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QIS1 – Summary report

Sanitized version

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Introduction

1. The European Commission (EC) requested the Committee of European Insurance and Occupational Pension Supervisors (CEIOPS) to advise on the development of a new solvency system (Solvency II) to be applied to European life, non-life and reinsurance undertakings.
2. In the second wave of Calls for Advice¹ CEIOPS was requested to acquire insight into the possible quantitative impacts of the new solvency system through quantitative impact studies (QIS). The results of QIS will form a key input into the EC's Impact Assessment report of the Solvency II Framework Directive. CEIOPS conducted a first QIS (QIS1) during the autumn/winter of 2005 with a focus on testing the level of prudence in technical provisions under several hypotheses. The EC expects the results of QIS1 in February 2006 (MARKT/2519/05). CEIOPS is currently preparing a more comprehensive round of QIS (QIS2) including solvency requirements which is scheduled to start in May 2006.
3. This document highlights the general trends and observations found in the country reports submitted by the national supervisors. The main objective is to give a clear and concise view of the findings.
4. CEIOPS points out that only the individual country reports can provide a complete picture of the national results. To interpret country-specific information the context of the corresponding country report should be taken into account.
5. As requested by CEIOPS, each national supervisor that wished to participate in QIS1 invited a range of different types and sizes of undertakings to carry out calculations in line with the QIS1 specification that had been drawn up within CEIOPS working groups, and to complete a spreadsheet and questionnaire summarising the results.² The calculations were generally based on data as at the end of the 2004 financial year, and were requested to be provided by undertakings by 31 December 2005.
6. In total, 150 undertakings that exercise life business, 190 undertakings that exercise non-life business and 4 specifically identified reinsurance undertakings submitted QIS1 reports to their national supervisors. Since some of these undertakings are mixed or composite undertakings, the total is 312. The submitted country reports also provided information on the number of undertakings that were able to provide more data than just the amount of the provisions on the current bases (i.e. the number of undertakings that were able to provide the best estimate or percentile calculations that had been requested). Adjusted for this information, the totals for the number of

¹ The Calls for Advice as well as CEIOPS' answers are available on CEIOPS' website: www.ceiops.org.

² The QIS1 specification documents may also be found on the CEIOPS website (see footnote 1).

life and non-life undertakings providing this requested data become 122 and 170, respectively, and the overall total would then become 272 (taking mixed or composite undertakings into account). For the 259 undertakings of which the size category³ was given, 68 were classified as small, 90 as medium-sized and 101 as large. Finally, a number of undertakings and countries expressed a keen interest in participating in the QIS1 exercise but were unable to provide figures before the deadline. Compared to the Preparatory Field Study (PFS), which was held in advance of QIS1 to collect relevant information on life undertakings, slightly fewer countries participated but the number of participating life undertakings increased. In particular the participation of small and medium-sized undertakings increased significantly.

7. Nineteen national supervisors submitted country reports, three of which only covered non-life insurance. Not all reports give data or qualitative answers for all questions asked, however. Most reports give information on the current basis, the best estimates and the 75th and 90th percentiles. As indicated above, some supervisors did state that a number of undertakings were unable to give any information on any of the percentiles nor, in some cases, on the best estimate. Few reports had any data on the 60th percentile or company views. Four national supervisors had insurers which provided information on the Cost of Capital approach for their technical provisions.
8. CEIOPS asked the national supervisors that chose not to participate to clarify their reason for doing so. Among the reasons for non-participation were a lack of experience, resources and time. But, as one supervisor mentioned, some of the insurers are subsidiaries of large international groups that did participate so it may be possible to learn from the study even without having participated in it.
9. The structure of this report closely follows the structure of the country reports filled in by the national supervisors. Chapter 1 presents the general observations and conclusions. It aims to present a concise summary of the results and give the general conclusions that can be drawn from the QIS1 exercise. All country report tables have been aggregated to calculate the results for all participating undertakings and Chapter 2 shows the quantitative results. Chapter 3 focuses on the methodology applied by the undertakings and the subject of Chapter 4 is the resources required to enable the undertakings to calculate the technical provisions and risk margins. Finally, Chapter 5 summarises any additional comments or views presented by the national supervisors and the participating insurance undertakings.

³ Based on national definitions. For reasons of comparability across countries CEIOPS hopes to develop a consistent definition of undertaking size for QIS2.

General observations and conclusions

General Observations

- 1.1 The goals of QIS1 were twofold. Firstly, QIS1 focused on the level of prudence in the current technical provisions, benchmarking them against some predefined confidence levels. This could give a rough indication of the impact of the proposed rules on the required provisions. In addition, CEIOPS hoped that this exercise would provide information about the practicability of the calculations involved. To this end CEIOPS invited life and non-life insurance undertakings and reinsurers to participate in this exercise. In QIS1, if the precise figures could not be obtained, approximations could be used, and the qualitative information received about the methods and models used by market participants was also very important for CEIOPS. If undertakings were unable to complete the whole survey, a partial submission could then be considered as CEIOPS indicated that receiving as much good quality information as possible was appreciated.
- 1.2 CEIOPS recognises that this first quantitative impact study has limitations. Due to time constraints and the novelty of the approaches tested, the figures presented by the undertakings are only an indication, and not all undertakings were able to complete the spreadsheets, especially for the optional questions. QIS1 was very much a learning process.
- 1.3 As mentioned in the introduction the general observations in this chapter are clarified along the lines of the following the country reports filled in by the national supervisors.

Given the calculations, what impact in broad terms on the level of technical provisions is expected? Please distinguish between the impact of the different approaches that were tested for the valuation of the liabilities (i.e. best estimate, 75th, 90th percentile, company view, 60th percentile).

- 1.4 The main conclusions for non-linked life insurance seem to be that the best estimates of the technical provisions are lower than the current bases for most undertakings, and that the risk margins for the various percentiles are small so that the percentiles are also below the current bases. There is not enough information on alternative company approaches, such as the cost-of-capital approach, suggested by a few firms, to draw any conclusions on these. The inclusion of future bonuses seems to have a relevant impact on the estimated provisions. Some caution is advised, however, since the methodology used for determining future bonuses differed substantially between national markets. Some national supervisors reported that the impact on the provisions varies strongly from undertaking to undertaking, while others find that the reported ratios of the best estimate and the

percentiles to the current basis are broadly similar for the reporting life insurers. Of the supervisors that reported larger variations, none were able to give an indication of the relationship with the size of the undertaking.

- 1.5 For non-life insurance again the best estimates and the 75th and 90th percentiles are generally lower than the current bases, though some countries reported an increase in the provisions if these are undiscounted. Again the risk margins are usually small, though there is at least one substantial outlier. The effect of discounting seems substantial. Most country reports gave an estimated reduction of between ten and fifteen percentage points. Again little information was given concerning the 60th percentile and any alternative company views on how the risk margin might be assessed.

What is the covered market share (in % provisions) of the participating institutions for life and non-life business?

- 1.6 The covered market share for the participating countries is on average about 44% for life and 43% for non-life (weighted by reported technical provisions).⁴ The market shares vary substantially per country. Life market shares run from a minimum of 15% to a maximum of 82% and for non-life the minimum is 20% and the maximum is 97%. Due to confidentiality considerations, no country report that included information on reinsurers gave any information on the market share covered by the reinsurers.

What is your opinion about the sample of insurers that participated in QIS1? Do you consider it as representative for the different sizes and types of firms? Are all business lines / homogenous risk groups adequately covered, or are some business lines generally not included?

- 1.7 Since several countries did not participate, CEIOPS cannot draw any definite conclusions for the European Economic Area (EEA) as a whole. For the participating countries the results are usually either representative for the whole market or for large undertakings only. Five supervisors described their sample as representative for the national market, and another nine supervisors considered their sample adequate or representative for large insurers only. For another four country reports the sample is thought to be inadequate.
- 1.8 Of the country reports that reflected on the business lines included, only three stated that all business lines relevant for the national market were generally included by the undertakings. Most national supervisors did not give information on which lines of business were excluded, so it

⁴ The unweighted averages are 48% for life and 54% for non-life.

is not possible to give a general view on which lines are excluded the most.

Were firms able to complete all parts of the spreadsheets? How much variation was there between different sizes and types of firms in this respect?

- 1.9 The general trend seems to be that most participating undertakings were able to supply the information on the best estimate. The 75th and 90th percentiles were given by about two-thirds of the participating undertakings, though this varied by country. The rest of the information requested was given in fewer cases. Most participating undertakings did not answer the optional questions; and in particular questions concerning the company view on risk margins were only rarely answered. Data net of reinsurance was not provided in the majority of cases. Most insurers considered a reinsurer default to be unlikely or did not at the time possess any means to model its effects on the provisions.
- 1.10 There is a great deal of variation in terms of the parts of the spreadsheets answered and the quality of those answers. There does seem to be a slightly greater ability for large insurance undertakings to complete the spreadsheets compared to smaller ones according to some country reports, and non-life undertakings appear to be able to answer more parts of the questionnaire than life undertakings.
- 1.11 Differences in the amount of guidance provided by the national supervisor can partially explain the variation between the countries of the ability of undertakings to complete the spreadsheets. One supervisor helped the undertakings overcome problems by providing a pre-specified stress test. Another requested the undertakings to provide data and made the calculations itself. Others provided little to no guidance.

What type of problems did the institutions face during the execution of the QIS1-study and were any suggestions made about how to overcome them? – e.g. with respect to data availability, calculation of risk margins? Did these problems vary according to the size or type of firm?

- 1.12 Three problems were mentioned in nearly all country reports: a lack of time, of resources and of experience. A fourth prominent problem is a lack of sufficient data and the appropriate choice of actuarial assumptions. There were also difficulties for a lot of undertakings in deriving risk margins, accounting for financial risks and treating reinsurance. Roughly half of the national supervisors presenting a view on the problems per size category of the undertaking indicate that it is more difficult for smaller undertakings, but the other half state that the problems were encountered irrespective of the size of the undertaking.

Few supervisors offer a view in their country reports on the relationship of the type of undertaking with the problems mentioned so it is difficult to observe a general trend in these observations.

- 1.13 Some suggestions were reported in the country summaries. The suggestion that was made most frequently was a request for more guidance, and in particular for more explicit guidance. Explicit examples of this are the development of simple approximations that could be applied to benchmark the risk margins for non-financial risks, and the setting of risk margins for lines of business by the regulators. Some undertakings would also like to have more time to develop adequate models.

Please summarize any views expressed on the suitability and appropriateness of the proposed methodology.

- 1.14 Though the majority of participants raised no objections regarding the proposed valuation principles, most criticism seems to have focused on the use of percentiles. Some participants considered an explicit confidence level to be arbitrary and doubted that such information could ever be known with any confidence. One country report even mentions the concern that it may lead to a false image of control. Another problem mentioned with the percentile approach is that the difficulties in choosing an underlying distribution may make it imprecise. A third substantial problem seems to be that insurers sometimes make very rough assumptions for their calculations, though this may be a result of the time constraints. Also mentioned by some QIS1 participants are that all valuation should be done on a market value basis (e.g. according to a Cost of Capital approach), that there are concerns with respect to double counting if prudence margins are included in both the provisions and the required capital, and that harmonisation of provisions should be stressed.

How much consistency was there between firms in their approach (e.g. risk factors identified, and the choice of models and assumptions applied for each risk factor) to the assessment of the risk margins for the 75th percentile (and other percentile) valuation(s) of the liabilities?

- 1.15 The consistency between undertakings within the reporting countries seems to be fairly high for both life and non-life for ten of the reporting countries (of which one only for life and two for non-life), though in several cases there are large differences in the parameterisation and in the assumptions chosen, which in some cases lead to very different outcomes. In some cases the consistency can be explained by guidance by national supervisors on the approach taken by firms to QIS1. There were four countries (of which one only for life and one for non-life) which found that there was a great deal of inconsistency between the

methods applied. Little information is given on the exact nature of the differences. The remaining countries could not give a view on the level of consistency in the approaches used. Not much information is presented in the country reports on the differences in the risk factors identified.

- 1.16 The consistency between reporting countries in their approach to risk factors, modelling and applied assumptions is considerably lower. This can be partially explained by the differences in guidance by national supervisors. The differences between the 75th and 90th percentile risk margins on the other hand are fairly consistent for life undertakings in the participating countries. The difference between both percentiles (as a percentage of the current bases) is less than two percentage points for most countries. For non-life, the corresponding figure is roughly seven percentage points, though here there are two outliers of which one is substantial.⁵

Which approach to financial risks was chosen in the best estimate and percentile valuations? (Please provide a full description in Section 3 of this report of the method(s) applied to assess the amount of any risk margin that was added for financial risks)

- 1.17 It seems that most non-life insurers did not calculate financial risks. Of the country reports giving information on the approaches of non-life undertakings to financial risks, only one stated that financial risks were estimated at market value, and another that actuarial methods were applied. For life insurance, financial risks were considered to be more significant – one national supervisor stated that life undertakings felt it was the main risk – so more national supervisors report that life undertakings applied a valuation methodology that took account of these risks. Three reports spoke of a generally applied market-consistent valuation (with a fourth stating that only one of the reporting undertakings did so), and another two observed the application of a valuation that is not considered to be market consistent. Finally, five reports stated that there was generally no specific valuation methodology applied to take account of financial risks, other than for the financial guarantees that were taken into account deterministically in the guaranteed cash flow. On assessing these answers it should be noted that the term financial risk may not have been used uniformly in the reports.
- 1.18 Part of the undertakings that did not include a valuation of financial risks in the assessment of the risk margin, did so because they felt that financial risks should not be within the scope of the risk margin or, more specifically, that allowance for financial risks is relevant to the capital held by the undertaking and not to the provisions, particularly when these risks can be hedged.

⁵ Unweighted averages in all cases.

What level of additional resources would be required to carry out the calculations in accordance with the proposed valuation principles and methodology?

- 1.19 One main problem with estimating the additional resources required is that for about half of the reporting countries there is a large undertaking bias, and there could also be a selection bias in that undertakings with a greater ability to meet the resource requirements of QIS1 could be expected to have a greater propensity to participate. Additionally, not many undertakings were able to give a view on the level of additional resources required. With these caveats in mind, the following results are found. In general, life undertakings need to make substantial investments and non-life need smaller investments. Since only a few undertakings were able to present cost estimations and since the costs vary strongly from undertaking to undertaking, it is difficult to reach a general conclusion. For life undertakings some country reports stated that a number of person years would be needed to develop the necessary systems and controls and to produce the annual reporting figures. On the other hand, one national supervisor reported that in general all insurers were able to carry out all calculations in accordance with the valuation principles proposed by the supervisor.

What is your opinion about the quality and plausibility of the reported values?

- 1.20 Most national supervisors, eleven in total, considered the reported values for the non-life sector to be fairly reliable and a good indicator of the methods and approaches used if regulation comparable to the QIS1 specification were in force. Seven were equally positive about the life sector. In all instances the national supervisors did stress that there still were differing views on, among other things, the parameterisation of the stochastic models, the calibration of the stress tests applied, the homogeneity of the business written and the estimation of future developments (demographic etc.). It is generally noted that it is still a learning process, and time restrictions made the data quality lower than it could have been.
- 1.21 Some national supervisors had reservations on the usefulness of their reported values due to the sample size. A small sample reduces the information value of the reported data because a verification of the results through a comparative analysis becomes impossible.

General Conclusions

- 1.22 The first quantitative impact study has given CEIOPS valuable information on the impact of the best estimate and the risk margins on the required technical provisions and on the ability of undertakings to perform the requested calculations, which were the two main goals of

the study. The foremost general conclusions are that the best estimate plus risk margin tends to be less than the provisions on current bases, and that the risk margins tend to be small, for most undertakings and classes of business. By comparison, for non-linked life the future bonuses seem to have a much larger impact on the required provisions than the risk margin in most countries, and for non-life the effect of discounting is relatively large for some classes of business. These findings show that Solvency II proposals will have significant implications, although the total effect can only be assessed after the QIS2 exercise, which includes also the effect of the solvency capital requirements, valuation of assets and definition of available capital.

- 1.23 The impact study also provides a good insight into the methodological issues that the requested calculations provide. For life undertakings the calculation of future bonuses was handled very differently by undertakings, in part because of differing national regulations. Further, the stochastic modelling of financial guarantees and the calculation of risk margins gave problems for a significant number of life undertakings, nonetheless the problems varied with the country. Life undertakings especially requested more guidance. For non-life the undertakings applied very differing approaches, though the outcomes tended to be similar nonetheless.
- 1.24 The results cannot be considered representative for the EEA as a whole, however. Not all countries chose to participate, and in the countries that did participate there tends to be a size bias. It is to be expected that especially the smaller undertakings are the ones with a stronger national component, so that information on the impact of the required calculations on their technical provisions should give a better indication on the effects for a national market than the information of larger, internationally oriented undertakings. Finally, for the optional questions very little information was received.

Quantification of the technical provisions

Introduction and tables

- 2.1 A summary of the quantitative data provided in each country report has been included below. For reasons of confidentiality some CEIOPS' members chose not to disclose some of their data. Great care should be taken in interpreting the results shown. The data may differ in its representativeness, reliability, definition and in the methods applied to derive it. The individual country reports should be consulted before drawing conclusions from the tables.
- 2.2 This data is only shown here for total liabilities as the data for individual risk groups was often fairly sparse, and the selection of risk groups was not uniform across both undertakings and countries. It should be noted that all the data is shown gross of reinsurance, there being significantly less available data in most countries for the net of reinsurance provisions.
- 2.3 Care should be taken in making comparisons of the data shown in the various columns of the following tables, since the sample of undertakings providing data for each column is not always the same (e.g. not all undertakings providing best estimate data were also able to provide data for the various percentile provisions, and in particular there were usually fewer undertakings providing data for the 60th percentile, or for the company's own approach, than for the 75th and 90th percentiles).
- 2.4 In each table, the figure shown in each row is the figure provided by individual countries in respect of all their participating undertakings. Where appropriate there is also a QIS1 participant-wide row containing the sum of the individual country replies (for amounts). Rows are labelled according to the ISO-3166-1 alpha-2 country codes. The QIS1 additional row is labelled Q1.
- 2.5 **Table 1A**
- This table shows the number of participating undertakings with relevant life provisions and non-life provisions, along with the market share represented by these undertakings, in each country. Reinsurance undertakings are only included in the totals.

T1A	Number of undertakings providing figures				
	Number of undertakings			Market share	
	Life	Non-life	Total	Life	Non-life
AT	8	12	17	33%	85%
BE	7	8	10	60%	51%
DE	46	43	92	63%	58%
DK	4	3	7	37%	56%
FI		4			57%
FR	14	32	47	50%	45%
HU	3	4	5	52%	77%
IS		3	3		97%
LU		2	2		24%
IT	5	3	7	15%	23%
NL	4	3	4	55%	35%
NO	3	15	18	66%	42%
PL	4	9	13	67%	91%
PT	11	9	18	82%	86%
SE	2	3	5	19%	20%
SI	2	2	2	55%	60%
UK	9	15	21	35%	47%
Q1	122	170	272		

2.6 Tables 1B and 1C

The tables show the proportion of participating undertakings in each country that were able to provide an assessment of the best estimate provisions, along with the various percentiles requested. For non-life provisions, the information presented is for the discounted provisions, and there is also a column for the proportion of undertakings providing a figure for the standard deviation of the provisions.

It would appear that a reasonably high proportion of non-life undertakings in most countries were able to provide both a best estimate along with the 75th and 90th percentile provisions, as well as the standard deviation of the provisions. However, for life undertakings, the pattern is more variable, and many life undertakings were unable to assess the percentile provisions.

T1B	Summary of availability of data from undertakings				
	Proportion of insurers with relevant life provisions providing (gross of reinsurance)				
	Best estimate	75 th percentile	90 th percentile	60 th percentile	Company view
AT	100%	13%	13%	0%	0%
BE	100%	57%	71%	29%	14%
DE	100%	85%	85%	0%	2%
FR	86%	25%	25%	17%	0%
HU	100%	33%	67%	33%	33%
IT	100%	60%	60%	20%	0%
NL	75%	50%	50%	25%	25%
NO	100%	33%	33%	0%	0%
PL	100%	75%	75%	25%	0%
PT	100%	55%	55%	9%	9%
SE	100%	50%	50%	0%	0%
SI	100%	100%	100%	0%	0%
UK ¹	78%	78%	78%	67%	22%

T1C	Summary of availability of data from undertakings					
	Proportion of insurers with relevant non-life provisions providing discounted provisions (gross of reinsurance)					
	Best estimate	75 th percentile	90 th percentile	Standard deviation	60 th percentile	Company view
AT	83%	17%	17%	14%	14%	8%
BE	75%	75%	75%	50%	38%	25%
DE	91%	89%	89%	91%	43%	4%
FI	100%	100%	100%	100%	75%	0%
FR	78%	78%	78%	72%	66%	19%
HU	75%	75%	75%	75%	50%	25%
IS	33%	33%	33%	33%	0%	0%
IT	100%	100%	100%	67%	67%	0%
NL	100%	67%	67%	33%	33%	33%
NO	40%	40%	40%	40%	40%	0%
PL	56%	56%	56%	56%	0%	0%
PT	78%	78%	78%	78%	0%	22%
SE	33%	33%	33%	33%	0%	0%
SI	100%	100%	100%	100%	0%	0%
UK ¹	83%	83%	67%	67%	83%	17%

Notes

- 1) For non-life undertakings, the ratios shown for the UK are based on only those firms that were able to provide figures for total provisions.

2.7 Table 2

This table shows for life undertakings the ratio of the best estimate (both including and excluding future bonuses) and the various percentile provisions (including future bonuses) to the current

provisions held by these undertakings. The figures for each country are based on a weighted average of these ratios for their undertakings, with the weights equal to the amount of the current provisions. The final column also shows the effect on the 75th percentile risk margin of including allowance for diversification, though these numbers were only provided by a few undertakings and countries and should therefore be treated with some caution.

The ratio of the best estimate to current provisions appears to be quite variable, but the size of the risk margins added mainly for non-economic risks was quite low. This suggests that the key factors in the assessment of the provisions for most life undertakings are likely to be the approach taken to valuing future bonuses, and the approach taken to valuing financial options and guarantees.

T2 Summary of life insurance provisions gross of reinsurance								
	Current bases (€ millions)	Best estimates		Total liabilities				
		Total liabilities (incl. future bonuses)	Total liabilities (excl. future bonuses)	75 th percentile	90 th percentile	60 th percentile	Company view on risk margins	Effect of diversification on 75 th percentile risk margin
AT	19 091		79,7%					
BE	64 291	90,2%	73,4%	91,6%	93,9%	83,9%	92,5%	38,6%
DE ²								
FR	417 805	101,6%	78,2%	104,5%	107,0%	105,3%		
HU	1 806	75,8%		84,6%	80,0%	80,6%	85,2%	
IT	45 279	97,7%	88,6%	99,0%	100,1%			7,0%
NL	91 129	94,8%	86,3%	96,6%	97,3%	98,5%	96,5%	12,0%
NO	37 732	98,2%	87,9%	95,9%	99,8%			
PL	1 904	71,2%	71,2%	79,6%	87,0%	74,0%		
PT	20 582	96,0%		98,1%	100,2%	101,5%	96,8%	
SE	20 713	89,1%	89,1%	89,5%	89,6%			
SI	523	87,8%	70,0%	88,6%	89,4%			
UK ³	350 000	100,4%		101,6%	102,3%	90,9%	95,9%	18,1%
Q1	1 409 949							

Notes

- 1) Sample sizes differ across Members States.
- 2) Germany participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.
- 3) If the QIS1 life provisions were compared with recently introduced realistic reporting figures in the UK, then the relevant percentages would be just below 100%.

2.8 **Table 3**

This table shows the minimum, maximum and unweighted average ratios, for undertakings in each country, of the ratio of the 75th percentile provision (including future bonuses) to the current provisions. The final column shows the 'standard deviation' of these observed ratios across undertakings in each country.

There is clearly considerable variation in these ratios between individual undertakings in some countries. Some of this may be attributable to the different types of business written, as, for example, it has been noted by some countries, that the ratio of the 75th percentile provisions to the current provisions can be quite low for protection business.

T3	Total 75 th percentile liabilities as % of current provisions			
	Minimum	Average	Maximum	Standard deviation
BE	86,9%	91,5%	94,5%	4,1%
DE ¹				
FR ²	101,7%	104,8%	106,5%	2,7%
HU	84,6%	84,6%	84,6%	
IT	96,5%	99,0%	100,7%	1,7%
NL	94,9%	96,9%	99,1%	2,1%
NO	95,9%	95,9%	95,9%	
PL	-13,9%	64,8%	129,1%	72,6%
PT	56,2%	101,8%	137,7%	12,7%
SE	89,5%	89,5%	89,5%	
SI	62,4%	77,4%	92,4%	15,0%
UK	7,8%	88,3%	108,0%	35,8%

Notes

- 1) Germany participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.
- 2) The ratios include future bonuses that are not included in the current provisions.

2.9 **Table 4A**

This table shows some basic data for the size of the current provisions, along with any equalisation provisions, held by participating undertakings, together with the proportion of provisions for which they were able to assess best estimate provisions.

T4A	Summary of non-life insurance provisions gross of reinsurance - Current bases						
	Current bases			Total deferred acquisition costs (€ millions)	Total equalisation provision (€ millions)	Estimated level of confidence in current provisions	Percentage of provisions included
	Premium provisions (€ millions)	Claim provisions (€ millions)	Total (€ millions)				
AT	920	5 145	6 065				
BE	1 021	5 992	7 613	90	290		81%
DE ¹							
FI	501	2 849	3 409		799		75%
FR	1 076	26 394	27 539				78%
HU		740		3	40	92%	85%
IS	93	439	532		8		100%
IT	2 292	8 380	10 672		62		85%
LU						>99%	94%
NL	696	3 357	4 068	134		91%	63%
NO	739	1 738	2 622		2 976		
PL	1 198	1 343	2 541	25	184		60%
PT	44	1 827	1 871				
SE	1 683	4 369	6 052				
SI	154	311	465	17	92		100%
UK		89 600	98 100	1 749	636	>99% ²	88%
Q1³	10 501	182 439	171 996	2 021	10 172		

Notes

- 1) Germany participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.
- 2) The estimated level of confidence in current provisions is the figure provided by those few firms that gave this information. It was assessed by reference to discounted provisions. For those firms that based the figure on undiscounted provisions, it was in the range of 80-85%.
- 3) The total premium provisions and claims provisions do not add up to the total provisions in the current bases.

2.10 Table 4B

This table shows for non-life undertakings the ratio of the undiscounted best estimate and the undiscounted 75th percentile provisions to the current provisions held by these undertakings. The figures for each country are based on a weighted average of these ratios for their undertakings with the weights equal to the amount of the current provisions. There are separate columns included for the premium provisions, claim provisions and the total provisions. It is thought though that there were relatively fewer undertakings that were able to provide figures for the premium provisions than for the other columns.

There can be seen to be considerable variation between countries in these average ratios of the undiscounted best estimate provision to the current provision, the reasons for which are not evident from the country reports. The average risk margin implied by the 75th percentile does though seem to be fairly close to 5% for most countries.

T4B	Summary of non-life insurance provisions gross of reinsurance before discounting in % of current bases					
	Best estimates			75th percentile		
	Premium provisions	Claim provisions	Total	Premium provisions	Claim provisions	Total
AT		73%			79%	
BE	94,1%	86,4%	82,0%	97,6%	94,5%	84,7%
DE ¹						
FI	102,7%	126,1%	120,4%	105,9%	131,5%	125,4%
FR	100,4%	88,3%	88,5%	100,4%	92,9%	92,9%
HU		90,3%			97,4%	
IS	100,0%	73,1%	77,8%	100,0%	81,9%	85,2%
IT		96,3%			101,7%	
LU ¹						
NL	95,3%	96,7%	96,1%	99,9%	100,7%	100,2%
NO	76,7%	101,5%	88,9%	84,7%	108,8%	94,8%
PL	92,2%	72,3%	76,0%	95,1%	77,1%	80,5%
PT	95,1%	90,8%	90,9%	95,8%	97,7%	97,6%
SE	100,0%	100,0%	100,0%	104,1%	103,1%	103,4%
SI	104,9%	97,5%	86,0%		104,6%	
UK	86,7%	91,5%	102,2%	90,0%	94,7%	117,3%

Notes

- 1) Luxembourg and Germany participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.
- 2) Sample sizes differ across Member States.

2.11 Tables 4C and 4D

These tables show for non-life undertakings the ratio of the discounted best estimate and the various percentile provisions to the current provisions held by these undertakings, and there is also a column showing the ratio of the standard deviation assessed by each undertaking to the current provisions. The figures for each country are based on a weighted average of these ratios for their undertakings with the weights equal to the amount of the current provisions.

Table 4C presents these ratios for the total provisions, while table 4D shows these ratios for the claim provisions only. It should be noted that some countries provided data only for the total provisions, others for only the claim provisions, while some countries showed data for both

(though not necessarily based on the same sample of undertakings for each part of the table).

The penultimate column of the table for the total liabilities also shows the effect on the 75th percentile risk margin of including allowance for diversification, though these numbers were only provided by a few undertakings and countries, and should therefore be treated with some caution. The final column shows the ratio of the 75th percentile total liability to the sum of the current provisions plus any equalisation provisions currently held by undertakings.

There can be seen to be considerable variation between countries in these average ratios of both the discounted best estimate and the various percentile provisions to the current provisions. The average size of the risk margin for the 90th percentile also appears to be significantly more variable than the risk margin for the 75th percentile. The average standard deviation of the provisions does though appear to be less than 10% for most countries.

T4C Summary of non-life insurance provisions gross of reinsurance - after discounting								
	Total liabilities after discounting						75th percentile	
	Best estimate	75 th percentile	90 th percentile	Standard deviation	60 th percentile (optional)	Company view on risk margins (optional)	Effect of diversification on risk margin	Ratio to current provision plus equalisation provision
BE	74,2%	76,6%	79,1%	3,9%		75,4%		73,1%
DE ¹								
FI	84,2%	86,9%	89,6%	4,8%	84,7%		37,4%	70,4%
FR	81,5%	84,5%	88,3%	17,9%	88,4%	99,8%		86,2%
HU							55%	
IS ¹								
IT								86,4%
LU ¹								
NL	82,7%	84,6%	87,8%	5,3%	80,5%	6,5% ²		84,6%
NO	79,0%	84,3%	89,3%	8,7%	81,1%		45,8%	72,2%
PL	64,2%	67,6%	71,9%	6,7%				53,2%
PT	86,8%	87,0%	93,8%	8,4%		84,3%		
SE	88,7%	91,8%	99,3%	4,6%				
SI	81,9%							
UK	89,7%	102,3%	124,8%	30,0%	66,0%	99,5%	13,2%	101,7%

Notes

- 1) Luxembourg, Germany and Iceland participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.

T4D	Summary of non-life claims provisions gross of reinsurance after discounting					
	Only claims provisions					
	Best estimate	75 th percentile	90 th percentile	Standard deviation	60 th percentile (optional)	Company view on risk margins (optional)
AT	63,0%	68,0%	72,0%	5,0%	64,0%	
BE	76,9%	78,6%	80,8%	4,2%		81,1%
DE ¹						
FR	80,8%	84,0%	88,0%	4,8%	90,9%	
HU	79,7%	85,7%	94,1%	7,8%	89,4%	91,0%
IT	83,6%	88,3%	93,4%	6,6%	84,3%	
NL	82,1%	84,5%	87,5%	4,1% ³	82,7%	5,4%
NO	87,3%	93,6%	99,5%	10,5%	89,9%	
PT	86,5%	86,7%	93,6%	8,9%		84,3%
UK ²	80,8%	85,2%	91,0%	8,5%		89,2%

Notes

- 1) Germany participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.
- 2) The subset of UK undertakings providing information on claim provisions is not the same as the subset of UK undertakings providing information about total provisions, so the figures in the final 2 sections of Table 4c are not directly comparable.
- 3) Only the risk margin without the best estimate.

2.12 Tables 5A and 5B

These tables show the minimum, maximum and unweighted average ratios, for undertakings in each country, of the ratio of the 75th percentile discounted provision to the current provisions. The final column shows the 'standard deviation' of these observed ratios across undertakings in each country. Table 5A presents these ratios for the total provisions, while table 5B shows these ratios for the claim provisions only.

There is clearly considerable variation in these ratios between individual undertakings in some countries. Some of this may be attributable to the different types of business written, particularly for undertakings operating in some market niche.

T5A	Total 75th percentile liabilities as % of current provisions			
	Minimum ratio	Average ratio	Maximum ratio	Standard deviation
BE	80,2%	85,7%	95,3%	4,5%
FI	75,4%	84,3%	88,2%	5,9%
FR	70,9%	83,5%	95,4%	8,4%
IS ¹				
LU ¹				
NL	82,7%	85,7%	88,7%	4,3%
NO	58,2%	92,3%	114,3%	20,1%
PL	58,8%	85,1%	102,6%	14,7%
PT	51,0%	95,8%	139,4%	11,5%
SE	95,3%	95,3%	95,3%	4,6%
SI	69,1%	83,7%	98,3%	14,6%
UK	59,0%	82,2%	108,2%	16,7%

Notes

- 1) Luxembourg and Iceland participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.

T5B	75th percentile claim provisions as % of current provisions			
	Minimum ratio	Average ratio	Maximum ratio	Standard deviation
AT	40,3%	65,9%	87%	18,95%
BE	71,9%	80,9%	90,6%	7,2%
DE ¹				
FR	71,0%	83,3%	93,9%	8,2%
HU	71,2%	82,1%	93,0%	8,8%
IT	78,0%	88,7%	95,7%	7,3%
NL	68,4%	80,4%	92,3%	16,9%
NO	73,5%	98,3%	118,3%	15,3%
PT	56,1%	92,1%	133,5%	7,8%
UK	69,3%	85,3%	102,3%	10,5%

Notes

- 1) Germany participated in this part of QIS1, however, the numbers have been deleted for reasons of confidentiality.

2.13 Table 6

This table shows some miscellaneous information collected from undertakings in each country. The first two columns show the proportion of life undertakings that applied either a term or a duration approach to discounting their provisions. The third column shows the proportion of life undertakings that applied a simulation approach to the assessment of their risk margins. The fourth column shows the

proportion of life undertakings that were able to make a market-consistent assessment of the value of financial options and guarantees. The fifth column shows the additional provisions that would result for life undertakings if a surrender value floor were applied, though it should be noted that very few undertakings and countries were able to provide this information.

The sixth and seventh columns show the proportion of non-life undertakings that applied either a term or a duration approach to discounting their provisions. The eighth column shows the proportion of non-life undertakings that applied a simulation approach to the assessment of their risk margins.

T6	Miscellaneous informations							
	Life undertakings					Non-life undertakings		
	applying term approach to discounting	applying duration approach to discounting	able to assess risk margins by simulation	able to calculate market value of options and guarantees	Additional value of surrender value floor	applying term approach to discounting	applying duration approach to discounting	able to assess risk margins by simulation
	%	%	%	%	%	%	%	%
BE	100%	0%	86%	86%		100%	0%	100%
DE	96%	4%	6%	2%		87%	4%	
FR	71%					16%	65%	
HU	100%	0%	67%	0%	39%	100%	0%	75%
IT	80%	20%	60%	60%	20%	100%	0%	100%
NL	100%	0%	100%	100%	3%	100%	0%	100%
NO	100%	0%		33%	13%	40%		100%
PL	100%	0%	75%	25%	34%	62%		
PT	100%	0%	49%	6%		67%		83%
SE	100%	100%		50%				
SI	100%					100%		
UK	60%	40%	17%	78%		82%	18%	85%

Assessment of Provisions Net of Reinsurance

2.14 Many undertakings were unable to assess their provisions under the QIS1 specification on a net of reinsurance basis. For most of those undertakings that were able to make this assessment, and for most lines of business, it was stated that the ratios of the calculated technical provisions to the technical provisions on current basis, did not differ significantly according to whether the ratios were assessed from gross of reinsurance figures or net of reinsurance figures. In many cases, this may be a direct reflection of the approach taken by undertakings to this calculation.

Differences between risk groups regarding the spread between current basis and percentile for life provisions

- 2.15 For non-life undertakings, there was no clear pattern reported by supervisors for any differences between each identified risk group, though the risk margins for discounted provisions assessed by undertakings in most countries for motor business seemed to be generally lower than for other classes of business. It was also noted in some countries that the risk margins assessed by undertakings for some types of reinsurance accepted were higher than for direct business.
- 2.16 For life undertakings, there was a very variable pattern reported by each country for the provisions held for with-profit policies, which may be partly attributable to the different approaches taken to valuing future bonuses. In addition it was noted by some countries that for term insurance and disability insurance the relative decrease in technical provisions was more significant than for life insurance of the savings type (endowment insurance and annuity insurance). Moreover, the calculations of provisions for term insurance could often produce a negative result, if future bonuses are not included.

Comparison of 75th percentile and best estimate + ½ standard deviation for non-life

- 2.17 Most countries reported that there were few, if any, instances where the best estimate plus one half of the standard deviation exceeded the 75th percentile. Risk groups where the converse sometimes applied were said to be accident and health, and miscellaneous risks, particularly where the undertaking had written only small volumes of business.

Methodological Issues

- 3.1 This is a list of methodological questions included in the QIS1 package. Below is a brief summary of the answers received.

Life

Do the insurance undertakings apply a common approach to the selection of homogenous risk groups that have been reported in the spreadsheets? If not, do you consider slight modifications which would make it possible to come with a standardized segmentation into homogenous risk groups?

- 3.2 Insurance undertakings in general did not apply any common approach to the selection of homogenous risk groups that have been reported in the spreadsheets (although there were some exceptions). The number of risk classes mentioned varied from 1 to 16. The general nature of the product type was considered as a possible basis for classification (e.g. unit linked business, traditional business split into with-profit and non-profit lines with sub-classes such as endowments, annuities and protection products; the level of guaranteed interest rate and the bonus policy was also considered to be an important risk factor). Supervisors' views on this issue seem also quite varied; some requested detailed segmentation principles for a harmonized homogenous risk classification system in QIS2, while some thought harmonisation not necessary, and most others were somewhere between these extremes.

Please describe often applied methods and assumptions in the industry for each key parameter for best estimates and risk margins of the percentiles. What are the most relevant risk factors and their relative importance? Please summarise the explanations provided by firms for their choice of these methods and assumptions. Were risk margins assessed by stochastic simulation or on a deterministic approach? Can any conclusions be drawn on how could deterministic methods (e.g. scenarios) be calibrated to a stochastic approach?

- 3.3 Generally speaking deterministic cash-flow projections were rather common, comprehensive stochastic modelling relatively rare, and in between numerous 'limited stochastic approaches' were used. Deterministic approaches were motivated by the scarcity of sufficiently good quality data, resource constraints, and the lack of theoretical tools to derive appropriate probability distributions for all risk factors. Theoretically the methods to derive assumptions range from expert opinions to distributional approaches. The latter approach is still in its development stages and the work is considered very challenging. The data used for the evaluation of underwriting risk (mortality and longevity, morbidity, persistency, expenses etc) included company-specific experience and expert opinion, together with national statistics

and market information. The relative importance of each risk factor depended on the portfolio of the insurer, and it may also be related to some market-specific product features (e.g. the common levels of insurance protection and interest rate guarantees). A risk margin for financial risks has been calculated in some countries (deterministically or stochastically), while in the other countries it was not included in the risk margin. To sum up the country reports, best estimates were commonly calculated using various different methods, but risk margins caused major difficulties in the QIS1 exercise. However, several interesting approaches to approximate risk margins were mentioned in the reports that were mainly based on probability distribution fitting or stress tests. In one country a set of pre-specified scenarios and correlations defined by the supervisor were used to overcome the above mentioned difficulties.

Please describe how expected trends or developments are taken into account.

3.4 A significant number of participants did not take into consideration future developments and trends (at least not explicitly and transparently). On the other hand, those who addressed the issue used several approaches and restrictions, for instance:

- in the forecasts a decrease or an increase in mortality rates was applied (for example mortality tables were adjusted with a multiplier function);
- sometimes generation mortality tables were used with a mean-reversion to some benchmark level (e.g. the average European mortality forecast);
- sometimes insurers used the longevity trend assumptions of the tables published by actuarial association (possibly adjusted to their own experience);
- sometimes insurers accounted for mortality and morbidity trend uncertainty as well as trend changes;
- sometimes a stochastic projection of realistic yearly improvements based on recent trends in life expectancy was taken into account;
- many insurers did not explicitly take expense inflation into account (assuming that the future inflation will be in balance with an assumed increase in efficiency); and
- trends were not taken into account in cases where assuming continuation of current levels of a given risk factor is the more conservative approach. Otherwise, projections of trends visible from recent experience may have been used.

Please explain the approach that has been applied to value financial guarantees, and other (embedded) options. Were the values of options and guarantees assessed by stochastic simulation or on a deterministic approach?

3.5 Regarding the valuation of financial guarantees and options a certain split was apparent both market-wise and also within many markets. This can be observed from tables 6, 1 and 2 which show that only about a quarter of the QIS1 participants was able to estimate a market value of these guarantees and options, but on the other hand in four countries the majority of participants was able to do it. In case of a market-consistent valuation, often a risk neutral arbitrage-free valuation model based on stochastic Monte-Carlo simulation was used. These models (often provided by a third party) were calibrated to the relevant market data and therefore an additional risk margin was typically not included. In case the valuation was not based on financial models, risk-theoretical or econometric (e.g. based on utility theory) approaches were common. In some other cases undertakings calculated financial guarantees and options in a deterministic way and non-separately. In some markets financial guarantees and surrender values can at the moment be taken into account only deterministically in the guaranteed cash flows while other options need to be assessed qualitatively. Several country reports included interesting and rather detailed analyses. In conclusion, at the moment there is a lot of variation between different markets and companies. Model-based stochastic approaches are developing but there are differences between the methodology applied and many of these models are still more or less work in progress when it comes to validation, calibration (e.g. the use of current or historical market data) and testing (e.g. back-testing and sensitivity testing, taking also into account the integration of economic and non-economic risks, replication errors etc, possible modelling errors).

Please explain the approaches that have been applied to value bonuses.

3.6 As could be expected in the light of PFS results, several alternative approaches to bonus valuation were reported, ranging from simply their exclusion to comprehensive stochastic modelling. In some cases the same arbitrage-free investment models have been applied both to price the guarantees and to value the bonuses. In one country most insurers which valued future bonuses projected the future bonus shares on the assumption that their assets earn the risk-free interest rate. Other examples include bonus provisions modelled together with mathematical provisions taking into account the local regulations, or as a fall-back option simple approximation techniques were used (e.g. flat rate approaches linked to either current market interest rates or recently declared bonus levels). In some cases future bonuses were not taken into account and only already declared and promised bonuses

were considered in the calculations. To sum up, at least the following approaches can be distinguished:

- assuming a risk-free rate of return for all the asset portfolios of undertakings;
- defining the bonus provision as the difference between the current provisions and the market-rate discounted best estimate provisions;
- using arbitrage-free arguments and models, or alternatively constructing a replicating portfolio of assets with approximately similar cash-flows to liabilities;
- using Monte-Carlo simulations and ALM methods; and
- ad hoc company-specific models.

3.7 Regarding bonus policy, in some markets bonuses are rules-based and leave little room for management discretion. Another approach was taken by countries and participants who explicitly modelled the bonuses within the overall stochastic model in a manner consistent with the principles currently followed, including allowance for likely management action. One report describes the following steps: simulation of economic scenarios of the asset portfolio; investment income above a certain threshold return is allocated to the contract reserve and translated into future benefits to the policyholder; the value of such bonus options is then the net present value of such future benefits, averaged over the different economic scenarios.

Management actions

3.8 The explicit and direct modelling of management actions for regulatory valuation purposes appeared as a new idea for most undertakings. When applied, it usually dealt with bonuses. However, in some markets the modelling of management actions was quite common (in one case it was closely connected to the information the firms are requested to provide to policyholders and regulators).

Surrender value floor

3.9 In most cases a surrender value floor was not taken into account separately but rather via persistency risk modelling. Those who did the calculation used mainly rough estimates or deterministic stress tests. One approach to assess the amount of persistency risk in the liabilities was to use suitable cohorts and calculate the difference between the

best estimate liability and the surrender rate scenario liability (corresponding to the 60th, 75th and 90th percentiles).

Expenses

- 3.10 In many countries rather simple deterministic projections were used, typically based on inflation assumptions and company-specific experience. There were differences in the approaches and it was also pointed out that deriving explicit probability distributions for expenses has been particularly problematic (assumptions may be relatively arbitrary).

Reinsurance (to what extent conceptually similar between life and non-life?)

- 3.11 In most cases entities declared that reinsurance ceded has an insignificant impact, so it has not been modelled. Some undertakings were unable to fully value the effect of reinsurance on their portfolio or concluded that small approximate modifications to the provisions were sufficient. The approach for life and non-life was very similar in cases where reporting undertakings were composite insurers. In a couple of countries reinsurance (both accepted and ceded) was explicitly modelled in a similar way as direct business written.

Allowance for diversification

- 3.12 Diversification over the whole portfolio was not taken into account in most cases. If it was addressed, a correlation matrix was typically used. In its calibration historical data and expert judgement were used in a conservative way to take into account possible tail correlations.

Own approach to risk margins

- 3.13 Few undertakings followed their own approach to risk margin. Those who did usually applied the Market Value Margin method advocated by the CRO Forum and the CEA. One application of this method was the Cost of Capital calculation (used also as a part of the Swiss Solvency Test).

Non-life

Methods for the estimation of best estimates and percentiles

- 3.14 The participants applied accepted deterministic and stochastic claims reserving methods to determine the best estimate and percentiles for the claims provision. The most common methods for the calculation of the best estimate appear to be Chain Ladder and Bornhuetter-Ferguson. Other approaches employed are loss ratio, Benktander, link ratio, Cape Cod and the grossing up method. The percentiles were usually estimated through a form of bootstrapping or by applying the results of Mack on the prediction error of the best estimate. The prevailing distribution assumption for the future payments was the lognormal distribution, but normal, Pareto, gamma and Poisson distributions were also reported.
- 3.15 Most participants were able to calculate discounted provisions. Regarding the discounting of the risk margins, approximate approaches were reported. For example, the discounted value was derived under the assumption that discounting reduces best estimate and percentiles by the same proportion.
- 3.16 Some undertakings reported the use of tail adjustments to payment patterns in case the run-off triangles did not cover the full run-off period.
- 3.17 The participants gave a lower priority to the determination of premium provisions. In some countries they were calculated only for a part of the sample. The methods and assumptions applied for the estimation were not reported extensively. A relevant conceptual difference in the valuations could be observed: some participants assumed that the unearned premiums serve as a floor to premium provision, while others did not. Also, the approaches on the projection of future cash flows, in particular the choice of distributions, varied.

Types and sources of data analysed

- 3.18 The estimation of claims provisions was usually based on run-off triangles of paid and incurred claims. The number of claims, average claim sizes and historical loss ratios were also mentioned. The number of run-off years covered by the triangles varied depending on insurer and line of business.
- 3.19 For the estimation of premium provisions, historical loss ratios were taken into account.

Claims inflation

- 3.20 The approaches for the allowance of claims inflation differed widely. Some participants did not take it into account. Other participants used projection methods (e.g. Chain Ladder) that implicitly take it into account by extrapolating past inflation. Some participants explicitly allowed for deterministic inflation, while others even employed a statistic model for inflation.

Allowance for large claims

- 3.21 No uniform treatment of large claims regarding the claims provision could be observed. Some insurers did not consider them separately. Other participants removed large claims from the base data and made separate allowance for such claims, for instance by case reserves. For some companies a separate probabilistic treatment of latent liability claims was reported.
- 3.22 Regarding premium provisions, approaches for large claims also varied from no separate treatment to probabilistic modelling.

Non-statistical methods

- 3.23 In some countries, non-statistical methods were applied to large losses, loss adjustment expenses, small portfolios or tail reserves. Case reserves or provisions on current bases were posted in many of these cases.

Valuation of statutory provisions

- 3.24 Since the level of prudence in European non-life provisions is not harmonized, differing practices were reported, ranging from prudent case reserves for reported claims and prudent estimates for IBNR to undiscounted best estimate reserves.

Reinsurance ceded

- 3.25 The ability of the participants to determine the provisions net of reinsurance varied strongly. Some companies derived the net provisions from the value of the gross provisions, in the easiest case by multiplying the provisions by the net to gross ratio of the current provisions. This approach was applied mainly for proportional reinsurance. Other participants estimated net provisions by means of

net run-off triangles. The preparation of these data triangles often proved difficult, in particular for complex or changing reinsurance programmes.

Salvage and subrogation

- 3.26 Reports were poor on this issue. Most participants seem to have used data net of salvage and subrogation, or the difference between net and gross was not considered significant.

Diversification

- 3.27 Only some of the participants were able to determine provisions allowing for diversification at company or group level. In most cases the variance of the whole portfolio was derived from the variance of the sub-portfolios by means of correlation assumptions. These assumptions varied from uncorrelated to fully correlated ones. Some participants took strong correlation of inflationary effects into account or treated large claims separately.

Own approach to risk margins

- 3.28 Only fourteen participants calculated risk margins according to an own approach. Eight of them adopted an approach similar to the cost-of-capital method (used also as part of the Swiss Solvency test). Within this group that adopted a cost of capital approach, the outcome was below the 60th percentile for two companies and in a range of between 70th and 85th percentile, depending on the line of business, for two other companies. (The results of the remaining four companies were not reported separately.)

Both Life and Non-life

Use of simulation models

- 3.29 The use of simulation models varied. Some countries reported that such models were not applied or only applied rarely. Other countries observed the use of models developed by the participants themselves or by external advisors. For non-life provisions, the simulation techniques do not appear to be essential since analytic estimation methods are available. Still in six countries nearly all participants were able to use simulation for the non-life risk margins calculations. On the other hand, as one report pointed out, it may not be possible to

achieve full compliance with the QIS1 specifications for life insurance solely through the use of analytical methods (for example the calculation of confidence intervals for mortality and longevity risk, or the valuation of more complex embedded options). However, comprehensive stochastic modelling can be very demanding. On average around a quarter of the participants were able to use simulation techniques when calculating risk margins, and for calculating the market values of financial guarantees and options. There may be some significant sample and size bias though in this figure, so that it cannot be used as a proxy for the whole EEA life insurance market. Some participants applied stress test techniques to overcome the problems of simulation.

Treatment of reinsurance accepted

- 3.30 Only a few participants analysed reinsurance accepted. In these cases, it was treated in a similar way to directly written business. The reinsurance portfolios were apportioned in line with the direct business, or alternatively a single risk group was established.

Tax effects

- 3.31 In three countries, life insurers took tax effects into account. The approaches reflected the national taxation rules applied to insurance undertakings.

Company views on suitability of methodology

- 3.32 Manifold views were reported. The main concerns are listed below:
- some participants noted that the probability distribution for life and non-life risks are unknown. Arbitrary company-specific assumptions may lead to incomparable provisions. Market-wide assumptions could better ensure comparability but may not reflect the risk profile of each insurer;
 - some participants pointed out that implementation of simulation models for life provisions would lead to unjustified and high expenses; and
 - some participants support a market-consistent valuation of technical provisions (e. g. cost of capital approach) for conceptual and practical reasons.

Possible simplifications

3.33 Several simplifications were proposed by participants, among them the following:

- the use of deterministic approaches in life insurance, for example stress and scenario techniques;
- application of risk margins as a percentage of the best estimate, depending on the risk; and
- use of model points instead of a policy-by-policy calculation in life insurance.

Systems and data issues

Choice of segments

- 4.1 Life insurance has already been discussed. Regarding non-life insurance many direct insurers were able to report their results in the risk groups according to the Accounting Directive. If modifications were made, their effects were usually not considered very significant. However, in some countries a national risk classification or company-specific approaches were common and could make it difficult to allocate risk margins to risk groups according to the Accounting Directive. Reinsurers typically used company-specific segmentations.

Lines of business that could not be included

- 4.2 In many cases some of the business lines have not been included in the QIS1 calculations. The main reasons for this were materiality considerations, IT or methodological or data problems, and time and resource constraints. The following examples from different markets were mentioned: accepted reinsurance, credit and suretyship, aviation, parts of third party liability, accident and health, health insurance (operated according to life assurance), disability riders, unit linked, morbidity, independent agents, indirect insurance, transport funds & casco, IBNR liability, IBNR disability, old life insurance contracts, certain group insurance contracts.

How figures were combined for entities within a group

- 4.3 Quite typically, pooling of data was used in non-life insurance where calculations were based on pooled data from different entities within a group. However, in a number of cases, each of the entities in a group reported as a separate participant (or sometimes within a group not all companies contributed to the study).

Term structure or duration approach issues for application of discount rates

- 4.4 Typically the given QIS1 term structures have been used. In some cases, however, the duration approach was preferred because of IT system restrictions. Regarding other than QIS1 prescribed interest rate curves, the risk-free rate was usually based either on local sovereign debt or swap rates at the relevant terms. Also corporate bond rates adjusted for the default risk were mentioned as an alternative, although most of these undertakings thought that the interest rates assumed in the valuation of options and guarantees should be the same as those used in the financial markets when valuing similar contracts. There is also a question about how to fill in the gaps, and how to extrapolate appropriate interest rates for those durations that are not directly observable from the market rates (e.g. for certain non-Euro interest rates).

Practical difficulties encountered for (a) best estimate and (b) risk margins

- 4.5 In general there were less practical problems in non-life than in life insurance, and in the best estimate valuation than in the percentile valuation. The cost, time and resources were greater for QIS1 calculations than in traditional actuarial methods. In particular, the time and expertise required to perform the analysis and check the calibration were much greater than for current methods of valuation. Also risk classification caused problems for a number of firms (cf. point 4.1 above).
- 4.6 The following list gives examples of the difficulties that were mentioned: extracting sufficient and reliable data, lack of time, lack of resources, IT systems, lack of understanding of the methodology among staff members, setting appropriate volatility parameters, inability to run a fully stochastic model (for all risk factors), developing views on the nature of the probability distribution of mortality etc risks, a lack of scientific backing (for instance for assumption of normality), difficulties to incorporate the effect of expectations, sensitivity of the model to the assumptions taken in the model for financial risks, estimation of correlation between lines of business, treatment of reinsurance (e.g. changes of reinsurance coverage, recoverables), and all in all the very general nature of the specification and guidance given by CEIOPS which did not lead to harmonised approaches and comparable results between countries and undertakings.
- 4.7 As discussed in earlier chapters, in life insurance most participants were not able to estimate the probability distributions for all risk factors. This problem did not necessarily vary according to the size or type of company. Also the use of stochastic simulation in general, and the valuation of risk margins, time value of options, and bonuses frequently caused difficulties. Some non-life specific problems encountered were estimating premium provisions, the variability of the tail, and allowing for model and parameter error.

Overall reliability and accuracy of results

- 4.8 In general the undertakings themselves seem rather satisfied with the reliability of their QIS1 results. Still, some felt cautious about this issue. In many cases comprehensive testing and audit of the models and results was not possible for QIS1. It was also noted that everyone is in a learning process and that the results reflect the first attempt. Another point worth mentioning is that the models used were originally designed for other purposes, rather than for the QIS1 calculations.

4.9 Some reasons that could hinder reliability are the following:

- Life insurance:
 - uncertainty of the best estimate determination of trends in the risk factors, e.g. longevity in life insurance and health expenses in health insurance;
 - uncertainty of the best estimate determination of options of the policyholder (e.g. surrender option) and of the insurer (e.g. premium adjustment option);
 - calibration of financial models (the values of options and guarantees will be dependent on underlying market prices, which are subject to fluctuations and may not even be available for all types of embedded options. This is likely to make the technical provisions more volatile than under a traditional actuarial basis, particularly for those countries where market data is scarce or capital markets are not deep and liquid enough.);
 - the estimation uncertainties caused by long time horizons;
 - uncertainty about the probability distributions needed for percentile calculations;
 - uncertainty whether the provided term structure is risk-free regarding long durations.
- Non-life insurance:
 - model error of the applied stochastic model can be significant;
 - uncertainty if historical data fit current business and future developments;
 - uncertainty in the estimation due to insufficient data basis (claims triangles too short for long-tailed business);
 - uncertainty about the shape of the probability distribution of future cash flows; and
 - regarding discounted provisions: uncertainty concerning the estimation of payout patterns and whether the provided term structure is risk-free regarding long durations.

4.10 Some of these uncertainties may reduce when firms have more experience of applying the new approach proposed in the QIS1 specification; and through a combination of backtesting models and

assumptions in these models, and analysing the causes of changes in the financial results from one year to another.

Resources that would be required (a) for initial development of systems and (b) ongoing annual valuations

- 4.11 This question depends on several factors, e.g. the initial level of modelling infrastructure and knowledge, the type of portfolios, the level of detail requested by supervisors etc, so that generalisations cannot easily be made. However, it seems that more resources will be needed to develop systems for the QIS1 approach to valuations for life insurance business than for non-life insurance business. Resource requirements can be very substantial; it was not an uncommon comment that several years and a significant amount of money would be needed for an insurer to build the necessary knowledge, systems and processes. Therefore a careful cost-benefit analysis of the systems required for the new valuation approach was requested by many firms. Few participants could give a resource estimate for annual valuations at this stage.

Views on sources of data for calibration purposes

- 4.12 A number of life insurance undertakings believe that financial models and scenarios may be calibrated according to market data. On the other hand underwriting assumptions should be based on company-specific or sector data. This view was also shared by most non-life undertakings. In addition the development and use of actuarial standards and industry statistics was advocated. This would be particularly helpful for small and recently established undertakings.

Current practices on segmentation, diversification and reporting

- 4.13 This question received rather little attention in the reports. Many participants do not take diversification into account at present but are planning to include it in the future. Segmentation practices are fairly diverse as was pointed out above. Regular reporting to the board of directors of uncertainty in technical provisions is fairly widespread in some countries.

Other issues raised, or views offered, by undertakings or supervisors

- 5.1 Only three national supervisors raised an issue here and another two supervisors gave company views. One supervisor stated that more time is needed to come to a good comparison of the results, since the models and assumptions used by the insurance undertakings differed substantially. One undertaking gave a similar view and added that because of this there may be a danger in using the results to formulate a conclusion. A second supervisor stressed that EEA countries should receive the same information as the EU countries despite not taking part in CEIOPS' Financial Stability Committee. The latter supervisor stressed the interactivity of the QIS process and considers it important that the limitations of QIS1 are taken into account in future QIS rounds.
- 5.2 Two supervisors relayed several views that were offered by participating insurers. Some of the points mentioned here were already mentioned elsewhere. A selection of the views offered will be presented here:
- the calculation of the total standard deviation is not correct; a square root of the variances is better because of the independence of risk groups;
 - more guidance is needed to reduce the scope for interpretation by the insurers;
 - a percentile approach is quite subjective; the Cost of Capital approach facilitates a direct economic interpretation of the market value margin;
 - hedgeable risks should not be included in the risk margin; and
 - there is a danger of double counting of margins in both the provisions and the capital requirement (see earlier on in Chapter 1).
- 5.3 Finally, one national supervisor reported on an alternative approach to QIS1 and the results of the alternative approach could not be fitted into the summary tables in a meaningful way. The alternative approach was chosen by the insurance industry as a consequence of strong reservations as to the methodology of the QIS1 approach to the valuation of the technical provisions. Its undertakings expressed the opinion that a confidence interval approach to determine a risk margin of an insurance portfolio would not be appropriate because of the prediction and modelling errors inherent in long-term life insurance.