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# PART VI

*Accompanying document to the*

WHITE PAPER

on Insurance Guarantee Schemes

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**EUROPEAN COMMISSION**
DIRECTORATE-GENERAL JRC
JOINT RESEARCH CENTRE

# PART I

# METHODOLOGICAL REPORT

## Insurance Guarantee Schemes: derivation of loss distributions and funding needs.

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# Introduction

Insurance guarantee schemes (IGS) provide last-resort protection for policyholders and other beneficiaries when insurers are unable to fulfil their contractual commitments. IGSs offer protection against the risk that claims will not be met in the event of failure of an insurance undertaking by paying compensation or by securing continuation of the contract.

In its Communication of 4 March 2009 'Driving European recovery', the Commission stressed the need to reinforce the protection of consumers. It stressed in particular that additional measures are needed to reinforce depositor, investor and insurance policyholder protection. The Communication stated that an effective and comprehensive legal framework for retail financial services needs to be put in place and that, among other moves, the Commission would therefore review, in the beginning of 2010 the adequacy of existing guarantee schemes in the insurance sector and make appropriate legislative proposals.

To this end, the Commission intends to adopt a White Paper on IGSs by the beginning of this year. The White Paper will set out a possible European solution for IGSs and propose appropriate follow-up measures. In line with the better regulation agenda, the White Paper will be accompanied by an impact assessment (IA).

In this context, Unit H2 'Insurance and Pensions' of the Internal Market and Services Directorate-General asked the Joint Research Centre to support the impact assessment process by providing scientific expertise.

In response Unit G09 'Econometrics and Applied Statistics' of the Joint Research Centre, in cooperation with Unit MARKT-H2, developed the methodology presented in this report and used it to conduct a quantitative assessment of several of the policy options considered for inclusion in the White Paper.

In order to provide data in timely fashion to the other services of the Commission, the results presented in the report are based exclusively on publicly available data, allowing estimation of results under several high-level policy options by employing some simplifying assumptions. More precise estimates and results referring to lower-level policy options could be performed depending on the availability of additional data.

It should be noted that the methodology proposed takes into consideration the fact that introducing IGSs in the EU context means establishing a new prudential tool in a field already subject to solvency prudential requirements for insurance undertakings and in which the Solvency II measures are also going to be introduced in the near future. Consequently, the IA methodology will take into account, wherever possible, the features of current and future prudential regulation and make use of data gathered in the evaluation exercises aimed at assessing the impact of the introduction of Solvency II.

The rest of this report is organised as follows. The first section proposes the methodology for the IA exercise: estimation of loss distributions for IGSs based on a default risk model. The second section analyses the data available and the derivation of the input parameters. It also presents the current best parameter settings. The third section presents the results and compares them with: the results provided in the Oxera report, actual fund sizes and data on past failures as reported by Oxera. The fourth section compares the results obtained under different policy options. The final section contains all the annexes.

Motor insurance falls outside the scope of this report and is therefore not included in the figures on non-life and total insurance.

# 1 Problem definition and methodology

## *1.1 Protection offered by insurance guarantee schemes and its costs*

Insurance guarantee schemes (IGS) provide last-resort protection for policyholders and other beneficiaries in case an insurance company becomes insolvent and is unable to meet its claims. IGS can offer protection in two main ways:

1. by compensating policyholders/beneficiaries or,
2. by securing continuation of the insurance portfolio.

The IGS protection can also be limited to specific subsets of policyholders and/or be subject to other limits, for example on the amounts of the protected claims, the location of the risk or insurance contract or the nationality of the underwriting insurer.

In order to provide protection, the IGS must gather funds from market players on either an ex-ante or an ex-post basis. The size of the funds collected depends on the yearly expected losses that can be caused by the default of one or more insurance undertakings and on the extent of protection provided.

The expected costs of an insurers' insolvency over a certain period (one year in this report) depend on three main factors:

1. The average **probability of default** (PD) over the period considered;
2. The **exposure at default** (EAD), which is the average maximum amount of a company's liabilities to claimants, beneficiaries and insured;
3. The **loss given default** (LGD), which is the average shortfall of assets over liabilities or the share of the exposure which it is not possible to recover from the defaulting company's assets.

Combination of these three components yields a very simple formula for determining the expected amount:

$$Expected\ Costs\ of\ Insolvencies = LGD \times EAD \times PD$$

Equation 1.1

This formula can also be used to calculate expected losses within an insurance market if all insurers are assumed to be identical and defaulting independently from each other. However, such an approach does not provide any information on the possible variation on the size of defaults or on the probability associated to defaults of different sizes.

Information on the distribution of losses from insurance defaults is indeed necessary in order to assess the effective level of risk to which the public is exposed and take decisions on the desired level of protection.

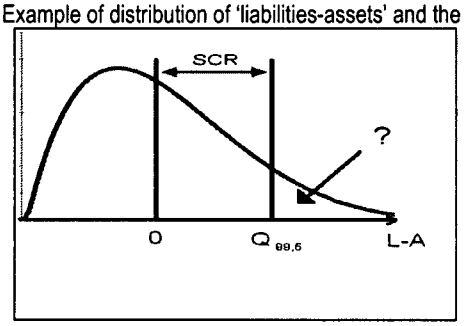
In particular, as IGS funds constitute a cost, a trade-off will be faced between cost and protection. A decision will therefore need to be taken on the maximum loss which could be covered by an IGS, based on the cost of funds and the probability of occurrence of such a loss. Therefore, in order to be able to take decisions on the desired amount of funds, it is necessary to estimate the distribution of the losses an IGS might suffer. The distribution of losses that can hit the IGS then makes it possible to calculate the amount of funds it would need to collect in order to cover all losses incurred with a chosen probability level.

## 1.2 Calculating the IGS loss distribution

In order to know the distribution of the losses generated by the default of a single undertaking, the distribution of the difference between the undertaking's liabilities and assets would need to be known.

Computing the distribution of losses in case of default in the Solvency II framework would imply knowing the distribution of the difference between liabilities and assets conditional on the fact that this value exceeds the SCR (Solvency Capital Requirements). This in turn calls for estimation of the tail of the 'liabilities – assets' distribution lying beyond the 99.5 percentile for each insurance company covered by the IGS (see Figure 1.1).

Figure 1.1: Example of distribution of 'liabilities-assets' and the role of SCR




Therefore, if we could reliably estimate the tails of these distributions and their correlation factors, we could obtain the complete distribution of IGS losses. It is, however, very difficult to estimate the tails of these distributions, as it requires highly complex actuarial models dealing with risks and losses stemming from extreme events plus precise data at individual company level.

As we are interested only in the total loss distribution of an IGS and not in the losses of the individual undertakings, it is possible to include some simplifying assumptions which allow direct estimation of the IGS loss distributions without any need to estimate the individual loss distributions.

The first simplification that can be introduced deals with the size of the losses: by considering average rather than individual increases in expected liabilities it is possible to introduce a limit on the maximum increase in the expected liabilities faced by an insurer (see Annex 2 for details). By introducing this simplification, the EAD can be estimated as a function of the capital requirements on the current date.

Focusing on an EAD calculated in this way frees the IGS loss distribution calculation problem of complications linked to estimation of the tails of the individual loss distribution. Also, the EAD of the IGS to a defaulting insurer can be obtained on the basis of information easily available at this time.

The IGS loss distribution calculation problem can then be seen as that of calculating the losses on a portfolio of exposures to a number of insurance undertakings. This, in turn, makes it possible to build on the extensive work on portfolio loss theory developed in the literature on financial risk management.

Various well-established portfolio models are available. However, for familiarity and diffusion reasons in the prudential regulation context, a natural choice is to pick the Merton-Vasicek model[1]. The Merton-Vasicek model is one of the most widely applied tools for quantitative financial risk management. It is routinely used to assess default portfolio risk across a variety of business sectors, including insurance, and forms the basis for the derivation of the FIRB Basel II formula.

[1] The Vasicek model is based on the Merton model of firm default, which has been used in the literature to calculate the loss distributions and funding needs of American IGSs.

This methodology allows easy calculation of the IGS loss distribution on the basis of a formula[2] giving the maximum loss which should not be exceeded in one year under any given probability level $\alpha$[3], an amount known as the 'Value at Risk ($\alpha$)':

$$VaR_{\alpha} = EAD \times LGD \times N\left(\frac{N^{-1}(-\alpha)\sqrt{\rho} - \delta(-\rho) + N^{-1}(PD)}{\sqrt{1-\rho} - \delta(-\rho)}\right)$$

Equation 1.2

where:
- EAD is 'Exposure At Default' or the maximum amount for which the guarantor could be exposed towards the defaulting company;
- LGD is 'Loss Given Default' or the percentage of the loss which will effectively be incurred on the exposure once the rate of recovery from remaining assets of the defaulting company has been taken into account;
- $\alpha$ is the confidence level, or the probability of not facing a loss larger than $VaR_{\alpha}$;
- N and $N^{-1}$ are the normal distribution and the inverse normal distribution respectively;
- $\rho$ is the correlation coefficient with the 'systematic' risk factor ;
- $\delta$ is a correction term to take into account the fact that the portfolio is made up of a discrete number of relatively large exposures and not of a very large number of identical small exposures. This correction term is called a 'granularity adjustment' and is calculated as the sum of the squares of the shares of all exposures in the portfolio; and
- PD is the average probability of default of any insurance undertaking over the period considered.

By letting the confidence level vary in the formula presented in Equation 1.2 the loss corresponding to each confidence level can be computed, obtaining a distribution of losses. An example of the shape of this 'Vasicek distribution' for different values of $\alpha$ and other parameters is given in Table 1.1.

Table 1.1: Example of the shape of the Vasicek distribution of losses under different parameters

| | Input parameters (ρ=0.2) | | | | | |
|---|---|---|---|---|---|---|
| | PD=0.1% | | | PD=0.5% | | |
| | δ=0 | δ=0.1 | δ=0.3 | δ=0 | δ=0.1 | δ=0.3 |
| | Loss not exceeded with probability α, expressed as share of total exposure | | | | | |
| α=70% | 0.07% | 0.05% | 0.01% | 0.44% | 0.34% | 0.15% |
| α=95% | 0.42% | 0.44% | 0.38% | 1.98% | 2.22% | 2.36% |
| α=99% | 1.10% | 1.42% | 1.93% | 4.30% | 5.65% | 8.38% |
| α=99.5% | 1.51% | 2.09% | 3.24% | 5.57% | 7.65% | 12.33% |
| α=99.9% | 2.81% | 4.32% | 8.22% | 9.10% | 13.38% | 24.11% |
| α=99.99% | 5.53% | 9.30% | 20.24% | 15.38% | 23.69% | 44.21% |
| α=99.999% | 9.30% | 16.30% | 36.35% | 22.74% | 35.35% | 63.24% |

The version of the Vasicek model presented above is one of its simplest forms. Many more detailed variants of the model are presented in the literature, but this particular form was chosen to combine the advantages of limited data needs with those of scientific rigour and acceptability.
In fact, it is easy to see that, when the correlation factor and the market granularity adjustment are both set to zero, Equation 1.2 reduces to the elementary formula presented in Equation 1.1[4]:

[2] The derivation of Equation 1.2 is illustrated in Vasicek, 2002, 'The distribution of loan portfolio value', published in *Risk*. The model can also be solved computationally if the whole structure of the exposures is known.
[3] Strictly speaking, $\alpha$ is defined as a confidence level. This means that, for any $\alpha$, the model output is the smallest value such that losses will exceed it with a probability no larger than 1-$\alpha$ over the reference period.

$$VaR = EAD \times LGD \times PD$$

which is also used in the Oxera report and is based on the implicit assumptions that default events are completely uncorrelated and that the exposure is made up of an extremely large number of very small companies.
What the Vasicek model does, therefore, is to provide a probability distribution of losses by taking into consideration the fact that in the real world the exposure can be concentrated and defaults can be correlated.
A more detailed description of model assumptions and how they relate to insurance undertakings can be found in Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**.

[4] Here the VaR has no confidence level as the distribution is degenerate and concentrated in the single point.

## 1.3 Estimation of the exposure at default

As discussed in the previous section, by considering the average maximum joint exposure rather than individual exposures it is possible to derive a formula for determining the exposure at default[5] which depends solely on known values rather than on estimation of the tail of the individual loss distributions.

The best estimate for the exposure of an insurance company to claimants and policy holders is given by the Technical Provisions (TP) including the risk margin.[6]

However, consideration must be given to the fact that, in the event of default due to a miscalculation of the risk margins, the exposure could be higher than the current level of technical provisions (see, e.g., the Mannheimer case described on page 89 of the 2007 Oxera report and Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**).

Moreover, in cases where 'continuation of the contracts' or 'portfolio transfer' are pursued, rather than pure compensation of outstanding claims, the prudential viability of the portfolio must be reconstructed[7].

For these reasons, in order to estimate the average maximum exposure at default, it is necessary to include additional terms proportional to solvency capital requirements, which offer the best estimate of the additional capital required in case the technical provisions are exhausted.

Therefore, for cases in which continuation of the portfolio is desired, the formula for estimation of the exposure at default to be used is (for derivations see Annex A2):

$$EAD = TP_0 + SCR_0 \left( 2 - w_M + \sqrt{- w_M \frac{SCR_0}{TP_0}} \right)$$

Equation 1.3

where:

- $TP_0$ are the adjusted technical provisions at the current date[8];
- $SCR_0$ is the solvency capital requirement at the current date; and
- $w_M$ is the ratio of the solvency capital requirement for market risk to the total SCR[9].

In cases of a pure compensation of the claimants and beneficiaries with exclusion of the unearned premiums, the EAD for non-life insurance is estimated as:

$$EAD = \left( TP_0 + \left( - v_M \right) SCR_0 \right) \times \frac{Tot\pi - I\pi}{Tot\pi}$$

Equation 1.4

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[5] More precisely, the actual amount of funds needed at the end of the IGS intervention is given by the EAD x LGD where the loss given default is calculated as one minus the ratio of remaining assets over liabilities. In this report LGD is assumed to be 15%. For further details of the reasons of this choice see section 2.2.1 and Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**.

[6] The technical provisions are the amounts set aside for the liabilities and to meet the insurer's commitments under the contracts.

[7] This applies in the case that ALL existing policies will remain covered until their original contractual expiry date. In cases where some insurance policies are allowed to be discontinued at the time of default, only the viability of the 'surviving' part of the original portfolio will have to be secured.

[8] See Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**.

[9] A detailed explanation of how the SCR and its components are computed in the Solvency II framework is available in the document 'QIS4 Technical Specifications (MARKT/2505/08)'.

where
$U\pi$ are the unearned premiums at the current date;
$Tot\pi$ are the total written premiums at the current date;
and the other abbreviations have the same meaning as in Equation 1.3.

In cases of pure compensation including the unearned premiums, the EAD for non-life insurance is considered to be:

$$EAD = \left(P_0 + \left(-\nu_M\right) SCR_0\right) \times \frac{Tot\pi - U\pi}{Tot\pi} + U\pi$$

Equation 1.5

where:
all abbreviations have the same meaning as in Equation 1.3.

Finally, in the case of a pure compensation option in life insurance the formula for determining the EAD is given as:

$$EAD = \left(P_0 + \left(-\nu_m\right) SCR_0\right)$$

Equation 1.6

# 2 Input analysis

Motor insurance falls outside the scope of this report and is therefore not included in the figures on non-life and total insurance.

## 2.1 Input parameters

Based on Equation 1.2, the loss distribution of the insurance sector can be estimated knowing five parameters:

1- the average probability of default for each undertaking in the portfolio ($p$);
2- the correlation between defaults ($\rho$);
3- the loss given default incurred on the exposures in case of default (LGD);
4- the total potential exposure at default of the covered undertakings (EAD);
5- the granularity (concentration) of exposures in the portfolio of covered undertakings ($\delta$).

Moreover, as adopting a certain set of policy options over another would determine a difference in the value of some of the parameters (e.g. a different exposure or a different concentration in the portfolio of IGS exposures), loss distributions corresponding to different policy choices can be obtained.
The loss distributions can then be used to calculate funding needs associated with any desired confidence level and form a basis for guiding policy-makers in choosing the coverage level desired.

## 2.2 Available data and parameter estimation

In this report the aim is to produce approximate figures based on publicly available aggregate data. The results based on these figures, while not immediately usable for policy implementation, should none the less be precise enough to add detail to previous work on the subject (such as the Oxera report). They offer guidance the first phase of the discussion and provide cross-checks against previously proposed quantifications of potential IGS losses.

By relying on publicly available aggregate data (i.e. data from CEIOPS, CEA and the OECD[10]), it is possible to estimate a loss function based on the home country responsibility principle, under the additional assumption that the national market structure is a good proxy for the structure of exposures based on home country responsibility. Under some additional assumptions, the data currently available also allow estimation of the loss function for a pan-EU IGS and loss functions for the host country responsibility principle.

As data on the structure of claims are lacking, it is not possible to evaluate loss functions under limits on reimbursement amounts in this phase: it is therefore assumed that all claims will be fully repaid. By employing some restrictive proportionality assumptions, it will instead be possible to

[10] CEIOPS refers to the statistical annex to the 'Report on Financial Conditions and Financial Stability in the European Insurance and Occupational Pension Fund Sector 2007-2008 (Risk Update)' by CEIOPS (http://www.ceiops.eu/media/files/publications/reports/SA-Insurance-2007.xls), QIS4 to the selected tables from the CEIOPS report on its Fourth Quantitative Impact Study (QIS4) for Solvency I (http://www.ceiops.eu/media/files/consultations/QIS/CEIOPS-SEC-82-8%20QIS4%20Report%20Table%20Annex.pdf) and CEA to 'Tables from European Insurance in Figures (2007 Data) (http://www.cea.eu/uploads/DocumentsLibrary/documents/1225184978_eif-2006_fix.xls)

calculate loss distributions for the cases in which portfolio continuation is chosen and in which a pure compensation option is pursued (with or without consideration of unearned premiums).
Finally, it is possible to obtain the joint loss function and the separate loss functions for the life and non-life business lines, again under some assumption of proportionality.

### 2.2.1 Calibration of the default probability, correlation and loss given default

The EAD and the 'granularity adjustment' (δ) can be recovered from aggregate data and are discussed below in subsections 2.2.2 and 2.2.3. The remaining parameters are chosen to be in line with the relevant literature and the Oxera report (see Annex **Fehler! Verweisquelle konnte nicht gefunden werden.** for details). In some cases several choices are explored:
- the default probability $p$ is set at values of 0.5% (the maximum allowed under Solvency II) and 0.1% (the value consistent with default insurance ratings obtained by Oxera);
- the correlation parameter ρ is kept fixed at 0.2 for both business lines, in line with the literature;
- the loss given default is fixed at 15% (in line with the Oxera report).

If the asset shortfall were increased to 45% (in line with the Basel II foundation guidelines), the resulting funding needs would equal three times the funding needs under the asset shortfall of 15%.

### 2.2.2 Estimation of the EAD

Table 2.1 shows, step-by-step, the calculations used to obtain the EAD from the publicly available data; the results for France are given as an example. The example presented here focuses on the case where the loss distribution is calculated based on the home state principle, portfolio continuation and full coverage. This corresponds to the case where the EAD is calculated in accordance with Equation 1.3. The calculations provide results for the total insurance sector, as well as for the life and non-life business lines separately.

In the calculation three main parts can be identified:

1. the calculation relating to the gross premiums written by business line (rows A to I);
2. the calculations relating to the technical provisions (rows J to V);
3. the calculations relating to the term for the additional capital requirements as presented in Equation 1.3, including SCR (rows W to AL).

The first part of the calculation aims to quantify the share of composite companies activities' in the life and non-life business lines, as the information provided by CEIOPS divides companies into three mutually exclusive categories: companies active only in the life business, companies active only in the non-life business and composite companies, with both activities. The 'Market' column indicates the reference business line used for the calculations in each row: 'Total' means total activities in the whole insurance sector; 'Total Life' and 'Total Non-Life' refer to total activities in the life and non-life business lines, respectively; 'Pure Life Companies' and 'Pure Non-Life Companies' mean the activities of companies engage in only life or non-life business (i.e. activities of composite companies are excluded).
Next, technical provisions are calculated by using CEIOPS data (rows J to M). As the technical provisions reported in CEIOPS tables are calculated under the Solvency I settings they need to be adjusted to correspond to technical provisions under QIS4 by applying the ratio of the QIS4 previsions to Solvency I provisions. For countries where this ratio is not available a simple average by business line across all other countries is calculated, while the ratio for the total insurance business (not provided in the QIS4 report) is obtained by taking the weighted average between life and non-life business with weights proportional to the size of their premiums.

The calculations for the SCR are slightly more complicated. The only absolute number available refers to the total eligible QIS4 capital and is presented only for the total insurance sector and for companies which responded to the QIS4 questionnaire. This number is expanded to represent also non respondents by multiplying it by the rate of response in terms of total premiums. Next, by using the solvency ratio, the current SCR ($SCR_0$) can be obtained for the total insurance sector in each Member State. $SCR_0$ can then be split up between the different business lines based on their shares of total gross premiums.

$SCR_0$ is then used to calculate the additional capital requirement as specified in the last term of Equation 1.3, which is referred to in the table as $SCR_{total}$. All the information necessary for this part can be obtained from Tables 77 and 78 in the Annex of selected tables in the QIS 4 Report. Plugging them into the formula, the second term of Equation 1.3 is obtained in rows AG to AJ of the table for the different business lines. Splitting this between life and non-life and adding the technical provisions lead to the EAD for the total insurance sector, for the non-life business line and for the total life business line.

Table 2.1: Detailed Calculation of EAD for France (rows Δ and A to V)

| Label | Parameters | Market | Source | France |
|---|---|---|---|---|
| Δ | Share of Motor in Non-Life | Total Non-Life | CEA | 31.16% |
| A | Gross Premiums Written (m€) | Composite Companies | CEIOPS Sheet 2 | 112 409 |
| B | Gross Premiums Written (m€) | Pure Life Companies | CEIOPS Sheet 2 | 37 667 |
| C | Gross Premiums Written (m€) | Pure Non-Life Companies | CEIOPS Sheet 2 | 58 068 |
| D | Gross Premiums Written (m€) | Total | CEIOPS Sheet 2 | 208 144 |
| E | Gross Premiums Written (m€) | Total Life | CEIOPS Sheet 4 | 136 528 |
| F=(E-B)/A | Gross Premiums Written (m€) | Total Life | | 87.95% |
| G=1-F | Share of Life Insurance in Composite Companies | Total Non-Life | | 12.05% |
| H=B+F*A | Share of Life Insurance in Composite Companies | Total Life | | 136 528 |
| I=(C+G*A)*(1-Δ) | Gross Premiums Written (m€) | Non-Life | | 49 297 |
| J | Gross Technical Provisions (m€) | Composite Companies | CEIOPS Sheet 7 | 891 543 |
| K | Gross Technical Provisions (m€) | Pure Life Companies | CEIOPS Sheet 7 | 311 323 |
| L | Gross Technical Provisions (m€) | Pure Non-Life Companies | CEIOPS Sheet 7 | 121 027 |
| M | Gross Technical Provisions (m€) | Total | CEIOPS Sheet 7 | 1 323 893 |
| N=K+F*J | Gross Technical Provisions (m€) | Total Life | | 1 095 414 |
| O=(L+G*J)*(1-Δ) | Gross Technical Provisions (m€) | Non-Life | | 157 276 |
| P=N+O | Gross Technical Provisions (m€) | Total | | 1 252 689 |
| Q | Gross Technical Provisions (m€) | Total Life | QIS4 | 100.50% |
| R | TP_QIS4/TP_Soll | Non-Life | QIS4 | 81.05% |
| S | TP_QIS4/TP_Soll | Total | QIS4 | 93.81% |
| T=N*Q | TP_QIS4/TP_Soll | Total Life | | 1 100 891 |
| U=O*R | Corrected TP (m€) | Non-Life | | 127 479 |
| V=P*S | Corrected TP (m€) | Total | | 1 175 140 |

Table 2.1: Detailed Calculation of EAD for France (continued: rows W to AO)

| | | | | |
|---|---|---|---|---|
| W | Total Eligible Capital QIS4 (m€) | Total | QIS4-HOME | 191 472 |
| X | QIS4 Eligible Capital to SCR | Total | QIS4-HOME | 2.51 |
| Y | Market Share of Questionnaire QIS4 | Total Life | QIS4-HOME | 95.00% |
| Z | Market Share of Questionnaire QIS4 | Total Non-Life | QIS4-HOME | 79.40% |
| AA=(Y*H+Z*I)/(H+I) | Market Share of Questionnaire QIS4 | Total | | 90.86% |
| AB=W/AA | Total Eligible Capital by MS (m€) | Total | QIS4-HOME | 210 730 |
| AC=AB/X | $SCR_0$ (m€) | Total | | 83 822 |
| AD=AC*A/D | $SCR_0$ (m€) | Composite Companies | | 45 269 |
| AE=AC*B/D | $SCR_0$ (m€) | Pure Life Companies | | 15 169 |
| AF=AC*C/D | $SCR_0$ (m€) | Pure Non-Life Companies | | 23 385 |
| | .... | | | |
| AG | $SCR_{total}$ (m€) | Composite Companies | | 68 827 |
| AH | $SCR_{total}$ (m€) | Pure Life Companies | | 29 444 |
| AI | $SCR_{total}$ (m€) | Pure Non-Life Companies | | 51 540 |
| AJ | $SCR_{total}$ (m€) | Total | | 170 768 |
| AK=AH+F*AG | $SCR_{total}$ (m€) | Total Life | | 89 976 |
| AL=(AI+G*AG)*(1-Δ) | $SCR_{total}$ (m€) | Non-Life | | 41 188 |
| AM=T+AK | EAD- Home State Principle (m€) | Total Life | | 1 190 866 |
| AN=U+AL | EAD- Home State Principle (m€) | Non-Life | | 168 667 |
| AO=V+AJ | EAD- Home State Principle (m€) | Total | | 1 345 909 |

*CEA refers to 'European Insurance in Figures (2007 Data)' by CEA[11]; CEIOPS refers to the statistical annex to the 'Report on Financial Conditions and Financial Stability in the European Insurance and Occupational Pension Fund Sector 2007-2008 (Risk Update)' by CEIOPS [12] and QIS4 to the selected tables from the CEIOPS report on its Fourth Quantitative Impact Study (QIS4) for Solvency II[13].*

### 2.2.3 Calculation of the market granularity

The granularity adjustment is calculated on a country basis and for each business line. It is based on the number of market players and their market shares. The granularity correction terms are estimated using data from CEA[14] on the market shares for the top 5, top 10 and top 15 companies for the life and non-life business line at country level, together with data on the number of companies. Additionally, for several countries, detailed information on the first 5 companies in the life and non-life business lines is available.

A separate granularity correction coefficient is computed for the life and non-life business lines, while the coefficient for the total insurance sector is based on a weighted average of the coefficients for each business line.

As data for the top 5 companies are sometimes provided for each individual company and sometimes as an aggregate, for each country and business line the following approach has been used: in cases where the individual sizes of the top 5 companies are available, these will be used

[11] http://www.cea.eu/uploads/DocumentsLibrary/documents/1225184978_eif-2006_fix.xls
[12] http://www.ceiops.eu/media/files/publications/reports/SA-Insurance-2007.xls
[13] http://www.ceiops.eu/media/files/consultations/QIS/CEIOPS-SEC-82-08%20QIS4%20Report%20Table%20Annex.pdf
[14] Tables from European Insurance in Figures (2007 data): http://www.cea.eu/uploads/DocumentsLibrary/documents/1225184978_eif-2006_fix.xls

directly to calculate their market share; in cases where individual data on market shares are not complete or absent, any available shares are subtracted from the total top 5 market share and the difference is equally split between the companies for which no data are available.
Similarly, in order to allocate a market share to all the top 10 companies, the market shares already allocated to the top 5 companies are deducted from the total market share of the top 10 and then the residual market share is split equally between the remaining five companies. The same approach is used for the other companies making up the top 15. For the remaining companies (up to the total number in the market), the market share not yet allocated to the top 15 companies is equally divided between them.
For several countries only the number of companies in the country is available but their market shares are unknown, hence the total market is equally divided between all companies[15].

The granularity adjustment, $\delta$, is then obtained by taking the sum of the squares of all market shares within each country and business line. A granularity factor of one corresponds to the case where a single company is present on the market, while the correction factor tends towards zero as the market structure tends towards the limit case where an infinite number of identical companies are operating on the market. Missing information will lead to an underestimate of granularity adjustment, especially in the cases where only the number of companies in the country is available.

### 2.2.4 Parameter values

The values of EAD, total premiums and $\delta$ based on the home state principle for each country and business line are summarised in Table 2.2. The values of the probability of default, $\rho$ and LGD are constant across countries and business lines, as discussed in section 2.2.1, and set at 0.1% and 0.5%, 0.2 and 15% respectively. Total premiums are reported for comparison purposes.

[15] This is the case for Hungary, Luxembourg and Romania for the life business line and for Bulgaria, the Czech Republic, Denmark, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg and Romania for the non-life business line.

Table 2.2: δ, EAD and total gross premiums written for the total insurance sector and by business line, all EEA countries, 2007

| | Total | | | Life | | | Non-life | | |
|---|---|---|---|---|---|---|---|---|---|
| | δ | EAD (m€) | Total gross premiums written (m€) | δ | EAD (m€) | Total gross premiums written (m€) | δ | EAD (m€) | Total gross premiums written (m€) |
| AT | 0.13 | 67 554 | 12 992 | 0.12 | 58 188 | 7 141 | 0.14 | 10 984 | 5 851 |
| BE | 0.13 | 190 151 | 27 886 | 0.14 | 168 163 | 22 179 | 0.09 | 19 236 | 5 707 |
| BG | 0.07 | 392 | 354 | 0.12 | 203 | 120 | 0.05 | 212 | 234 |
| CY | 0.15 | 3 078 | 531 | 0.18 | 2 717 | 358 | 0.07 | 344 | 173 |
| CZ | 0.10 | 8 994 | 3 338 | 0.15 | 6 544 | 2 034 | 0.02 | 1 877 | 1 304 |
| DE | 0.05 | 1 006 801 | 144 749 | 0.05 | 765 180 | 75 170 | 0.05 | 248 637 | 69 579 |
| DK | 0.05 | 135 949 | 18 304 | 0.07 | 118 090 | 13 190 | 0.01 | 10 074 | 5 114 |
| EE | 0.30 | 569 | 193 | 0.33 | 509 | 118 | 0.25 | 101 | 75 |
| ES | 0.06 | 213 026 | 42 653 | 0.05 | 164 938 | 23 455 | 0.06 | 50 081 | 19 198 |
| FI | 0.21 | 44 020 | 4 704 | 0.21 | 37 099 | 2 784 | 0.20 | 7 888 | 1 920 |
| FR | 0.08 | 1 347 573 | 185 825 | 0.08 | 1 189 627 | 136 528 | 0.07 | 168 067 | 49 297 |
| GB | 0.07 | 2 092 219 | 351 427 | 0.06 | 2 034 005 | 305 184 | 0.07 | 103 562 | 46 243 |
| GR | 0.09 | 9 495 | 3 537 | 0.10 | 7 630 | 2 504 | 0.05 | 1 693 | 1 032 |
| HU | 0.04 | 5 887 | 2 728 | 0.05 | 5 282 | 2 017 | 0.03 | 340 | 712 |
| IE | 0.08 | 161 216 | 41 428 | 0.08 | 147 444 | 37 563 | 0.01 | 13 425 | 3 865 |
| IS | 0.19 | 795 | 223 | 0.35 | 147 | 34 | 0.17 | 650 | 189 |
| IT | 0.12 | 423 251 | 78 452 | 0.11 | 389 126 | 61 438 | 0.13 | 32 622 | 17 014 |
| LI | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| LT | 0.10 | 643 | 326 | 0.12 | 525 | 204 | 0.06 | 157 | 122 |
| LU | 0.02 | 80 074 | 11 107 | 0.02 | 76 571 | 10 093 | 0.03 | 3 558 | 1 014 |
| LV | 0.13 | 269 | 224 | 0.28 | 83 | 53 | 0.08 | 191 | 171 |
| MT | 0.17 | 1 980 | 454 | 0.20 | 1 293 | 214 | 0.13 | 589 | 240 |
| NL | 0.10 | 313 024 | 70 162 | 0.11 | 266 317 | 26 437 | 0.09 | 82 629 | 43 725 |
| NO | 0.23 | 86 755 | 12 179 | 0.23 | 79 468 | 9 838 | 0.21 | 7 803 | 2 341 |
| PL | 0.19 | 20 855 | 8 634 | 0.18 | 17 059 | 6 743 | 0.24 | 3 490 | 1 890 |
| PT | 0.14 | 45 402 | 11 561 | 0.14 | 40 297 | 9 205 | 0.14 | 4 992 | 2 356 |
| RO | 0.04 | 1 468 | 1 044 | 0.05 | 781 | 415 | 0.03 | 646 | 629 |
| SE | 0.12 | 238 147 | 20 316 | 0.10 | 191 510 | 12 985 | 0.16 | 53 695 | 7 331 |
| SI | 0.23 | 3 897 | 1 246 | 0.21 | 2 041 | 443 | 0.24 | 1 455 | 803 |
| SK | 0.16 | 2 860 | 1 161 | 0.14 | 2 299 | 848 | 0.23 | 496 | 313 |
| EU total[16] | 0.08 | 6 418 794 | 1 045 336 | 0.08 | 5 693 521 | 759 423 | 0.08 | 821 041 | 285 912 |

[16] The EU row indicates the average δ (weighted average by total gross premiums written) and total EAD and premiums.

## 2.3 Data needed for improved estimation

The values of the parameters presented above, and used in this report, are based on publicly available data. The nature of this data implies that the estimation of some parameters has to rely on assumptions (e.g. some aggregated amounts are split proportionally to gross premiums written in each business line or market) and that some policy options cannot currently be evaluated as this would require additional disaggregated data.

In order to obtain more precise estimates, additional data would need to be gathered from other sources, such as supervisors or associations of insurers.

In order to try gathering such additional data, a questionnaire has been constructed in parallel with the development of the methodology: the questionnaire aims to collect specific data which would improve the precision of estimates, make available additional details for evaluation of different policy options and allow the generation of more detailed problem definition statistics.

Following consultation with the services, the questionnaire has been distributed to national associations of insurers in the second half of 2009. A report summarizing the main results of the questionnaire and the usability of the data gathered is presented together with this methodological report.

# 3 Model results

## 3.1 Selection of cases and policy options

As explained in the White Paper Impact Assessment and in the previous sections, the funding needs and the level of protection for any given IGS will depend on the policy options adopted for its operations.

Given the availability of data and the nature of the exercise, in this report the comparison will be limited to a set of high-level policy options.

In particular, throughout the rest of the analysis, the funding needs based on the loss distribution calculated on the basis of the home state principle, portfolio continuation and full coverage will be used as a baseline case.

Table 3.1 below summarises all the policy options used for the construction of the baseline case. Alternative sets of policy options and the associated funding needs will be discussed in Section 4.

## 3.2 IGS funding needs at selected probability levels (home state principle)

The initial results based on the proposed model and on the aggregate publicly available data are presented in this section. The model provides, for any given confidence level $\alpha$, the Value at Risk ($VaR_\alpha$) which is the maximum loss which should be expected with probability $\alpha$. In other words, if an IGS holds this amount, it will be able to cover all losses in $\alpha$% for all years.

As holding capital and using funds to cover default losses is costly, the choice of $\alpha$ will depend on the trade-off chosen by the policymakers between additional security for consumers and higher costs for firms contributing to the fund. If the policymakers or supervisors would like to put in place a very prudent IGS, then a very high value for $\alpha$ (such as 99.9%) would be chosen, resulting in a very large funding needs and/or the possibility of involvement in very large interventions. However, too prudent choice of $\alpha$ could be costly and the policymakers might therefore decide to put in place an IGS which covers less risk and is less prudent in order to balance current costs and the possibility of facing losses which could not be covered.

Table 3.2 to Table 3.6 show, for each EEA country, the expected losses an IGS will have to face for different confidence levels and the corresponding size as a share of the total premium gathered in the national insurance sector. The estimates were obtained by considering that each country would have an individual IGS fund operating under the home state principle in place for both the life and non-life insurance businesses, for all policies and without limitations on payment[17]. The results can be read as follows: for the French total insurance sector with a LGD of 15% and a PD of 0.1%, the result shows that if the IGS holds a fund of €138.69m (which is equal to 0.07% of the total premium collected in 2007) it will hold enough capital to cover all losses happening in $\alpha$=75% of the years. Only in 25% of the years will a fund of this size not be sufficient to cover the losses suffered.

Additional tables dealing with the robustness of schemes to extremely large default incidents are available in Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**. A comparison of the potential costs to participants in IGS schemes funded using an ex-post and ex-ante mechanism in the case of large defaults has also been provided in Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**.

[17] For a more detailed discussion on policy options see Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**.

Table 3.1: Summary of policy options applied in the calculation of the baseline case model results

| | **Baseline case (home state principle)** |
|---|---|
| **Status quo versus change** | |
| Introduce a legally binding EU-wide approach to IGS | X |
| Only partially binding EU-wide approach | |
| No binding EU-wide approach | |
| **Nature of intervention** | |
| Pure compensation to claimants | |
| Continuation of contracts | X |
| **Eligible claimants** | |
| Natural persons only | |
| Natural persons + SMEs | |
| Natural and legal persons except financial institutions | |
| Natural and legal entities | X |
| **Compensation limits and reductions** | |
| Capping payouts | |
| Capping payouts for non-compulsory insurance (MT) | |
| Level of coverage in percentage terms | 100 |
| Level of coverage in percentage terms (compulsory, MT) | |
| Fixed deductible | |
| Other reduction in benefits | |
| **Policies covered** | |
| Only life | X |
| Only non-life | X |
| Both life and non-life | X |
| **Funding** | |
| Ex-ante | NC |
| Ex-post | NC |
| Capping the level of contributions over a period | NC |
| **Other sources of funding** | |
| Borrowing power | NC |
| Credit facility from members in place | NC |
| State guarantee on borrowing | NC |
| Additional guarantees as private initiative (large failures) | NC |
| **Geographic scope** | |
| An IGS in each MS based on the home state principle | X* |
| An IGS in each MS based on the host state principle | |
| A single EU-wide IGS | |
| An IGS in each MS covering only domestic activity supplemented by an additional IGS covering cross-border transactions | |
| **Types of policies covered** | |
| Without exclusions | X |
| With exclusions | |

**: Home state principle results based on the assumption that exposure structure is proportional to national market structure.*
*NC stands for 'not considered'.*

Table 3.2: IGS funding needs for the total insurance sector, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; funding needs in absolute value and as a share of the total gross premiums written

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| AT | Funding needs (m€) | 41.56 | 126.82 | 616.39 | 5.63 | 21.59 | 153.91 |
| | Share of premiums | 0.32% | 0.98% | 4.74% | 0.04% | 0.17% | 1.18% |
| BE | Funding needs (m€) | 118.45 | 357.71 | 1 717.44 | 16.17 | 61.22 | 429.37 |
| | Share of premiums | 0.42% | 1.28% | 6.16% | 0.06% | 0.22% | 1.54% |
| BG | Funding needs (m€) | 0.28 | 0.75 | 3.11 | 0.04 | 0.14 | 0.79 |
| | Share of premiums | 0.08% | 0.21% | 0.88% | 0.01% | 0.04% | 0.22% |
| CY | Funding needs (m€) | 1.82 | 5.74 | 28.98 | 0.24 | 0.96 | 7.21 |
| | Share of premiums | 0.34% | 1.08% | 5.46% | 0.05% | 0.18% | 1.36% |
| CZ | Funding needs (m€) | 6.06 | 17.09 | 75.76 | 0.87 | 3.03 | 19.08 |
| | Share of premiums | 0.18% | 0.51% | 2.27% | 0.03% | 0.09% | 0.57% |
| DE | Funding needs (m€) | 753.31 | 1 921.86 | 7 539.74 | 116.25 | 357.05 | 1 913.98 |
| | Share of premiums | 0.52% | 1.33% | 5.21% | 0.08% | 0.25% | 1.32% |
| DK | Funding needs (m€) | 102.02 | 259.49 | 1 014.21 | 15.78 | 48.27 | 257.50 |
| | Share of premiums | 0.56% | 1.42% | 5.54% | 0.09% | 0.26% | 1.41% |
| EE | Funding needs (m€) | 0.19 | 0.90 | 7.11 | 0.02 | 0.12 | 1.64 |
| | Share of premiums | 0.10% | 0.47% | 3.68% | 0.01% | 0.06% | 0.85% |
| ES | Funding needs (m€) | 157.54 | 406.72 | 1 619.01 | 24.11 | 75.16 | 410.70 |
| | Share of premiums | 0.37% | 0.95% | 3.80% | 0.06% | 0.18% | 0.96% |
| FI | Funding needs (m€) | 21.33 | 78.33 | 470.36 | 2.48 | 12.01 | 114.23 |
| | Share of premiums | 0.45% | 1.67% | 10.00% | 0.05% | 0.26% | 2.43% |
| FR | Funding needs (m€) | 941.76 | 2 568.60 | 10 928.65 | 138.69 | 462.69 | 2 761.11 |
| | Share of premiums | 0.51% | 1.38% | 5.88% | 0.07% | 0.25% | 1.49% |
| GB | Funding needs (m€) | 1 519.96 | 3 994.22 | 16 246.62 | 229.81 | 732.18 | 4 116.51 |
| | Share of premiums | 0.43% | 1.14% | 4.62% | 0.07% | 0.21% | 1.17% |
| GR | Funding needs (m€) | 6.58 | 18.09 | 77.66 | 0.96 | 3.25 | 19.61 |
| | Share of premiums | 0.19% | 0.51% | 2.20% | 0.03% | 0.09% | 0.55% |
| HU | Funding needs (m€) | 4.51 | 11.23 | 42.79 | 0.71 | 2.11 | 10.88 |
| | Share of premiums | 0.17% | 0.41% | 1.57% | 0.03% | 0.08% | 0.40% |
| IE | Funding needs (m€) | 114.25 | 307.53 | 1 287.85 | 16.98 | 55.74 | 325.73 |
| | Share of premiums | 0.28% | 0.74% | 3.11% | 0.04% | 0.13% | 0.79% |
| IS | Funding needs (m€) | 0.40 | 1.43 | 8.27 | 0.05 | 0.22 | 2.02 |
| | Share of premiums | 0.18% | 0.64% | 3.70% | 0.02% | 0.10% | 0.90% |
| IT | Funding needs (m€) | 272.42 | 800.06 | 3 717.40 | 37.98 | 138.92 | 932.40 |
| | Share of premiums | 0.35% | 1.02% | 4.74% | 0.05% | 0.18% | 1.19% |
| LI | Funding needs (m€) | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| | Share of premiums | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| LT | Funding needs (m€) | 0.43 | 1.22 | 5.44 | 0.06 | 0.22 | 1.37 |
| | Share of premiums | 0.13% | 0.38% | 1.67% | 0.02% | 0.07% | 0.42% |
| LU | Funding needs (m€) | 63.97 | 152.01 | 546.08 | 10.34 | 29.11 | 139.03 |
| | Share of premiums | 0.58% | 1.37% | 4.92% | 0.09% | 0.26% | 1.25% |
| LV | Funding needs (m€) | 0.17 | 0.51 | 2.42 | 0.02 | 0.09 | 0.61 |
| | Share of premiums | 0.07% | 0.23% | 1.08% | 0.01% | 0.04% | 0.27% |
| MT | Funding needs (m€) | 1.10 | 3.65 | 19.43 | 0.14 | 0.59 | 4.80 |
| | Share of premiums | 0.24% | 0.80% | 4.28% | 0.03% | 0.13% | 1.06% |
| NL | Funding needs (m€) | 209.47 | 594.48 | 2 652.50 | 29.96 | 105.03 | 667.70 |
| | Share of premiums | 0.30% | 0.85% | 3.78% | 0.04% | 0.15% | 0.95% |
| NO | Funding needs (m€) | 39.01 | 151.16 | 963.68 | 4.34 | 22.45 | 231.80 |
| | Share of premiums | 0.32% | 1.24% | 7.91% | 0.04% | 0.18% | 1.90% |
| PL | Funding needs (m€) | 10.58 | 37.56 | 217.08 | 1.27 | 5.88 | 53.03 |
| | Share of premiums | 0.12% | 0.44% | 2.51% | 0.01% | 0.07% | 0.61% |
| PT | Funding needs (m€) | 27.09 | 84.78 | 424.36 | 3.60 | 14.24 | 105.62 |
| | Share of premiums | 0.23% | 0.73% | 3.67% | 0.03% | 0.12% | 0.91% |
| RO | Funding needs (m€) | 1.13 | 2.80 | 10.58 | 0.18 | 0.53 | 2.69 |
| | Share of premiums | 0.11% | 0.27% | 1.01% | 0.02% | 0.05% | 0.26% |
| SE | Funding needs (m€) | 149.65 | 448.61 | 2 135.34 | 20.54 | 77.07 | 534.33 |
| | Share of premiums | 0.74% | 2.21% | 10.51% | 0.10% | 0.38% | 2.63% |
| SI | Funding needs (m€) | 1.76 | 6.80 | 43.21 | 0.20 | 1.01 | 10.40 |
| | Share of premiums | 0.14% | 0.55% | 3.47% | 0.02% | 0.08% | 0.83% |
| SK | Funding needs (m€) | 1.60 | 5.27 | 27.97 | 0.20 | 0.86 | 6.91 |
| | Share of premiums | 0.14% | 0.45% | 2.41% | 0.02% | 0.07% | 0.60% |

The 'EU average' is obtained from the weighted average (by total gross premiums written) of funding needs for the 27 Member States of the EU. The 'EU total' is the simple sum of the funding needs for all 27 Member States of the EU.

Table 3.3: IGS funding needs for EU total and EU average for the total insurance sector, based on the home state principle, for different confidence levels and default probabilities; funding needs in absolute value and as a share of the total gross premiums written

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| EU total | Funding needs (m€) | 4 528.98 | 12 212.81 | 51 477.48 | 673.24 | 2 209.05 | 13 001.11 |
| | Share of premiums | 0.43% | 1.17% | 4.92% | 0.06% | 0.21% | 1.24% |
| EU avg | Funding needs (m€) | 837.77 | 2 222.02 | 9 150.66 | 125.89 | 405.44 | 2 316.28 |
| | Share of premiums | 0.43% | 1.17% | 4.92% | 0.06% | 0.21% | 1.24% |

Figure 3.1: IGS funding needs for the total insurance sector, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; the top figure indicates funding needs as a share of the total gross premiums written; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

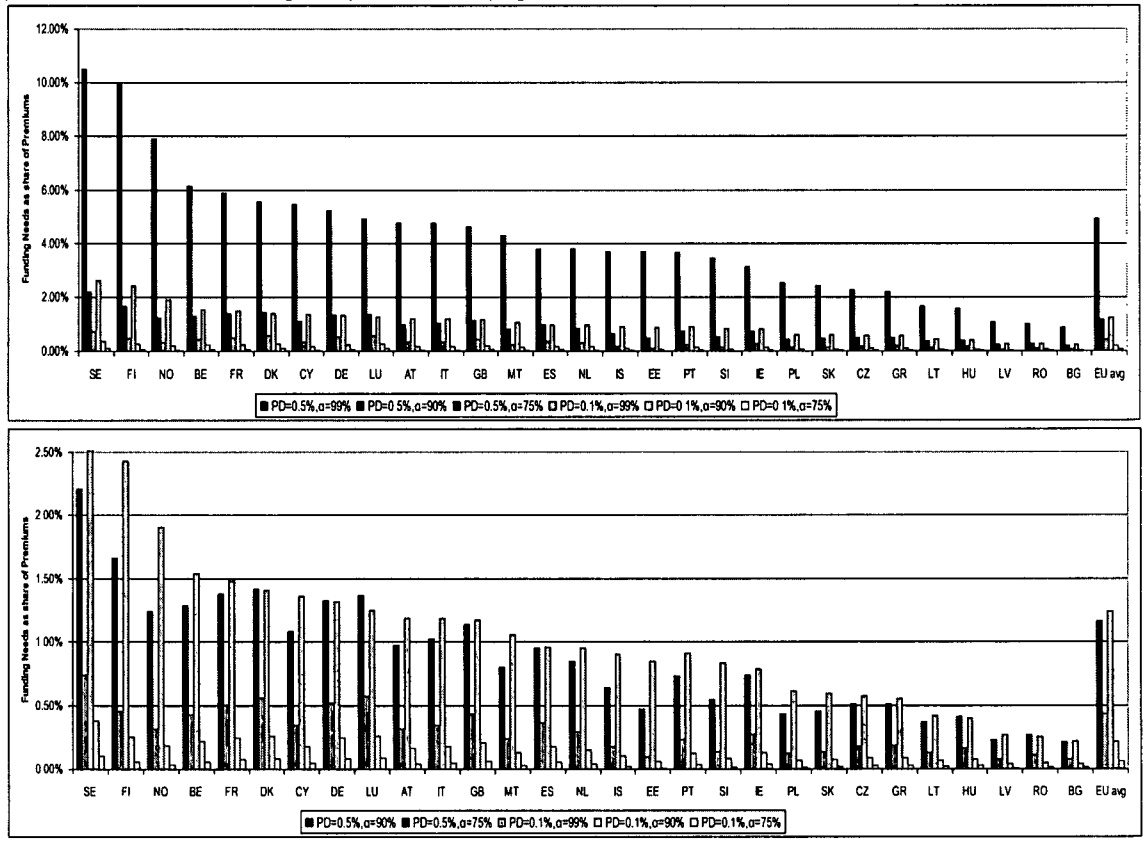


Figure 3.2: Summary of IGS funding needs for the total insurance sector, based on the home state principle, for different confidence levels and default probabilities as a share of the total gross premiums written; EU average and minimum, maximum and median values across all EEA countries

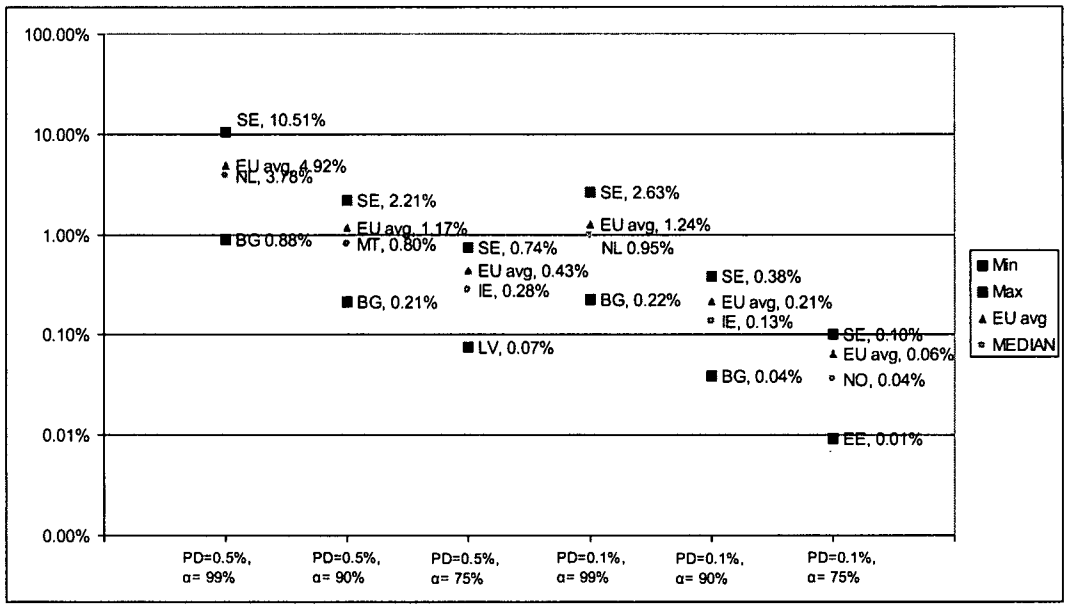


Figure 3.3: IGS funding needs for the total insurance sector, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; the top figure indicates funding needs in absolute terms; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99% case

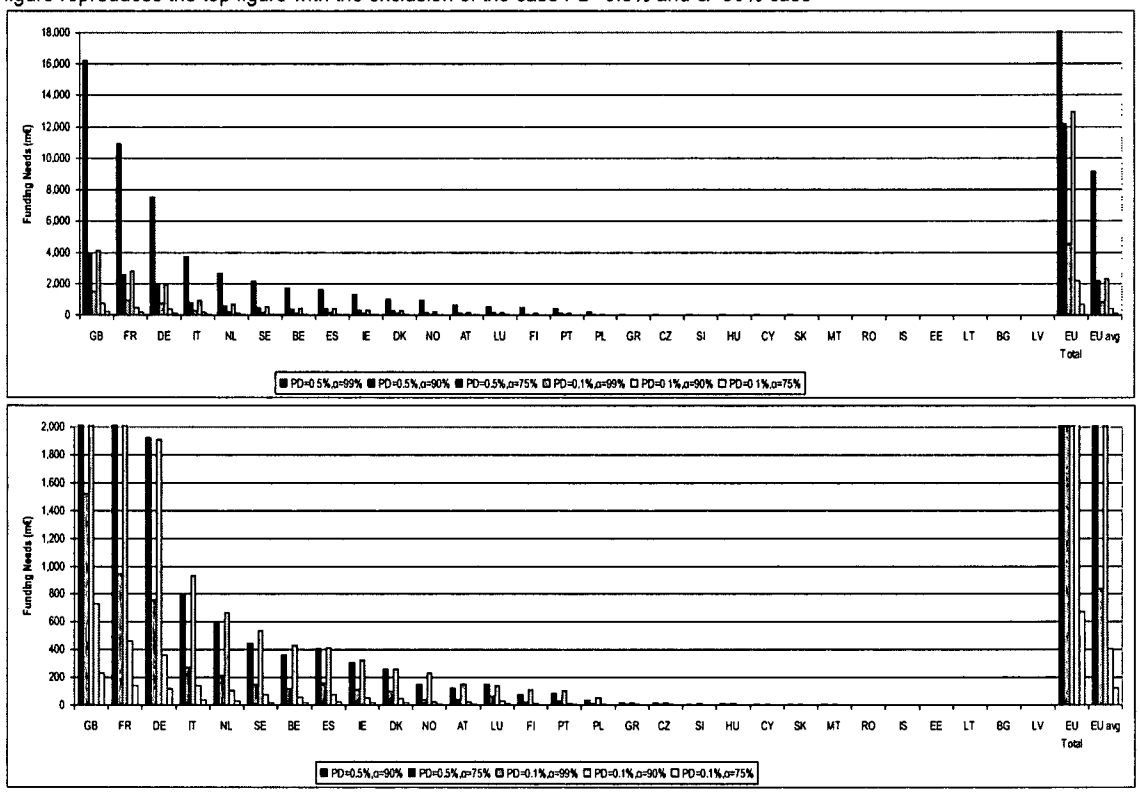


Table 3.4: IGS funding needs for the life business line, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; funding needs in absolute value and as a share of the total gross premiums written

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| AT | Funding needs (m€) | 36.63 | 109.64 | 520.95 | 5.03 | 18.85 | 130.38 |
| | Share of premiums | 0.51% | 1.54% | 7.30% | 0.07% | 0.26% | 1.83% |
| BE | Funding needs (m€) | 102.17 | 315.03 | 1 549.77 | 13.72 | 53.32 | 386.46 |
| | Share of premiums | 0.46% | 1.42% | 6.99% | 0.06% | 0.24% | 1.74% |
| BG | Funding needs (m€) | 0.13 | 0.38 | 1.81 | 0.02 | 0.07 | 0.45 |
| | Share of premiums | 0.11% | 0.32% | 1.51% | 0.01% | 0.05% | 0.38% |
| CY | Funding needs (m€) | 1.43 | 4.94 | 27.62 | 0.18 | 0.79 | 6.78 |
| | Share of premiums | 0.40% | 1.38% | 7.73% | 0.05% | 0.22% | 1.90% |
| CZ | Funding needs (m€) | 3.87 | 12.20 | 61.60 | 0.51 | 2.04 | 15.32 |
| | Share of premiums | 0.19% | 0.60% | 3.03% | 0.03% | 0.10% | 0.75% |
| DE | Funding needs (m€) | 571.87 | 1 460.67 | 5 738.76 | 88.18 | 271.23 | 1 456.70 |
| | Share of premiums | 0.76% | 1.94% | 7.63% | 0.12% | 0.36% | 1.94% |
| DK | Funding needs (m€) | 85.61 | 225.44 | 919.33 | 12.92 | 41.28 | 232.90 |
| | Share of premiums | 0.65% | 1.71% | 6.97% | 0.10% | 0.31% | 1.77% |
| EE | Funding needs (m€) | 0.15 | 0.77 | 6.69 | 0.01 | 0.09 | 1.51 |
| | Share of premiums | 0.13% | 0.65% | 5.67% | 0.01% | 0.08% | 1.28% |
| ES | Funding needs (m€) | 122.95 | 314.87 | 1 241.05 | 18.92 | 58.40 | 314.98 |
| | Share of premiums | 0.52% | 1.34% | 5.29% | 0.08% | 0.25% | 1.34% |
| FI | Funding needs (m€) | 17.58 | 65.61 | 401.24 | 2.02 | 9.96 | 97.16 |
| | Share of premiums | 0.63% | 2.36% | 14.41% | 0.07% | 0.36% | 3.49% |
| FR | Funding needs (m€) | 825.92 | 2 266.56 | 9 715.04 | 121.09 | 407.08 | 2 453.20 |
| | Share of premiums | 0.60% | 1.66% | 7.12% | 0.09% | 0.30% | 1.80% |
| GB | Funding needs (m€) | 1 479.55 | 3 883.16 | 15 770.79 | 223.90 | 712.24 | 3 996.29 |
| | Share of premiums | 0.48% | 1.27% | 5.17% | 0.07% | 0.23% | 1.31% |
| GR | Funding needs (m€) | 5.09 | 14.49 | 64.85 | 0.73 | 2.56 | 16.32 |
| | Share of premiums | 0.20% | 0.58% | 2.59% | 0.03% | 0.10% | 0.65% |
| HU | Funding needs (m€) | 4.00 | 10.08 | 38.92 | 0.62 | 1.88 | 9.89 |
| | Share of premiums | 0.20% | 0.50% | 1.93% | 0.03% | 0.09% | 0.49% |
| IE | Funding needs (m€) | 102.75 | 280.99 | 1 199.39 | 15.10 | 50.55 | 302.96 |
| | Share of premiums | 0.27% | 0.75% | 3.19% | 0.04% | 0.13% | 0.81% |
| IS | Funding needs (m€) | 0.04 | 0.21 | 2.00 | 0.00 | 0.03 | 0.45 |
| | Share of premiums | 0.11% | 0.62% | 5.84% | 0.01% | 0.07% | 1.30% |
| IT | Funding needs (m€) | 253.42 | 736.69 | 3 381.89 | 35.61 | 128.59 | 849.20 |
| | Share of premiums | 0.41% | 1.20% | 5.50% | 0.06% | 0.21% | 1.38% |
| LI | Funding needs (m€) | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| | Share of premiums | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| LT | Funding needs (m€) | 0.33 | 0.99 | 4.72 | 0.05 | 0.17 | 1.18 |
| | Share of premiums | 0.16% | 0.49% | 2.31% | 0.02% | 0.08% | 0.58% |
| LU | Funding needs (m€) | 61.25 | 145.33 | 521.14 | 9.91 | 27.84 | 132.68 |
| | Share of premiums | 0.61% | 1.44% | 5.16% | 0.10% | 0.28% | 1.31% |
| LV | Funding needs (m€) | 0.03 | 0.13 | 1.01 | 0.00 | 0.02 | 0.24 |
| | Share of premiums | 0.06% | 0.25% | 1.91% | 0.01% | 0.03% | 0.45% |
| MT | Funding needs (m€) | 0.64 | 2.32 | 13.59 | 0.08 | 0.36 | 3.31 |
| | Share of premiums | 0.30% | 1.08% | 6.35% | 0.04% | 0.17% | 1.55% |
| NL | Funding needs (m€) | 171.55 | 503.46 | 2 337.43 | 23.93 | 87.45 | 586.32 |
| | Share of premiums | 0.65% | 1.90% | 8.84% | 0.09% | 0.33% | 2.22% |
| NO | Funding needs (m€) | 35.06 | 137.69 | 890.97 | 3.85 | 20.28 | 213.77 |
| | Share of premiums | 0.36% | 1.40% | 9.06% | 0.04% | 0.21% | 2.17% |
| PL | Funding needs (m€) | 9.06 | 31.07 | 172.78 | 1.12 | 4.96 | 42.44 |
| | Share of premiums | 0.13% | 0.46% | 2.56% | 0.02% | 0.07% | 0.63% |
| PT | Funding needs (m€) | 24.06 | 75.26 | 376.40 | 3.20 | 12.64 | 93.69 |
| | Share of premiums | 0.26% | 0.82% | 4.09% | 0.03% | 0.14% | 1.02% |
| RO | Funding needs (m€) | 0.59 | 1.49 | 5.79 | 0.09 | 0.28 | 1.47 |
| | Share of premiums | 0.14% | 0.36% | 1.39% | 0.02% | 0.07% | 0.35% |
| SE | Funding needs (m€) | 127.14 | 363.39 | 1 635.17 | 18.09 | 63.97 | 411.32 |
| | Share of premiums | 0.98% | 2.80% | 12.59% | 0.14% | 0.49% | 3.17% |
| SI | Funding needs (m€) | 0.97 | 3.61 | 22.09 | 0.11 | 0.55 | 5.35 |
| | Share of premiums | 0.22% | 0.81% | 4.98% | 0.03% | 0.12% | 1.21% |
| SK | Funding needs (m€) | 1.39 | 4.30 | 21.27 | 0.19 | 0.73 | 5.30 |
| | Share of premiums | 0.16% | 0.51% | 2.51% | 0.02% | 0.09% | 0.63% |

Table 3.5: IGS funding needs: EU total and EU average for the life business line, based on the home state principle, for different confidence levels and default probabilities; funding needs in absolute value and as a share of the total gross premiums written.

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| EU total | Funding needs (m€) | 4 010.12 | 10 832.88 | 45 751.09 | 595.32 | 1 957.90 | 11 553.79 |
| | Share of premiums | 0.53% | 1.43% | 6.02% | 0.08% | 0.26% | 1.52% |
| EU avg | Funding needs (m€) | 843.30 | 2 237.15 | 9 214.04 | 126.69 | 408.17 | 2 332.37 |
| | Share of premiums | 0.53% | 1.43% | 6.02% | 0.08% | 0.26% | 1.52% |

Figure 3.4: IGS funding needs for the life business line, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; the top figure indicates funding needs as a share of the total gross premiums written, the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

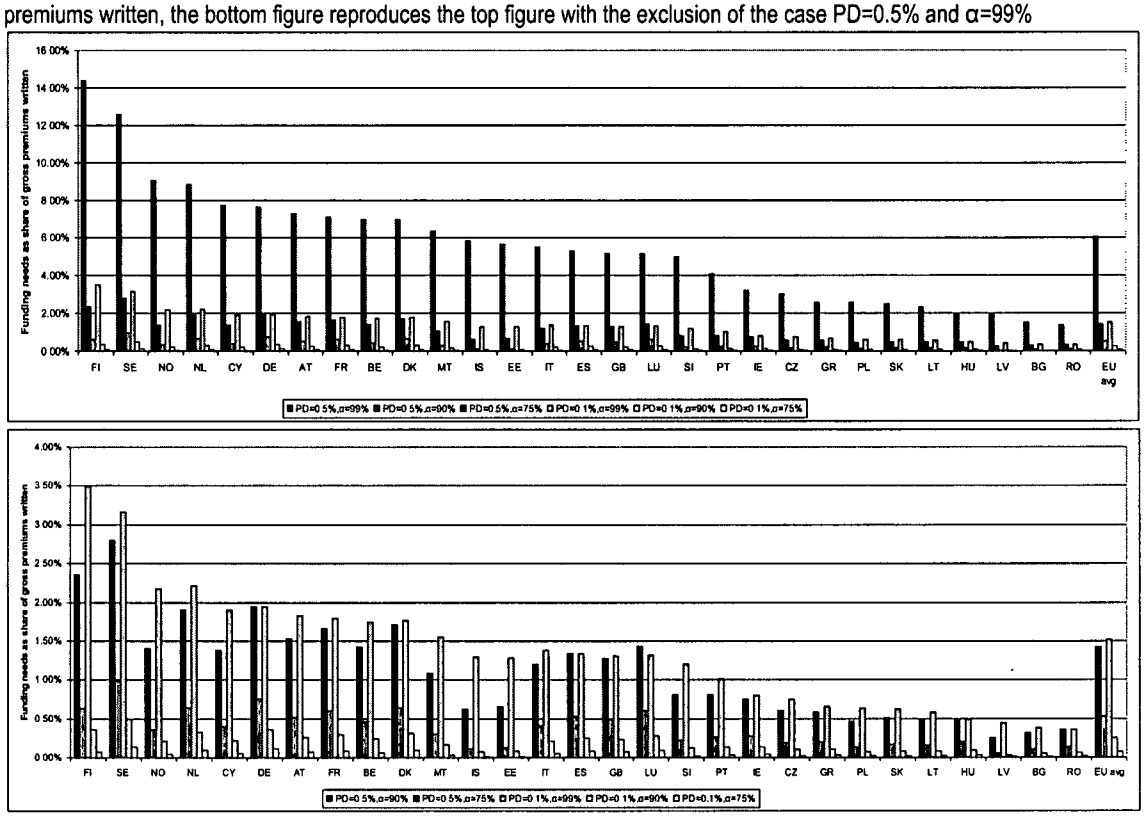


Figure 3.5: Summary of IGS funding needs for the life business line, based on the home state principle, for different confidence levels and default probabilities as a share of the total gross premiums written; EU average and minimum, maximum and median values across all EEA countries

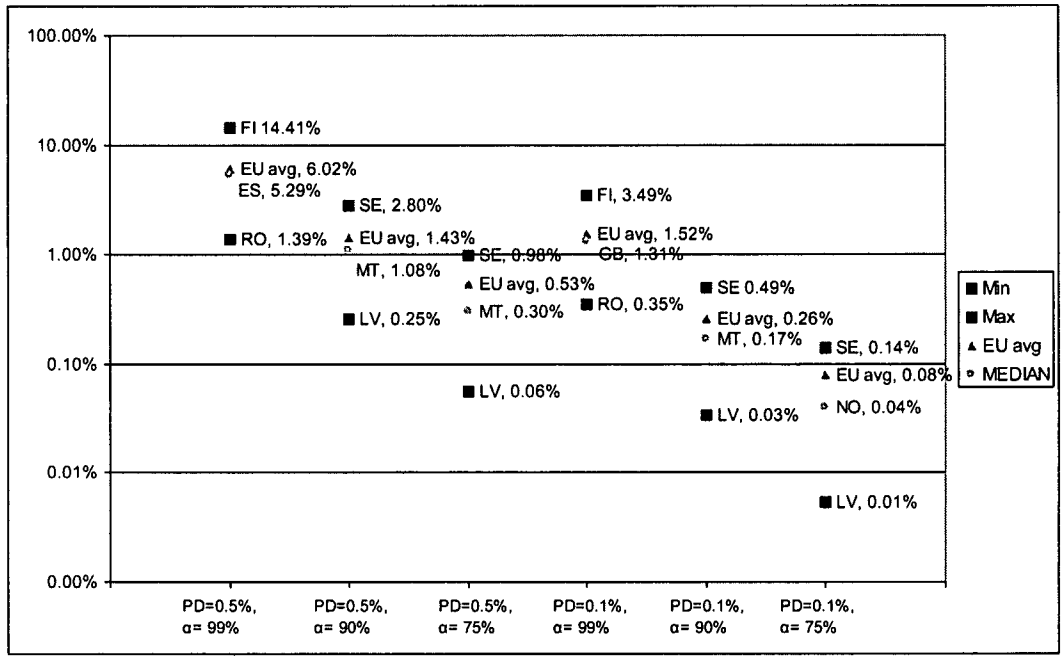


Figure 3.6: IGS funding needs for the life business line, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; the top figure indicates funding needs in absolute terms; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

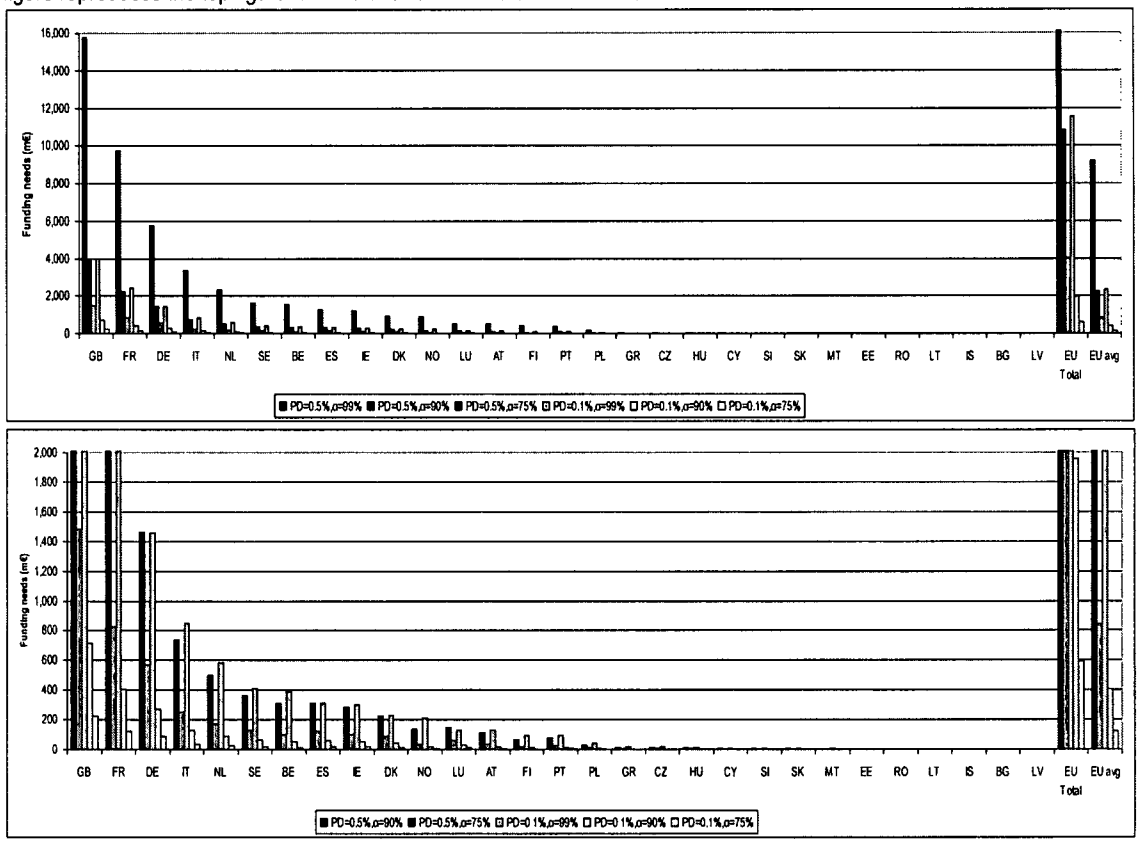


Table 3.6: IGS funding needs for the non-life business line, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; expressed in absolute value and as a share of total gross premiums written

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| AT | Funding needs (m€) | 6.56 | 20.52 | 102.53 | 0.87 | 3.45 | 25.52 |
| | Share of premiums | 0.11% | 0.35% | 1.75% | 0.01% | 0.06% | 0.44% |
| BE | Funding needs (m€) | 13.12 | 36.60 | 160.02 | 1.90 | 6.52 | 40.35 |
| | Share of premiums | 0.23% | 0.64% | 2.80% | 0.03% | 0.11% | 0.71% |
| BG | Funding needs (m€) | 0.16 | 0.40 | 1.57 | 0.02 | 0.08 | 0.40 |
| | Share of premiums | 0.07% | 0.17% | 0.67% | 0.01% | 0.03% | 0.17% |
| CY | Funding needs (m€) | 0.25 | 0.66 | 2.71 | 0.04 | 0.12 | 0.69 |
| | Share of premiums | 0.14% | 0.38% | 1.57% | 0.02% | 0.07% | 0.40% |
| CZ | Funding needs (m€) | 1.49 | 3.57 | 12.93 | 0.24 | 0.68 | 3.29 |
| | Share of premiums | 0.11% | 0.27% | 0.99% | 0.02% | 0.05% | 0.25% |
| DE | Funding needs (m€) | 186.27 | 474.60 | 1 859.02 | 28.77 | 88.22 | 471.95 |
| | Share of premiums | 0.27% | 0.68% | 2.67% | 0.04% | 0.13% | 0.68% |
| DK | Funding needs (m€) | 8.19 | 19.07 | 66.74 | 1.34 | 3.68 | 17.00 |
| | Share of premiums | 0.16% | 0.37% | 1.31% | 0.03% | 0.07% | 0.33% |
| EE | Funding needs (m€) | 0.04 | 0.17 | 1.17 | 0.00 | 0.02 | 0.28 |
| | Share of premiums | 0.06% | 0.23% | 1.55% | 0.01% | 0.03% | 0.37% |
| ES | Funding needs (m€) | 36.67 | 95.62 | 385.25 | 5.57 | 17.59 | 97.66 |
| | Share of premiums | 0.19% | 0.50% | 2.01% | 0.03% | 0.09% | 0.51% |
| FI | Funding needs (m€) | 3.95 | 14.16 | 82.81 | 0.47 | 2.20 | 20.19 |
| | Share of premiums | 0.21% | 0.74% | 4.31% | 0.02% | 0.11% | 1.05% |
| FR | Funding needs (m€) | 119.58 | 320.65 | 1 336.68 | 17.82 | 58.23 | 338.18 |
| | Share of premiums | 0.24% | 0.65% | 2.71% | 0.04% | 0.12% | 0.69% |
| GB | Funding needs (m€) | 74.60 | 197.67 | 812.18 | 11.21 | 36.10 | 205.66 |
| | Share of premiums | 0.16% | 0.43% | 1.76% | 0.02% | 0.08% | 0.44% |
| GR | Funding needs (m€) | 1.28 | 3.23 | 12.54 | 0.20 | 0.60 | 3.18 |
| | Share of premiums | 0.12% | 0.31% | 1.21% | 0.02% | 0.06% | 0.31% |
| HU | Funding needs (m€) | 0.27 | 0.65 | 2.37 | 0.04 | 0.12 | 0.60 |
| | Share of premiums | 0.04% | 0.09% | 0.33% | 0.01% | 0.02% | 0.08% |
| IE | Funding needs (m€) | 10.96 | 25.38 | 88.25 | 1.80 | 4.91 | 22.48 |
| | Share of premiums | 0.28% | 0.66% | 2.28% | 0.05% | 0.13% | 0.58% |
| IS | Funding needs (m€) | 0.36 | 1.20 | 6.39 | 0.05 | 0.19 | 1.58 |
| | Share of premiums | 0.19% | 0.63% | 3.38% | 0.02% | 0.10% | 0.83% |
| IT | Funding needs (m€) | 20.09 | 61.26 | 297.37 | 2.72 | 10.43 | 74.26 |
| | Share of premiums | 0.12% | 0.36% | 1.75% | 0.02% | 0.06% | 0.44% |
| LI | Funding needs (m€) | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| | Share of premiums | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| LT | Funding needs (m€) | 0.12 | 0.30 | 1.19 | 0.02 | 0.06 | 0.30 |
| | Share of premiums | 0.10% | 0.25% | 0.98% | 0.01% | 0.05% | 0.25% |
| LU | Funding needs (m€) | 2.81 | 6.77 | 24.75 | 0.45 | 1.29 | 6.30 |
| | Share of premiums | 0.28% | 0.67% | 2.44% | 0.04% | 0.13% | 0.62% |
| LV | Funding needs (m€) | 0.14 | 0.36 | 1.53 | 0.02 | 0.07 | 0.39 |
| | Share of premiums | 0.08% | 0.21% | 0.89% | 0.01% | 0.04% | 0.23% |
| MT | Funding needs (m€) | 0.36 | 1.10 | 5.41 | 0.05 | 0.19 | 1.35 |
| | Share of premiums | 0.15% | 0.46% | 2.25% | 0.02% | 0.08% | 0.56% |
| NL | Funding needs (m€) | 56.53 | 157.25 | 685.05 | 8.21 | 28.06 | 172.78 |
| | Share of premiums | 0.13% | 0.36% | 1.57% | 0.02% | 0.06% | 0.40% |
| NO | Funding needs (m€) | 3.79 | 13.89 | 83.28 | 0.44 | 2.13 | 20.23 |
| | Share of premiums | 0.16% | 0.59% | 3.56% | 0.02% | 0.09% | 0.86% |
| PL | Funding needs (m€) | 1.48 | 5.98 | 39.83 | 0.16 | 0.87 | 9.51 |
| | Share of premiums | 0.08% | 0.32% | 2.11% | 0.01% | 0.05% | 0.50% |
| PT | Funding needs (m€) | 2.97 | 9.32 | 46.77 | 0.39 | 1.56 | 11.64 |
| | Share of premiums | 0.13% | 0.40% | 1.99% | 0.02% | 0.07% | 0.49% |
| RO | Funding needs (m€) | 0.50 | 1.23 | 4.56 | 0.08 | 0.23 | 1.16 |
| | Share of premiums | 0.08% | 0.20% | 0.73% | 0.01% | 0.04% | 0.18% |
| SE | Funding needs (m€) | 30.32 | 99.17 | 522.29 | 3.89 | 16.26 | 129.20 |
| | Share of premiums | 0.41% | 1.35% | 7.12% | 0.05% | 0.22% | 1.76% |
| SI | Funding needs (m€) | 0.64 | 2.52 | 16.35 | 0.07 | 0.37 | 3.92 |
| | Share of premiums | 0.08% | 0.31% | 2.04% | 0.01% | 0.05% | 0.49% |
| SK | Funding needs (m€) | 0.22 | 0.86 | 5.57 | 0.02 | 0.13 | 1.34 |
| | Share of premiums | 0.07% | 0.27% | 1.78% | 0.01% | 0.04% | 0.43% |

Table 3.7: IGS funding needs: EU total and EU average for the non-life business line, based on the home state principle, for different confidence levels and default probabilities; funding needs in absolute value and as a share of the total gross premiums

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| EU total | Funding needs (m€) | 579.55 | 1 559.05 | 6 577.43 | 86.39 | 282.02 | 1 659.57 |
| | Share of premiums | 0.20% | 0.55% | 2.30% | 0.03% | 0.10% | 0.58% |
| EU avg | Funding needs (m€) | 91.87 | 241.52 | 985.11 | 13.89 | 44.24 | 249.44 |
| | Share of premiums | 0.20% | 0.55% | 2.30% | 0.03% | 0.10% | 0.58% |

Figure 3.7: IGS funding needs for the non-life business line, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; the top figure indicates funding needs as a share of the total gross premiums written; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

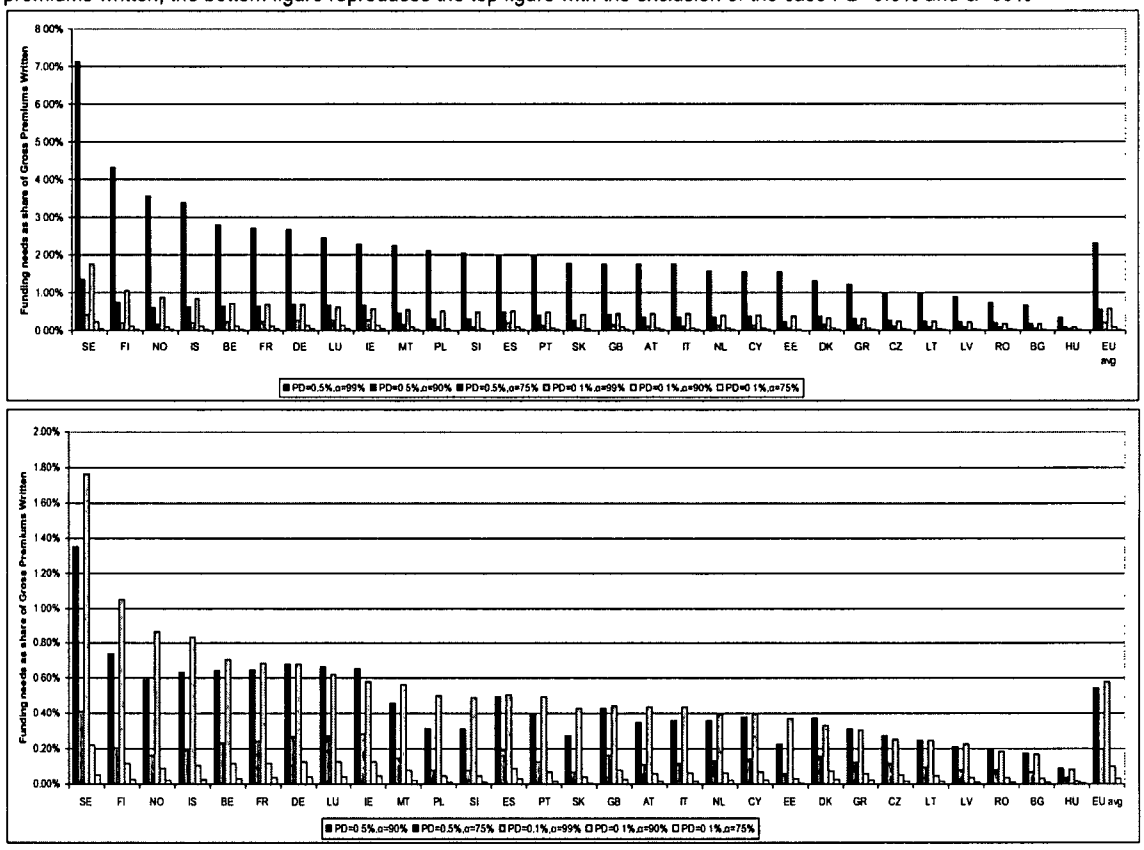


Figure 3.8: Summary of IGS funding needs for the non-life business line sector, based on the home state principle, for different confidence levels and default probabilities as a share of the total gross premiums written; EU average and minimum, maximum and median values across all EEA countries

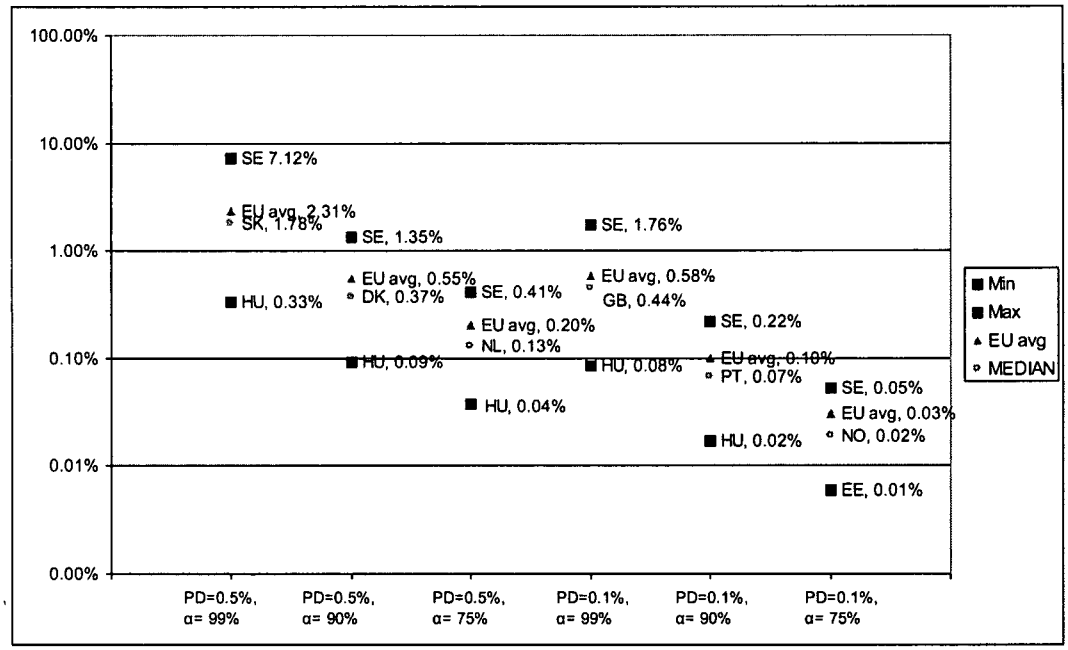


Figure 3.9: IGS funding needs for the non-life business line, based on the home state principle, for different confidence levels and default probabilities; all EEA countries; the top figure indicates funding needs in absolute terms; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

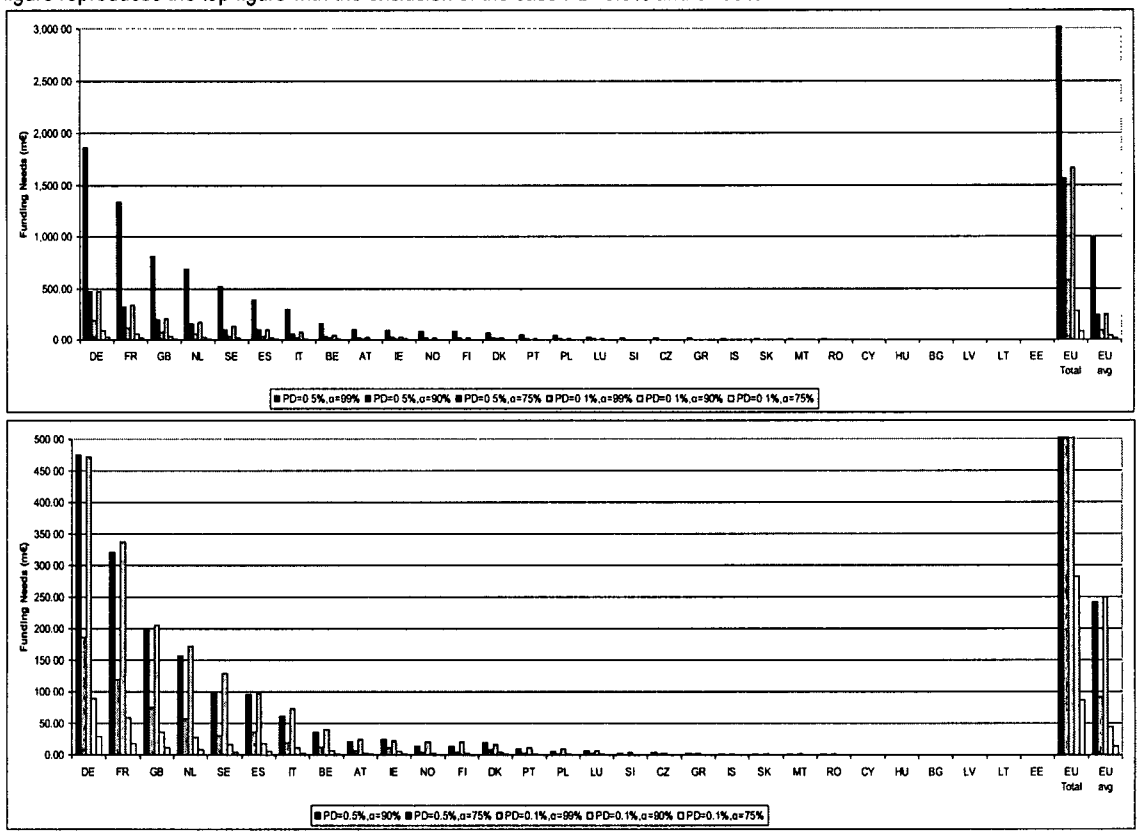



Table 3.8: IGS funding needs: EU total in absolute value and as a share of total premiums, based on the home state principle, for total insurance sector, life and non-life business lines

| | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|
| α → | 75% | 90% | 99% | 75% | 90% | 99% |
| **Absolute values (in m€)** | | | | | | |
| **Total insurance (EU)** | 4 529 | 12 213 | 51 477 | 673 | 2 209 | 13 001 |
| **Life (EU)** | 4 010 | 10 833 | 45 751 | 595 | 1 958 | 11 554 |
| **Non-life (EU)** | 580 | 1 559 | 6 577 | 86 | 282 | 1 660 |
| **As share of total premiums** | | | | | | |
| **Total insurance (EU)** | 0.43% | 1.17% | 4.92% | 0.06% | 0.21% | 1.24% |
| **Life (EU)** | 0.53% | 1.43% | 6.02% | 0.08% | 0.26% | 1.52% |
| **Non-life (EU)** | 0.20% | 0.55% | 2.30% | 0.03% | 0.10% | 0.58% |

### 3.2.1 Analysis of probability levels associated with funding needs presented in the Oxera report

This section compares the results from the previous section with the results presented in the Oxera report (2007). Note that the current data availability limitations make it impossible to reproduce detailed results reflecting the policy options activated at country level. Moreover, it should be kept in mind that the results given in this report were obtained using 2006 and 2007 data, whereas the Oxera report is based on 2004-2006 data.

Oxera's IGS report (Oxera 2007; and updated figures in CEIOPS 2009) not only provides figures on actual fund sizes, but also aims to estimate the expected future insurance guarantee costs (for which the results are presented on pages 102 and 103 in Tables 5.4 and 5.5). The same results can be obtained with the model presented in Equation 1.2 when setting $\rho$ and $\delta$ at zero, highlighting how this result reflects the situation on a market with infinite granularity populated by insurers with completely independent default risks. The full model of Equation 1.2, however, makes it possible to obtain, besides the funding needs, the probability of exceeding any given loss threshold for the various EU countries.

The first comparison therefore aims to calculate the confidence level associated with the IGS sizes proposed in the Oxera report, in other words the probability that losses in any given year will not be higher than the proposed funding needs.

In order to favour comparability with the Oxera report, the EAD estimate in this section will be limited to technical provisions for calculations with the full model as well, but the adjustment for technical provisions will be taken into account[18]. The other input parameters of the model are: *PD* is set at 0.1%; $\rho$ is taken as equal to 0.2 and an asset shortfall of 15% is assumed. These parameters are completed by adding the business line and country-specific $\delta$ presented in Table 2.2. Results reproducing Table 5.4 from the Oxera report are presented in Table 3.9 and Table 3.10. The first column of each table indicates the funding needs obtained using the Oxera formula based on the updated EAD data, the second the confidence level and the last two the input parameters used in the calculations.

Table 3.9: Comparison of loss distributions calculated in accordance with the model expressed by Equation 1.2 with the results of the formula employed in the Oxera report (2007, updated figures in CEIOPS, 2009) to obtain Tables 5.4 and 5.5; the yellow column indicates the probability that losses over a certain period will not exceed the amounts in the first column, when the loss distributions are calculated using the parameters in the last two columns (data for the life business line)

| | Expected costs of insolvencies using OXERA formula (m€) | Probability of NOT exceeding this value, according to model | Input parameters (ρ=0.2 PD=0.1% LGD=15%) | |
|---|---|---|---|---|
| | | | EAD used for this calculation (adjusted TPs) (m€) | δ |
| Germany | 104.59 | 79.15% | 697 273 | 0.05 |
| Spain | 23.23 | 79.21% | 154 875 | 0.05 |
| United Kingdom | 265.95 | 79.70% | 1 772 996 | 0.06 |
| Poland | 2.75 | 84.21% | 18 349 | 0.18 |
| Italy | 56.25 | 81.61% | 374 968 | 0.11 |
| France | 164.31 | 80.56% | 1 095 414 | 0.08 |
| Malta | 0.17 | 84.85% | 1 147 | 0.20 |

[18] See section 2.2.2 'Estimation of the EAD and Annex **Fehler! Verweisquelle konnte nicht gefunden werden.** for further details on this procedure.

Table 3.10: Comparison of loss distributions calculated in accordance with the model expressed by Equation 1.2 with the results of the formula employed in the Oxera report (2007, updated figures in CEIOPS, 2009) to obtain Tables 5.4 and 5.5; the yellow column indicates the probability that losses over a certain period will not exceed the amounts in the first column, when the loss distributions are calculated using the parameters in the last two columns (non-life business line)

| | Expected costs of insolvencies using OXERA formula (m€) | Probability of NOT exceeding this value, according to model | Input parameters (ρ=0.2 PD=0.1% LGD=15%) | |
|---|---|---|---|---|
| | | | EAD used for this calculation (adjusted TPs) (m€) | δ |
| Germany | 29.46 | 79.10% | 196 403 | 0.05 |
| Spain | 6.46 | 79.57% | 43 090 | 0.05 |
| United Kingdom | 13.53 | 20.49% | 90 215 | 0.05 |
| Poland | 0.40 | 86.27% | 2 647 | 0.05 |
| Italy | 4.28 | 82.41% | 28 547 | 0.05 |
| France | 23.59 | 80.12% | 157 276 | 0.05 |
| Malta | 0.04 | 82.53% | 272 | 0.05 |

The same approach could be applied for all the expected shares of losses indicated in Table 5.5 of the Oxera report to calculate, for each of the resulting losses, the probability of not exceeding such a loss.

Besides calculating the probability of not exceeding a certain loss, it might also be interesting to know the effect of the different inputs on the resulting IGS funding needs. For this reason Table 3.11 shows the effect of changing the different inputs one by one when moving from the Oxera formula to the full model used to obtain the results in Table 3.2 to Table 3.6. The first six rows in Table 3.11 indicate the input parameters for the life insurance business in Germany. In every row, the green cells indicate the difference from the first column where the Oxera input has been used[19]. The row 'Expected costs using Oxera formula' indicates the cost proposed by Oxera (EAD*PD*LGD) for each combination of input parameters. Below this row the corresponding probability that the IGS will have to bear a loss which does not exceed these funding needs is added. To emphasise the effect of changing the input parameters, the last rows indicate for various α values, the corresponding cost to set up an IGS with such a confidence level and the corresponding size as a share of the total premium.

[19] As outlined in section1.2, Oxera's equation for funding needs (*EAD x LGD x p*) can be seen as a particular case for this model where both ρ and δ are set to zero and the distribution collapses to a single point.

Table 3.11: The effects of changes in the model parameters on results. Example using data for the life insurance business line in Germany. The first column is obtained by applying the formula presented in the Oxera report (2007), which is equivalent to the model expressed in Equation 1.2 with ρ and δ set to zero, the second and third column introduce positive correlation and granularity parameters, the next three columns show the effects of changes in PD, EAD and LGD, the last column resets δ to zero.

| | Data from OXERA report | Include ρ | Include δ | Set PD=0.5 % | Update EAD data | Set LGD=45 % with updated EAD data | Set δ =0 with updated EAD data |
|---|---|---|---|---|---|---|---|
| **δ** | 0.00 | 0.00 | 0.05 | 0.05 | 0.05 | 0.05 | 0.00 |
| **PD** | 0.10% | 0.10% | 0.10% | 0.50% | 0.10% | 0.10% | 0.10% |
| **ρ** | 0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **EAD (in m€)** | 641 078 | 641 078 | 641 078 | 641 078 | 765 639 | 765 639 | 765 639 |
| **LGD** | 15% | 15% | 15% | 15% | 15% | 45% | 45% |
| **Gross premiums written(in m€)** | 73 969 | 73 969 | 73 969 | 73 969 | 75 170 | 75 170 | 75 170 |
| **Expected costs using Oxera formula (in m€)** | 96.16 | 96.16 | 96.16 | 480.81 | 114.85 | 344.54 | 344.54 |
| **Probability of not exceeding value** | N.A. | 76.72% | 79.15% | 75.07% | 79.15% | 79.15% | 76.72% |
| **Funding needs (in m€)** | | | | | | | |
| **α** | | | | | | | |
| **75.00%** | 96 | 88 | 74 | 479 | 88 | 265 | 314 |
| **90.00%** | 96 | 235 | 227 | 1 224 | 271 | 814 | 842 |
| **95.00%** | 96 | 407 | 423 | 2 039 | 505 | 1 514 | 1 460 |
| **99.00%** | 96 | 1 054 | 1 220 | 4 808 | 1 458 | 4 373 | 3 776 |
| **99.50%** | 96 | 1 453 | 1 740 | 6 374 | 2 078 | 6 235 | 5 208 |
| **99.90%** | 96 | 2 700 | 3 422 | 10 810 | 4 086 | 12 259 | 9 673 |
| **Funding needs as a share of gross premiums written** | | | | | | | |
| **α** | | | | | | | |
| **75.00%** | 0.13% | 0.12% | 0.10% | 0.65% | 0.12% | 0.35% | 0.42% |
| **90.00%** | 0.13% | 0.32% | 0.31% | 1.65% | 0.36% | 1.08% | 1.12% |
| **95.00%** | 0.13% | 0.55% | 0.57% | 2.76% | 0.67% | 2.01% | 1.94% |
| **99.00%** | 0.13% | 1.42% | 1.65% | 6.50% | 1.94% | 5.82% | 5.02% |
| **99.50%** | 0.13% | 1.96% | 2.35% | 8.62% | 2.76% | 8.29% | 6.93% |
| **99.90%** | 0.13% | 3.65% | 4.63% | 14.61% | 5.44% | 16.31% | 12.87% |

## 3.3 *Analysis of probability levels associated with existing IGS fund sizes*

Another comparison which can be performed is between funding needs according to the model expressed by Equation 1.2 and the actual fund sizes in place or target fund sizes across European states. This comparison is shown in Table 3.12, which also indicates the probability of not exceeding the actual or target funds according to the model, assuming a given set of policy options.

The first two rows of the table compare the funding needs calculated by the model with the actual fund sizes – or in some cases the target fund sizes – of existing IGSs in Member States, as reported by Oxera. Note that the data presented concern only IGSs of countries which have an ex-ante funding system in place and for which the actual or the target level fund has been provided.

This comparison assumed the correlation coefficient $\rho$ to be 0.2, the confidence level $\alpha$= 90%, the loss given default 15% and the probability of default 0.1% and 0.5%. The results show that there are several countries with an actual fund that exceeds the maximum loss results given the parameter values assumed.

It is also interesting to see which combinations of parameters in this model would produce maximum losses that correspond to the actual or target funds. This is shown in the lower section of the table. The first row in the lower section shows what confidence level[20] has to be chosen, leaving everything else unchanged, to obtain maximum losses identical to the actual funds. In the case of Germany, for instance, the result is an $\alpha$ of around 77.1%, which means a probability of 77.1% that the losses will not exceed the target fund of €640bn.

The next three rows show how the level $\alpha$ changes as different sets of parameters are applied. The fifth and sixth rows show what probability of default would have to be assumed to obtain a maximum loss equal to the actual funds with an $\alpha$ of 90% and an asset shortfall of 15% and 45% respectively.

The last two rows show what level of asset shortfall would reproduce, in this model, the actual funding needs given a probability of default of 0.5% and 0.1% respectively.

The last row of the table, in particular, shows how using a PD of 0.1% the actual fund sizes of certain countries could be obtained only by assuming assets shortfalls in excess of 100%.

Note that countries can choose several different policy options which can have a major impact on the expected payout. Table 3.13 provides a summary of the differences among policy options adopted in the Member States cited in Table 3.12 and in the model used in obtaining the results. Options marked in parentheses refer to alternative options analyzed in Section 4.

[20] The probability that the actual fund size is the maximum loss that will not be exceeded with that probability during the reference period.

Table 3.12: Comparison of estimated IGS funding needs indicated in section 3.2 with actual funding reported by Oxera (2007)

| | | Life | | | | | | Non-life | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Latvia | Malta(#) | France | Germany | Romania | Latvia | Malta(#) | Romania | Denmark | Spain |
| Estimated IGS funding needs (ρ=0.2, α=90%, PD=0.5%,LGD 15%) (in m€) | | 0.13 | 2.35 | 2 266.56 | 1 460.67 | 1.49 | 0.36 | 1.16 | 1.23 | 19.07 | 406.72 |
| Estimated IGS funding needs (ρ=0.2, α=90%, PD=0.1%,LGD 15%)(in m€) | | 0.02 | 0.36 | 407.08 | 271.23 | 0.28 | 0.07 | 0.20 | 0.23 | 3.68 | 75.16 |
| Actual fund size (OXERA, latest available figures) (in m€) | | 0.8 (1) | 2.33 (2) | 569 (4) | 640 (2) | 136 (3) | 17.1 (3) | 2.8 (1) | 2.33 (2) | 84.5 (3) | 40.3 (2) | 1331 (3) |
| The model used in this study would produce results identical to the actual fund size with the following parameters: | | | | | | | | | | | | |
| ρ=0.2, LGD=15%, PD=0.5% then | α = | 98.55% | 89.93% | 67.99% | 77.15% | 44.24% | 99.97% | 99.79% | 95.62% | 100.00% | 97.00% | 98.47% |
| ρ=0.2, LGD=45%, PD= 0.5% then | α = | 94.49% | 77.39% | 45.94% | 53.99% | 24.00% | 98.96% | 97.36% | 85.48% | 100.00% | 84.67% | 91.00% |
| ρ=0.2, LGD=15%, PD=0.1% then | α = | 99.85% | 98.36% | 92.80% | 96.33% | 81.64% | 100.00% | 99.99% | 99.58% | 100.00% | 99.87% | 99.93% |
| ρ=0.2, LGD=45%, PD= 0.1% then | α = | 99.15% | 94.62% | 81.38% | 63.32% | 63.32% | 99.96% | 99.84% | 97.64% | 100.00% | 98.44% | 99.13% |
| ρ=0.2, α =90%, LGD=15% then | PD = | 2.35% | 0.50% | 0.14% | 0.05% | 0.05% | 6.11% | 3.85% | 0.97% | 65.26% | 1.06% | 1.62% |
| ρ=0.2, α =90%, LGD=45%then | PD = | 0.89% | 0.19% | 0.05% | 0.02% | 0.02% | 1.91% | 1.25% | 0.35% | 13.72% | 0.35% | 0.54% |
| ρ=0.2, α =90%, PD=0.5% then | LGD = | 89.32% | 14.88% | 3.77% | 1.40% | 1.40% | 172.03% | 115.07% | 30.24% | 1030.23% | 31.71% | 49.09% |
| ρ=0.2, α =90%, PD=0.1% then | LGD = | 662.41% | 95.84% | 20.97% | 7.52% | 7.52% | 922.67% | 635.40% | 178.30% | 5437.75% | 164.23% | 265.63% |

*Notes: (#)IGS funding needs for Malta are estimated based on the host state principle, as explained in section 4.*
*(1) 2006 data; (2) target fund size as given for 2008; (3) 2008 data; (4) 2007 data.*

Table 3.13: Summary of policy options currently applied in selected EU Member States and used for the model employed in this report

| | Used in this report | Life | | | | | Non-life | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LV | MT | FR | DE | RO | LV | MT | RO | DK | ES |
| **Status quo versus change** | | | | | | | | | | | |
| Introduce a legally binding EU-wide approach to IGS | X | | | | | | | | | | |
| Only partially binding EU-wide approach | | | | | | | | | | | |
| No binding EU-wide approach | | X | X | X | X | X | X | X | X | X | X |
| **Nature of intervention** | | | | | | | | | | | |
| Pure compensation to claimants | X | X | X | X | | X | X | X | X | X | X |
| Continuation of contracts | (X) | | | X | X | | | | | | X |
| **Eligible claimants** | | | | | | | | | | | |
| Natural persons only | | X | | | | | X | X | | | |
| Natural persons + SMEs | | | | | | | | | | X | |
| Natural and legal persons except financial institutions | | | | X | | | | | | | |
| Natural and legal entities | X | | X | | X | X | | | X | | X |
| **Compensation limits and reductions** | | | | | | | | | | | |
| Capping payouts | | X | | X | | | X | | | | n/a |
| Capping payouts for non-compulsory insurance (MT) | | | X | | | | | X | | | |
| Level of coverage in percentage terms | 100 | 100 | 75 | 100 | | 100 | 50 | 75 | 100 | 100 | n/a |
| Level of coverage in percentage terms (compulsory) | | | 100 | | | | | 100 | | | |
| Fixed deductible | | | | | | | | | | X | |
| Other reduction in benefits | | | | | X | | | | | | X |
| **Policies covered** | | | | | | | | | | | |
| Only life | X | X | X | X | X | X | | | | | |
| Only non-life | X | | | | | | X | X | X | X | |
| Both life and non-life | X | | | | | | | | | | X |
| **Funding** | | | | | | | | | | | |
| Ex-ante | NC• | X | X | X | X | X | X | X | X | X | X |
| Ex-post | NC• | | | X | | | | | | | |
| Capping the level of contributions over a period | NC | X | | X | X | | X | | | | |
| **Other sources of funding** | | | | | | | | | | | |
| Borrowing power | NC | | X | X | X | | | X | | X | |
| Credit facility from members in place | NC | | | X | | | | | | | |
| State guarantee on borrowing | NC | | | | | | | | | X | |
| Additional guarantees as private initiative (large failures) | NC | | | | X | | | | | | |
| **Geographic scope** | | | | | | | | | | | |
| An IGS in each MS based on the home state principle | X* | | | X | X | X | | | X | X | X |
| An IGS in each MS based on the host state principle | (X) | X | X | | | | X | X | | | |
| A single EU-wide IGS | (X) | | | | | | | | | | |
| An IGS in each MS covering only domestic activity supplemented by an additional IGS covering cross-border transactions | (X) | | | | | | | | | | |
| Other | | | | | | | | | | | X |
| **Types of policies covered** | | | | | | | | | | | |
| Without exclusions | X | | | X | X | X | | | X | | |
| With exclusions | | X | X | | | | X | X | | X | X |

**: Home state principle results based on the assumption that exposure structure is proportional to national market structure.*

*•: This topic is shortly discussed in Annex A4*

*NC stands for not considered; Options marked (X) are analysed in Section 4*

*Source: CEIOPS 2009*

## 3.4 *Analysis of historical losses stemming from selected defaults of insurance undertakings*

An initial comparison has been performed between historical observed costs for IGS funds and the loss distribution of IGS funds obtained under the settings applied in this study. There are several cases where IGSs have provided protection to claimants in relation to both life and non-life business. Three failures in relation to non-life business and one in relation to life business are considered here. Their historical data are taken from the Oxera report (p. 89 et seq.) and are summarised in Table 3.14.

Table 3.14: Historical losses stemming from defaults of selected insurance undertakings

| Country | Failure | Sector | Total cost (m€) | As share of country total premium | Fund size in country (year) (m€) | Target fund size in country (m€) |
|---|---|---|---|---|---|---|
| Germany | Mannheimer | Life | 100 | 0.13% | 136 (2008) | 640 |
| Denmark | Plus Forsiking A/S | Non life | 13.1 | 0.18% | | 40.3 |
| United Kingdom | Independent Insurance | Non life | 738 | 0.84% | | |
| United Kingdom | Chester Street | Non life | 146.5 | 0.17% | | |

The graphs set out below present the cumulative loss distribution functions implied by Equation 1.2 under two different PD values. For each country and line of business the fund sizes as a share of premium are plotted on the x-axis on a logarithmic scale[21] while confidence levels are indicated on the y-axis. The curves indicate the maximum losses which should not be exceeded with a certain probability and the pink and blue curves correspond to different choices for the PD parameter (0.1% and 0.5%). The vertical green line starts from the point on the x-axis corresponding to the size of a historic failure and the confidence level of not exceeding this loss with a given choice of PD can be read where the vertical green line crosses the curves.
For calculation of the fund needs, the following parameters have been set: PD has been taken as 0.1% and 0.5%; ρ as 0.2 and the asset shortfall as 15%.



[21] I.e. doubling the distance along the axis equals a tenfold increase in the loss.

Figure 3.10: Position of the losses generated by the Mannheimer default on the estimated loss distribution function for the life business line in Germany, based on home state principle and two different probabilities of default

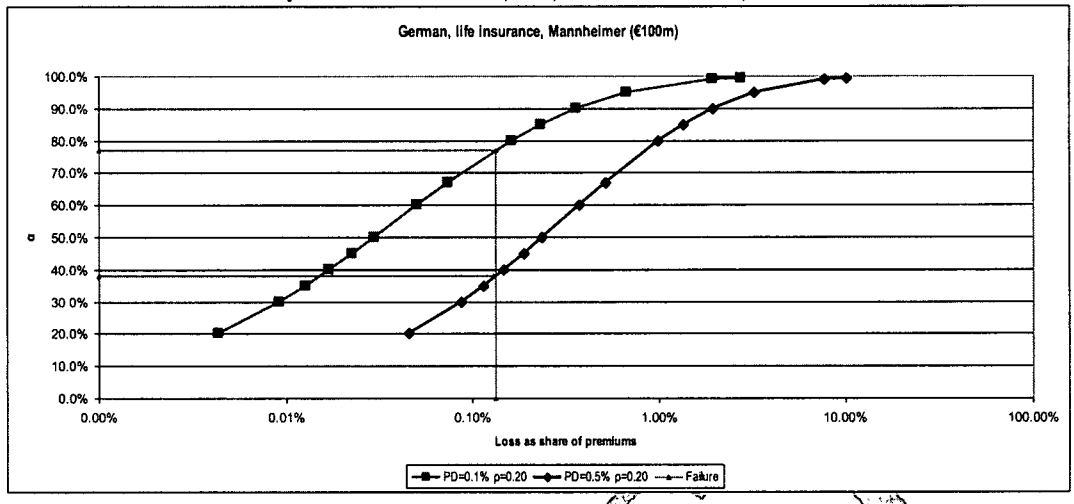



Figure 3.11: Position of the losses generated by the Plus Forsiking default on the estimated loss distribution function for the non-life business line in Denmark, based on home state principle and two different probabilities of default

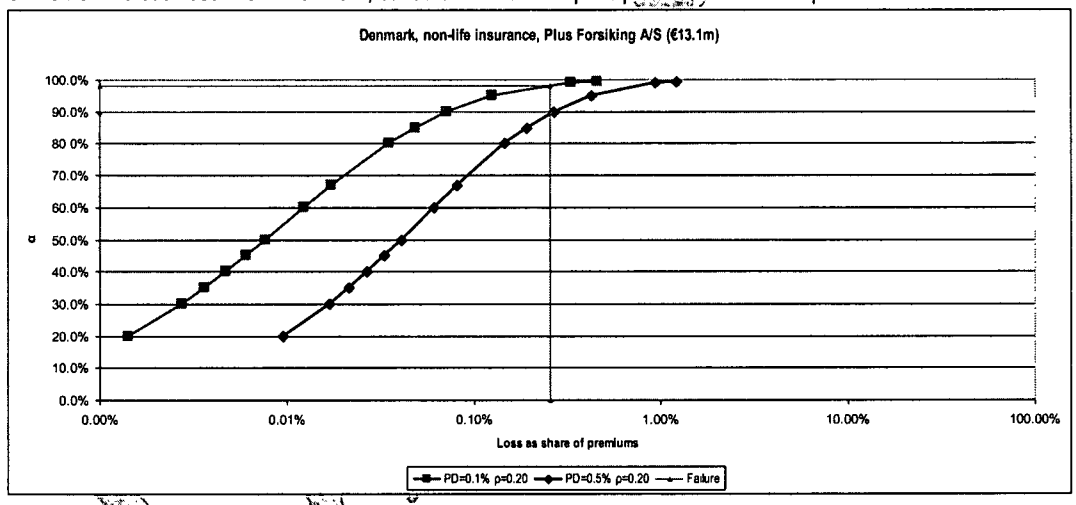


Figure 3.12: Position of the losses generated by the Independent Insurance default on the estimated loss distribution function for the non-life business line in the United Kingdom, based on home state principle and two different probabilities of default

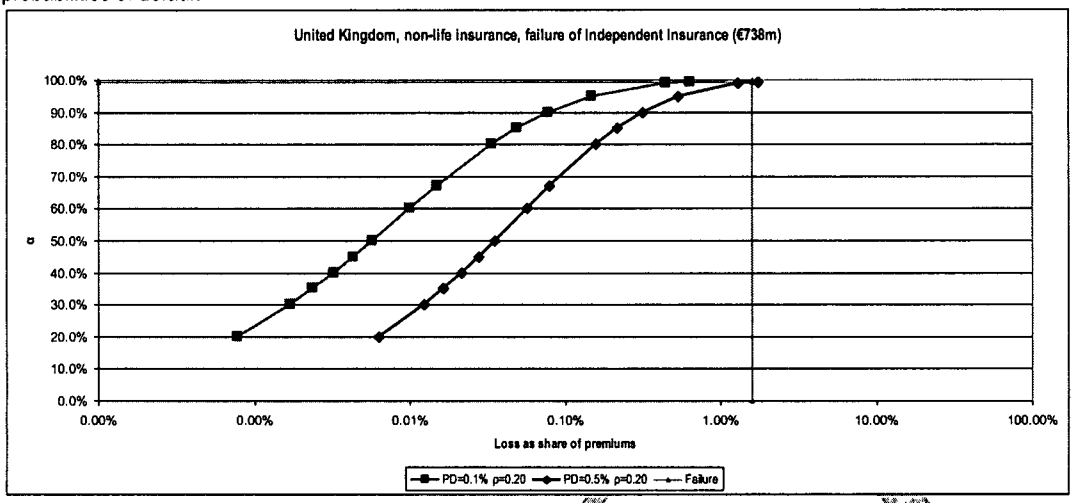
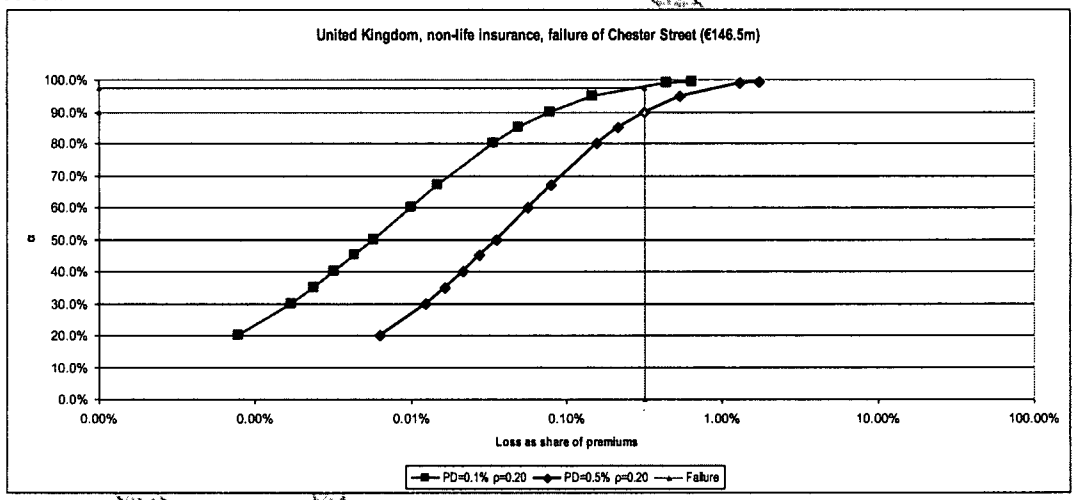



Figure 3.13: Position of the losses generated by the Chester Street default on the estimated loss distribution function for the non-life business line in the United Kingdom, based on home state principle and two different probabilities of default



# 4 Analysis of alternative policy options

## *4.1 Introduction*

The previous chapter presented one specific policy option and calculated the corresponding funding needs. That option corresponded to the case where each Member State puts in place an IGS working on the basis of the home state principle, portfolio continuation and full coverage.

This chapter compares the funding needs if different policy options are introduced, such as changing the geographical scope and the nature of interventions, with that baseline case.

Policy options used in this analysis include:

- using the host state rather than the home state principle;
- using a national IGS covering domestic activities supplemented by an additional EU-wide IGS for cross-border insurance transactions:
    a. including cross-border activities conducted under the freedom to provide services (FPS);
    b. excluding cross-border activities conducted under the freedom to provide services;
- using a single pan-European scheme rather than national schemes;
- using a pure compensation mechanism rather than portfolio continuation/transfer.

The definition of home, host and domestic activities are presented in Table 4.3.

An overview of all the selected scenarios is given in Table 4.1.

Table 4.1: Summary of the structure of the different policy options

| | Home state | Host state | Domestic w/o cross-border (FPS and branches | Domestic w/o cross-border (branches only) | Pan-EU IGS | Home state with compensation |
|---|---|---|---|---|---|---|
| **Status quo versus change** | | | | | | |
| Introduce a legally binding EU-wide approach to IGS | X | X | X | X | X | X |
| Only partially binding EU-wide approach | | | | | | |
| No binding EU-wide approach | | | | | | |
| **Nature of intervention** | | | | | | |
| Pure compensation to claimants | | | | | | X |
| Continuation of contracts | X | X | X | X | X | |
| **Eligible claimants** | | | | | | |
| Natural persons only | | | | | | |
| Natural persons + SMEs | | | | | | |
| Natural and legal persons except financial institutions | | | | | | |
| Natural and legal entities | X | X | X | X | X | X |
| **Compensation limits and reductions** | | | | | | |
| Capping payouts | | | | | | |
| Capping payouts for non-compulsory insurance | | | | | | |
| Level of coverage in percentage terms | 100 | 100 | 100 | 100 | 100 | 100 |
| Level of coverage in percentage terms (compulsory) | | | | | | |
| Fixed deductible | | | | | | |
| Other reduction in benefits | | | | | | |
| **Policies covered** | | | | | | |
| Only life | | | | | | |
| Only non-life | | | | | | |
| Both life and non-life | X | X | X | X | X | X |
| **Funding** | *Not covered* | | | | | |
| Ex-ante | | | | | | |
| Ex-post | | | | | | |
| Capping the level of contributions over a period | | | | | | |
| **Other sources of funding** | *Not covered* | | | | | |
| Borrowing power | | | | | | |
| Credit facility from members in place | | | | | | |
| State guarantee on borrowing | | | | | | |
| Additional guarantees as private initiative (large failures) | | | | | | |
| **Geographic scope** | | | | | | |
| An IGS in each MS based on the home state principle | X | | | | | X |
| An IGS in each MS based on the host state principle | | X | | | | |
| A single EU-wide IGS | | | | | X | |
| An IGS in each MS covering only domestic activity and an additional IGS covering cross-border transactions | | | X | X | | |
| **Types of policies covered** | | | | | | |
| Without exclusions | X | X | X | X | X | X |
| With exclusions | | | | | | |

To obtain the data necessary for calculation of the funding needs under the different policy options, CEIOPS data on premiums for 2007 are used. Table 4.2 presents the data given by CEIOPS, while Table 4.3 shows how these data were used to obtain the premiums covered for different policy options.

Due to the limitations of the data currently available, $\delta$ was kept constant for each country over the different policy options. As a consequence, the probability distribution of losses remains invariant across policy options.
Moreover, in each country, due to lack of detailed data, the change of the EAD when moving from one policy option to another was adjusted proportionally to the change in the total premiums covered under each policy option with respect to the baseline case.
The combined result of these two simplifications is that at this stage the loss as a share of covered premiums will remain constant across all policy options. For this reason this result is not reported.

A further limitation of the data currently available is that the data on cross-border transactions available from CEIOPS are based on an EEA aggregation. As a consequence, figures for common schemes such as single schemes for cross-border transactions and pan-EU schemes will refer to an EEA basis.

Table 4.4 to Table 4.9 present the whole set of input parameters used for all the policy options for all three business lines considered.

Table 4.2: Gross premiums written as reported by CEIOPS: total insurance sector (including motor), all EEA countries, 2007 (m€)

| | National enterprises | | | | by branches of non-EU/EEA countries in the MS (5) | by branches of other EU/EEA countries in the MS (6) |
|---|---|---|---|---|---|---|
| | Total (1) | of which: under FPS in other EU/EEA countries (2) | of which: by branches in other EU/EEA countries (3) | of which: by branches in non-EU/EEA countries (4) | | |
| **AT** | 16 019 | 0 | 59 | 0 | 27 | 0 |
| **BE** | 30 738 | 428 | 1 437 | 44 | 0 | 856 |
| **BG** | 770 | 0 | 0 | 0 | 0 | 0 |
| **CY** | 622 | 48 | 18 | 55 | 53 | 27 |
| **CZ** | 4 647 | 2 | 10 | 0 | 9 | 323 |
| **DE** | 165 171 | 498 | 1 351 | 34 | 2 001 | 2 490 |
| **DK** | 20 302 | 157 | 1 042 | 225 | 0 | 0 |
| **EE** | 356 | 0 | 63 | 0 | 0 | 16 |
| **ES** | 55 699 | 0 | 0 | 0 | 0 | 0 |
| **FI** | 5 888 | 15 | 196 | 0 | 0 | 0 |
| **FR** | 207 231 | 499 | 3 379 | 1 105 | 913 | 0 |
| **GB** | 349 166 | 0 | 0 | 0 | 18.590 | 3 163 |
| **GR** | 4 798 | 0 | 0 | 0 | 343 | 75 |
| **HU** | 3 674 | 0 | 0 | 0 | 0 | 0 |
| **IE** | 44 234 | 20 014 | 6 123 | 306 | 73 | 1 842 |
| **IS** | 429 | 4 | 0 | 0 | 0 | 0 |
| **IT** | 100 594 | 840 | 449 | 194 | 1 562 | 4 798 |
| **LI** | 2 798* | 2 776 | 1 | 3 | 0 | 0 |
| **LT** | 556 | 2 | 3 | 0 | 0 | 45 |
| **LU** | 11 410* | 10 300 | 854 | 36 | 0 | 111 |
| **LV** | 437 | 0 | 17 | 0 | 0 | 25 |
| **MT** | 689 | 385 | 3 | 0 | 5 | 28 |
| **NL** | 73 392 | 0 | 0 | 0 | 1 560 | 0 |
| **NO** | 13 698 | 353 | 10 | 0 | 0 | 2 909 |
| **PL** | 11 560 | 0 | 1 | 0 | 18 | 0 |
| **PT** | 13 497 | 3 | 120 | 1 | 68 | 0 |
| **RO** | 2 105 | 0 | 0 | 0 | 0 | 0 |
| **SE** | 23 796 | 0 | 0 | 0 | 0 | 0 |
| **SI** | 1 799 | 1 | 0 | 0 | 0 | 0 |
| **SK** | 1 707 | 2 | 7 | 0 | 0 | 0 |
| **Total** | **1 167 782** | **36 327** | **15 143** | **2 003** | **25 222** | **16 708** |

*Source: 'Report on Financial Conditions and Financial Stability in the European Insurance and Occupational Pension Fund Sector 2007-2008 (Risk Update)', Statistical Annex 2007, sheet 2.1: http://www.ceiops.eu/content/view/20/24/*

** For Liechtenstein and Luxembourg the FPS activity has been included in. 'National enterprises'.*

Table 4.3: Calculations to obtain gross premiums written covered under different policy options. Example with data referring to the total insurance sector (life, non-life and motor), all EEA countries, 2007 (m€), assuming no exclusions or limitations are applied; numbers in column headings refer to columns in Table 4.2

| | Home state principle (=1+5) | Host state principle (=1+5+6-3-4) | Cross-border (branches + FPS) (=2+3+4) | Domestic w/o cross-border (branches + FPS) (=1+5-2-3-4) | Cross-border (branches only) (=3+4) | Domestic w/o cross-border (branches only) (=1+5-3-4) | Total activity (=1+5+6) |
|---|---|---|---|---|---|---|---|
| AT | 16 046 | 15 987 | 59 | 15 987 | 59 | 15 987 | 16 046 |
| BE | 30 738 | 30 113 | 1 909 | 28 829 | 1 481 | 29 257 | 31 594 |
| BG | 770 | 770 | 0 | 770 | 0 | 770 | 770 |
| CY | 675 | 629 | 121 | 554 | 73 | 602 | 702 |
| CZ | 4 656 | 4 969 | 12 | 4 644 | 10 | 4 646 | 4 979 |
| DE | 167 172 | 168 277 | 1 884 | 165 289 | 1 385 | 165 787 | 169 662 |
| DK | 20 302 | 19 035 | 1 424 | 18 878 | 1 267 | 19 035 | 20 302 |
| EE | 356 | 309 | 63 | 293 | 63 | 293 | 372 |
| ES | 55 699 | 55 699 | 0 | 55 699 | 0 | 55 699 | 55 699 |
| FI | 5 888 | 5 692 | 211 | 5 677 | 196 | 5 692 | 5 888 |
| FR | 208 144 | 203 660 | 4 983 | 203 161 | 4 484 | 203 660 | 208 144 |
| GB | 367 756 | 370 919 | 0 | 367 756 | 0 | 367 756 | 370 919 |
| GR | 5 141 | 5 216 | 0 | 5 141 | 0 | 5 141 | 5 216 |
| HU | 3 674 | 3 674 | 0 | 3 674 | 0 | 3 674 | 3 674 |
| IE | 44 307 | 39 720 | 26 443 | 17 864 | 6 429 | 37 878 | 46 149 |
| IS | 429 | 429 | 4 | 425 | 0 | 429 | 429 |
| IT | 102 156 | 106 311 | 1 483 | 100 673 | 643 | 101 513 | 106 954 |
| LI | 2 798 | 2 794 | 2 780 | 18 | 4 | 2 794 | 2 798 |
| LT | 556 | 598 | 4 | 551 | 3 | 553 | 601 |
| LU | 11 410 | 10 631 | 11 190 | 220 | 890 | 10 520 | 11 521 |
| LV | 437 | 445 | 17 | 420 | 17 | 420 | 462 |
| MT | 694 | 719 | 388 | 306 | 3 | 691 | 722 |
| NL | 74 952 | 74 952 | 0 | 74 952 | 0 | 74 952 | 74 952 |
| NO | 13 698 | 16 597 | 364 | 13 335 | 10 | 13 688 | 16 607 |
| PL | 11 578 | 11 577 | 1 | 11 577 | 1 | 11 577 | 11 578 |
| PT | 13 565 | 13 444 | 123 | 13 441 | 121 | 13 444 | 13 565 |
| RO | 2 105 | 2 105 | 0 | 2 105 | 0 | 2 105 | 2 105 |
| SE | 23 796 | 23 796 | 0 | 23 796 | 0 | 23 796 | 23 796 |
| SI | 1 799 | 1 799 | 1 | 1 798 | 0 | 1 799 | 1 799 |
| SK | 1 707 | 1 700 | 10 | 1 698 | 7 | 1 700 | 1 707 |
| **Total** | **1 193 004** | **1 192 566** | **53 473** | **1 139 531** | **17 146** | **1 175 858** | **1 209 712** |

Table 4.4: Premiums covered under different policy options, in terms of gross premiums written, for the total insurance sector (life and non-life only; excluding motor), all EEA countries, 2007 data (m€)

| | Gross premiums written | | | | | | |
|---|---|---|---|---|---|---|---|
| | Home | Host | Domestic + single cross-border (branches and FPS) | Domestic + single cross-border (branches only) | Pan-EU/EEA | Home state principle; pure compensation | Home state principle; compensation (including unearned premiums) |
| Austria | 12 992 | 12 946 | 12 946 | 12 946 | | 12 992 | 12 992 |
| Belgium | 27 886 | 27 413 | 26 447 | 26 804 | | 27 886 | 27 886 |
| Bulgaria | 354 | 354 | 354 | 354 | | 354 | 354 |
| Cyprus | 531 | 485 | 416 | 464 | | 531 | 531 |
| Czech Republic | 3 338 | 3 630 | 3 330 | 3 331 | | 3 338 | 3 338 |
| Germany | 144 749 | 145 772 | 143 227 | 143 663 | | 144 749 | 144 749 |
| Denmark | 18 304 | 17 371 | 17 253 | 17 371 | | 18 304 | 18 304 |
| Estonia | 193 | 135 | 130 | 130 | | 193 | 193 |
| Spain | 42 653 | 42 653 | 42 653 | 42 653 | | 42 653 | 42 653 |
| Finland | 4 704 | 4 508 | 4 499 | 4 508 | | 4 704 | 4 704 |
| France | 185 825 | 182 441 | 182 057 | 182 441 | | 185 825 | 185 825 |
| United Kingdom | 351 427 | 353 767 | 351 427 | 351 427 | | 351 427 | 351 427 |
| Greece | 3 537 | 3 569 | 3 537 | 3 537 | | 3 537 | 3 537 |
| Hungary | 2 728 | 2 728 | 2 728 | 2 728 | | 2 728 | 2 728 |
| Ireland | 41 428 | 37 864 | 17 538 | 36 371 | | 41 428 | 41 428 |
| Iceland | 223 | 223 | 222 | 223 | | 223 | 223 |
| Italy | 78 452 | 81 778 | 77 519 | 78 046 | | 78 452 | 78 452 |
| Liechtenstein | 2 798 | 2 794 | 18 | 2 794 | | 2 798 | 2 798 |
| Lithuania | 326 | 359 | 324 | 325 | | 326 | 326 |
| Luxembourg | 11 107 | 10 320 | 417 | 10 228 | | 11 107 | 11 107 |
| Latvia | 224 | 241 | 217 | 217 | | 224 | 224 |
| Malta | 454 | 468 | 257 | 452 | | 454 | 454 |
| The Netherlands | 70 162 | 70 162 | 70 162 | 70 162 | | 70 162 | 70 162 |
| Norway | 12 179 | 13 979 | 11 958 | 12 173 | | 12 179 | 12 179 |
| Poland | 8 634 | 8 633 | 8 633 | 8 633 | | 8 634 | 8 634 |
| Portugal | 11 561 | 11 453 | 11 451 | 11 453 | | 11 561 | 11 561 |
| Romania | 1 044 | 1 044 | 1 044 | 1 044 | | 1 044 | 1 044 |
| Sweden | 20 316 | 20 316 | 20 316 | 20 316 | | 20 316 | 20 316 |
| Slovenia | 1 246 | 1 246 | 1 246 | 1 246 | | 1 246 | 1 246 |
| Slovakia | 1 161 | 1 158 | 1 157 | 1 158 | | 1 161 | 1 161 |
| Cross-border scheme | | | 44 254 | 10 539 | | | |
| Pan-EEA scheme | | | | | 1 057 738 | | |

Table 4.5: Input parameters (EAD and δ) under different policy options, total insurance sector (life and non-life only; excluding motor), all EEA countries, 2007 (EAD in m€)

| Name | δ | EAD | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Home | Host | Domestic + single cross-border (branches and FPS) | Domestic + single cross-border (branches only) | Pan-EU/EEA | Home state principle; pure compensation | Home state principle; compensation (including unearned premiums) |
| Austria | 0.13 | 67 554 | 67 317 | 67 317 | 67 317 | | 59 911 | 60 583 |
| Belgium | 0.13 | 190 151 | 186 928 | 180 338 | 182 773 | | 167 926 | 167 926 |
| Bulgaria | 0.07 | 392 | 392 | 392 | 392 | | 338 | 358 |
| Cyprus | 0.15 | 3 078 | 2 811 | 2 413 | 2 691 | | 2 814 | 2 814 |
| Czech Republic | 0.10 | 8 994 | 9 780 | 8 971 | 8 974 | | 6 632 | 6 632 |
| Germany | 0.05 | 1 006 801 | 1 013 915 | 996 216 | 999 247 | | 945 831 | 948 962 |
| Denmark | 0.05 | 135 949 | 129 020 | 128 145 | 129 020 | | 118 926 | 118 975 |
| Estonia | 0.30 | 569 | 398 | 383 | 383 | | 522 | 526 |
| Spain | 0.06 | 213 026 | 213 026 | 213 026 | 213 026 | | 190 826 | 192 003 |
| Finland | 0.21 | 44 020 | 42 186 | 42 099 | 42 186 | | 40 358 | 40 481 |
| France | 0.08 | 1 347 573 | 1 323 032 | 1 320 242 | 1 323 032 | | 1 233 672 | 1 241 835 |
| United Kingdom | 0.07 | 2 092 219 | 2 106 151 | 2 092 219 | 2 092 219 | | 1 976 408 | 1 978 512 |
| Greece | 0.09 | 9 495 | 9 582 | 9 495 | 9 495 | | 8 249 | 8 256 |
| Hungary | 0.04 | 5 887 | 5 887 | 5 887 | 5 887 | | 4 737 | 4 737 |
| Ireland | 0.08 | 161 216 | 147 348 | 68 250 | 141 537 | | 148 896 | 148 896 |
| Iceland | 0.19 | 795 | 795 | 788 | 795 | | 440 | 479 |
| Italy | 0.12 | 423 251 | 441 195 | 418 216 | 421 060 | | 387 111 | 388 629 |
| Liechtenstein | N.A. | N.A. | N.A. | N.A. | N.A. | | 0 | 0 |
| Lithuania | 0.10 | 643 | 708 | 640 | 641 | | 542 | 554 |
| Luxembourg | 0.02 | 80 074 | 74 404 | 3 009 | 73 738 | | 71 814 | 71 911 |
| Latvia | 0.13 | 269 | 288 | 260 | 260 | | 218 | 218 |
| Malta | 0.17 | 1 980 | 2 042 | 1 123 | 1 973 | | 1 489 | 1 502 |
| The Netherlands | 0.10 | 313 024 | 313 024 | 313 024 | 313 024 | | 300 900 | 300 900 |
| Norway | 0.23 | 86 755 | 99 576 | 85 184 | 86 711 | | 78 965 | 79 007 |
| Poland | 0.19 | 20 855 | 20 852 | 20 852 | 20 852 | | 17 129 | 17 320 |
| Portugal | 0.14 | 45 402 | 44 978 | 44 971 | 44 978 | | 41 409 | 41 531 |
| Romania | 0.04 | 1 468 | 1 468 | 1 468 | 1 468 | | 1 053 | 1 173 |
| Sweden | 0.12 | 238 147 | 238 147 | 238 147 | 238 147 | | 188 189 | 189 240 |
| Slovenia | 0.23 | 3 897 | 3 897 | 3 895 | 3 897 | | 2 171 | 2 473 |
| Slovakia | 0.16 | 2 860 | 2 853 | 2 851 | 2 853 | | 2 367 | 2 372 |
| Cross-border scheme | | | | 236 521 | 77 766 | | | |
| Pan-EEA scheme | | | | | | 6 506 344 | | |

Table 4.6: Premiums covered under different policy options, in terms of gross premiums written, life business line, all EEA countries, 2007 data (m€)

| | Gross premiums written | | | | | |
|---|---|---|---|---|---|---|
| | Home | Host | Domestic + single cross-border (branches and FPS) | Domestic + single cross-border (branches only) | Pan-EU/EEA | Home state principle; pure compensation |
| Austria | 7 141 | 7 121 | 7 121 | 7 121 | | 7 141 |
| Belgium | 22 179 | 22 011 | 21 680 | 21 895 | | 22 179 |
| Bulgaria | 120 | 120 | 120 | 120 | | 120 |
| Cyprus | 358 | 312 | 251 | 299 | | 358 |
| Czech Republic | 2 034 | 2 305 | 2 029 | 2 030 | | 2 034 |
| Germany | 75 170 | 75 937 | 74 771 | 75 012 | | 75 170 |
| Denmark | 13 190 | 13 112 | 13 095 | 13 112 | | 13 190 |
| Estonia | 118 | 55 | 55 | 55 | | 118 |
| Spain | 23 455 | 23 455 | 23 455 | 23 455 | | 23 455 |
| Finland | 2 784 | 2 588 | 2 588 | 2 588 | | 2 784 |
| France | 136 528 | 135 578 | 135 445 | 135 578 | | 136 528 |
| United Kingdom | 305 184 | 305 194 | 305 184 | 305 184 | | 305 184 |
| Greece | 2 504 | 2 509 | 2 504 | 2 504 | | 2 504 |
| Hungary | 2 017 | 2 017 | 2 017 | 2 017 | | 2 017 |
| Ireland | 37 563 | 35 373 | 17 101 | 34 348 | | 37 563 |
| Iceland | 34 | 34 | 34 | 34 | | 34 |
| Italy | 61 438 | 64 169 | 60 899 | 61 202 | | 61 438 |
| Liechtenstein | 2 756 | 2 756 | 21 | 2 756 | | 2 756 |
| Lithuania | 204 | 232 | 204 | 204 | | 204 |
| Luxembourg | 10 093 | 9 281 | 0 | 9 252 | | 10 093 |
| Latvia | 53 | 76 | 53 | 53 | | 53 |
| Malta | 214 | 217 | 209 | 214 | | 214 |
| The Netherlands | 26 437 | 26 437 | 26 437 | 26 437 | | 26 437 |
| Norway | 9 838 | 9 944 | 9 838 | 9 838 | | 9 838 |
| Poland | 6 743 | 6 742 | 6 742 | 6 742 | | 6 743 |
| Portugal | 9 205 | 9 112 | 9 111 | 9 112 | | 9 205 |
| Romania | 415 | 415 | 415 | 415 | | 415 |
| Sweden | 12 985 | 12 985 | 12 985 | 12 985 | | 12 985 |
| Slovenia | 443 | 443 | 443 | 443 | | 443 |
| Slovakia | 848 | 848 | 848 | 848 | | 848 |
| Cross-border scheme | | | 33 639 | 3 442 | | |
| Pan-EEA scheme | | | | | 769 296 | |

Table 4.7: Input parameters (EAD and δ) under different policy options, life business line, all EEA countries, 2007 data (EAD in m€)

| Name | δ | EAD | | | | | |
|---|---|---|---|---|---|---|---|
| | | Home | Host | Domestic + single cross-border (branches and FPS) | Domestic + single cross-border (branches only) | Pan-EU/EEA | Home state principle; pure compensation |
| Austria | 0.12 | 58 188 | 58 028 | 58 028 | 58 028 | | 53 452 |
| Belgium | 0.14 | 168 163 | 166 891 | 164 380 | 166 012 | | 152 592 |
| Bulgaria | 0.12 | 203 | 203 | 203 | 203 | | 183 |
| Cyprus | 0.18 | 2 717 | 2 367 | 1 904 | 2 268 | | 2 564 |
| Czech Republic | 0.15 | 6 544 | 7 415 | 6 528 | 6 530 | | 5 448 |
| Germany | 0.05 | 765 180 | 772 985 | 761 114 | 763 568 | | 736 269 |
| Denmark | 0.07 | 118 090 | 117 390 | 117 243 | 117 390 | | 112 060 |
| Estonia | 0.33 | 509 | 237 | 237 | 237 | | 464 |
| Spain | 0.05 | 164 938 | 164 938 | 164 938 | 164 938 | | 153 808 |
| Finland | 0.21 | 37 099 | 34 487 | 34 487 | 34 487 | | 34 770 |
| France | 0.08 | 1 189 627 | 1 181 346 | 1 180 195 | 1 181 346 | | 1 114 114 |
| United Kingdom | 0.06 | 2 034 005 | 2 034 070 | 2 034 005 | 2 034 005 | | 1 898 896 |
| Greece | 0.10 | 7 630 | 7 645 | 7 630 | 7 630 | | 6 897 |
| Hungary | 0.05 | 5 282 | 5 282 | 5 282 | 5 282 | | 4 651 |
| Ireland | 0.08 | 147 444 | 138 848 | 67 126 | 134 825 | | 136 608 |
| Iceland | 0.35 | 147 | 147 | 147 | 147 | | 111 |
| Italy | 0.11 | 389 126 | 406 424 | 385 715 | 387 632 | | 364 670 |
| Liechtenstein | 0.03 | 0 | 0 | 0 | 0 | | 0 |
| Lithuania | 0.12 | 525 | 598 | 525 | 525 | | 449 |
| Luxembourg | 0.02 | 76 571 | 70 414 | 0 | 70 189 | | 69 366 |
| Latvia | 0.28 | 83 | 119 | 83 | 83 | | 70 |
| Malta | 0.20 | 1 293 | 1 310 | 1 260 | 1 291 | | 1 148 |
| The Netherlands | 0.11 | 266 317 | 266 317 | 266 317 | 266 317 | | 252 736 |
| Norway | 0.23 | 79 468 | 80 324 | 79 468 | 79 468 | | 73 074 |
| Poland | 0.18 | 17 059 | 17 056 | 17 056 | 17 056 | | 14 664 |
| Portugal | 0.14 | 40 297 | 39 891 | 39 886 | 39 891 | | 37 423 |
| Romania | 0.05 | 781 | 781 | 781 | 781 | | 678 |
| Sweden | 0.10 | 191 510 | 191 510 | 191 510 | 191 510 | | 161 984 |
| Slovenia | 0.21 | 2 041 | 2 041 | 2 039 | 2 041 | | 1 677 |
| Slovakia | 0.14 | 2 299 | 2 299 | 2 299 | 2 299 | | 2 007 |
| Cross-border scheme | | | | 182 750 | 37 157 | | |
| Pan-EEA scheme | | | | | | 5 773 137 | |

Table 4.8: Premiums covered under different policy options, in terms of gross premiums written, non-life business line, all EEA countries, 2007 data (m€)

| | Gross premiums written | | | | | | |
|---|---|---|---|---|---|---|---|
| | Home | Host | Domestic + single cross-border (branches and FPS) | Domestic + single cross-border (branches only) | Pan-EU/EEA | Home state principle; pure compensation | Home state principle; compensation (including unearned premiums) |
| Austria | 5 851 | 5 825 | 5 825 | 5 825 | | 5 851 | 5 851 |
| Belgium | 5 707 | 5 402 | 4 766 | 4 908 | | 5 707 | 5 707 |
| Bulgaria | 234 | 234 | 234 | 234 | | 234 | 234 |
| Cyprus | 173 | 173 | 166 | 166 | | 173 | 173 |
| Czech Republic | 1 304 | 1 325 | 1 301 | 1 301 | | 1 304 | 1 304 |
| Germany | 69 579 | 69 835 | 68 456 | 68 651 | | 69 579 | 69 579 |
| Denmark | 5 114 | 4 259 | 4 158 | 4 259 | | 5 114 | 5 114 |
| Estonia | 75 | 80 | 75 | 75 | | 75 | 75 |
| Spain | 19 198 | 19 198 | 19 198 | 19 198 | | 19 198 | 19 198 |
| Finland | 1 920 | 1 920 | 1 911 | 1 920 | | 1 920 | 1 920 |
| France | 49 297 | 46 864 | 46 611 | 46 864 | | 49 297 | 49 297 |
| United Kingdom | 46 243 | 48 573 | 46 243 | 46 243 | | 46 243 | 46 243 |
| Greece | 1 032 | 1 060 | 1 032 | 1 032 | | 1 032 | 1 032 |
| Hungary | 712 | 712 | 712 | 712 | | 712 | 712 |
| Ireland | 3 865 | 2 491 | 437 | 2 023 | | 3 865 | 3 865 |
| Iceland | 189 | 189 | 187 | 189 | | 189 | 189 |
| Italy | 17 014 | 17 609 | 16 620 | 16 844 | | 17 014 | 17 014 |
| Liechtenstein | 43 | 38 | -2 | 38 | | 43 | 43 |
| Lithuania | 122 | 127 | 120 | 121 | | 122 | 122 |
| Luxembourg | 1 014 | 1 039 | 417 | 976 | | 1 014 | 1 014 |
| Latvia | 171 | 165 | 164 | 164 | | 171 | 171 |
| Malta | 240 | 251 | 49 | 238 | | 240 | 240 |
| The Netherlands | 43 725 | 43 725 | 43 725 | 43 725 | | 43 725 | 43 725 |
| Norway | 2 341 | 4 035 | 2 120 | 2 335 | | 2 341 | 2 341 |
| Poland | 1 890 | 1 890 | 1 890 | 1 890 | | 1 890 | 1 890 |
| Portugal | 2 356 | 2 341 | 2 340 | 2 341 | | 2 356 | 2 356 |
| Romania | 629 | 629 | 629 | 629 | | 629 | 629 |
| Sweden | 7 331 | 7 331 | 7 331 | 7 331 | | 7 331 | 7 331 |
| Slovenia | 803 | 803 | 803 | 803 | | 803 | 803 |
| Slovakia | 313 | 310 | 310 | 310 | | 313 | 313 |
| Cross-border scheme | | | 10 615 | 7 135 | | | |
| Pan-EEA scheme | | | | | 288 442 | | |

Table 4.9: Input parameters (EAD and δ) under different policy options, non-life business line, all EEA countries, 2007 data (EAD in m€)

| Name | δ | EAD | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Home | Host | Domestic + single cross-border (branches and FPS) | Domestic + single cross-border (branches only) | Pan-EU/EEA | Home state principle; pure compensation | Home state principle; compensation (including unearned premiums) |
| Austria | 0.14 | 10 984 | 10 936 | 10 936 | 10 936 | | 6 459 | 7 131 |
| Belgium | 0.09 | 19 236 | 18 209 | 16 067 | 16 545 | | 15 334 | 15 334 |
| Bulgaria | 0.05 | 212 | 212 | 212 | 212 | | 155 | 175 |
| Cyprus | 0.07 | 344 | 344 | 329 | 329 | | 250 | 250 |
| Czech Republic | 0.02 | 1 877 | 1 907 | 1 872 | 1 873 | | 1 184 | 1 184 |
| Germany | 0.05 | 248 637 | 249 552 | 244 626 | 245 321 | | 209 563 | 212 693 |
| Denmark | 0.01 | 10 074 | 8 390 | 8 191 | 8 390 | | 6 865 | 6 915 |
| Estonia | 0.25 | 101 | 108 | 101 | 101 | | 58 | 61 |
| Spain | 0.06 | 50 081 | 50 081 | 50 081 | 50 081 | | 37 017 | 38 195 |
| Finland | 0.20 | 7 888 | 7 888 | 7 850 | 7 888 | | 5 588 | 5 711 |
| France | 0.07 | 168 067 | 159 770 | 158 909 | 159 770 | | 119 558 | 127 721 |
| United Kingdom | 0.07 | 103 562 | 108 780 | 103 562 | 103 562 | | 77 512 | 79 616 |
| Greece | 0.05 | 1 693 | 1 738 | 1 693 | 1 693 | | 1 352 | 1 360 |
| Hungary | 0.03 | 340 | 340 | 340 | 340 | | 86 | 86 |
| Ireland | 0.01 | 13 425 | 8 653 | 1 519 | 7 027 | | 12 288 | 12 288 |
| Iceland | 0.17 | 650 | 650 | 644 | 650 | | 329 | 368 |
| Italy | 0.13 | 32 622 | 33 763 | 31 866 | 32 296 | | 22 441 | 23 959 |
| Liechtenstein | 0.04 | 0 | 0 | 0 | 0 | | 0 | 0 |
| Lithuania | 0.06 | 157 | 164 | 155 | 156 | | 93 | 105 |
| Luxembourg | 0.03 | 3 558 | 3 645 | 1 464 | 3 425 | | 2 449 | 2 545 |
| Latvia | 0.08 | 191 | 184 | 183 | 183 | | 147 | 147 |
| Malta | 0.13 | 589 | 616 | 120 | 585 | | 340 | 354 |
| The Netherlands | 0.09 | 82 629 | 82 629 | 82 629 | 82 629 | | 48 165 | 48 165 |
| Norway | 0.21 | 7 803 | 13 450 | 7 068 | 7 782 | | 5 890 | 5 933 |
| Poland | 0.24 | 3 490 | 3 490 | 3 490 | 3 490 | | 2 465 | 2 657 |
| Portugal | 0.14 | 4 992 | 4 960 | 4 958 | 4 960 | | 3 986 | 4 109 |
| Romania | 0.03 | 646 | 646 | 646 | 646 | | 375 | 495 |
| Sweden | 0.16 | 53 695 | 53 695 | 53 695 | 53 695 | | 26 205 | 27 256 |
| Slovenia | 0.24 | 1 455 | 1 455 | 1 455 | 1 455 | | 495 | 797 |
| Slovakia | 0.23 | 496 | 492 | 490 | 492 | | 361 | 366 |
| Cross-border scheme | | | | 34 345 | 22 982 | | | |
| Pan-EEA scheme | | | | | | 829 493 | | |

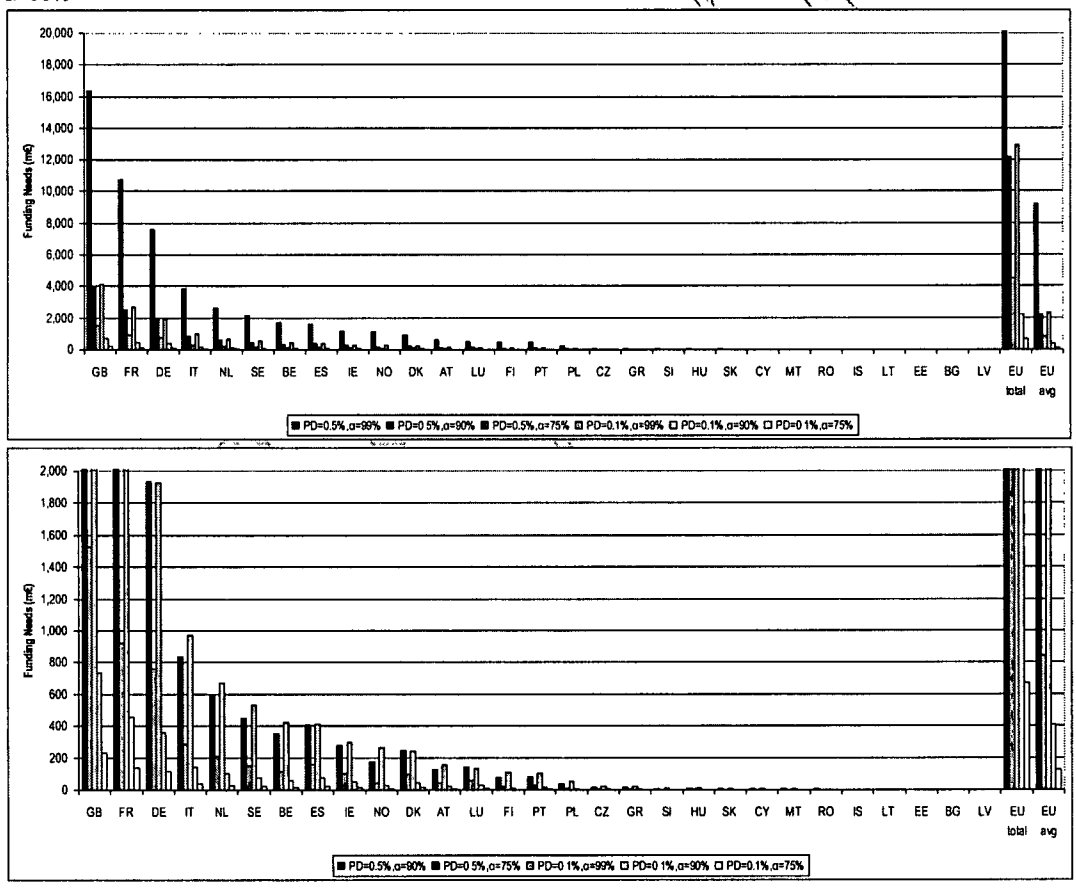
## 4.2 *Using the host state rather than the home state principle*

Under this option an IGS should be put in place in each Member State using the host state principle to determinate the policies covered. In this case the total premiums covered can be calculated using totals under national supervision plus the branches of EU/EEA countries operating in the country minus branches from the country operating in other EU/EEA or in non-EU/EEA countries.

As no data is available for the calculation of a different δ under different policy options, δ is kept constant in these estimates, while total premiums and EAD are adjusted.

### 4.2.1 Total insurance

Figure 4.1: IGS funding needs for the total insurance sector based on the host state principle for different confidence levels and default probabilities, all EEA countries, EU total and average, countries in order of funding needs; the top figure indicates funding needs; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%




The funding needs obtained for this policy option are then compared with those obtained under the home state principle. As δ has been kept constant across policy options, the probability distribution of losses remains unchanged in the two cases. This leads to a constant relative impact for each country and each choice of PD and α when moving from the home state to the host state principle. Relative differences in funding needs at country level are shown in Figure 4.2 and Table 4.10. Differences in the EU totals are presented in Table 4.14.

Figure 4.2: Relative difference between funding needs when moving from the home state principle to the host state principle, total insurance sector, all EEA countries, countries in order of gross premiums written.

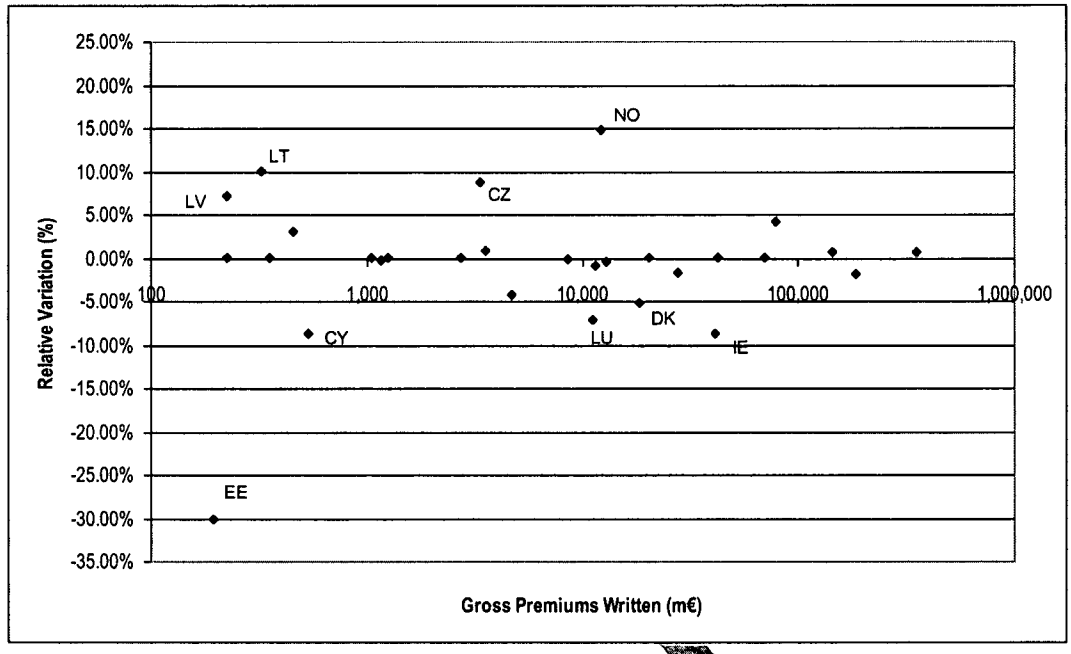



Table 4.10: Summary of relative differences between funding needs when moving from the home state principle to the host state principle, EU average and minimum, median and maximum across all EEA countries; total insurance sector

| MIN | | MEDIAN | | MAX | | EU avg |
|---|---|---|---|---|---|---|
| -30.00% | EE | 0.00% | NL | 14.78% | NO | 0.29% |

### 4.2.2 Life insurance

Figure 4.3: IGS funding needs for the life business line based on the host state principle for different confidence levels and default probabilities, all EEA countries, EU total and average, countries in order of funding needs; the top figure indicates funding needs; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

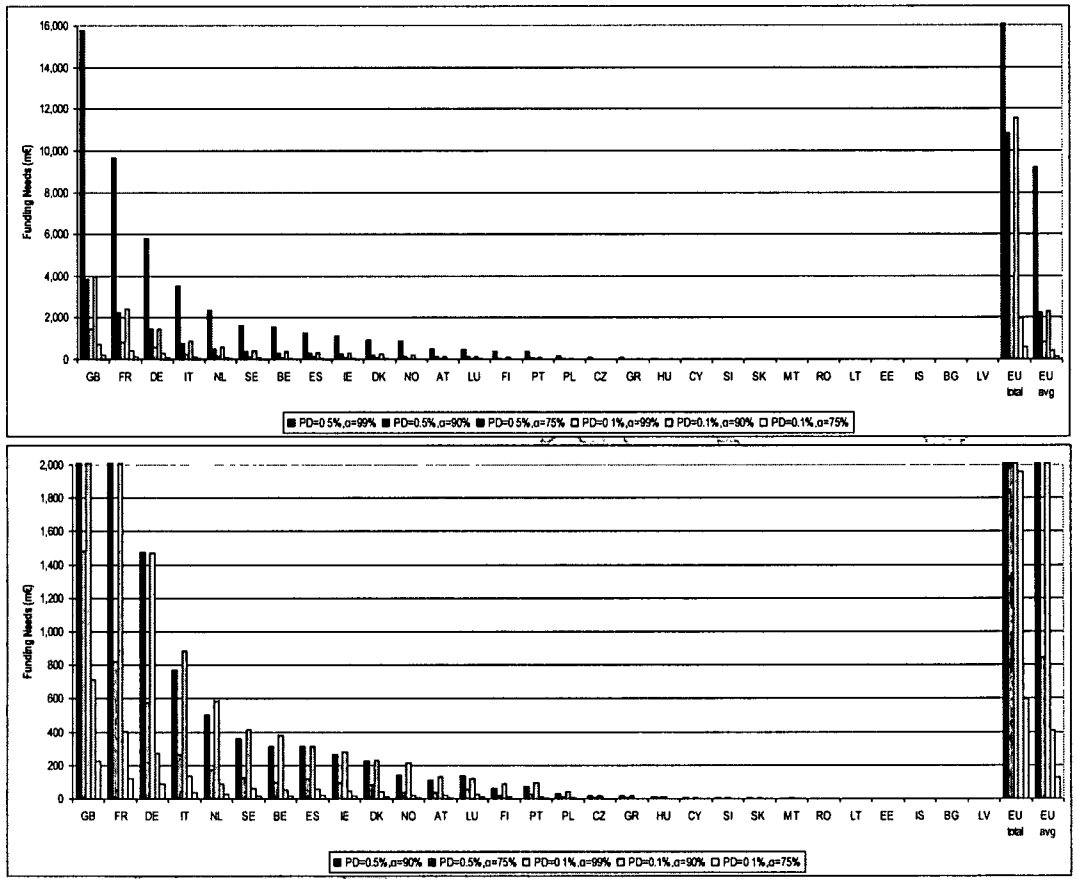


Figure 4.4: Relative difference between funding needs when moving from the home state principle to the host state principle, life business line; all EEA countries; countries in order of gross premiums written in the life business line

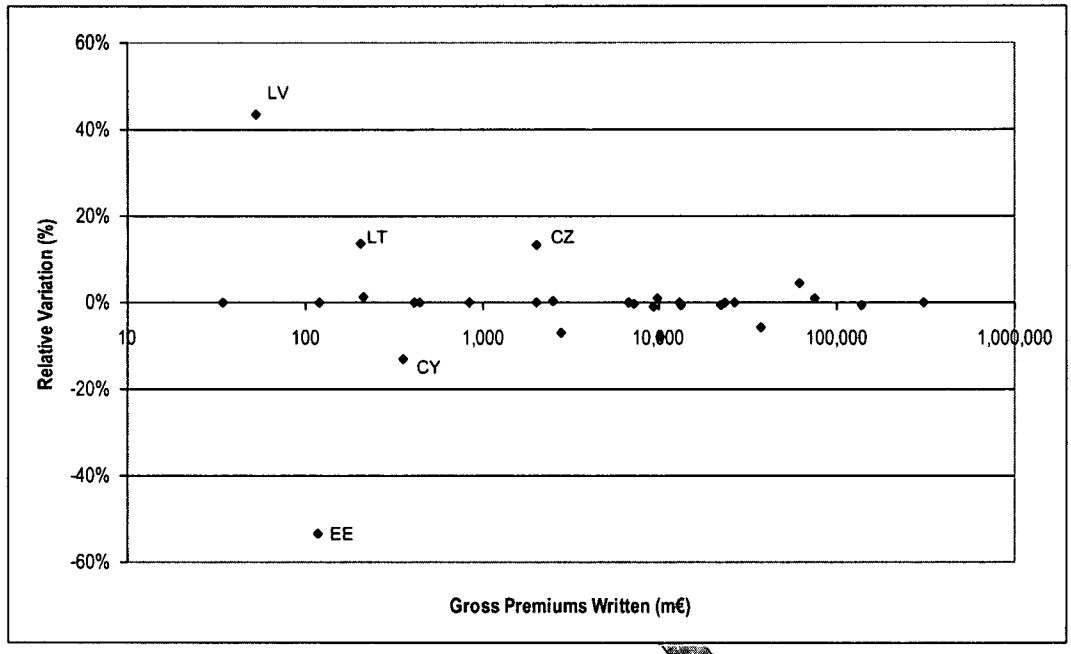
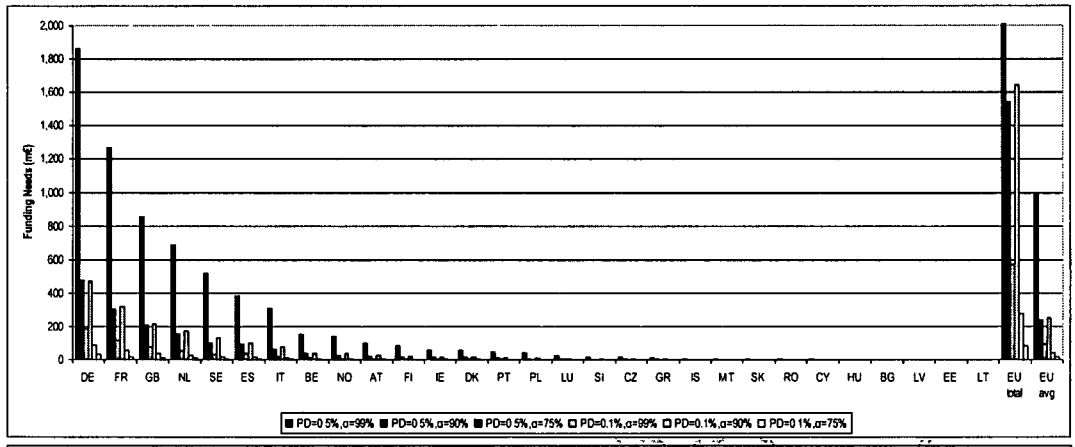



Table 4.11: Summary of relative differences between funding needs when moving from the home state principle to the host state principle; EU average and minimum, median and maximum across all EEA countries; life business line

| MIN | | MEDIAN | | MAX | | EU avg |
|---|---|---|---|---|---|---|
| -53.39% | EE | 0.00% | NL | 43.40% | LV | 0.14% |

### 4.2.3 Non-life insurance

Figure 4.5: IGS funding needs for the non-life business line based on the host state principle for different confidence levels and default probabilities, all EEA countries, EU total and average, countries in order of funding needs; the top figure indicates funding needs; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%



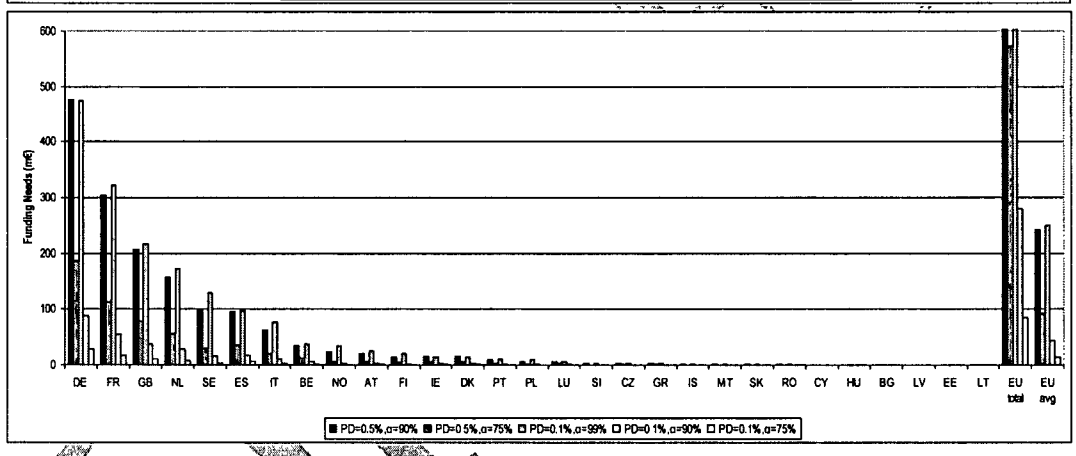



Figure 4.6: Relative difference between funding needs when moving from the home state principle to the host state principle, non-life business line, all EEA countries, countries in order of gross premiums written in the non-life business line

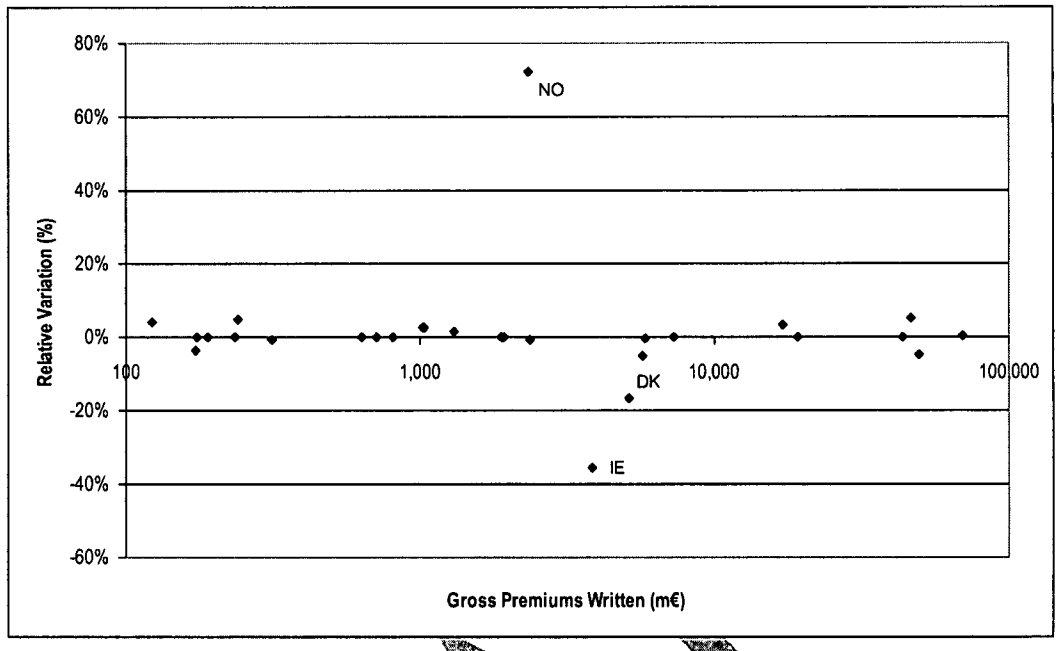



Table 4.12: Summary of relative differences between funding needs when moving from the home state principle to the host state principle; EU average and minimum, median and maximum across all EEA countries; non-life business line

| MIN | | MEDIAN | | MAX | | EU avg |
|---|---|---|---|---|---|---|
| -35.54% | IE | 0.00% | NL | 72.36% | NO | 0.04% |

### 4.2.4 Summary of statistics at EU level

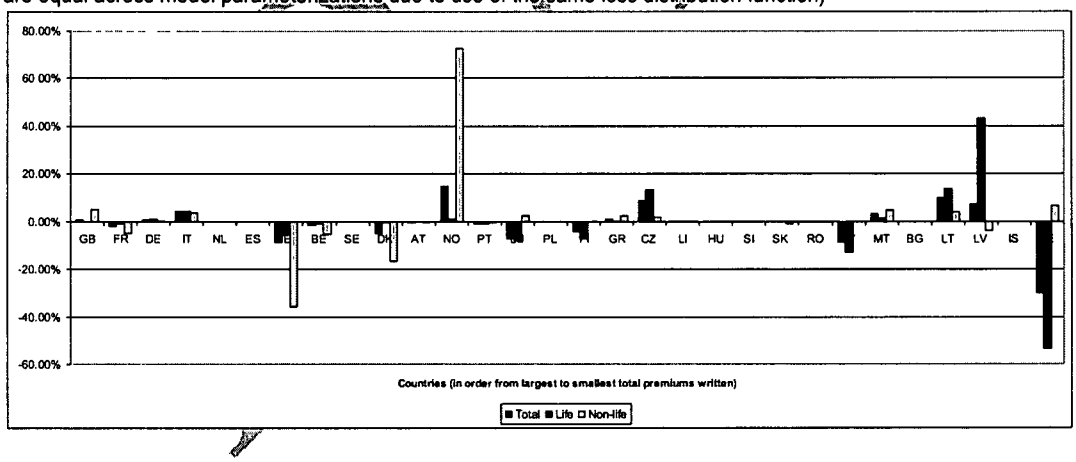
Table 4.13: Average funding needs at EU level based on the host state principle under different probabilities of default and confidence levels; weighted averages by gross premiums written for the total insurance sector and the life and non-life business lines (in m€)

| | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|
| α → | 75% | 90% | 99% | 75% | 90% | 99% |
| Total insurance (EU) | 840 | 2 229 | 9 177 | 126 | 407 | 2 323 |
| Life (EU) | 841 | 2 232 | 9 194 | 126 | 407 | 2 327 |
| Non-life (EU) | 92 | 242 | 986 | 14 | 44 | 250 |

Table 4.14: Total funding needs at EU level and relative variations in funding needs when moving from the home state principle to the host state principle under different probabilities of default and confidence levels for the total insurance sector and the life and non-life business lines (in m€)

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| Total insurance (EU) | Funding needs under home | 4 529 | 12 213 | 51 477 | 673 | 2 209 | 13 001 |
| | Funding needs under host | 4 516 | 12 180 | 51 345 | 671 | 2 203 | 12 968 |
| | Relative variation | -0.28% | -0.27% | -0.26% | -0.29% | -0.27% | -0.26% |
| Life (EU) | Funding needs under home | 4 010 | 10 833 | 45 751 | 595 | 1 958 | 11 554 |
| | Funding needs under host | 4 008 | 10 828 | 45 733 | 595 | 1 957 | 11 549 |
| | Relative variation | -0.05% | -0.04% | -0.04% | -0.06% | -0.05% | -0.04% |
| Non-life (EU) | Funding needs under home | 580 | 1 559 | 6 577 | 86 | 282 | 1 660 |
| | Funding needs under host | 573 | 1 543 | 6 519 | 85 | 279 | 1 645 |
| | Relative variation | -1.14% | -1.02% | -0.89% | -1.23% | -1.08% | -0.89% |

Figure 4.7: Relative difference between funding needs when moving from the home state principle to the host state principle for the total insurance sector and the life and non-life business lines, for all EEA countries (relative differences are equal across model parameterizations due to use of the same loss distribution function)



## 4.3 Setting up an EU-wide IGS covering cross-border activity (branches and FPS)

This section analyses the possibility of introducing an IGS in each Member State, covering all domestic activity[22], supplemented by an additional pan-EU scheme covering all cross-border activities, including those conducted under the freedom to provide services (FPS). Under this option the premiums covered by the national schemes covering domestic activity are obtained by starting from the total premiums under national supervision and subtracting premiums from branches, in both EU/EEA and non-EU/EEA countries and from activities conducted under the FPS[23].

Once the funding needs under the domestic activity principle are calculated, the funding needs for the additional cross-border IGS are obtained by adding up the differences between the funding needs based on the home state principle across all countries and the funding needs based on the domestic activity principle[24].

Note that the data available for Luxembourg on the life business line indicate domestic activity equal to zero. Again, due to lack of data for recalculation of δ under this policy option, the values of this parameter have been kept constant at to the values presented in section 2.

Under the assumption that there will be no appreciable diversification effects obtained by pooling the cross-border fraction at EU level the total amount of funds payable to the two funds (the domestic and the EU-wide) at country level will stay the same. As a consequence, the EU-level variation in funding needs due to introduction of this additional IGS can be obtained by adding up the individual differences across Member States.



[22] The definition of home, host and domestic activities are presented in Table 4.3.

[23] As explained in section 4.1, CEIOPS data do not provide separate data for cross-border activities within the EU and within the wider EEA. For this reason the EEA is taken as the basis for the calculations referring to this option.

[24] The implicit assumptions are that the single correlation factor in the model operates at country level only (decreasing the estimated funding needs for the additional scheme) and that no appreciable diversification effects are obtained by pooling the cross-border fraction at EU level (increasing the estimated funding needs for the additional scheme).

### 4.3.1 Total insurance

Figure 4.8: IGS funding needs for the total insurance sector under a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, for different confidence levels and default probabilities, all EEA countries, EU total and average, countries in order of funding needs; the top figure indicates funding needs; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

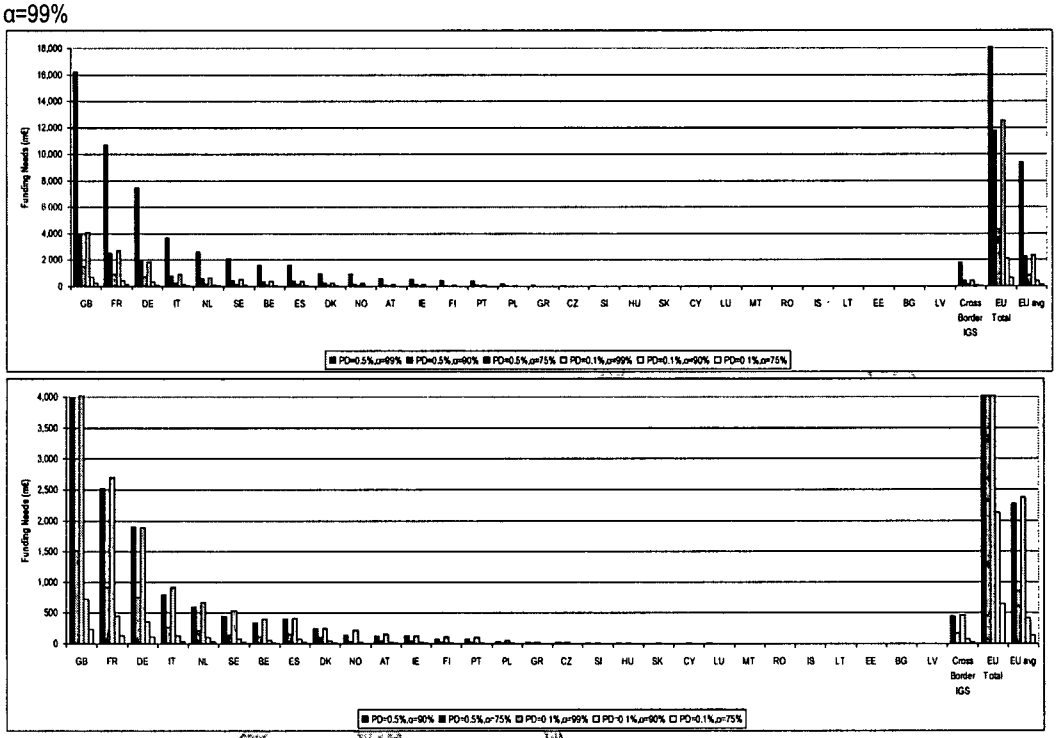



Figure 4.9: Absolute difference between funding needs when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, total insurance sector; all EEA countries; countries in order of funding needs (the sum of all the differences at country level gives the funding needs for the additional cross-border scheme)

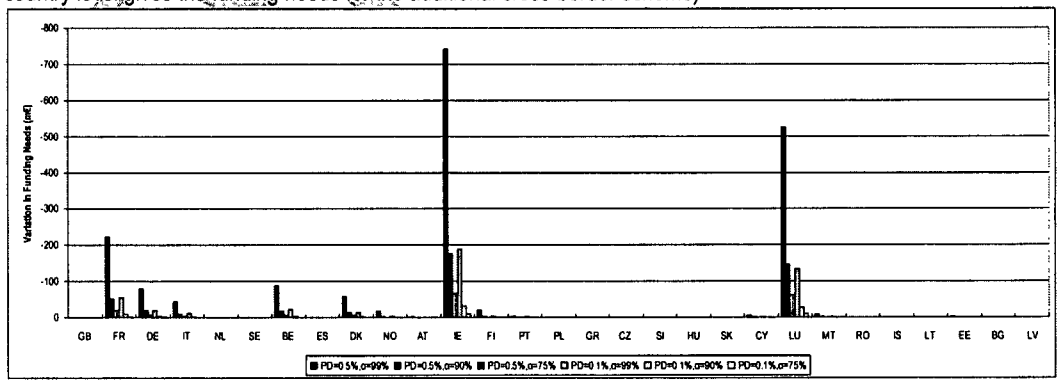


Figure 4.10: Relative difference between funding needs at country level when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, total insurance sector; all EEA countries; countries in order of gross premiums written

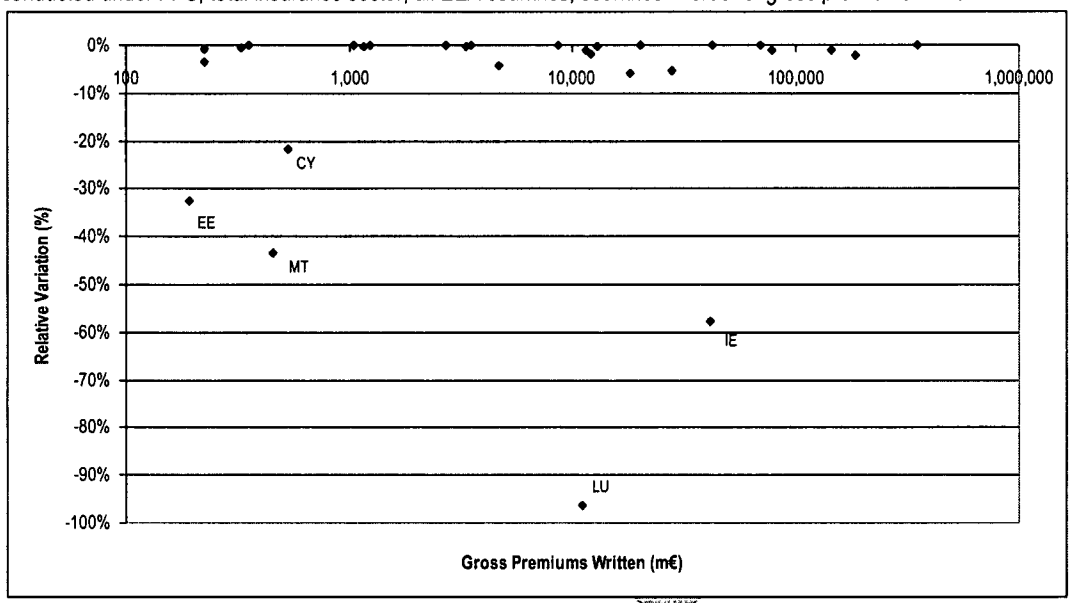



Table 4.15: Summary of relative difference between funding needs at country level when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS; EU average and minimum, median and maximum across all EEA countries; total insurance sector

| MIN | | MEDIAN | | MAX | | EU avg |
|---|---|---|---|---|---|---|
| -96.24% | LU | -0.78% | IS | 0.00% | GB | 2.84% |

### 4.3.2 Life insurance

Figure 4.11: IGS funding needs for the life business line under a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, for different confidence levels and default probabilities, all EEA countries, EU total and average, countries in order of funding needs; the top figure indicates funding needs; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

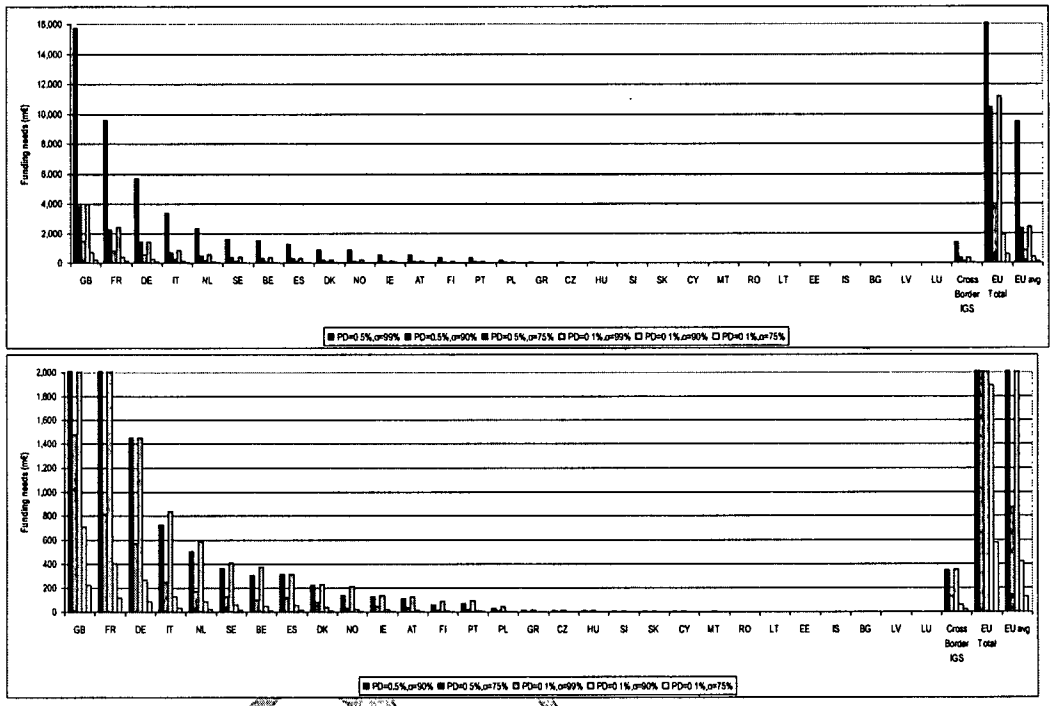



Figure 4.12: Absolute difference between funding needs when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, life business line; all EEA countries, countries in order of funding needs (the sum of all the differences at country level gives the funding needs for the additional cross-border scheme)

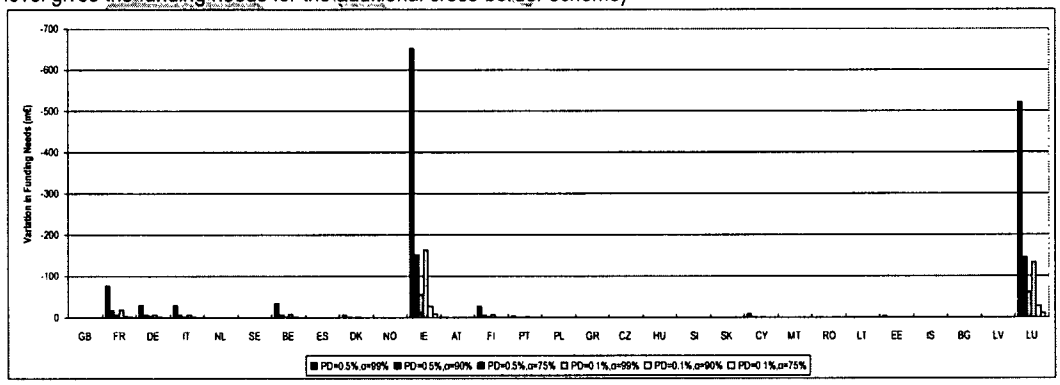


Figure 4.13: Relative difference between funding needs at country level when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, life business line; all EEA countries; countries in order of gross premiums written

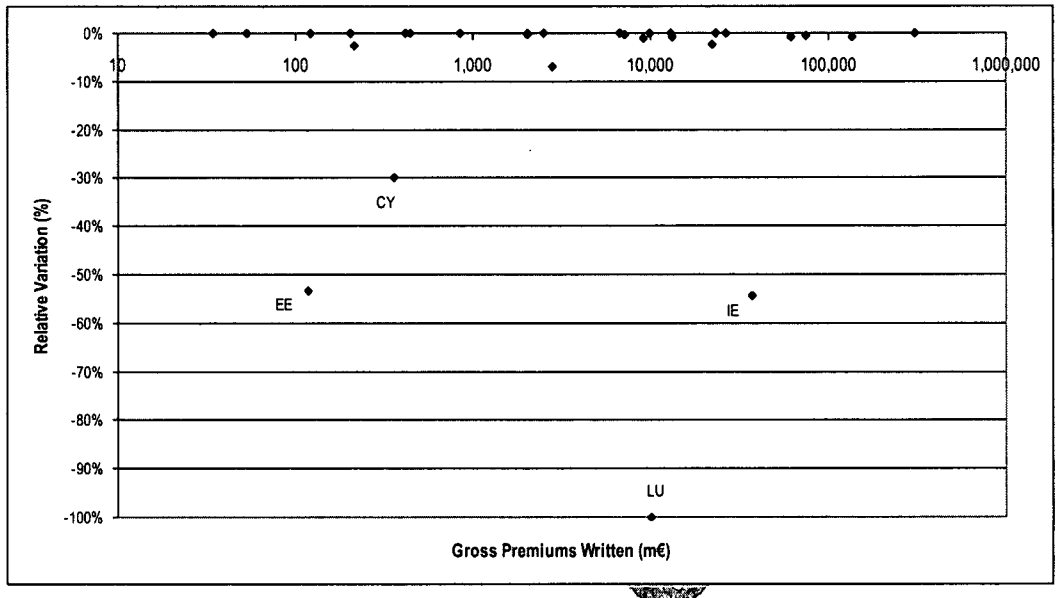



Table 4.16: Relative difference between funding needs at country level when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS; EU average and minimum, median and maximum across all EEA countries; life business line

| MIN | | MEDIAN | | MAX | | EU avg |
|---|---|---|---|---|---|---|
| -100.00% | LU | -0.09% | SI | 0.00% | GR | -3.93% |

### 4.3.3 Non-life insurance

Figure 4.14: IGS funding needs for the non-life insurance business line under a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, for different confidence levels and default probabilities, all EEA countries, plus EU total, EU average and cross-border IGS, countries in order of funding needs; the top figure indicates funding needs; the bottom figure reproduces the top figure with the exclusion of the case PD=0.5% and α=99%

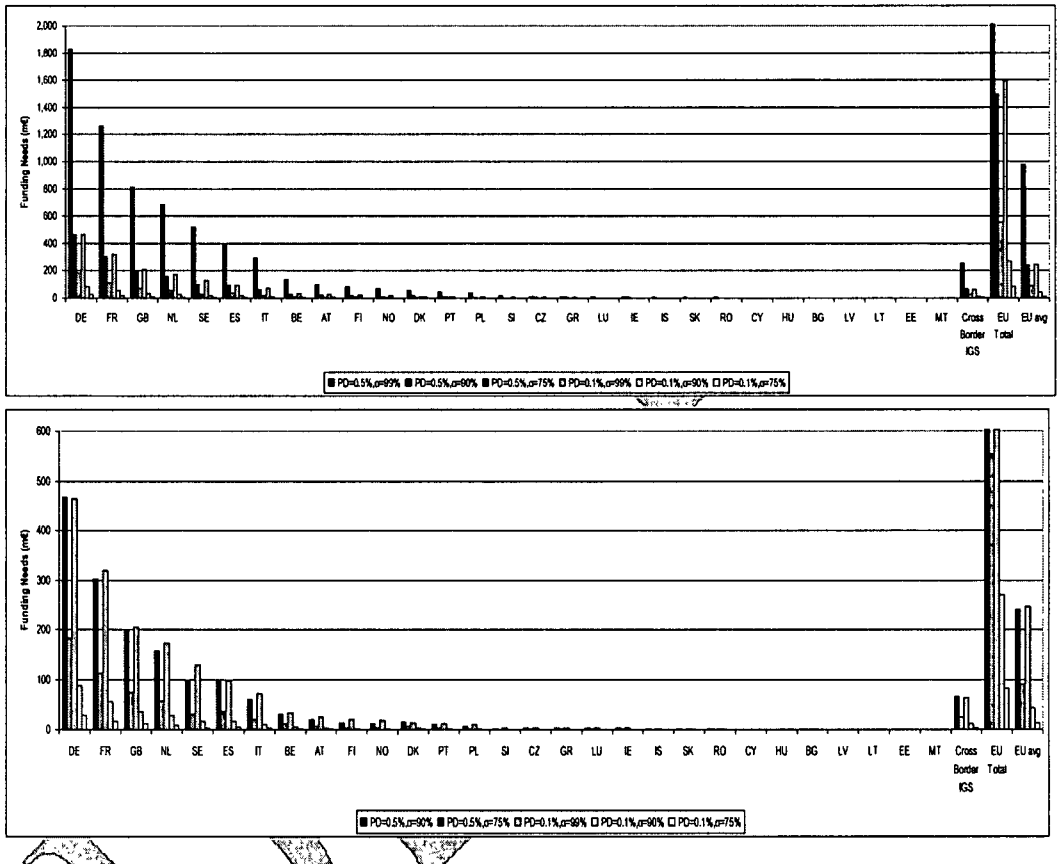



Figure 4.15: Relative difference between funding needs when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, non-life business line; all EEA countries; countries in order of funding needs (the sum of all the differences at country level gives the funding needs for the additional cross-border scheme)

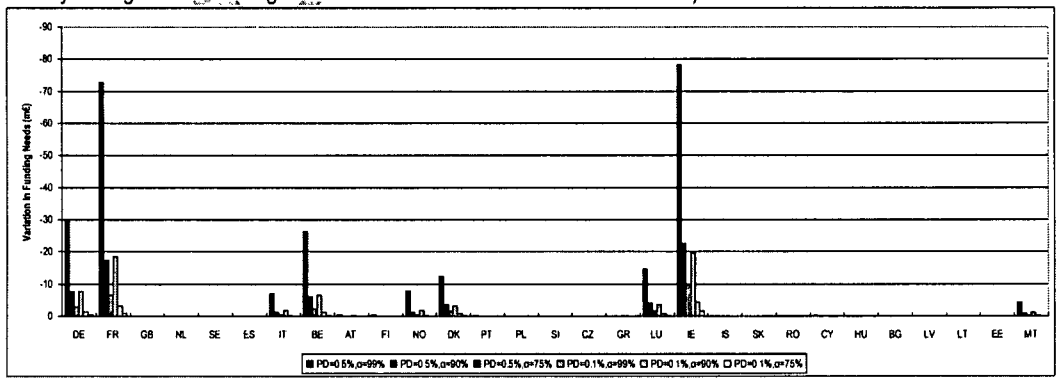


Figure 4.16: Relative difference between funding needs at country level when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, non-life business line; all EEA countries; countries in order of gross premiums written

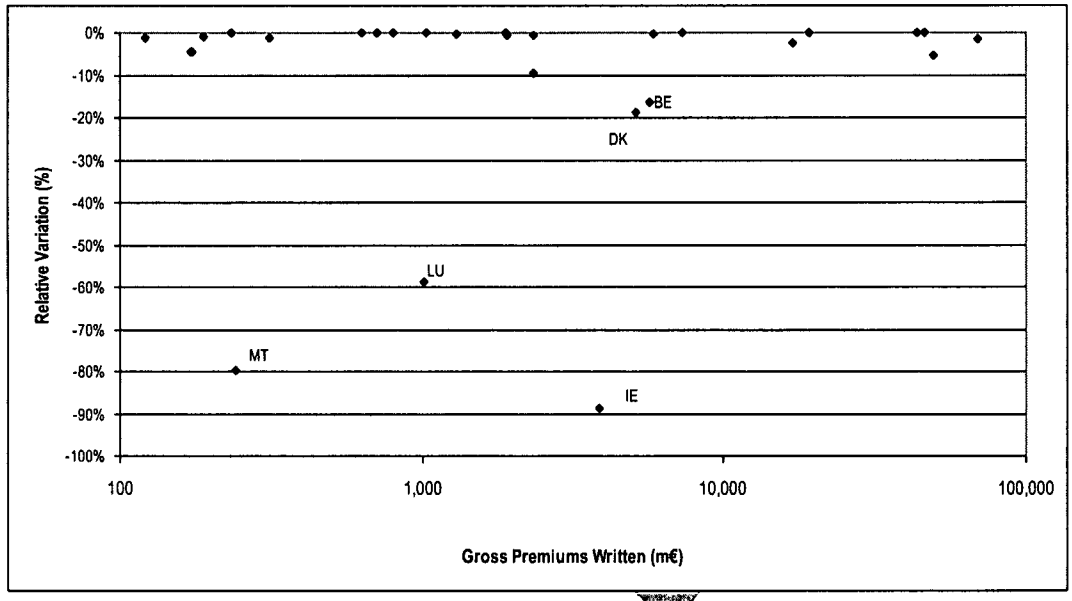



Table 4.17: Summary of relative differences between funding needs at country level when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS; EU average and minimum, median and maximum across all EEA countries; non-life business line

| MIN | | MEDIAN | | MAX | | EU avg |
|---|---|---|---|---|---|---|
| -88.69% | IE | -0.68% | PT | 0.00% | GB | -0.69% |

### 4.3.4 Summary of statistics at EU level

Table 4.18: Average funding needs at EU level under a domestic activity regime excluding all cross-border activities; under different probabilities of default and confidence levels; weighted averages by gross premiums written, for the total insurance sector and the life and non-life business lines (in m€)

| | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|
| α → | 75% | 90% | 99% | 75% | 90% | 99% |
| Total insurance (EU) | 860 | 2 280 | 9 385 | 129 | 416 | 2 376 |
| Life (EU) | 874 | 2 317 | 9 542 | 131 | 423 | 2 415 |
| Non-life (EU) | 91 | 240 | 978 | 14 | 44 | 248 |

Table 4.19: Total funding needs at EU level and relative variations in funding needs when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS; under different probabilities of default and confidence levels for the total insurance sector and the life and non-life business lines (in m€)

| | | PD = 0.5% | | | PD=0.1% | | |
|---|---|---|---|---|---|---|---|
| | α → | 75% | 90% | 99% | 75% | 90% | 99% |
| Total insurance (EU) | Funding needs under home | 4 529 | 12 213 | 51 477 | 673 | 2 209 | 13 001 |
| | Funding needs under domestic | 4 357 | 11 766 | 49 673 | 647 | 2 127 | 12 545 |
| | Relative difference | -3.80% | -3.66% | -3.51% | -3.90% | -3.72% | -3.51% |
| | Funding needs for cross-border IGS | 172 | 447 | 1 804 | 26 | 82 | 457 |
| Life (EU) | Funding needs under home | 4 010 | 10 833 | 45 751 | 595 | 1 958 | 11 554 |
| | Funding needs under domestic | 3 876 | 10 486 | 44 352 | 575 | 1 894 | 11 200 |
| | Relative difference | -3.34% | -3.20% | -3.06% | -3.45% | -3.26% | -3.06% |
| | Funding needs for cross-border IGS | 134 | 347 | 1 399 | 21 | 64 | 354 |
| Non-life (EU) | Funding needs under home | 580 | 1 559 | 6 577 | 86 | 282 | 1 660 |
| | Funding needs under domestic | 554 | 1 495 | 6 330 | 82 | 270 | 1 597 |
| | Relative difference | -4.39% | -4.09% | -3.76% | -4.60% | -4.22% | -3.78% |
| | Funding needs for cross-border IGS | 25 | 64 | 247 | 4 | 12 | 63 |

Figure 4.17: Relative difference between funding needs when moving from the home state principle to a domestic activity regime supplemented by an additional IGS covering all cross-border activities, including those conducted under FPS, for the total insurance sector and the life and non-life business lines, for all EEA countries (relative differences are equal across model parameterisations due to use of the same loss distribution function)