

**CEIOPS' Advice for
Level 2 Implementing Measures on Solvency II:
SCR standard formula - Article 111 (f)
Operational Risk**

(former CP 53)

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1. Introduction

- 1.1. In its letter of 19 July 2007, the European Commission requested CEIOPS to provide final, fully consulted advice on Level 2 implementing measures by October 2009 and recommended CEIOPS to develop Level 3 guidance on certain areas to foster supervisory convergence. On 12 June 2009 the European Commission sent a letter with further guidance regarding the Solvency II project, including the list of implementing measures and timetable until implementation.¹
- 1.2. This Paper aims at providing advice with regard to the design and calibration of the capital requirement for operational risk, as required in Article 111(1)(g), of the Solvency II Level 1 text.²
- 1.3. References in this advice to '*undertakings*' embrace both insurance and reinsurance undertakings, unless otherwise explicitly mentioned.
- 1.4. For the purpose of this advice, reference to technical provisions is to be understood as technical provisions excluding the risk margin, to avoid circularity issues.

¹ See <http://www.ceiops.eu/content/view/5/5/>.

² Latest version from 19 October 2009 available at <http://register.consilium.europa.eu/pdf/en/09/st03/st03643-re01.en09.pdf>.

2. Extract from Level 1 Text

2.1 Legal basis for implementing measure

- 2.1. The legal basis for the advice presented in this paper is primarily found in Article 111(1)(9) of the Level 1 text, which states:

Article 111 – Implementing measures

1. *In order to ensure that the same treatment is applied to all insurance and reinsurance undertakings calculating the Solvency Capital Requirement on the basis of the standard formula, or to take account of market developments, the Commission shall adopt implementing measures laying down the following: [..]*

(f) the methods and parameters to be used when assessing the capital requirement for operational risk set out in Article 107, including the percentage referred to in paragraph 3 of Article 107;

- 2.2. Article 101 of the Level 1 text mentions in paragraph 4 a list of risks, including under letter (f) 'operational risk'.

Article 101 - Calculation of the Solvency Capital Requirement

1. The Solvency Capital Requirement shall be calculated in accordance with paragraphs 2 to 5 [..]

4. The Solvency Capital Requirement shall cover at least the following risks: [..]

(f) operational risk.

Operational risk as referred to in point (f) of the first subparagraph shall include legal risks, and exclude risks arising from strategic decisions, as well as reputation risks.

- 2.3. More precisely, the Level 1 text considers 'operational risk' as one of three main elements of the solvency capital requirement (hereafter, SCR).

Article 103 - Structure of the standard formula

The Solvency Capital Requirement calculated on the basis of the standard formula shall be the sum of the following items:

(a) the Basic Solvency Capital Requirement, as laid down in Article 104;

(b) the capital requirement for operational risk, as laid down in Article 107;

(c) the adjustment for the loss-absorbing capacity of technical provisions and deferred taxes, as laid down in Article 108.

- 2.4. As mentioned in Article 103(b), Article 107 is dedicated to the specific regulation of operational risk:

Article 107. Capital requirement for operational risk

1. The capital requirement for operational risk shall reflect operational risks to the extent they are not already reflected in the risk modules referred to in Article 104. That requirement shall be calibrated in accordance with Article 101(3).

2. With respect to life insurance contracts where the investment risk is borne by the policyholders, the calculation of the capital requirement for operational risk shall take account of the amount of annual expenses incurred in respect of those insurance obligations.

3. With respect to insurance and reinsurance operations other than those referred to in paragraph 2, the calculation of the capital requirement for operational risk shall take account of the volume of those operations, in terms of earned premiums and technical provisions which are held in respect of those insurance and reinsurance obligations. In this case, the capital requirement for operational risks shall not exceed 30% of the Basic Solvency Capital Requirement relating to those insurance and reinsurance operations.

2.2 Other relevant Articles for providing background to the advice

- 2.5. The Level 1 text also mentions operational risk in the following provisions:

Article 13 – Definitions

(33) operational risk means the risk of loss arising from inadequate or failed internal processes, or from personnel and systems, or from external events;

Article 49 – Outsourcing

2. Outsourcing of critical or important operational functions or activities shall not be undertaken in such a way as to lead to any of the following: [..]

(b) increasing unduly the operational risk;

3. Advice

3.1 Explanatory text

3.1.1. QIS4 feedback

3.1. The QIS4 report³, included a summary of industry feedback:

The standard formula tested in QIS4 was similar to the QIS3 approach. Views diverged between respondents whether the operational risk charge in the standard formula is adequately designed. In general, non-life insurers and the smaller undertakings had a more positive opinion of the operational risk capital charge in QIS4 in comparison to life and larger undertakings and groups.

Many respondents noted that there are further improvements needed in the standard formula.

3.2. The main issues mentioned by those respondents are:

- *The correlation of 100% with other risks*

This correlation, thoroughly debated during the EU inter-institutional procedure for the Directive approval, has been settled in Article 103 of the Level 1 text.

- *Cap of 30 per cent is too high*

According to QIS 4 results, the operational risk charge was, on average, around 6% of the SCR (lowest average of 2% and highest average of 9.5%) and in only 8 Member States did some undertakings register values higher than 30% of the SCR

- *Lack of risk sensitivity to the wide spectrum of operational risks*

In this respect, it seems necessary to keep in mind that the design of the operational risk module in the SCR standard formula needs to maintain an appropriate balance between simplicity and accuracy.

- *Some respondents noted that the objectives of the operational risk charge can only be properly tackled through internal models and Pillar 2 measures, as operational risk has a wide range of qualitative measures which cannot be taken into account reliably in the standard formula.*

The Level 1 text is clear that operational risk must be taken into account in the SCR standard formula.

- *The responses to the qualitative questions indicated that there is a wide range of operational risk management systems in place, with some participants indicating that they have sophisticated techniques to quantify capital requirements for operational risk, while others have yet to start collecting and categorizing operational risk losses.*

³ <http://www.ceiops.eu/media/files/consultations/QIS/CEIOPS-SEC-82-08%20QIS4%20Report.pdf>

3.3. Regarding the design of the operational risk module in the SCR standard formula, the QIS4 report mentions (pp. 227 - 237)

- *47% of the respondents felt that the operational risk charge is **adequately designed**, while 53% of respondents thought it was not adequately designed;...*

*In relation to the **formula**, respondents stated that:*

- *The standard formula is too simplistic, since it is not risk sensitive, and rewards low pricing and reserving; ...*
- *The formula does not take into account the quality of the operational risk management processes of each undertaking, nor does it encourage the development of good risk management practices; ...*
- *The formula does not reflect the wide spectrum of operational risks that can materialise within an undertaking.*

*The main suggestions to **remedy the perceived deficiencies** in the standard formula were:*

- *The operational risk charge should be calculated as a percentage of the BSCR or the SCR;*
 - *The operational risk charge should be more sensitive to operational risks management;*
 - *The operational risk charge should be based on the entity-specific operational risk sources and the quality of the operational risk management process and the internal control framework*
 - *Diversification **benefits and risk mitigation techniques should be considered.***
- 3.4. Furthermore the CEIOPS QIS4 report states that *"The operational risk capital charge from the internal model tends to be higher than the standard formula with a median ratio of 133% and an inter quartile range of 100% to 233%. 13 of the 16 countries that provided details stated that the median of the ratios was at least 100%."*

This statement implies that, compared to internal model results, the QIS4 standard formula charge for operational risk is not high enough.

3.1.2 Scope of the operational risk module

3.5. The operational risk module of the SCR standard formula does not differ significantly from the QIS4 proposal.

3.6. According to Table 8 of the QIS4 report (page 31) more than 99% of non-life insurers and 93.6% of life insurers were able to calculate the operational risk SCR. This demonstrates that the QIS4 approach is workable.

3.7. CEIOPS has considered other options proposed for the calculation but has disregarded them on the basis of the analysis and reports on which it has consulted (see 3.1.4). In particular:

- Operational risk is a very complex, qualitative or subjective area and as such it is very difficult to find a standard formula that reflects the operational risk to a notional insurer that would be relevant across jurisdictions and across business areas. This is not to say that such a measure should not be attempted, and improved as far as possible. It is however a consideration that this formula has been improved as far as it can be, and as far as it does not reflect certain business models, this would imply the use of an internal model.
- CEIOPS recognises that applying a standard formula to many firms will inevitably lead to some firms holding more capital than what their internal model suggests and others not holding enough. This was recognised in the CEIOPS QIS4 report where some respondents noted that “operational risk has a wide range of qualitative measures which cannot be taken into account reliably in the standard formula.” It therefore seems sensible to have an operational risk charge in the standard formula that is likely to meet the 99.5% VaR criterion for most undertakings, and to allow those undertakings for whom the standard formula is not appropriate to apply for a partial internal model
- Furthermore, due to the complexity and nature of operational risk, the proposed formula tries to reflect an average profile, since more accurate designs would make the formula difficult to apply on a standard basis.

3.8. In view of the above:

- The calibration of the operational risk factors for the standard formula has been revised to be more consistent with the assessment obtained from internal models. Details of such analysis can be found in section 3.1.3.
- Diversification has not been taken into account as per the interpretation of Article 103 of the Level 1 directive text.
- A zero floor for all technical provisions has been explicitly introduced to avoid an undue reduction of the operational risk SCR.
- Health obligations are split between obligations pursued on a similar technical basis to that of life insurance (SLT Health) and those that are not (non SLT Health). This split shall be consistent with the split within the health module. For further information please refer to CEIOPS’ advice on SCR health underwriting risk (CEIOPS-DOC-43/09).⁴
- The Basic SCR is not a sufficiently reliable volume measure of the operational risk, and that a minimum level of granularity would be desirable in the design of the formula.

3.9. CEIOPS has also considered the option to introduce a ‘ladder factor’ as an attempt to reflect the degree of progress of each undertaking in the management of its operational risks. The discount would have been applied to the Operational Risk capital charge, allowing the transformation of qualitative criteria into a quantitative amount in the calculation of the SCR standard formula. After careful consideration, CEIOPS agreed that this ladder factor should not be included in the standard formula. Undertakings wishing to take this further may use a partial internal model.

⁴ Former CP 50. See <http://www.ceiops.eu/index.php?option=content&task=view&id=601>.

3.1.3 Design of the operational risk module

3.10. The inputs for this module are:

TP_{life}	= Total life insurance technical provisions (gross of reinsurance), with a floor equal to zero. This would also include unit-linked business and life like obligations on non-life contracts such as annuities.
$TP_{SLT\ Health}$	Technical provisions corresponding to health insurance (gross of reinsurance) that correspond to Health SLT ⁵ with a floor equal to zero.
$TP_{life-ul}$	= Total life insurance technical provisions for unit-linked business (gross of reinsurance), with a floor equal to zero.
TP_{nl}	= Total non-life insurance technical provisions (gross of reinsurance), with a floor equal to zero (excluding life like obligations on non-life contracts such as annuities).
$TP_{Non-SLT\ Health}$	= Technical provisions corresponding to health insurance that correspond to Health non SLT ⁶ (gross of reinsurance), with a floor equal to zero.
$Earn_{life}$	= Total earned life premium (gross of reinsurance), including unit-linked business.
$Earn_{SLT\ Health}$	= Total earned premiums corresponding to health insurance that correspond to Health SLT ⁷ (gross of reinsurance).
$Earn_{life-ul}$	= Total earned life premium for unit-linked business (gross of reinsurance)
$Earn_{nl}$	= Total earned non-life premium (gross of reinsurance)
$Earn_{Non\ SLT\ Health}$	Total earned premiums corresponding to health insurance that correspond to Health non SLT ⁸ (gross of reinsurance).

All the aforementioned inputs should be available for the last economic period and the previous one, in order to calculate their last annual variations.

Exp_{ul}	= Amount of annual expenses (gross of reinsurance) incurred in respect of unit-linked business ⁹
$BSCR$	= Basic SCR

⁵ For more information see CEIOPS-DOC-43/09 mentioned before.

⁶ idem

⁷ idem

⁸ idem

3.11. The capital charge for operational risk is determined as follows:

SCR_{op} = Capital charge for operational risk

where

$$SCR_{op} = \min \{ BSCR_{cap} \cdot BSCR; Op_{Inul} \} + UL_{-f} \cdot Exp_{ul}$$

where

$BSCR_{cap}$ = 30% as per the Level 1 text article 107.

Op_{Inul} = Basic operational risk charge for all business other than unit-linked business (gross of reinsurance)

UL_{-f} = Factor charge to be applied to the amount of annual expenses (gross of reinsurance) incurred in respect of unit-linked business. This is calibrated in section 3.1.4.

And Op_{Inul} is determined as follows:

$$Op_{Inul} = \max (Op_{premiums} ; Op_{provisions})$$

where

$$\begin{aligned} Op_{premiums} = & P_{life_f} * (Earn_{life} + Earn_{SLT\ Health} - Earn_{life-ul}) + \\ & P_{nl_f} * (Earn_{nl} + Earn_{Non-SLT\ Health}) + \\ & \text{Max} (0 , P_{life_f} * (\Delta Earn_{life} - \Delta Earn_{life-ul})) + \\ & \text{Max} (0 , P_{nl_f} * \Delta Earn_{non-life}) \end{aligned}$$

and

$$\begin{aligned} Op_{provisions} = & TP_{life_f} * (TP_{life} + TP_{SLT\ Health} - TP_{life-ul}) + \\ & TP_{nl_f} * (TP_{nl} + TP_{Non\ SLT\ Health}) + \\ & \text{Max} (0 , TP_{life_f} * (\Delta TP_{life} - \Delta TP_{life-ul})) + \\ & \text{Max} (0 , TP_{nl_f} * \Delta TP_{non-life}) \end{aligned}$$

where

P_{life_f} , P_{nl_f} , TP_{life_f} and TP_{nl_f} are the charge factors that need to be calibrated as per 3.1.4.

Δ = change in earned premiums / technical provisions from year t-1 to t, for earned premiums / technical provisions increases which

have exceeded an increase of 10%. Furthermore no offset shall be allowed between life and non-life Δ .¹⁰

3.1.4. Calibration

3.12. CEIOPS points out that the calibration in this advice is being considered to be in line with 99.5% VaR and a one year time horizon, incorporating the experience from the current crisis. QIS5 will give an indication of the overall impact of the proposed calibrations, not limited to the SCR but including technical provisions and own funds.

3.13. The design of the Operational risk module requires the calibration of the following factors:

P_{life_f}
 P_{nl_f}
 TP_{life_f}
 TP_{nl_f}
 UL_f

3.14. The calibration of the Operational risk factors has resulted in a particular challenging task mainly due to the lack of information available.

3.15. In producing a revised standard formula charge CEIOPS has aimed at setting the operational risk charge at a level of 99.5% VaR as required by the Level 1 text.

3.16. As there is no explicit way of measuring operational risk at the tail of the distribution, CEIOPS has used the responses from the internal model operational risk charges as a benchmark for where firms believe their 99.5% VaR for operational risk lies.

3.17. Factors should be chosen so that the standard formula operational risk charge is broadly in line with the undiversified operational risk from a firm's internal model. This is because it is CEIOPS interpretation that the level 1 text does not allow for diversification within the standard formula.

3.18. The CEIOPS QIS4 report also states that "Only 25% of respondents believed that the data used in their internal model for operational risk is sufficiently accurate, complete and appropriate. Operational risk data used is collected annually and is entity specific". Where there is insufficient data to estimate the capital charge accurately, it is possible that many undertakings may underestimate the risk in their models, especially given that the QIS4 results were not subject to regulatory challenge.

3.19. CEIOPS has carried out several analysis as well as referred to external information for validation and benchmarking purposes:

¹⁰ A small minority of CEIOPS members disagree with the current inclusion of factors for high growth of premiums and provisions in the design of the formula.

Analysis 1.

3.20. Was based on 5 EU countries and 32 entities in total, including both data on the pre-diversification and post-diversification charges. The sample of undertakings providing post-diversification charges was different than the sample providing pre-diversification charges.

3.21. Post-diversification data were disregarded since, unexpectedly, they resulted in higher capital charges than pre-diversification data, making evident that the sample of undertakings providing post-diversification data was biased in respect of the sample of undertakings informing pre-diversification data.

3.22. The following data is presented:

1. Internal models operational pre-diversification charge in relation to non-life technical provisions (Table 1 below).
2. Internal models operational pre-diversification charge in relation to non-life earned premiums (Table 2 below).
3. Internal models operational pre-diversification charge in relation to life technical provisions excluding unit-linked business (Table 3 below).
4. Internal models operational pre-diversification charge in relation to life earned premiums excluding unit-linked business (Table 4 below).

3.23. The following analysis was carried out:

- Production of summary statistics for each of the data subsets above.
- A charge was selected based on the 50 percentile of the pre-diversification charge of the internal models.

mean		5,19%
standard deviation		5,62%
Pearson coefficient		108,29%
Percentiles	10	1,24%
	20	2,27%
	30	2,79%
	40	2,98%
	50	3,55%
	60	4,31%
	70	4,98%
	80	5,94%
	90	9,86%
	100	29,02%

mean		4,34%
standard deviation		3,01%
Pearson coefficient		69,41%
Percentiles	10	1,08%
	20	2,25%
	30	2,83%
	40	3,33%
	50	3,80%
	60	4,10%
	70	4,89%
	80	5,37%
	90	7,91%
	100	13,41%

Table 3		
mean		1,01%
standard deviation		1,26%
percentile	10	0,13%
	20	0,17%
	30	0,30%
	40	0,49%
	50	0,59%
	60	0,89%
	70	1,09%
	80	1,57%
	90	1,84%
	100	6,43%
Pearson coefficient		124,18%

Table 4		
mean		11.17%
standard deviation		15.29%
percentile	10	1.64%
	20	2.22%
	30	3.01%
	40	4.21%
	50	5.44%
	60	7.51%
	70	9.68%
	80	14.84%
	90	27.97%
	100	75.60%
Pearson coefficient		136.90%

3.24. The overall conclusion of this analysis is that operational risk in the QIS4 standard formula was under-calibrated.

3.25. The revised factors rounded to the first decimal are presented below:

	New Factors	QIS4 Factors
TP - life	0.6%	0.30%
TP - non-life	3.6%	2.00%
Prem - life	5.5%	3.00%
Prem - non-life	3.8%	2.00%

3.26. For unit-linked business, CEIOPS has assumed that the characteristics are similar to those of other life products. Therefore the QIS4 parameter will evolve in line with the life parameter.

Analysis 2

3.27. CEIOPS considered:

If we assume that the allowance for diversification credit between operational risk and other risks in models may be around 50%, then the size of the diversified component for operational risk would be around one half of the size of the undiversified component. This undiversified component should in principle meet the 99.5% VaR criterion. Thus a proxy

could be to simply double the parameters for operational risk in the standard approach SCR for life and non-life undertakings.

- 3.28. Based on the CRO Forum results, this would then seem to make the operational risk charge in the standard formula, on average, closer to the operational risk charge produced from an undiversified internal model, and hence to meet a 99.5% VaR criterion.

	New Factors	QIS4 Factors
TP – life	0.6%	0.3%
TP - non-life	4.0%	2.0%
Prem - life	6.0%	3.0%
Prem - non-life	4.0%	2.0%
UL factor	50%	25%

CRO Forum Study

- 3.29. The analysis from the Chief Risk Officers (CRO) Forum QIS4 benchmarking study dated 30 October 2008¹¹ shows diversified internal model operational risk results to be a similar percentage of total capital required as the standard formula operational risk results.
- 3.30. As noted by the study, the QIS4 requirements for operational risk in the standard approach are significantly lower than the pre-diversification allowance in internal models. In contrast to many internal models, though, the standard approach does not allow for diversification between the operational risk capital requirements and the remaining capital requirements. The net result is that the parameters in the QIS4 standard formula are broadly equivalent to those set by firms for their internal model operational risk charge after applying their diversification assumptions (with the exception of health business).
- 3.31. The CRO Forum results have not been subject to supervisory challenge so the firms in the analysis could have allowed for too much diversification rather than too little. It is not yet clear how much diversification benefit will be allowed for internal models. In line with the banking experience, internal model numbers may increase due to supervisory challenge. In addition, to encourage internal model development and to address the issue of the standard formula not providing incentives to manage operational risk, the undiversified standard formula charge should be higher than the diversified internal model charge and not the same.
- 3.32. The CRO Forum results support the view that the standard formula operational risk parameters have not been set high enough to meet a 99.5% VaR criterion for most undertakings.

¹¹ <http://www.croforum.org/publications.ecp>

ABI Study - Calibration

- 3.33. The ABI has also shared with CEIOPS an analysis based on a small sample of firms.
- 3.34. The ABI asked their members to provide the information such as:
- QIS4 Operational Risk Capital Requirement
 - ICA Capital Charge for Operational Risk – Diversified
 - ICA Capital Charge for Operational Risk – Undiversified
 - Gross Premiums - Gross premiums written per financial statements (this is the best indicator of actual activity). It excludes taxes but includes brokerage and commission. Earned premiums reflect prior years so not appropriate. Net premiums could be unduly low where there is a high proportion of reinsurance.
 - Technical Provisions - Gross insured liabilities (claims plus IBNR) before reinsurance but excluding provisions for unearned premiums - per financial statements.
 - Net Income – Net premiums.
 - Total Expenses - All administrative expenses excluding costs associated with sales/acquisitions (e.g. brokerage), and excluding reinsurance costs. It should include exception and non-operating costs as these are an indicator of the operational risks faced by firms. This number can be extracted from financial statements.
 - Total Insured Value - For property lines - sum of policy limits net of reinsurance; for liability lines - sum of exposures (net of reinsurance) based on single claim per policy. (For many PI lines, exposure is potentially unlimited as there are no limits to the number of claims.)
 - No of Employees (FTE) - FTE - Per financial statements (i.e. excludes contractors and outsourcers)
- 3.35. Data was received from 7 life and 6 non-life firms.
- 3.36. The data provided by firms was then turned into ratios firstly to check whether the standard formula for operational risk gave results that were in line with the current parameters.
- 3.37. By looking at Table 1, it is clear that further calibration of the current formula is required. The ratios of QIS4/ Gross Premium and QIS4/ Technical provisions should be close to the current standard formula parameters. Even a sample size this small shows a divergence from these figures of 0.03 and 0.003 respectively for gross premiums (or earnings) and technical provisions for life firms and 0.02 and 0.02 respectively for gross premiums (or earnings) and technical provisions for non-life firms.
- 3.38. The differences between the diversified and undiversified ICA figures demonstrate that diversification is key to many firms for operational risk. However, the standard formula is supposed to be the undiversified operational risk figure according to the Solvency II Level 1 text.

3.39. The undiversified ICA figures demonstrate that the life parameters should be 0.0322 for gross premiums and 0.0051 for technical provisions for life firms. In terms of non-life companies, the parameter for gross premiums is 0.0458 while that for technical provisions is 0.0349. It should be noted that this is a small sample, so is indicative only.

Table 1. OP risk analysis results - ABI

LIFE										
Analysis	OIS4/Gross Premium	ICA - diversified/ Gross Premium	ICA - undiversified/ Gross Premium	OIS4/ Technical Reserves	ICA - diversified/ Technical Reserves	ICA - undiversified/ Technical Reserves	OIS4/Net Income	ICA - diversified/ Net Income	ICA - undiversified/ Net Income	
Average	1.938%	2.140%	3.220%	0.356%	0.190%	0.511%	26.157%	23.449%	22.890%	
Min	0.071%	0.071%	0.071%	0.021%	0.000%	0.021%	0.818%	1.289%	2.596%	
Max	5.039%	5.282%	9.184%	1.242%	0.343%	0.944%	123.143%	80.815%	80.815%	
Median	1.663%	1.269%	2.567%	0.175%	0.249%	0.549%	7.033%	15.714%	11.363%	
75th percentile	0.026348	0.033068	0.031868	0.003197	0.002712	0.007194	0.15433	0.18	0.249911	
NON-LIFE										
Analysis	OIS4/Gross Premium	ICA - diversified/ Gross Premium	ICA - undiversified/ Gross Premium	OIS4/ Technical Reserves	ICA - diversified/ Technical Reserves	ICA - undiversified/ Technical Reserves	OIS4/Net Income	ICA - diversified/ Net Income	ICA - undiversified/ Net Income	
Average	2.935%	2.881%	4.577%	2.675%	2.572%	3.487%	14.851%	15.700%	14.505%	
Min	2.001%	0.643%	2.614%	1.934%	0.459%	1.367%	3.056%	0.725%	3.487%	
Max	4.661%	6.161%	8.807%	4.004%	5.254%	5.254%	38.514%	27.978%	27.027%	
Median	2.603%	2.356%	4.054%	2.281%	2.567%	3.860%	5.517%	17.048%	13.000%	
75th percentile	3.471%	3.645%	4.319%	3.330%	3.262%	4.748%	26.224%	25.745%	20.014%	

3.40. The ABI also considered other variables that could be used to model operational risk. However in terms of the Directive text for Solvency II it is explicitly stated that earning (or gross premiums) and technical provisions should be used. Nevertheless for information we provide a summary of their conclusions:

- The results for Net Income and Employees were treated differently by member firms so any analysis of these figures would not be meaningful.
- In the case of Employees, firms were not unanimous in their views as to the treatment of outsourcing since the firm is still responsible for outsourcing contracts, but it is difficult to find the exact numbers of outsourced staff.
- The variable Total Insured Value (Table 3) also caused much confusion. Although some firms were eager to collect this data, other firms, both life and non-life either felt this was not relevant to their business or were not able to provide this information. The low amount of data provided meant that for non-life firms, no meaningful analysis of the data was possible.
- Total Expenses was probably the most successful variable of the data collected and this may be useful in other analyses of operational risk. This could be a parameter that is used together with gross premiums and technical provisions in business areas other than just unit-linked ones. It may not be particularly useful on its own, but combined with other

measures, it may refine the risk sensitivity of the standard operational risk measure. On the other hand, it may be more complicated and so be a better measure for an internal model for operational risk as it reflects a way of measuring the cost of replacing business processes that are currently in place.

- Other methods of valuing operational risk including using past loss data, such as that collected in the ORIC database, are also very useful both to compare with ICA and QIS4 figures and in their own right for use in internal models. ORIC will also be doing work on this area in the future.

FSA UK Analysis

- 3.41. The UK FSA carried out a small analysis based on internal ICA data: 15 life firms and 13 non life firms.
- 3.42. The FSA compared the adequacy of the range of factors from the different analysis and proposals and illustrated the results on graphs as presented in the annex.

Parameters	QIS 4	FSA	FSA1	FSA2	FSA3	Analysis 1	ABI
TP - life	0.3%	0.60%	1.25%	1.25%	1.10%	0.60%	0.51%
TP - non-life	2.0%	4.00%	2.00%	2.00%	4.00%	3.60%	3.49%
TP - health	0.2%	0.40%	0.20%	0.20%	0.20%		
Prem - life	3.0%	6.00%	8.00%	8.00%	8.00%	5.50%	3.22%
Prem - non-life	2.0%	4.00%	6.00%	6.00%	5.00%	3.80%	4.58%
Prem - health	2.0%	4.00%	2.00%	2.00%	2.00%		
L BSCR cap	30.0%	30.00%	60.00%	20.00%	20.00%	30.00%	30.00%
NL BSCR cap	30.0%	30.00%	60.00%	20.00%	20.00%	30.00%	30.00%
UL factor	25.0%	25.00%	50.00%	25.00%	25.00%	25.00%	25.00%

- 3.43. The results of the analysis show clearly that the QIS 4 factors are too low.

3.1.5 Results

- 3.44. After considering the above analysis and reports, CEIOPS recommends the final factors to be as follows:

	New Factors	QIS4 Factors
TP - life	0.6%	0.3%
TP - non-life	3.6%	2.0%
Prem - life	5.5%	3.0%
Prem - non-life	3.8%	2.0%
UL factor	25%	25%
BSCR cap -life	30%	30%
BSCR cap non-life	30%	30%

- 3.45. Irrespective of the source, the calibration has shown that the QIS 4 factors were too low.
- 3.46. CEIOPS has selected the final factors from Analysis 1. The underlying reason behind the choice is that this is based on a larger sample of data. It is important to note that the results are not far different from those produced by other analysis or reports.

3.2 CEIOPS' advice

Definition

- 3.47. Operational risk is the risk of loss arising from inadequate or failed internal processes, or from personnel and systems, or from external events (Article 13(33) of the Level 1 text). Operational risk shall include legal risks, and exclude risks arising from strategic decisions, as well as reputation risks (Article 101(4)(f) of the Level 1 text). The operational risk module is designed to address operational risks to the extent that these have not been explicitly covered in other risk modules.
- 3.48. For the purpose of this advice, reference to technical provisions is to be understood as technical provisions excluding the risk margin, to avoid circularity issues.

Calibration

- 3.49. Based on the assumptions contained in the explanatory text, CEIOPS has calibrated the sub-module according to 99.5% VaR and a one year time horizon.
- 3.50. The overall conclusion of our analysis is that operational risk in the QIS4 standard formula was under-calibrated.
- 3.51. CEIOPS thus proposes the following operational risk factors:

	New Factors	QIS4 Factors
TP - life	0.6%	0.3%
TP - non-life	3.6%	2.0%
Prem - life	5.5%	3.0%
Prem - non-life	3.8%	2.0%
UL factor	25%	25%
BSCR cap -life	30%	30%
BSCR cap non-life	30%	30%

Inputs

3.52. The inputs for this module are:

TP_{life} = Total life insurance technical provisions (gross of reinsurance), with a floor equal to zero. This would also include unit-linked business and life like obligations on non-life contracts such as annuities.

$TP_{SLT\ Health}$ = Technical provisions corresponding to health insurance (gross of reinsurance) that correspond to Health SLT with a floor equal to zero.

$TP_{life-ul}$ = Total life insurance technical provisions for unit-linked business (gross of reinsurance), with a floor equal to zero.

TP_{nl} = Total non-life insurance technical provisions (gross of reinsurance), with a floor equal to zero (excluding life like obligations of non-life contracts such as annuities).

$TP_{Non-SLT\ Health}$ = Technical provisions corresponding to health insurance that correspond to Health non SLT (gross of reinsurance), with a floor equal to zero.

$Earn_{life}$ = Total earned life premium (gross of reinsurance), including unit-linked business.

$Earn_{SLT\ Health}$ = Total earned premiums corresponding to health insurance that correspond to Health SLT (gross of reinsurance)

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

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

$Earn_{Non\ SLT\ Hea.}$ = Total earned premiums corresponding to health that correspond to Health non SLT (gross of reinsurance).

All the aforementioned inputs should be available for the last economic period and the previous one, in order to calculate their last annual variations.

Exp_{ul} = Amount of annual expenses (gross of reinsurance) incurred in respect of unit-linked business. Administrative expenses should be used (excluding acquisition expenses); the calculation should be based on the latest past years expenses and not on future projected expenses.

$BSCR$ = Basic SCR

Calculations

3.53. The capital charge for operational risk is determined as follows:

$$SCR_{op} = \text{Capital charge for operational risk}$$

where

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

Where

$$Op_{Inul} = \text{Basic operational risk charge for all business other than unit-linked business (gross of reinsurance)}$$

is determined as follows:

$$Op_{Inul} = \max (Op_{premiums} ; Op_{provisions})$$

where

$$\begin{aligned} Op_{premiums} = & 0.055 * (Earn_{life} + Earn_{SLT Health} - Earn_{life-ul}) + \\ & 0.038 * (Earn_{non-life} + Earn_{Non SLT Health}) + \\ & \text{Max}(0 , 0.055 * (\Delta Earn_{life} - \Delta Earn_{life-ul})) + \\ & \text{Max}(0 , 0.038 * \Delta Earn_{non-life}) \end{aligned}$$

and:

$$\begin{aligned} Op_{provisions} = & 0.006 * (TP_{life} + TP_{SLT Health} - TP_{life-ul}) + \\ & 0.036 * (TP_{non-life} + TP_{Non SLT Health}) + \\ & \text{Max}(0 , 0.006 * (\Delta TP_{life} - \Delta TP_{life-ul})) + \\ & \text{Max}(0 , 0.036 * \Delta TP_{non-life}) \end{aligned}$$

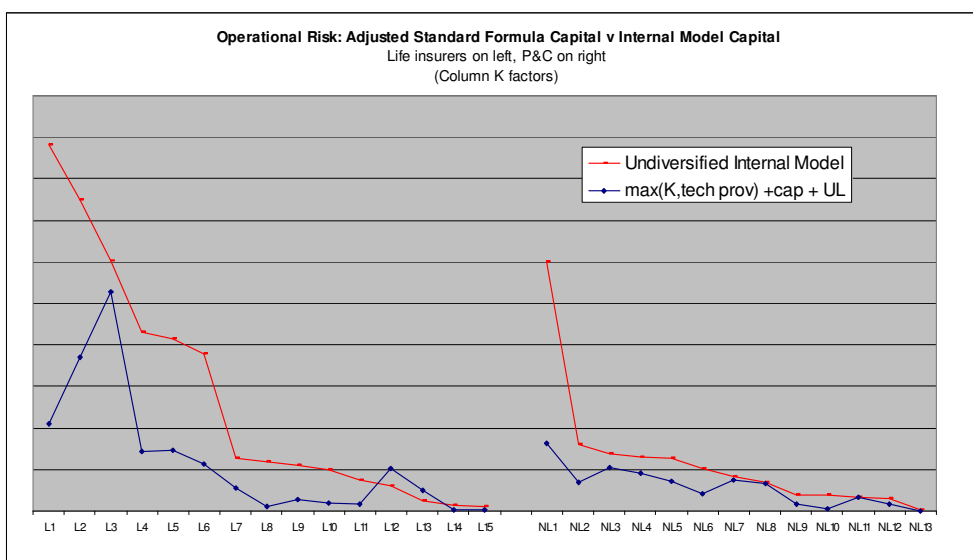
where

Δ = change in earned premiums / technical provisions from year t-1 to t, for earned premiums / technical provisions increases which have exceeded an increase of 10%. Furthermore no offset shall be allowed between life and non-life Δ .

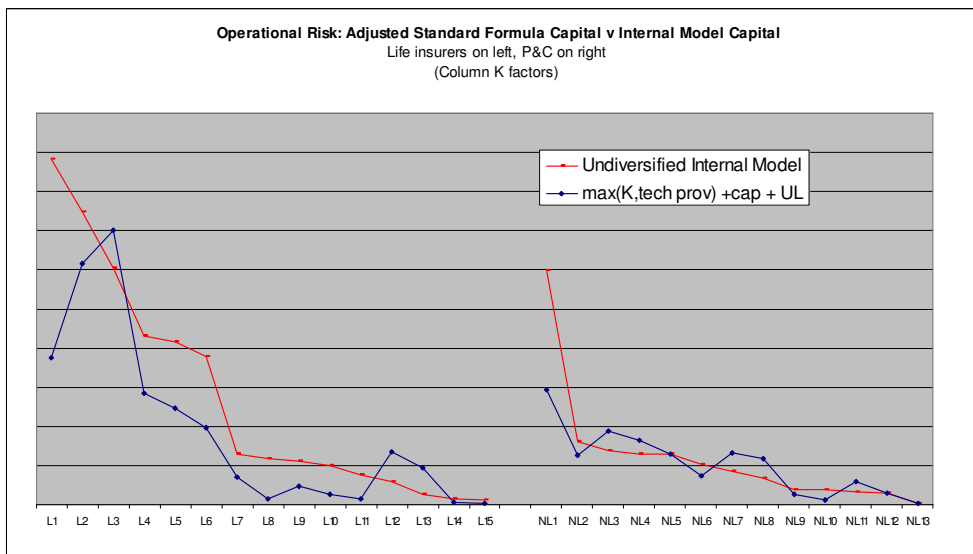
ANNEX

Parameters	QIS 4	FSA	FSA1	FSA2	FSA3	Analysis 1	ABI
TP - life	0.3%	0.60%	1.25%	1.25%	1.10%	0.60%	0.51%
TP - non-life	2.0%	4.00%	2.00%	2.00%	4.00%	3.60%	3.49%
TP - health	0.2%	0.40%	0.20%	0.20%	0.20%		
Prem - life	3.0%	6.00%	8.00%	8.00%	8.00%	5.50%	3.22%
Prem - non-life	2.0%	4.00%	6.00%	6.00%	5.00%	3.80%	4.58%
Prem - health	2.0%	4.00%	2.00%	2.00%	2.00%		
L BSCR cap	30.0%	30.00%	60.00%	20.00%	20.00%	30.00%	30.00%
NL BSCR cap	30.0%	30.00%	60.00%	20.00%	20.00%	30.00%	30.00%
UL factor	25.0%	25.00%	50.00%	25.00%	25.00%	25.00%	25.00%

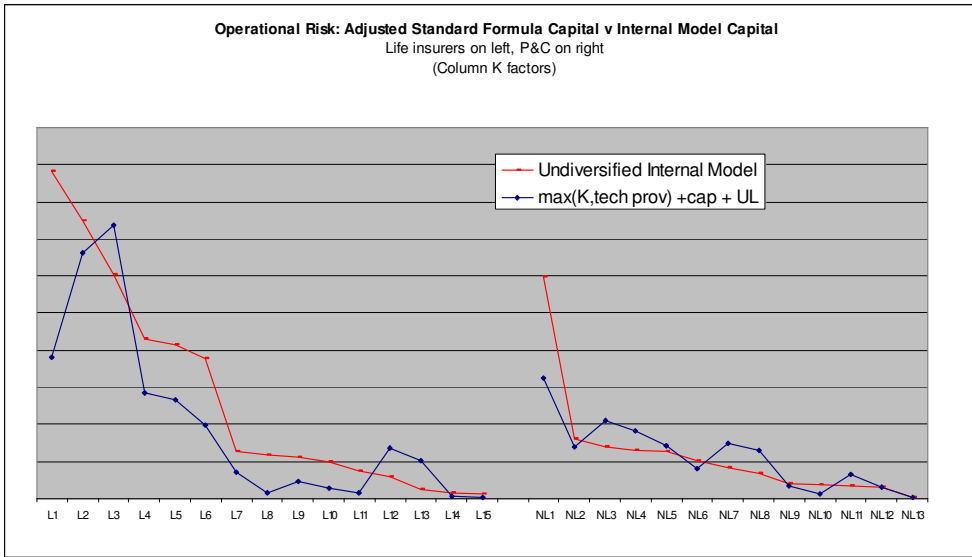
- Graph 1. QIS 4 vs Internal Model



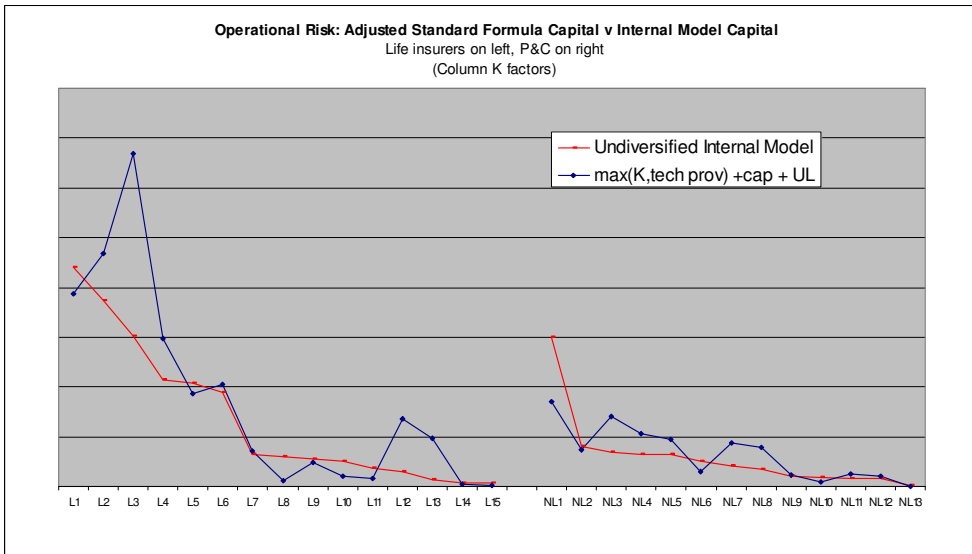
- Graph 2. Analysis 1 vs Internal Model



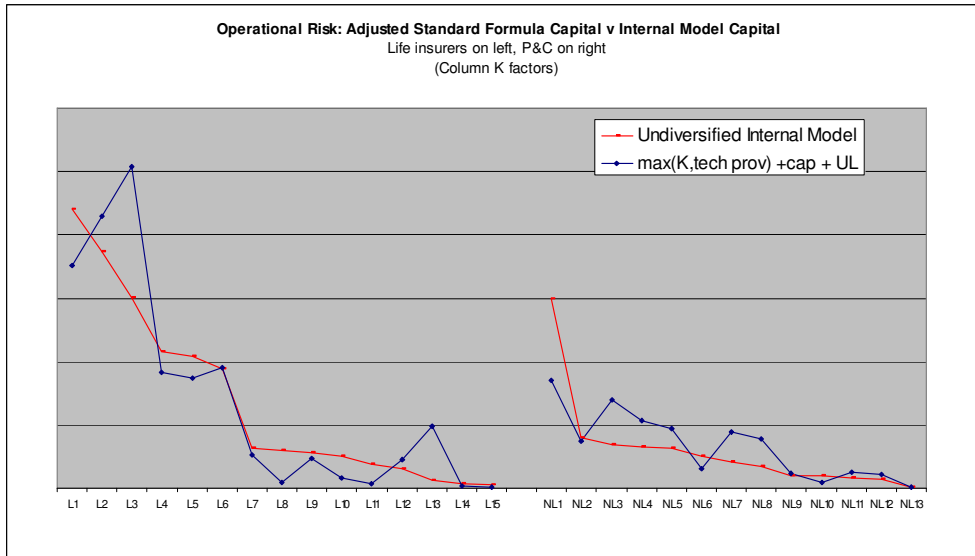
- Graph 3. FSA vs Internal Model



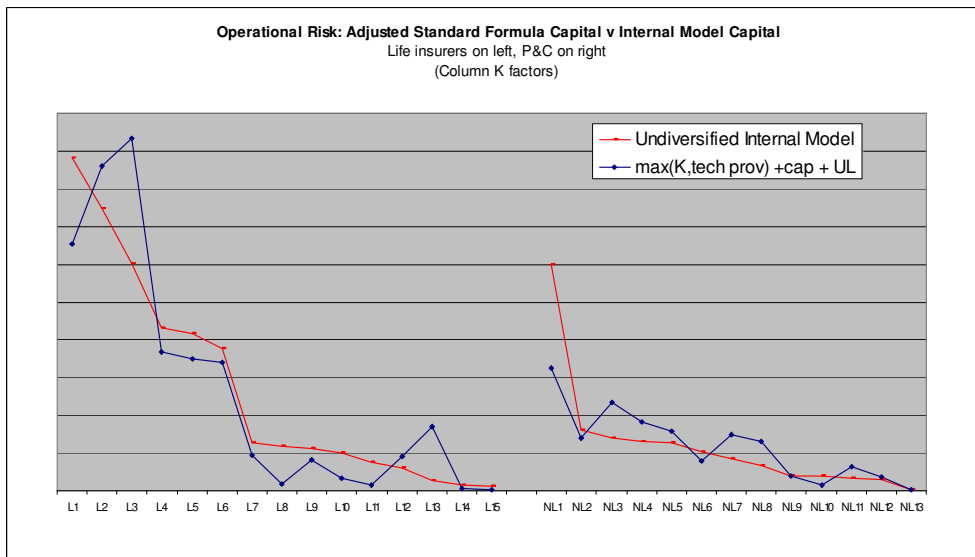
- Graph 4. FSA 1 vs Internal Model



- Graph 5. FSA 2 vs Internal Model



- Graph 6. FSA 3 vs Internal Model



- Graph 7. ABI vs Internal Model

