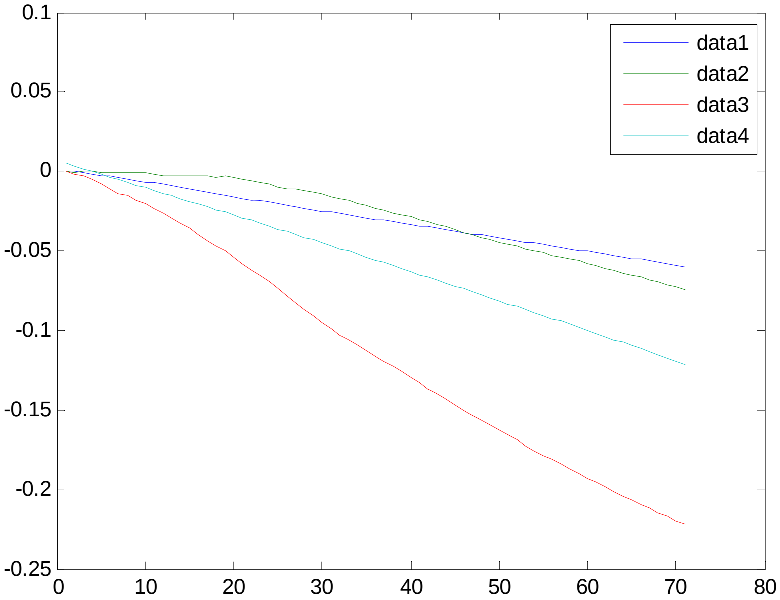

Figure 1

45. **Figure 2** plots the selected lines and the interpolated one for A rating, with similar meaning and methodology as the previous graph.

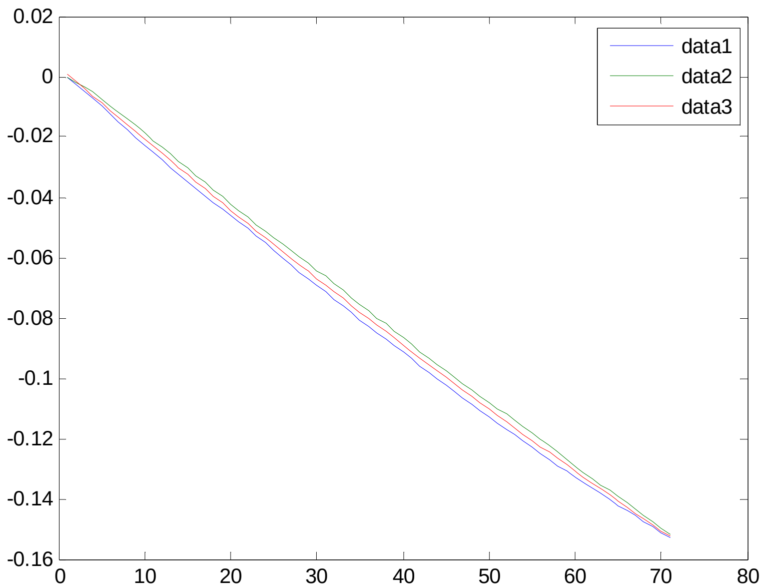

Figure 2

46.**Figure 3** depicts the selected lines and the interpolated one for BBB rating, following the same rationale and presentation as above

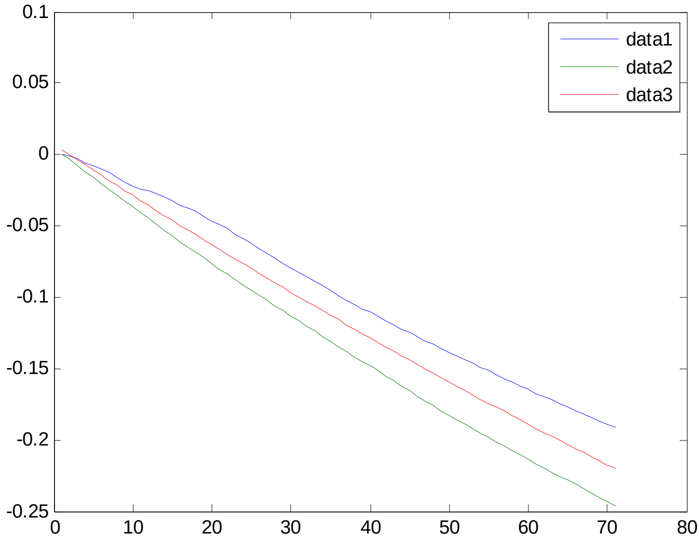

Figure 3

47.**Figure 4** contains the lines and the interpolated one for BB or worse rating.

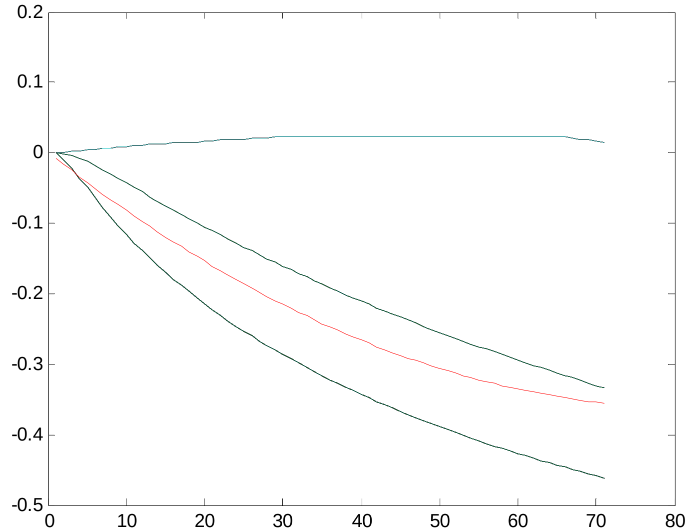

Figure 4

- Finally, g parameters for each rating are estimated using a conventional minimum squares method.

Final result

48.Concentration risk model for each group of rating *i*:

$$Conc_{\mathbf{i}} = Assets * XS_{\mathbf{i}} * g$$

where

XS_i = Excess exposure at each group of rating *i*

$$XS_i = \max\left\{0; \frac{Exposure\_group\_rating_i}{Assets_{xl}} - Concentration\_Threshold\_group\_rating_i\right\}$$

Assets * *XS*$_i$ = excess of exposure ***i*** above the threshold, expressed in units instead of percentage

g * *XS*$_i$ = the capital charge obtained as result of the calibration exercise

49. As one can see, the formula has been calibrated for different thresholds depending on each group of rating. These thresholds are listed in the following table:

Group of rating	**Threshold**
AA-AAA	0.05
A	0.05
BBB	0.03
BB-worse-unrated	0.03

50. The existence of different thresholds grounds on the fact that capital charges obtained according the calibrated parameters for buckets AAA-AA and A are not material for concentrations between 3-5%.

51. The final coefficients for each group of rating are the following ones:

$rating_i$	Credit Quality Step	G
AAA	1	0.15
AA		
A	2	0.18
BBB	3	0.30
BB or lower, unrated	4 – 6, -	0.73

Calibration of the MCR

Introduction

1. In January 2008, CEIOPS undertook an effort to test the calibration of the MCR in the QIS4 Technical Specifications on several countries' QIS3 data. This section gives a brief description of the calibration rationale and the results of this testing exercise.

2. Following Article 126(1) of the framework Directive proposal, the MCR should be calibrated to a confidence level in the range of 80% to 90% Value-at-Risk over a one-year period. In developing and testing the calibration for QIS4, CEIOPS used a percentage of the SCR as a proxy calibration target. It is recognised that there is no linear relationship between 80% or 90% VaR, and 99.5% VaR through all distributions. In CEIOPS' calibration exercise, following the lognormal assumptions underlying the SCR standard formula, the 25%·SCR to 45%·SCR interval was taken as a rough equivalent of the 80% to 90% VaR range, and the midpoint of this interval – i.e. 35% of the SCR – was used as a proxy calibration target.

Non-life business

Analysis: back-testing the calibration proposed in the draft QIS4 specifications

3. The non-life MCR premium and technical provisions factors in TS.XV.C.4 have been derived from the same underlying lognormal assumptions as in the SCR standard formula for non-life premium and reserve risk, respectively. Factors corresponding to 90% VaR over a one-year time horizon (i.e. the high end of the 80%–90% target interval of the framework Directive proposal) were chosen to implicitly compensate for the fact that this calibration approach does not take into account risks other than premium and reserve risk.

4. The α_h factor in TS.XV.D.5 for long-term health insurance provisions was calibrated to 35% of the observed QIS3 SCR to technical provisions ratio on one local market. The α_a factor was calibrated using non-life annuity data on a local market, reflecting the middle point between the 80% VaR and the 90% VaR calibration (yielding a 0.0197 and a 0.0306 factor respectively on that local market).

5. In January 2008, CEIOPS back-tested this calibration on QIS3 data. The testing took into account the QIS4 changes in SCR premium and reserving risk factors. For composite firms, a proxy non-life SCR was calculated to allow a separate non-life MCR to SCR comparison.

6. Testing for 460 insurers in 19 countries resulted in the following non-life MCR to SCR ratios:

MCR to SCR ratio (non-life)	*number of firms*
lower than 10%	20
10% to 20%	60
20% to 30%	126
30% to 40%	125
40% to 50%	88
50% to 60%	20
60% to 70%	9
70% to 80%	2
80% to 90%	8
90% to 100%	0
higher than 100%	2

7. One significant outlier group with high MCR to SCR ratios that has been identified in the testing are health insurers on a local market where a market-wide mandatory equalisation system is in place. All but one other non-life MCR to SCR ratios observed in the testing were lower than 70%, with three-quarters of the results falling between 20% and 50%.

8. Given these results, CEIOPS observes that the factors proposed for non-life business generally provide a satisfactory interplay between the SCR and the MCR.

Life business

Analysis: back-testing the calibration proposed in the draft QIS4 specifications

9. The calibration presented in the draft QIS4 specifications in December 2007 was derived via least squares linear fitting for 35% of the SCR on the QIS3 data of one local market, taking into account the following adjustments:

   - the counterparty default risk was removed from the SCR, as this risk component was concentrated in a small number of firms, and was difficult to reproduce by a linear formula;

   - the lapse catastrophe component was removed from the SCR, given the change of methodology in QIS4;

   - the SCR was adjusted to exclude ’free assets’, so that the calibration of the MCR reflect the financial position of a company with little to no ’free assets’ above the technical provisions and the SCR. The rationale for this adjustment is that the MCR being tested is unaffected by assets.

10. Where QIS3 data were insufficient to yield a reasonable factor, expert adjustments were applied to the fitting results to obtain a calibration. These included the technical provisions charge for the with-profit death, disability

and survivorship; unit-linked death, disability and survivorship; non-profit death, disability and savings classes; and the capital-at-risk charge for remaining contract term of less than 5 years.

11. In January 2008, CEIOPS back-tested this calibration on QIS3 data. The testing took into account the QIS4 changes regarding lapse catastrophe risk. For composite firms, a proxy life SCR was calculated to allow a separate life MCR to SCR comparison (it is noted however that, on some markets, composites have different life risk profiles than life-only firms, so the splitting of the SCR for composites did not always lead to comparable results).

12. A major issue that emerged from the testing related to the different risk absorption characteristics of future profit sharing on different markets. On those markets where future discretionary benefits have a high risk absorbency, there is a strong negative correlation between discretionary bonus provisions and risks, justifying a negative factor. On some of these markets, the initial calibration (with a zero factor for discretionary bonus provisions and a 2.5%-3.5% factor on provisions for guaranteed benefits) resulted in high MCR to SCR ratios in the testing. For one specific market, a –26% factor for discretionary bonus provisions has been suggested instead, while a 6.8% factor would apply to provisions for guaranteed benefits (the latter factor reflecting the risks of a firm that has no discetionary bonus provisions to absorb losses).

13. On other markets however the relationship between future discretionary bonuses and risk mitigation is less straightforward. It has been raised that future discretionary bonuses may actually have a higher risk profile (e.g. through riskier investments) on some markets. On such markets the factors suggested above could lead to negative MCR results (stopped only by the absolute floor).

Refinement of the initial approach and second round of back-testing

14. CEIOPS therefore tried to refine the initial approach in the following way (see paragraph TS.XV.E.3–4):

$$MCR_{Life} = \max\left\{\alpha_{WPg} \cdot TP_{WPg} + \alpha_{WPb} \cdot TP_{WPb};\ \gamma_{WPg} \cdot TP_{WPg}\right\} + \sum_{i\{non-WP\}} \alpha_i \cdot TP_i + \sum_j \beta_j \cdot CAR_j\ .$$

where

TP_{WPg}	=	technical provisions (net best estimate) for guaranteed benefits relating to with-profits contracts
TP_{WPb}	=	technical provisions (net best estimate) for discretionary bonuses relating to with-profits contracts

and where the capital charge on technical provisions other than with-profits and on capital at risk is unchanged from the QIS4 Technical Specifications, and where the new alpha and gamma factors are the following:

	1st level segment	*sub-segment*	*factor α*	*factor γ (with-profit floor)*
WP g	*with-profit*	*guaranteed benefits*	*0.035*	*0.015*
WP b		*discretionary bonuses*	*–0.09*	

15. This refined approach for the with-profits segment was suggested as a middle ground between the two types of market identified above. It recognises future profit sharing as a risk mitigating factor, however it also includes a floor equal to 1.5% of technical provisions for guaranteed benefits to avoid extremely low results. Thus the capital charge should remain in a band between 1.5% and 3.5% of the guaranteed part of provisions.

16. Then a second round of back-testing (including QIS3 data of 286 firms in 18 countries, focusing on the refined approach for with-profits contracts, led to the following life MCR to SCR ratios:

MCR to SCR ratio (life)	*number of firms*
lower than 10%	33
10% to 20%	63
20% to 30%	62
30% to 40%	51
40% to 50%	26
50% to 60%	21
60% to 70%	12
70% to 80%	5
80% to 90%	6
90% to 100%	2
higher than 100%	5

Please note that the above data do not include the life results of composites in one market. The results of these undertakings are heavily affected by their accident and health businesses, and including them in the summary table would introduce heterogeneity and would distort the reading of the testing results.

17. The two rounds of back-testing against the QIS3 results in various Member States tend to show that the approach initially proposed in draft QIS4 specifications for life business could be further refined in order to take into account the specificities of with-profits contracts.