



# CRO Forum QIS4 Benchmarking Study

October 30, 2008



\* Associate Member

## **Agenda**

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**Introduction**

**Executive Summary**

**Solo Analysis**

**Group Analysis**

## **Background and objectives**

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### **Background**

- The CRO Forum companies have developed internal capital models, which they expect to be approved by the regulators as a basis for setting the level of target capital (“SCR”). The CRO Forum companies have also participated in QIS4.
- The CRO Forum asked Towers Perrin to repeat the benchmarking study for QIS4. The benchmarking was undertaken through a comparison of the results of internal models and those resulting from the QIS4 submissions from CRO Forum members, both for solo entities and for groups.

### **Objectives**

The objectives of the study are as follows:

- Compare the capital requirements produced by CRO Forum members’ internal models with those calculated according to the standard approach defined for QIS4.
- Obtain insight into the causes for differences between the standard approach under QIS4 and internal models.
- Identify any inherent conservatism/optimism in the QIS4 calibration, or potential problems in methodologies proposed by the Commission.

## Process

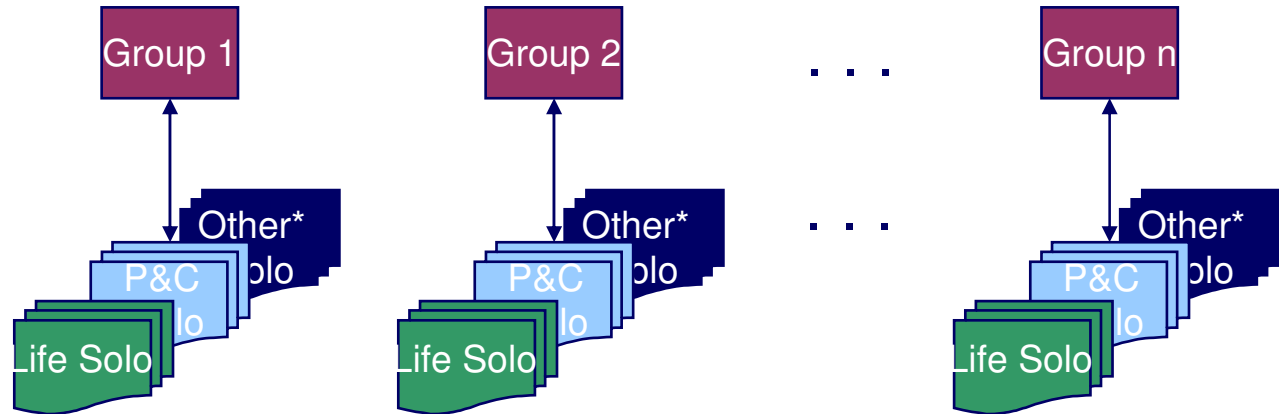
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- CRO Forum members recalibrated their internal model results to 1 year Value-at-Risk based on a 99.5% confidence interval i.e. a consistent basis was used for comparison with QIS4.
- The QIS4 results and internal model results were submitted to the Austrian Financial Market Authority (FMA) on behalf of CEIOPS for aggregation and analysis before being transmitted to Towers Perrin for analysis. The intention of this process was to ensure the confidentiality of the data.
- In order to protect confidentiality, no data is shown for individual companies. In general we have shown averages across companies, risks and countries, weighted by the corresponding measures.
- Furthermore, results are only shown if at least 3 companies submitted data for a particular segment of business (e.g. a specific country could have less than 3 material CRO Forum companies). In those cases where no results are shown for a particular segment these results are nevertheless used for later aggregation of results (e.g. across all countries).

# Data flow

**1 CRO Forum**

- Template completed by CRO Forum companies
- Submissions include data on
  - QIS4
  - Internal Models



**2 FMA**

- Data Check and Anonymization
- Data Aggregation and Analysis

At least 3 companies had to submit reliable data for it to be grouped in a particular segment

**3 Towers Perrin**

- Data Analysis and Interpretation

	B	CEE	F	GER	I	NL	SP	UK	EEA	Non-EEA	Other**	Total
Group									Group	Group	Group	Group
Life	Life Solo	Life Solo	Life Solo	Life Solo	Life Solo	Life Solo	Life Solo	Life Solo	Life Solo			
P&C and Other	P&C Solo	P&C Solo	P&C Solo	P&C Solo	P&C Solo	P&C Solo	P&C Solo	P&C Solo	P&C Other*			

\* Health insurer and Reinsurer

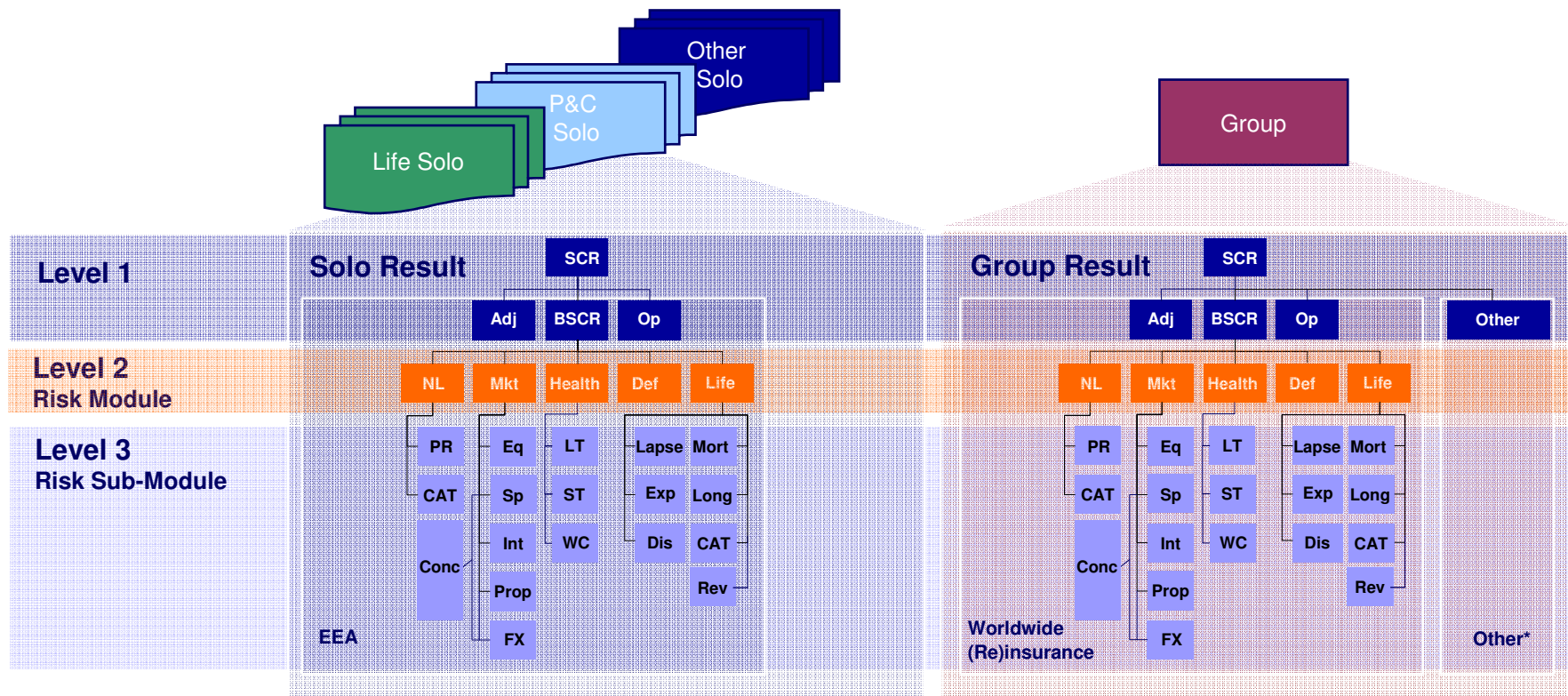
\*\* Other financial sectors and non-controlled participations

## **Classification for analysis**

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- Solo-entity and group results are analysed at three different levels – we follow the QIS4 terminology and approach for ease of comparison.
- The three different levels are set up as follows:
  - Level 1 consists of the top level results such as
    - Required Capital
    - Basic Solvency Capital Requirement (“BSCR”)
    - Operational Risk
  - Level 2 consists of the major Risk Modules
    - Underwriting Risks (Life, Non-Life, Health)
    - Market
    - Counterparty Default
  - The most granular level are the Risk Sub-Modules on level 3 which are aggregated to the Risk Modules.
- This is illustrated on the following page.

# Solo-entity and group results are analysed at three different levels



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- Other financial sector entities
- Non-controlled participations

## Further explanations on the analysis exhibited

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- Unless otherwise stated, the analysis shows following results:
  - All results include the risk absorbing properties of future profit sharing (also referred to as “Net“ risk charge);
  - Any risk (sub-)modules charges are on a pre-tax basis (i.e. excluding any tax adjustment such as the  $Adj_{DT}$  from QIS4)
  - Aggregate results across all risk modules such as the total Required Capital (i.e. SCR in QIS4) or the Eligible Capital are on a post-tax basis;
  - The solo analysis is based on data which is not adjusted for intra-group transactions.
- Please note that sample sizes are not always the same in each analysis part. This creates some inconsistencies because companies were not always able to provide all of the required inputs.
- Analysis, especially for the more granular risk sub-modules, was sometimes based on smaller sample sizes leading to higher variability of results.
- Where we show results of “All segments“, results for the following segments are included:
  - Life insurer
  - P&C insurer
  - Reinsurer
  - Health insurer
  - Composite (life and non-life)
  - Captive



# How to read the analysis

[Type of business]

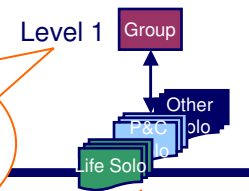
[Type of comparison]

Type of business:

- Solo Life
- Solo P&C
- Solo Other
- Group

Level of Analysis:

- 1 - Top Level
- 2 - Risk Modules
- 3 - Risk-Sub-Modules



Short description of ratio considered

■ [measure considered]

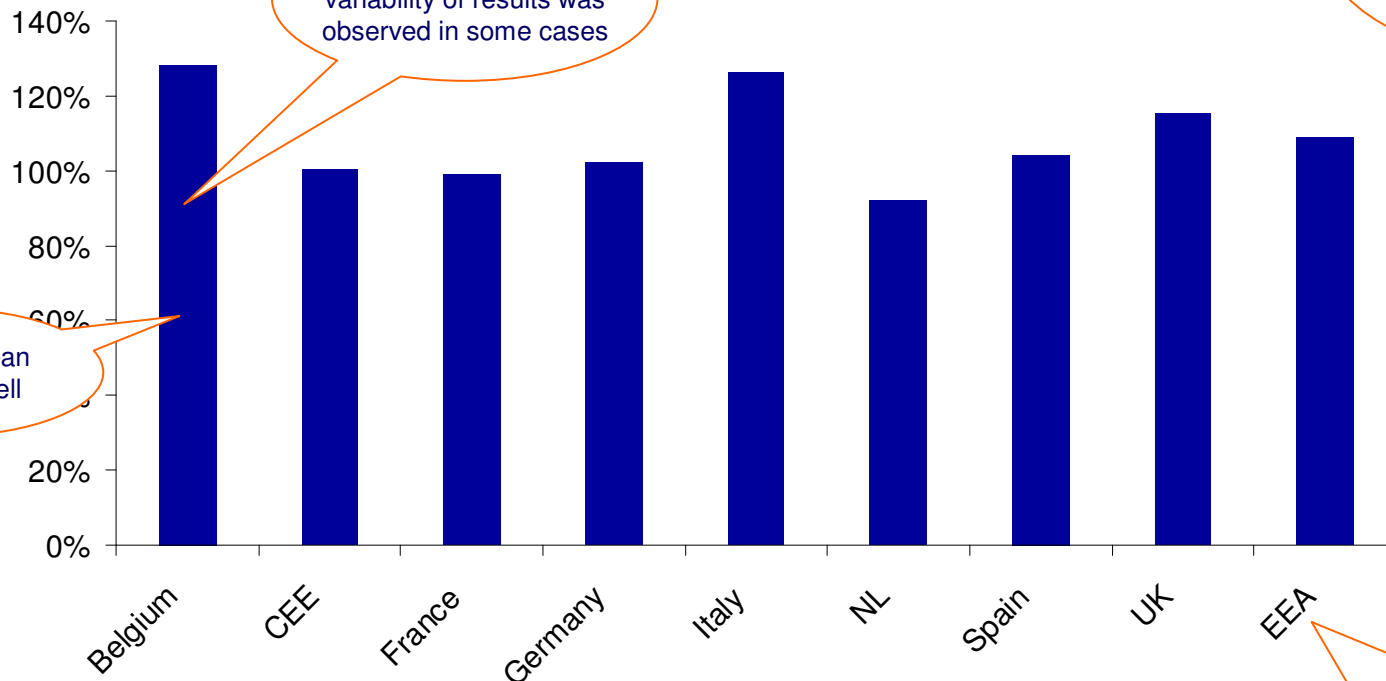
More detailed description of measure considered

Quick reference to what type of business is analyzed:

- Solo Life
- Solo P&C
- Solo Other
- Group

Significant variability of results was observed in some cases

Weighted mean in country cell



■ [comment 1]

■ [comment 2]

Comment box

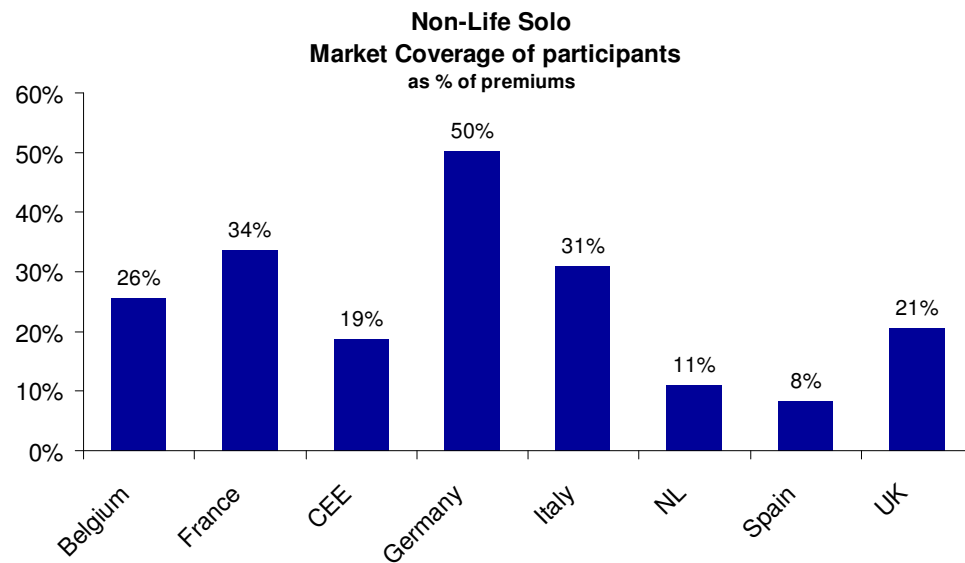
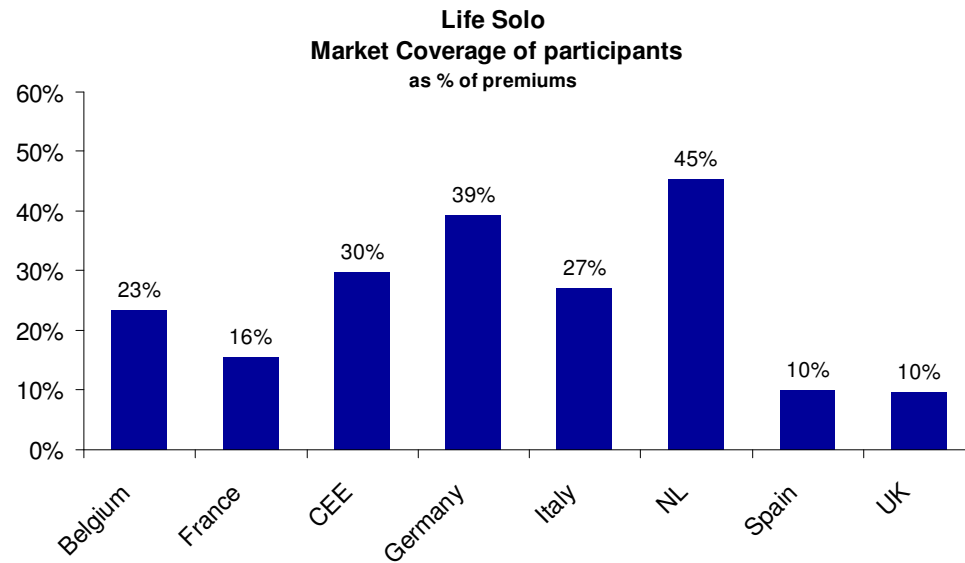
EEA includes weighted mean of all solo data, including those not passed the rule of 3

## **Participation/coverage**

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- A total of 135 solo entities were included in the study across 16 EU countries (QIS3 Benchmarking Study captured 84 solo entities).
- These submissions cover approximately one-fifth of the European insurance premiums.
- Group submissions were received from 15 groups, of which 9 groups submitted internal model results (QIS3 Benchmarking Study captured 7 groups).
- On a stand-alone basis, Composites and Captives were excluded due to a low volume of participations. However, both Composites and Captives are included on an overall segment basis (“All segments”).

## In aggregate, the study covers about one-fifth of the European solo business



Segment	Number of firms
Life insurer	70
Property & Casualties insurer	43
Composite (Life and non-life)	5
Health insurer	9
Reinsurance	7
Captive	1
<b>TOTAL</b>	<b>135</b>

Source: Submissions from participating companies and CEA market statistics.

Further countries for which submissions were received include Austria, Greece, Ireland, Luxembourg and Portugal.

For CEE, submissions were obtained from Hungary, Poland, Romania and Slovakia.

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**Group Analysis**

## Executive Summary - Key conclusions

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### Solo

- Although the overall differences between QIS4 and internal models have reduced compared to QIS3, there are a number of concerns about the consistency of the calibration.
- The consistency issues identified with the calibration of QIS4 are as follows:
  - There are higher capital requirements for market risks in internal models compared to QIS4, mainly caused by less severe stress tests for equity risk in QIS4 but also by neglecting implied volatility risk in QIS4.
  - QIS4 requirements for underwriting risks appear to be more onerous than those of internal models in aggregate, but the level of conservatism in QIS4 is not uniformly distributed across all underwriting risks. E.g. reserve risk volatilities in QIS4 are in almost all lines of business significantly above those of internal models.
  - The QIS4 requirements for standalone operational risk are significantly lower than in internal models. In contrast to many internal models, QIS4 does not allow for diversification between the operational risk capital requirements and the remaining capital requirements implying high conservatism. However, both differences currently offset each other.
- The allowance for diversification in QIS4 and in Internal Models is similar.
- Risk margins are substantially lower in internal models than in QIS4 due to the lack of allowance for diversification between non-hedgeable risks, lower cost of capital rates in Internal Models and the conservative calibration of underwriting risk capital in QIS4.
- The combined approach to calculating the MCR does not appear to provide a consistent and robust economic assessment, as the cap and floor are applied very frequently.

### Group

- The overall requirements under the Worldwide Consolidated method are similar for internal models and QIS4, which suggests that this method is best aligned with the economic assessment in internal models. Other methods tested in QIS4 do not allow for the proper economic treatment of group diversification effects.

## Executive Summary - Key recommendations

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- The CRO Forum recommends that the calibration be re-examined to incorporate a consistent approach across risks. Whilst the aggregate calibration may give a satisfactory impression, the CRO Forum is concerned that there is too much offsetting between risks, or different levels of conservatism across different risks.
- It is noted that the current calibration may have some unintended consequences:
  - In certain cases there appears no clear incentive, on average, for companies to use an internal model (e.g. market risks).
  - The inconsistent calibration could lead to cherry-picking between (partial) internal models and the standard approach.
- In respect of the approach for setting risk margins for non-hedgeable risks we refer to the principles outlined in our recently published paper on the Market Value of Liabilities for Insurance Firms dated 28 July 2008. In particular, this paper provides an analysis of the cost of capital rate which we believe is appropriate. Also the risk margin should reflect diversification benefits across non-hedgeable risks up to the group level.
- For the calculation of MCR we reiterate our support of a compact approach which fulfills better the objective of robustness.
- The Worldwide Consolidated basis is well aligned with Internal Models and should form the basis for setting group capital requirements.
- Finally, the CRO Forum recommends that CEIOPS should provide more guidance regarding the treatment of taxes, the reflection of constraints to fungibility of capital and future renewal premiums in the Standard Model.

■ The CRO Forum would be happy to work with CEIOPS to provide support in implementing these recommendations, and on any related issues for the Standard Model.

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**Group Analysis**

## Summary of findings – Solo-entity analysis

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- Whilst the aggregate results are reasonably close between QIS4 and Internal Models, **it is incorrect to conclude that the calibration is appropriate**. The aggregate results hide variations by segment, risk sub-modules and by country.
- **Total required capital for the Internal Model amounts to 109% of QIS4 SCR for life insurers and 90% for P&C insurers, with variations by country**. The calibration of the stresses for different risks seems to be the main driver of differences in the results.
- **A comparison between capital charges of internal models with those from the standard approach under QIS4 shows differences by risk module:**
  - The market risk component is higher in internal models than in QIS4; this difference is caused mainly by the higher equity risk stress tests in internal models (and for life insurers also by other risks, such as implied volatility risk, which are not explicitly modelled in QIS4);
  - The underwriting risk capital charges are substantially lower in Internal Models than in QIS4, e.g. the reserve risk volatilities are significantly lower in Internal Models than in QIS4.
- The **QIS4 requirements for standalone operational risk are significantly lower than in internal models. In contrast to many internal models, QIS4 does not allow for diversification between the operational risk capital requirements** and the remaining capital requirements implying high conservatism. However, both difference currently offset each other.
- **Risk margins are significantly lower in internal models than in QIS4**. This may be due to the lower cost of capital rate in Internal Models, the calibration of insurance risk capital and the lack of allowance for diversification between non-hedgeable risks in calculating risk margins. This may result in an **understatement of Available Capital in QIS4** of up to 10%.
- The **caps and floors used to calculate the MCR seem to be applied very frequently**. The cap applied especially for **reinsurers** where even the **average MCR linear was above the cap**. The floor applied especially for **P&C insurers** where even the **average MCR linear was below the floor**. This suggests that the formula used for the MCR does not provide an appropriate and robust economic assessment, and that the caps and floors are required frequently to correct the problem.



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Capital Charges

Top Level Analysis

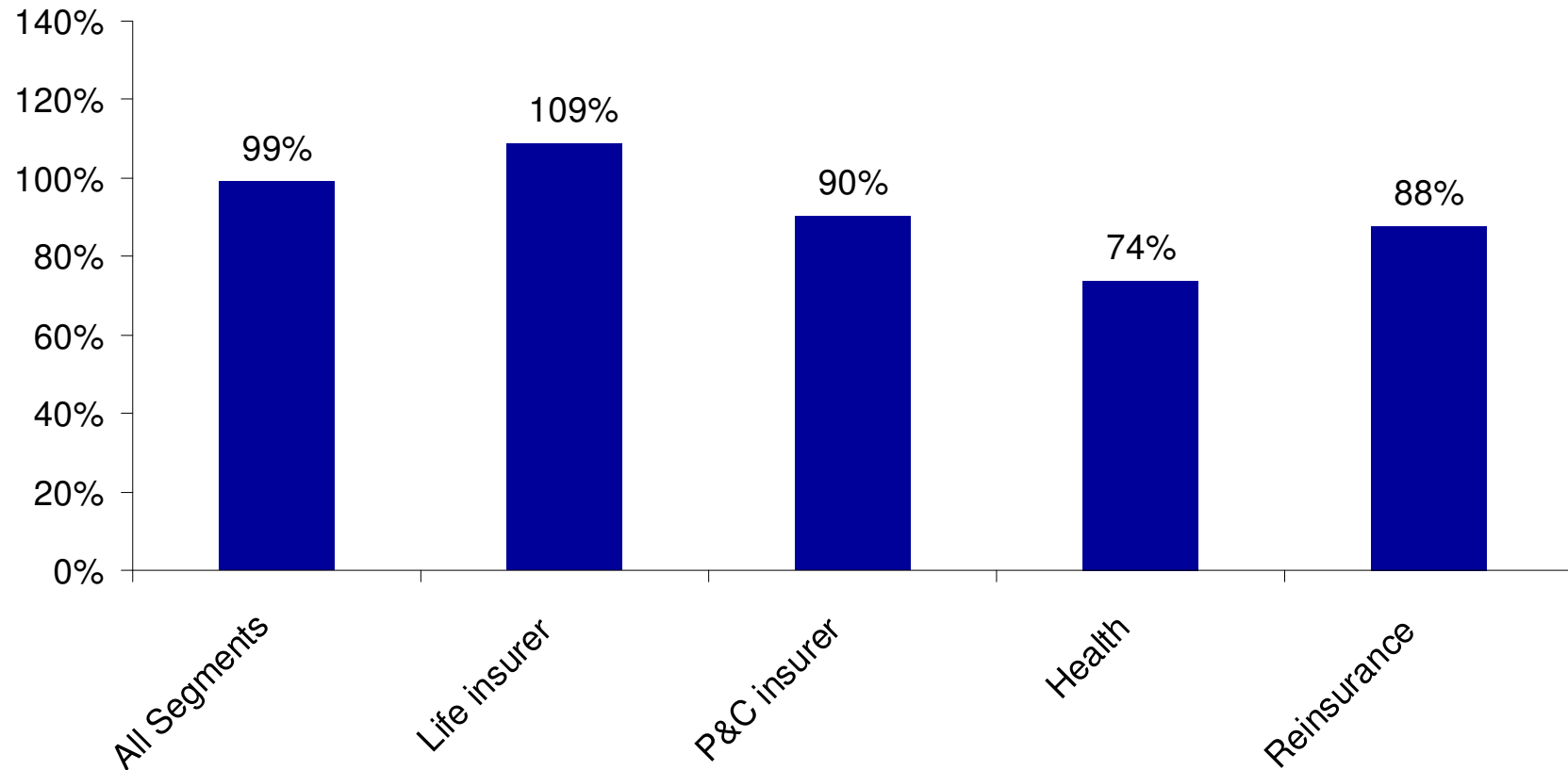
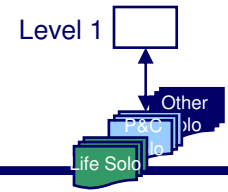
Second and Third Level Analysis

Calibrations

Group Analysis

## Overview Solo

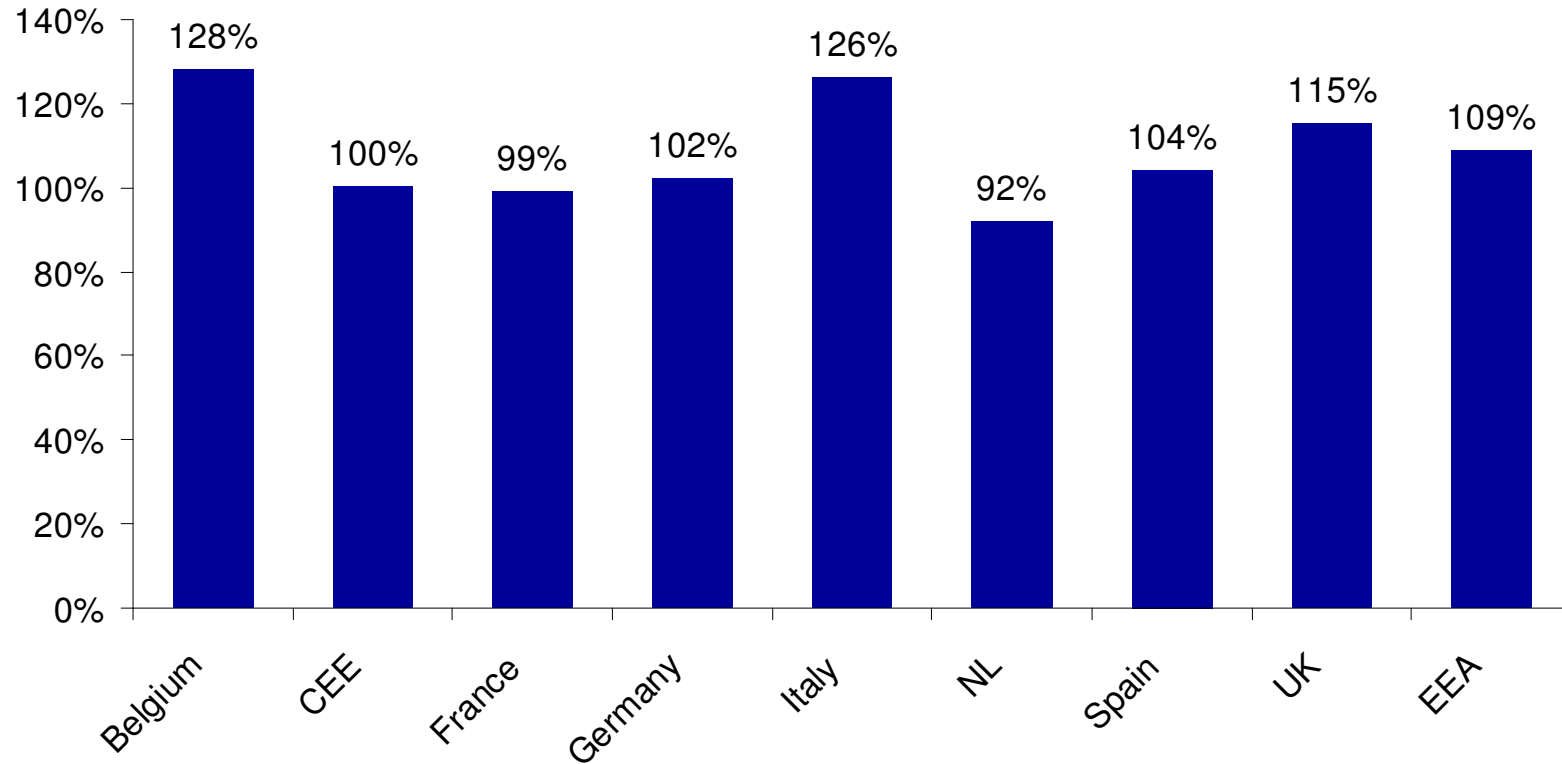
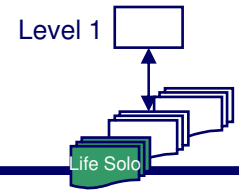
### Internal model Required Capital to QIS4 Required Capital



- QIS4 requirements are close to internal model requirements. Compared to the CRO Forum QIS3 Benchmarking Study, a narrowing of Internal Model requirements compared with QIS3 requirements has been observed.
- As can be seen later, there are higher capital requirements for market risks in internal models compared to QIS4, while QIS4 requirements for life and P&C underwriting risks appear to be more onerous than internal models.

## Solo Life

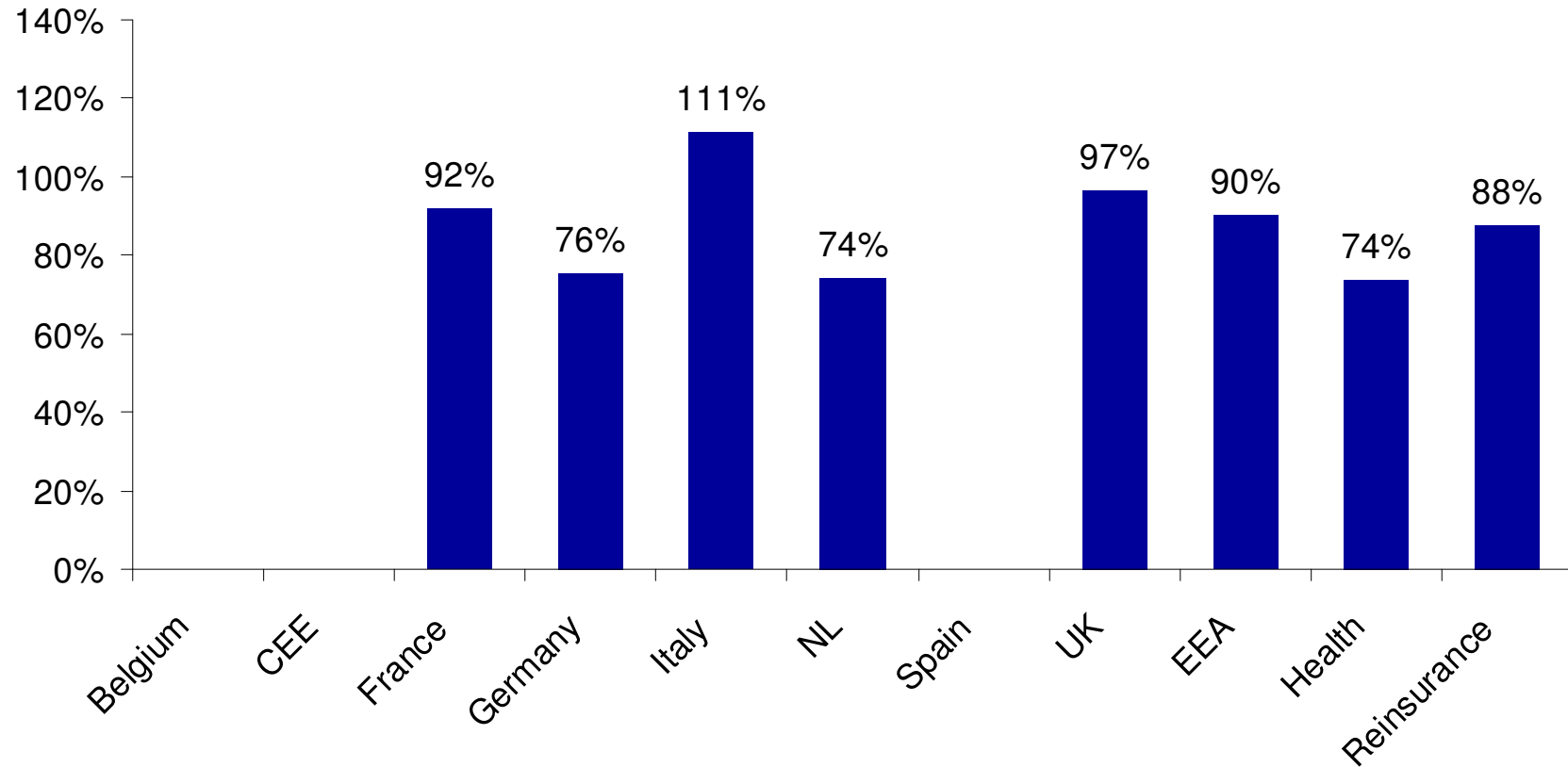
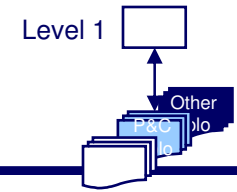
### Internal Model Required Capital to QIS4 Required Capital



- At an EEA level, internal model requirements are generally higher than QIS4 requirements, with some variation by country.
- This appears to be due to the high exposure to Market Risk for life companies, and lower stress tests for Market Risk under QIS4 compared to internal models.

## Solo P&C

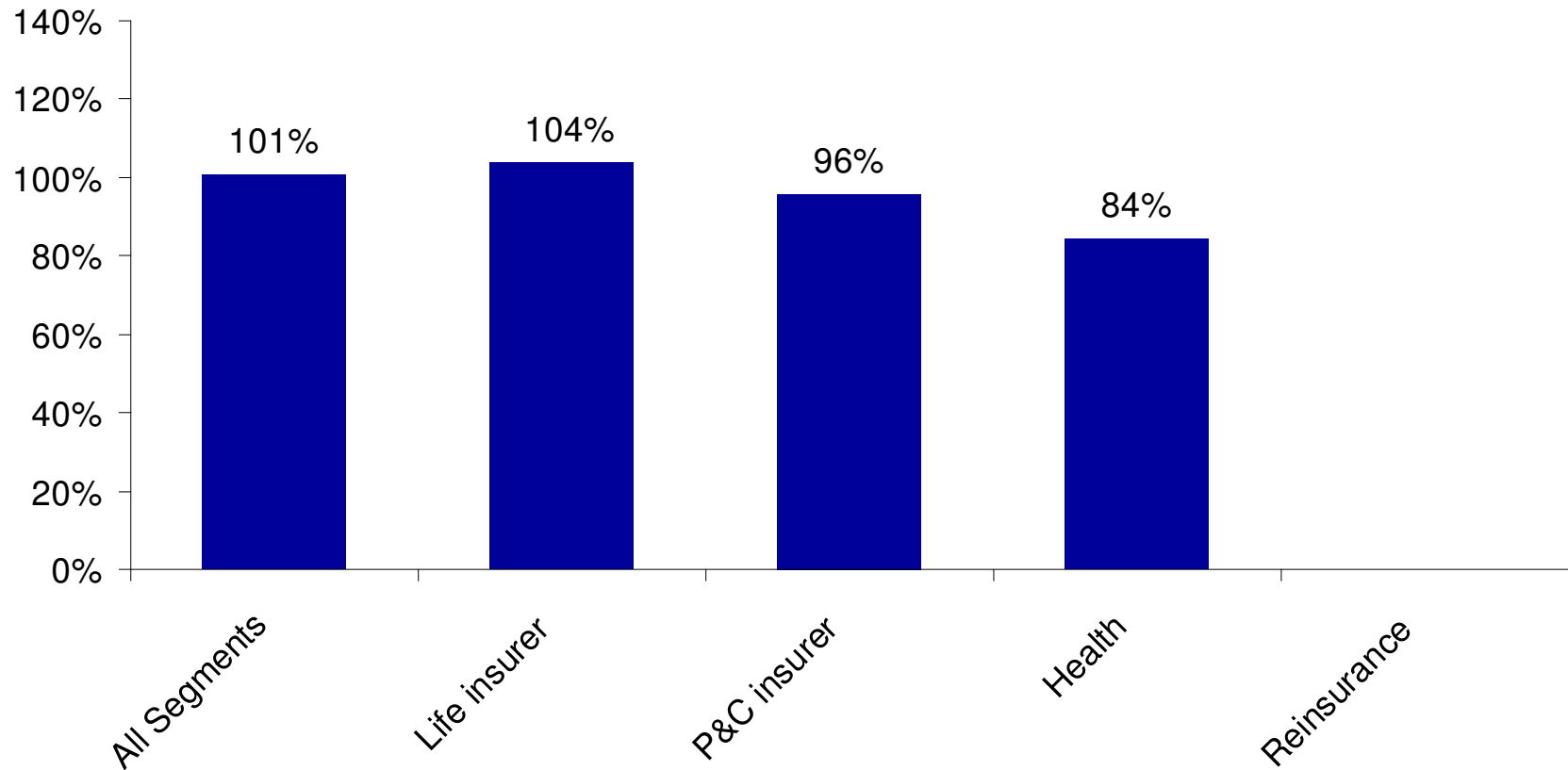
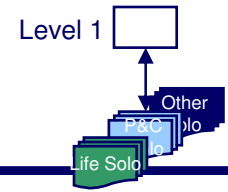
### Internal Model Required Capital to QIS4 Required Capital



- Internal model requirements are generally below QIS4 requirements (except for Italy).
- This suggests that the calibration is conservative, but it varies significantly between countries.

# Overview Solo

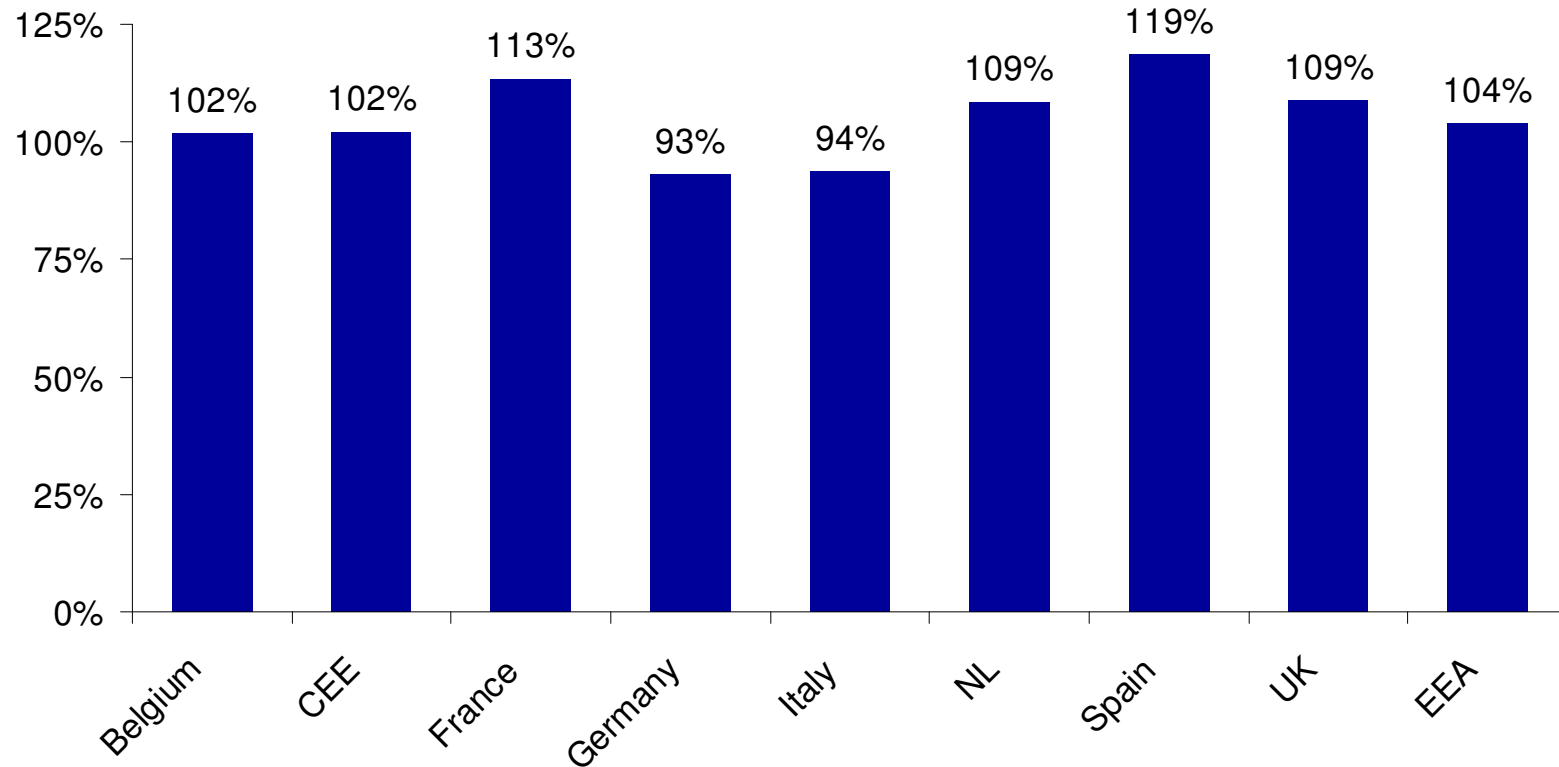
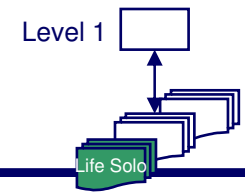
## Internal Model Eligible Capital to QIS4 Eligible Capital



■ Eligible Capital in Internal Models is similar to QIS4, but this hides some variation by segment and - as we will see later - by country.

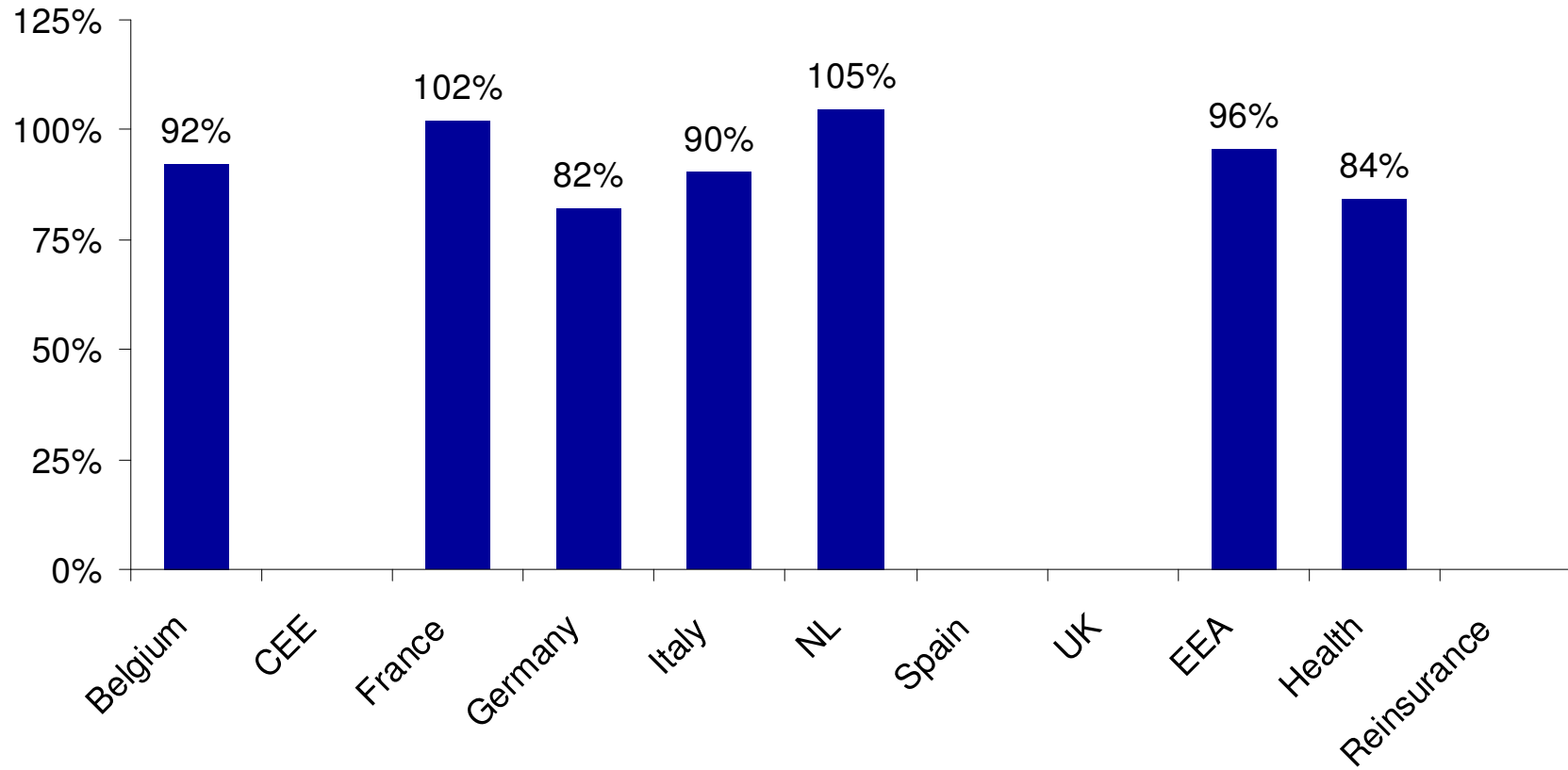
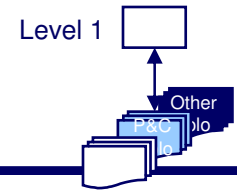
# Solo Life

## Internal Model Eligible Capital to QIS4 Eligible Capital



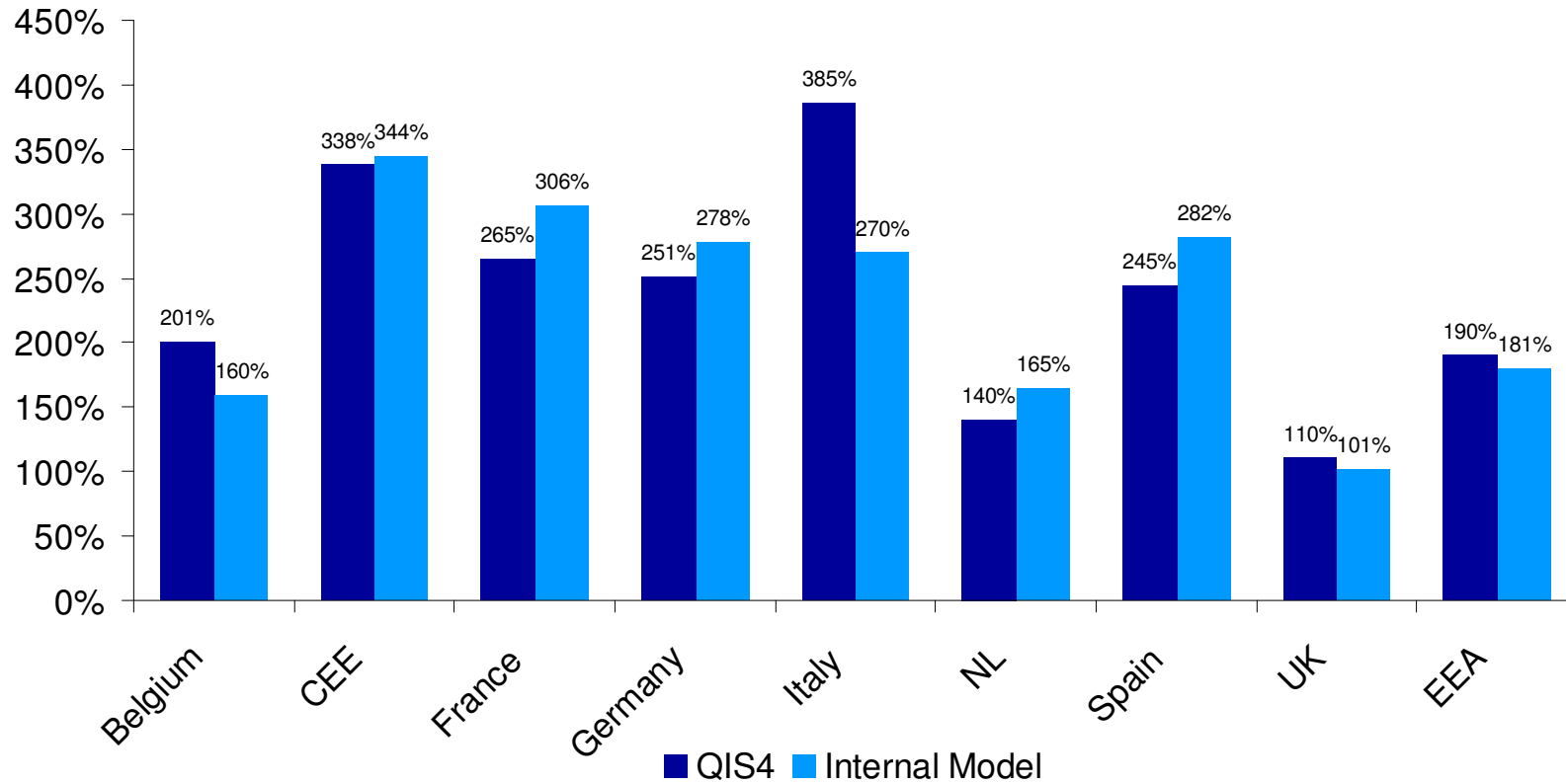
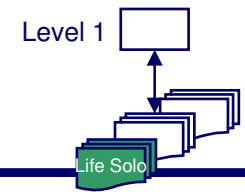
- Eligible Capital in Internal Models is generally higher than in QIS4, possibly due to higher Risk Margins in technical provisions under QIS4 than in internal models.

# Solo P&C and Other Internal Model Eligible Capital to QIS4 Eligible Capital



■ In aggregate for the EEA, the Eligible Capital is similar under QIS4 and Internal Models, but varies across countries.

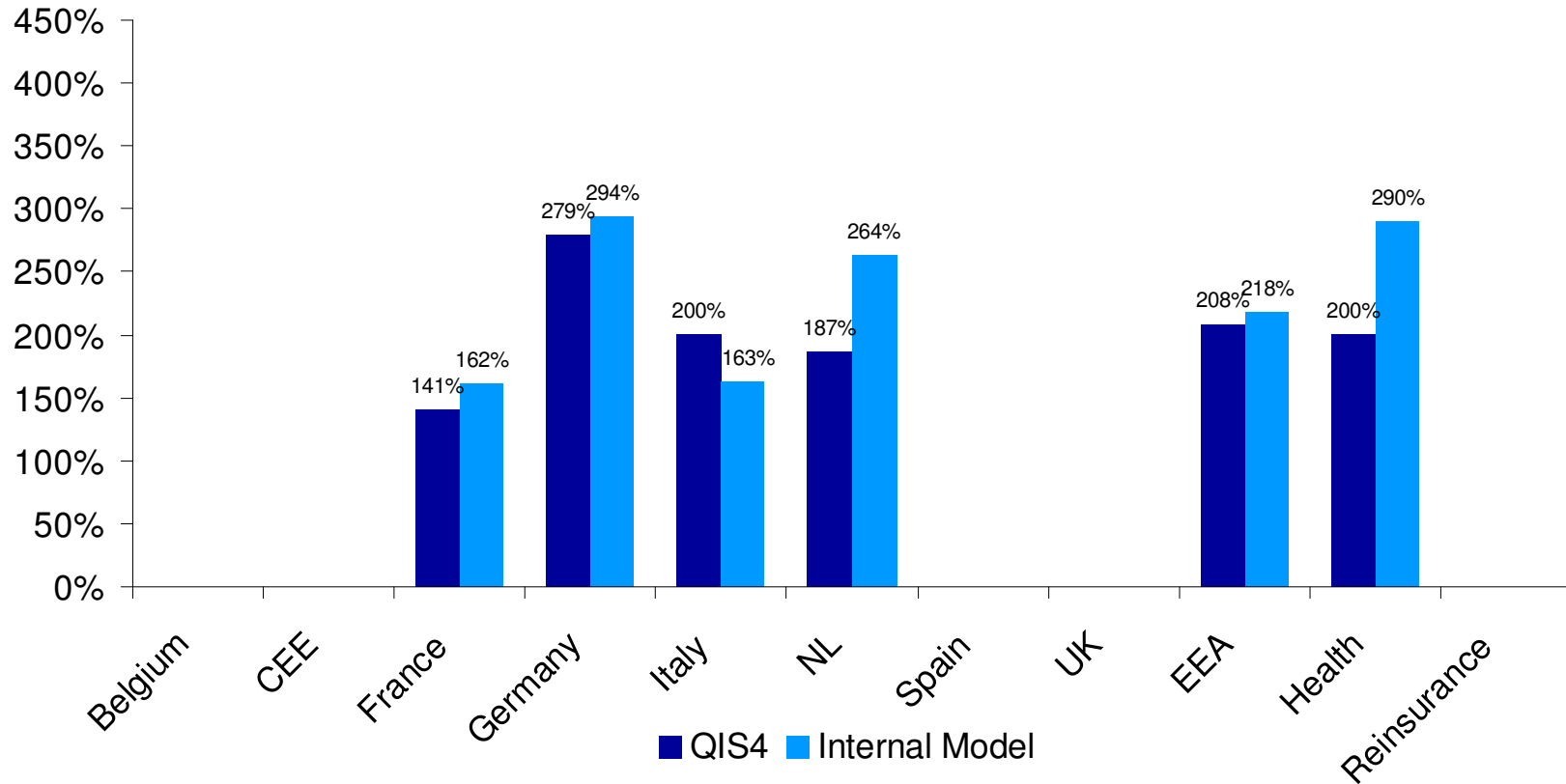
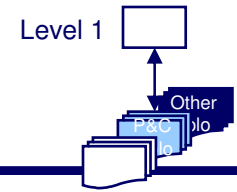
# Solo Life Coverage Ratios Eligible to Required Capital



■ For Life insurers, QIS4 coverage ratios are close to internal model coverage ratios on an EEA level but this hides some variation by country.



# Solo P&C and Other Coverage Ratios Eligible to Required Capital

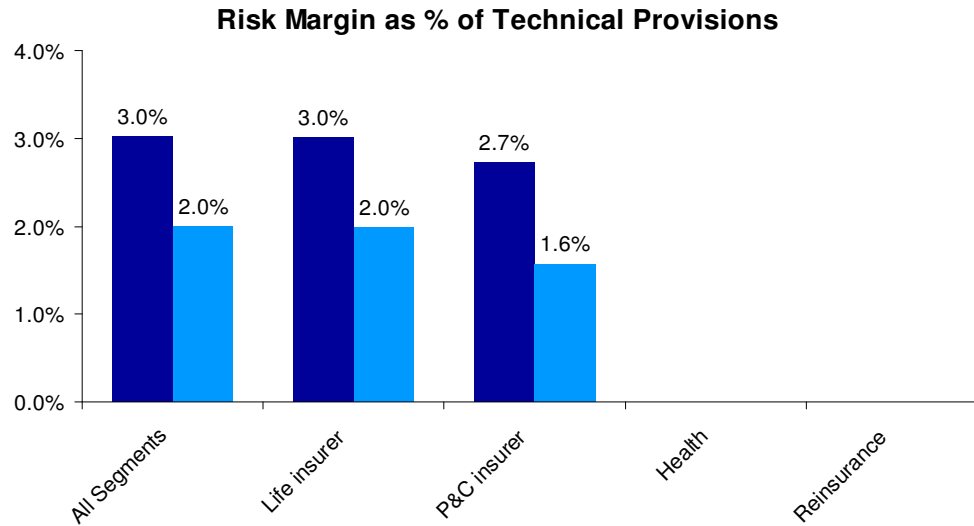
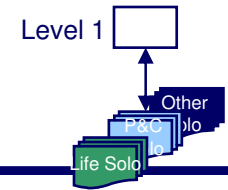


■ For P&C business, the QIS4 coverage ratios are close to internal model coverage ratios but this hides variations by country.

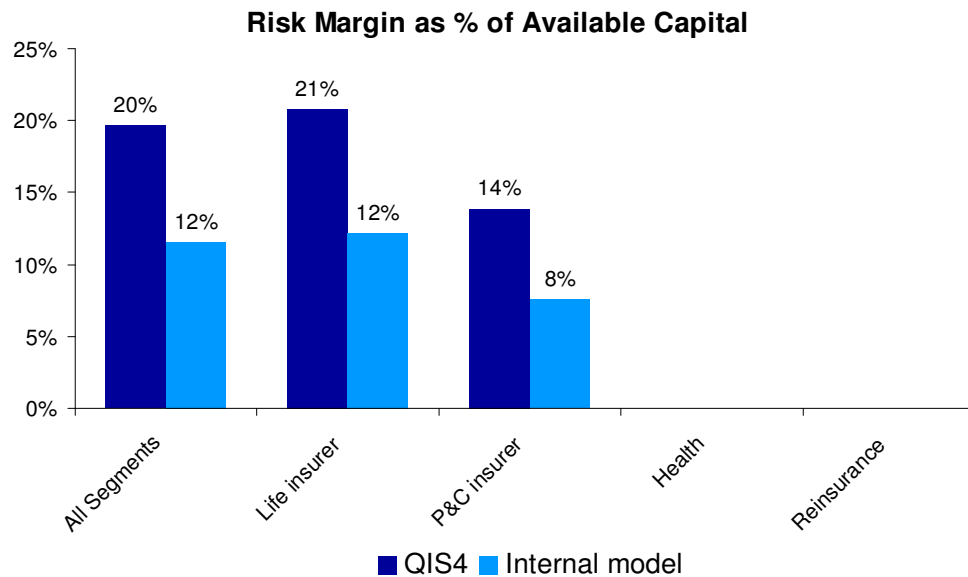
# Solo Overview

## Risk Margin

### as % of Technical Provisions and of Available Capital



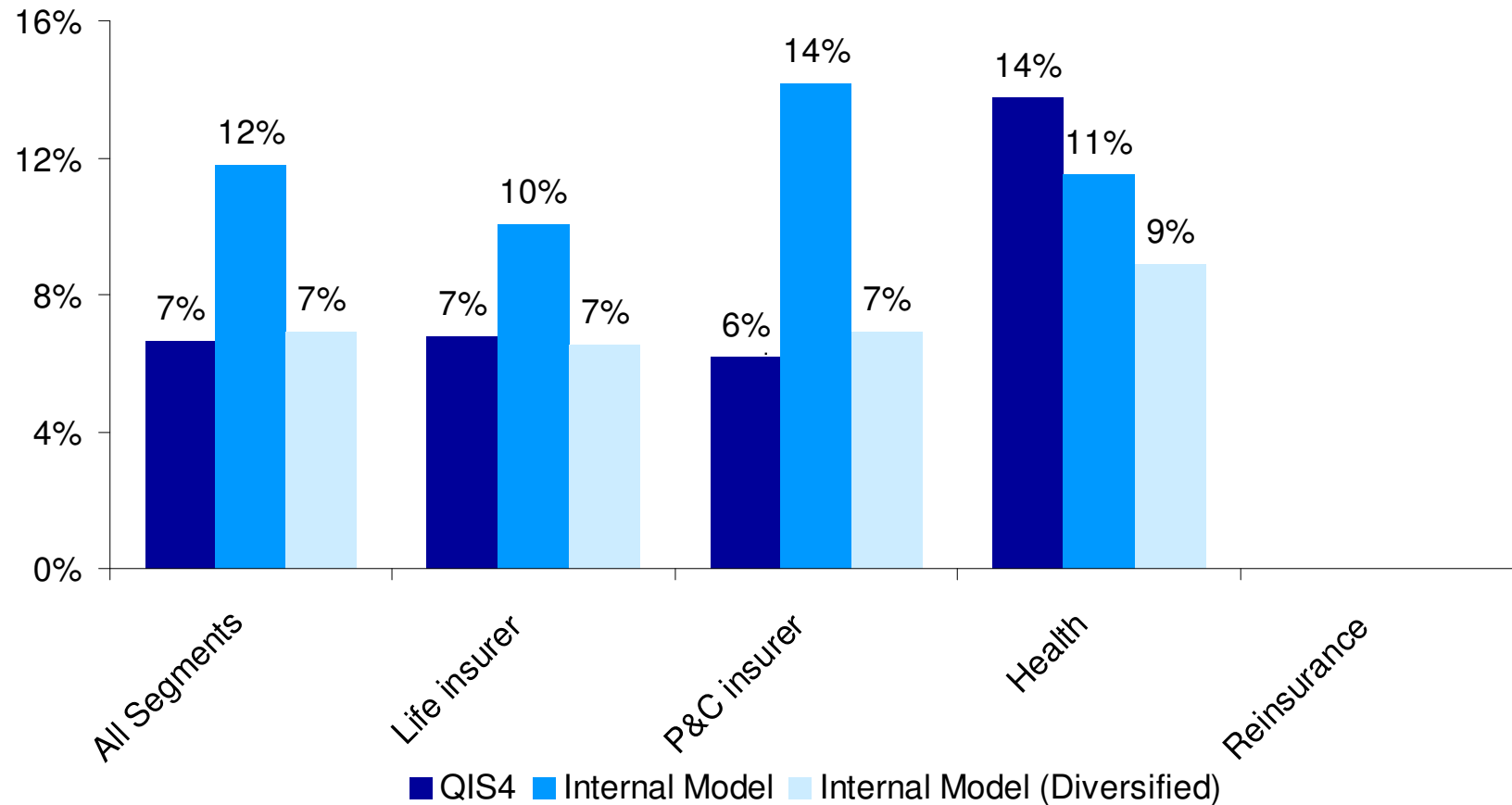
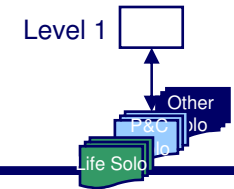
- Risk margins are substantially lower in internal models than in QIS4 This may be due to
  - the lower cost of capital rate in Internal Models,
  - the calibration of underwriting risk capital and
  - the lack of allowance for diversification between products in calculating risk margins.
- This may result in an understatement of Available Capital in QIS4 of up to 10%.



# Solo Overview

## Operational Risk

### as % of Required Capital

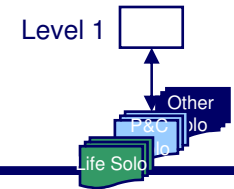


■ The QIS4 requirements for standalone operational risk are significantly lower than in internal models. In contrast to many internal models, QIS4 does not allow for diversification between the operational risk capital requirements and the remaining capital requirements implying high conservatism. However, both difference currently offset each other (exception health).

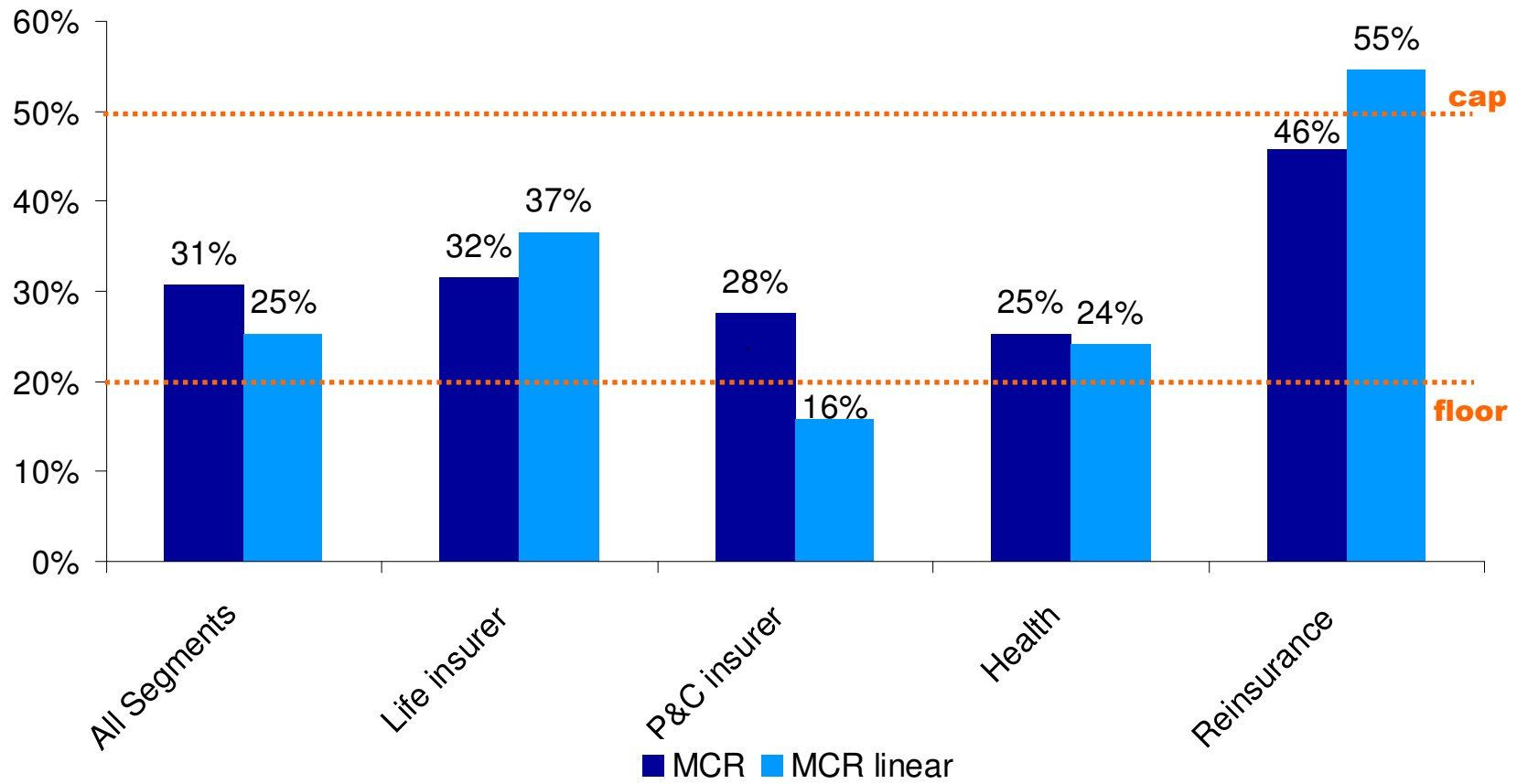
# Solo Overview

## MCR

### as % of QIS4 Required Capital



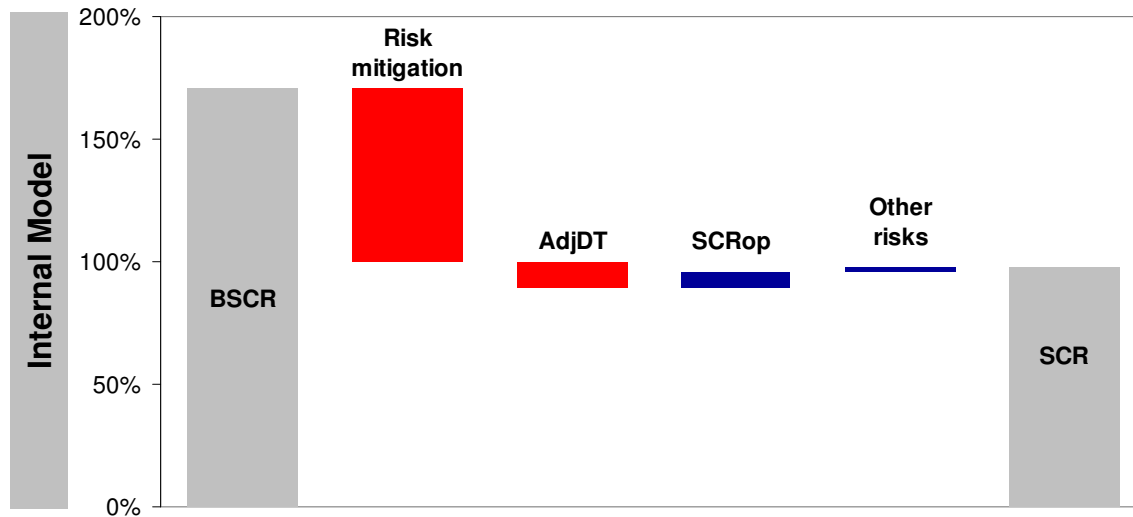
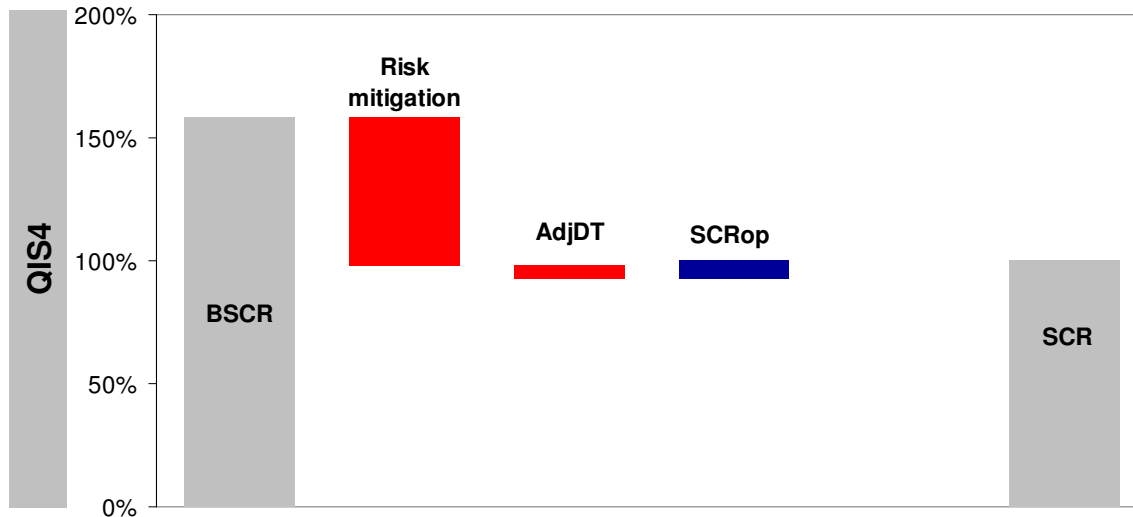
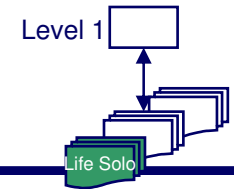
- “MCR” is the final Minimum Capital Requirement after applying the cap (50% of SCR) or floor (20% of SCR).
- “MCR linear” is the Minimum Capital Requirement resulting from the factors, but before applying the cap or floor.



- The caps and floors seem to be applied very frequently, especially for P&C and reinsurers, which suggests that the factors do not work well.
- MCR linear > MCR suggests a wide application of the cap, especially for reinsurers, where even the average MCR linear is above 50%.
- MCR linear < MCR suggests a wide application of the floor, especially for P&C insurers where even the average MCR linear is below 20%.

# Solo Life

## Breakdown of Required Capital as % of QIS4 Required Capital



- BSCR refers to the Basic Required Capital Charge in QIS4 (i.e. the aggregated SCRs excluding risk absorbing properties) and alike in Internal Model.
- Risk mitigation is reflecting potential double counting of future discretionary benefits.
- AdjDT refers to the QIS4 Adjustment for the risk absorbing effect of deferred taxes and alike in Internal Model.
- SCROp refers to the diversified operational risk charge (e.g. is equal to SCROp for QIS4).
- Other risks are risks in Internal Models which are not modelled in QIS4.

- At EEA level, broadly similar adjustments are made in Internal Models and QIS4.

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Top Level Analysis

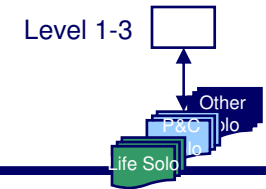
Second and Third Level Analysis

Calibrations

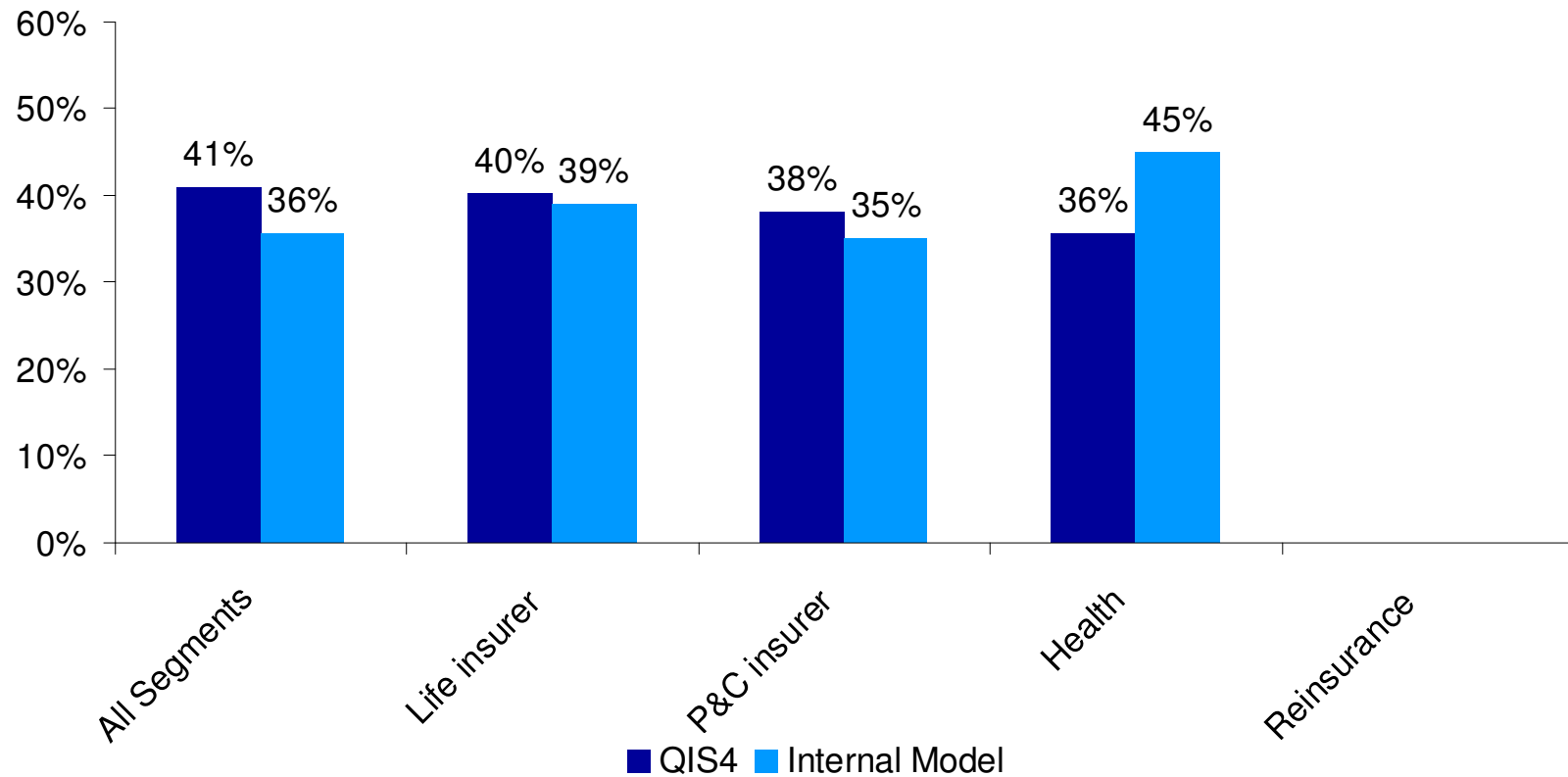
Group Analysis

# Solo Overview

## Impact of Diversification as % of QIS4 Sum of Risk Sub-Modules



- Diversification is between
  - sum of risk sub-modules not including operational risk, therefore capturing diversification across risk sub-modules but not within risk sub-modules;
  - aggregated Required Capital (e.g. for QIS4 gross results, aggregated Required Capital is defined as “BSCR”).

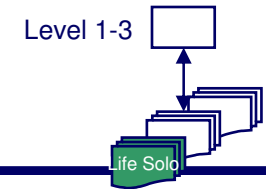


- For the different segments, diversification in QIS4 and internal models is broadly in line (except for health).

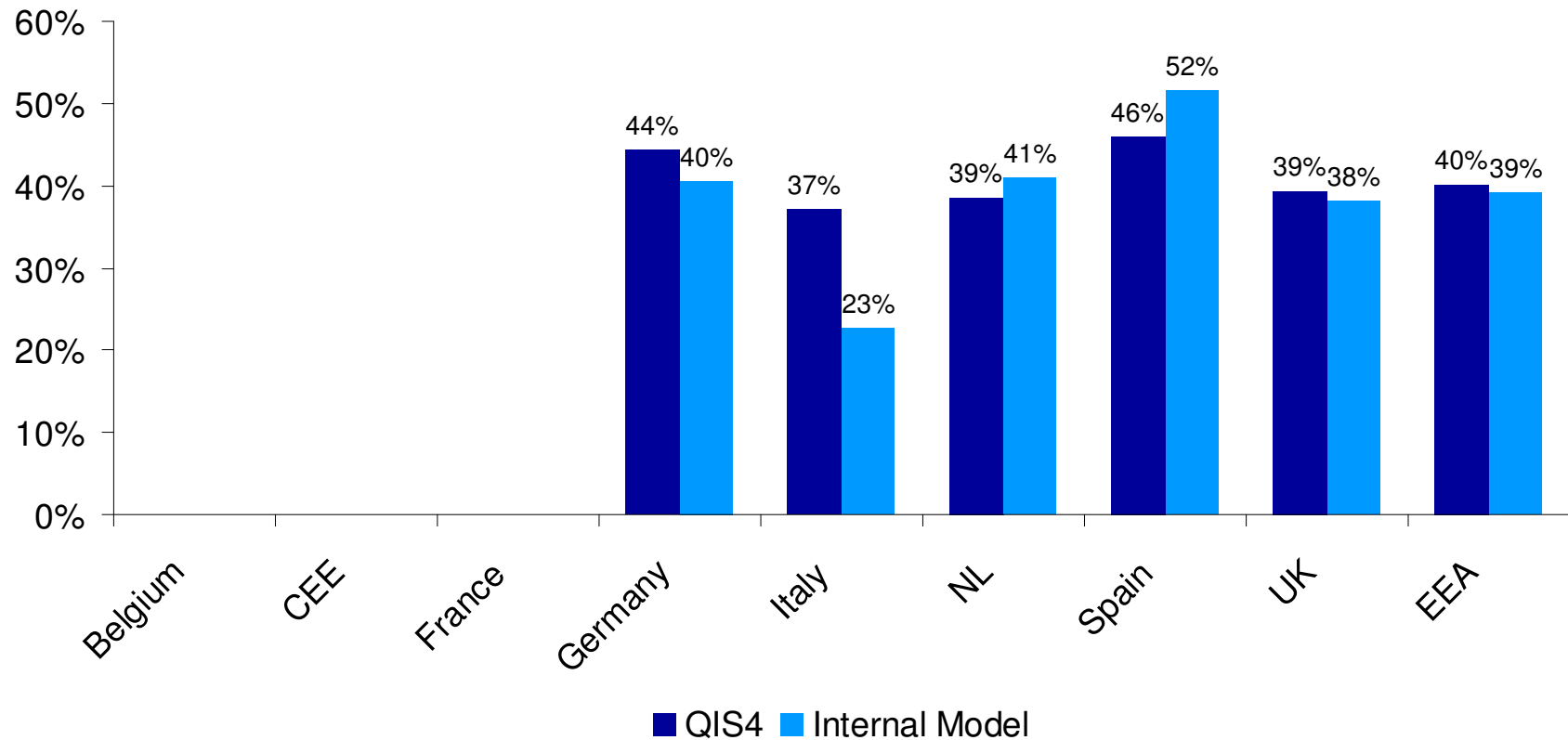
# Solo Life

## Impact of Diversification

### as % of QIS4 Sum of Risk Sub-Modules



- Diversification is between
  - sum of risk sub-modules not including operational risk, therefore capturing diversification across risk sub-modules but not within risk sub-modules;
  - aggregated Required Capital (e.g. for QIS4 gross results, aggregated Required Capital is defined as “BSCR”).



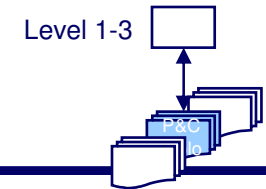
- For the different countries, diversification in QIS4 and internal models is broadly in line (except for Italy).



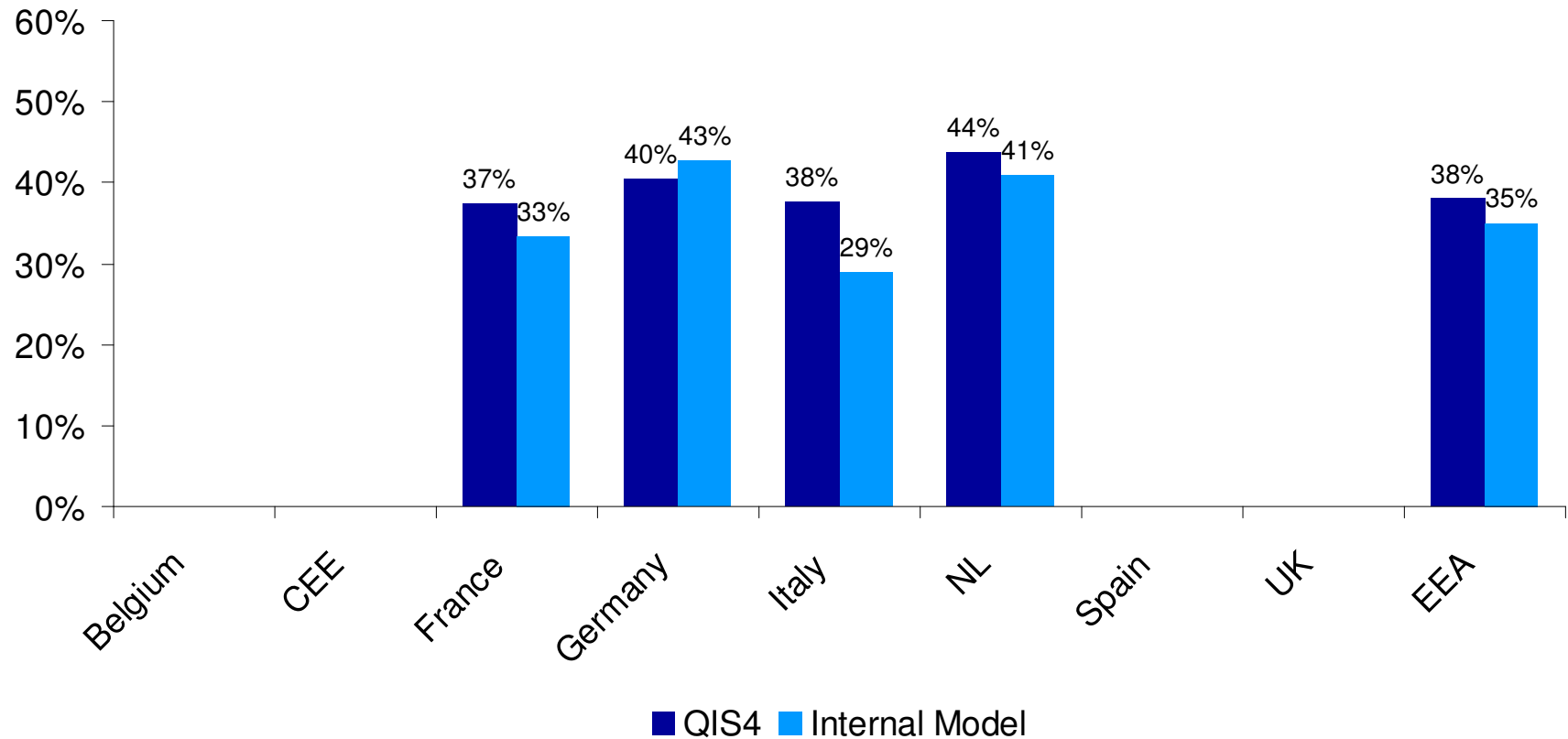
# Solo P&C

## Impact of Diversification

### as % of QIS4 Sum of Risk Sub-Modules



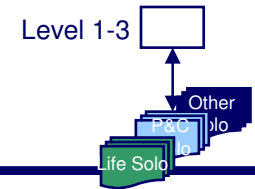
- Diversification is between
  - sum of risk sub-modules not including operational risk, therefore capturing diversification across risk sub-modules but not within risk sub-modules;
  - aggregated Required Capital (e.g. for QIS4 gross results, aggregated Required Capital is defined as "BSCR").



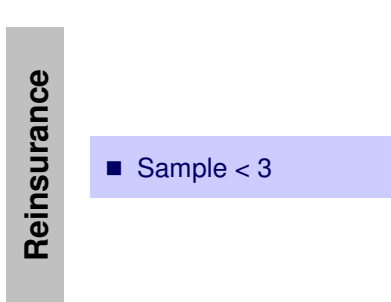
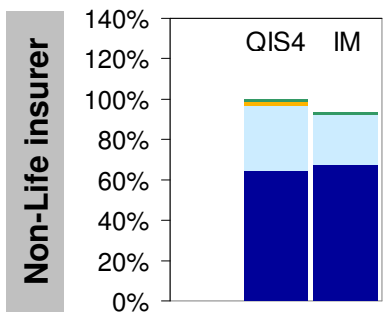
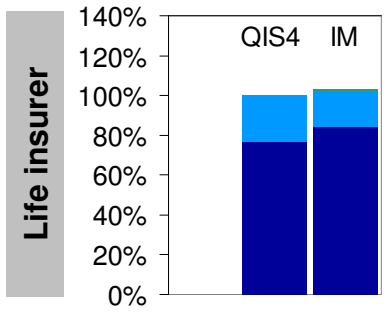
- For the different countries, diversification in QIS4 and internal models is broadly in line (except for Italy).

# Solo Overview

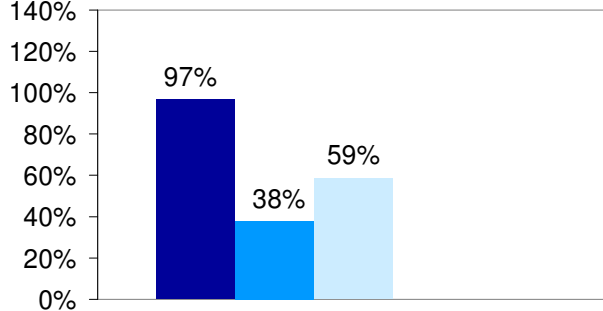
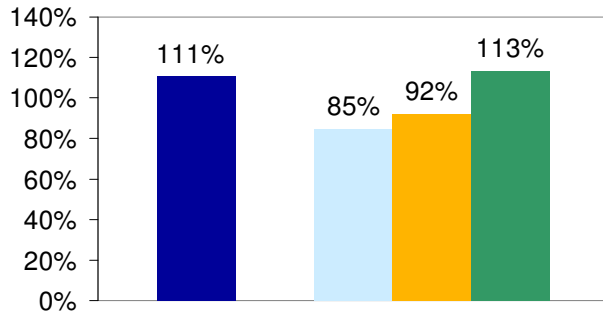
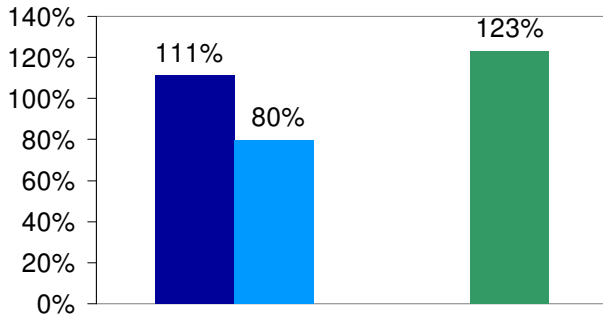
## Required Capital – Breakdown using Sum of Sub-Risk Module and Internal Model Risk Module Charges as % of QIS4 Risk Module Charges



Required Capital – Breakdown using Sum of Sub-Risk Modules



Risk Module Charges – Internal Model to QIS4



■ Market ■ Life u/w ■ Non-Life u/w ■ Health ■ Default

- **Left chart:** Each Risk Module is
  - undiversified, i.e. equals the sum of Risk Sub-Modules.
  - The denominator is the QIS4 Sum of all Risk Sub-Modules, i.e. each QIS4 Risk Sub-Module of every Risk Module has been added.
  - Please note that the sample size might be quite small.
- **Right chart:** Standalone Risk Module Charges.

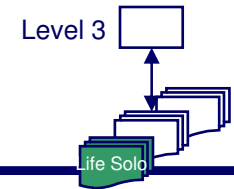
- Market risk is the predominant risk for life insurers and for P&C insurers.\*
- Capital requirements for market and default risks under internal models are above QIS4 requirements for both Life and P&C insurers.
- Capital requirements for underwriting risks in internal models substantially below QIS4 requirements.

\* For most P&C insurer it would be expected that underwriting risk should be more significant. The result as stated above is driven by very few large entities.

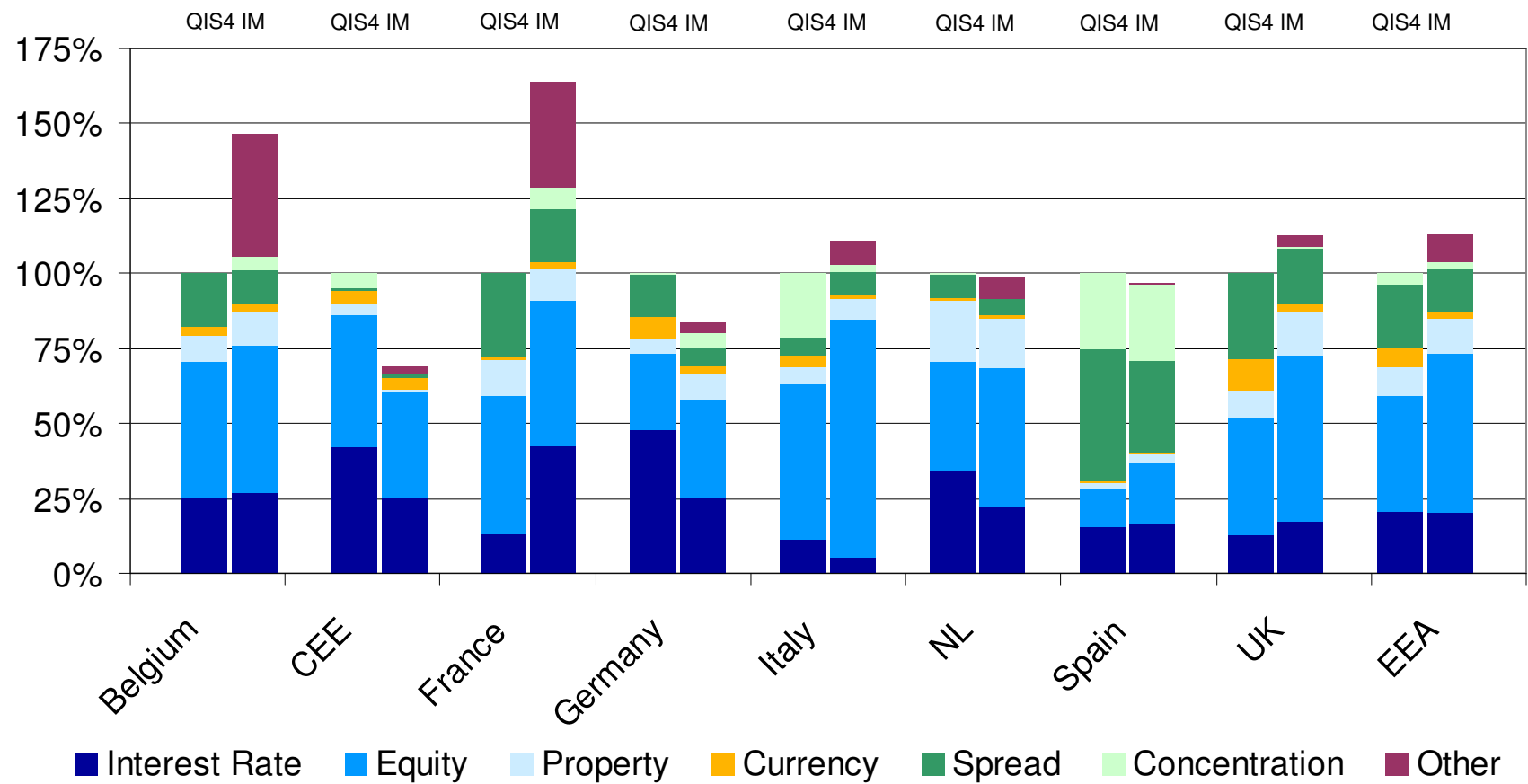
# Solo Life

## Market Risk – Breakdown by Risk Sub-Module

### Net Risk Sub-Modules as % of QIS4 Sum of Net Risk Sub-Modules

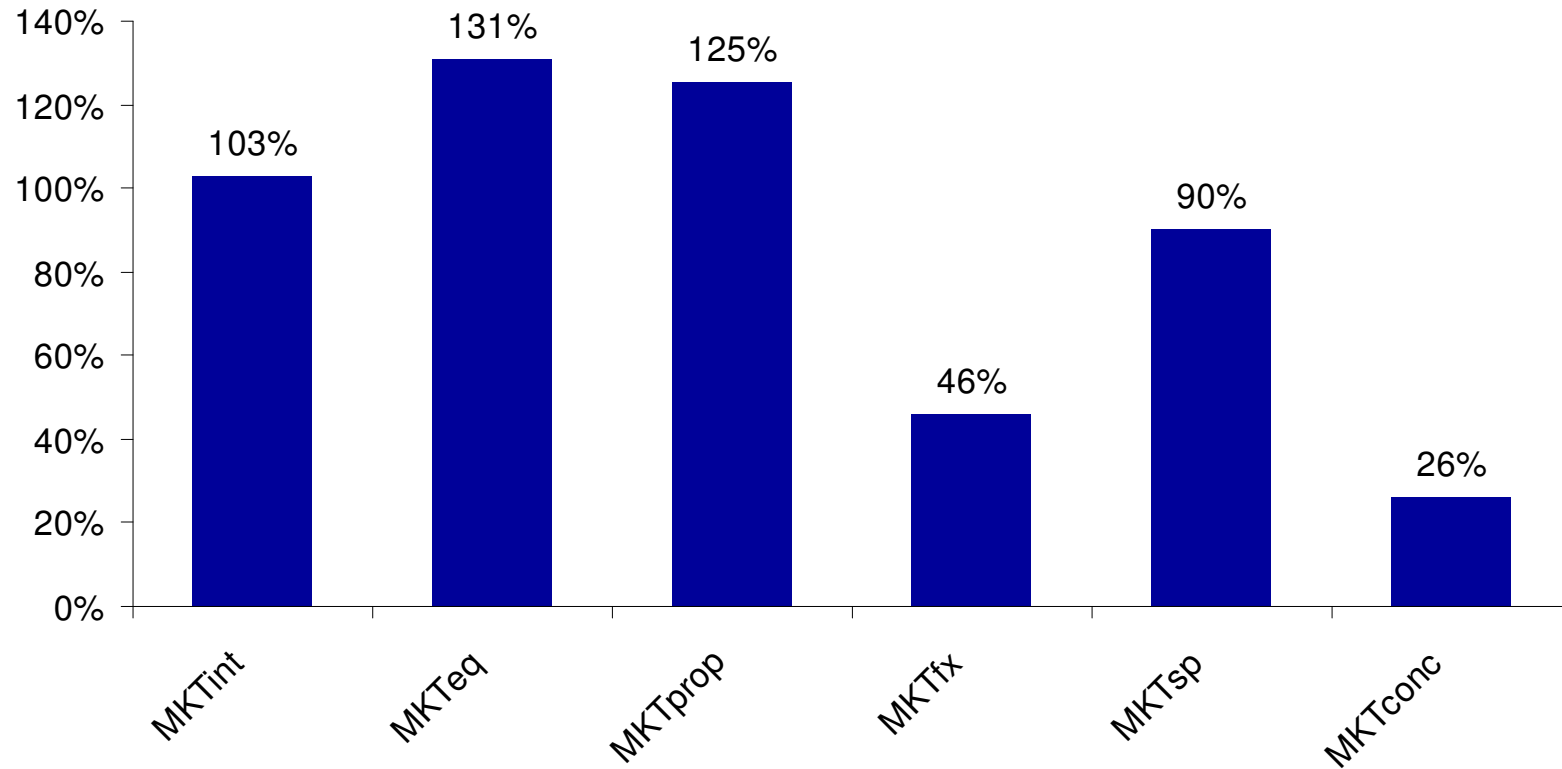
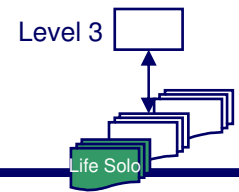


■ For the Sum of Net Risk Sub-Modules, the Risk Sub-Modules of the specific Risk Module have been added.



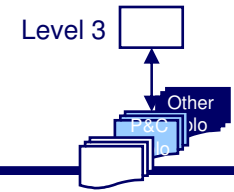
■ The breakdown of Market Risk capital charges by risk sub-module at EEA level broadly similar under QIS4 and Internal Models.  
 ■ However, there is a significant portion of other risks, mainly implied volatility risk, that is currently not modelled in QIS4.

# Solo Life Market Risk Sub-Modules Internal Model to QIS4

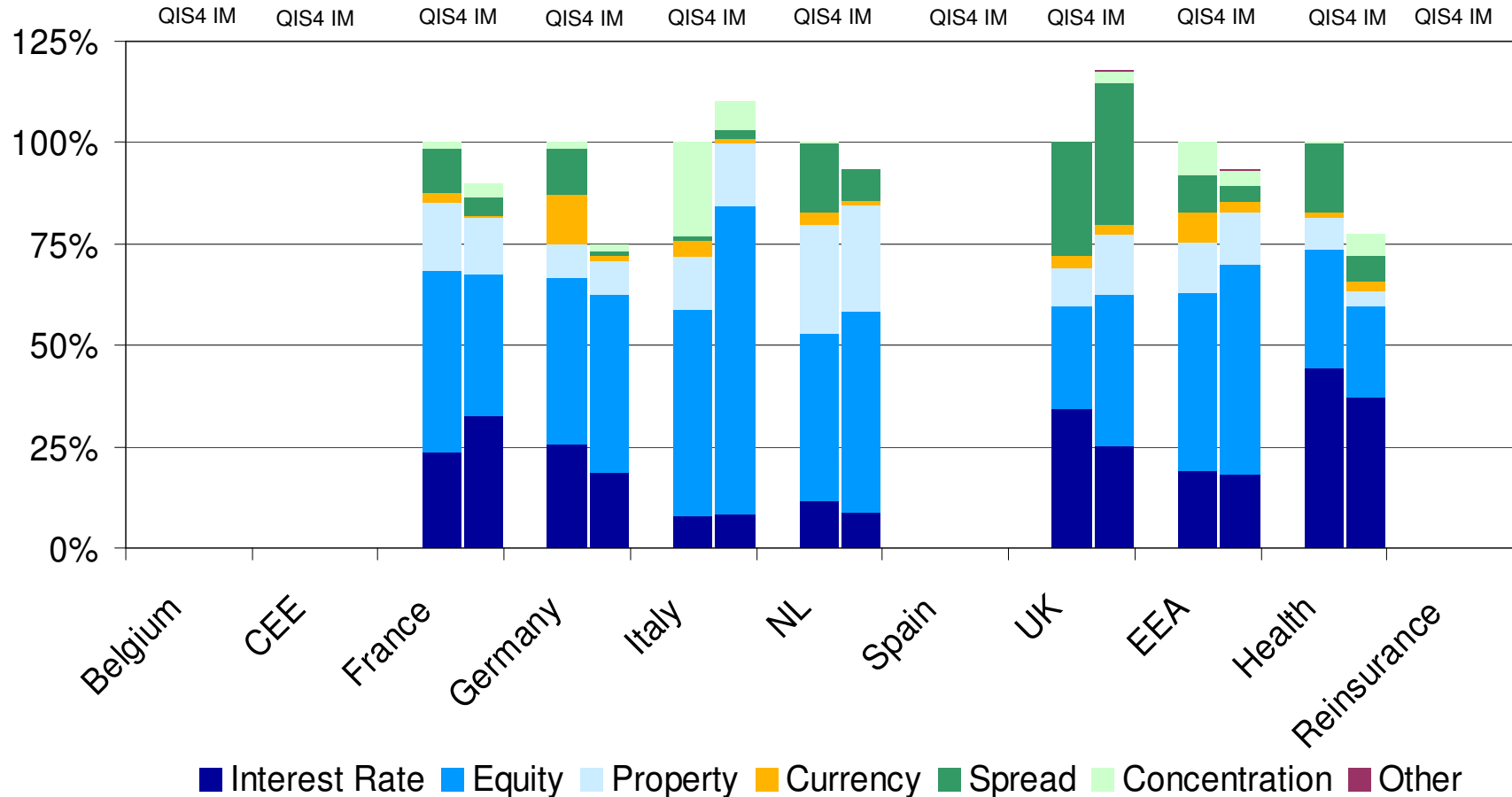


- At EEA level, the Interest rate risk charge is broadly similar for Internal Models and QIS4.
- Equity and property risk charges are higher in Internal Models than in QIS4.
- For the less significant market risks such as Foreign Exchange and Concentration Risk, the charges seem to be much lower in Internal Models but this might be due to the fact that in Internal Models these risk charges are partly captured in the other components.

# Solo P&C and Other Market Risk – Breakdown by Risk Sub-Module Net Risk Sub-Modules as % of QIS4 Sum of Net Risk Sub-Modules

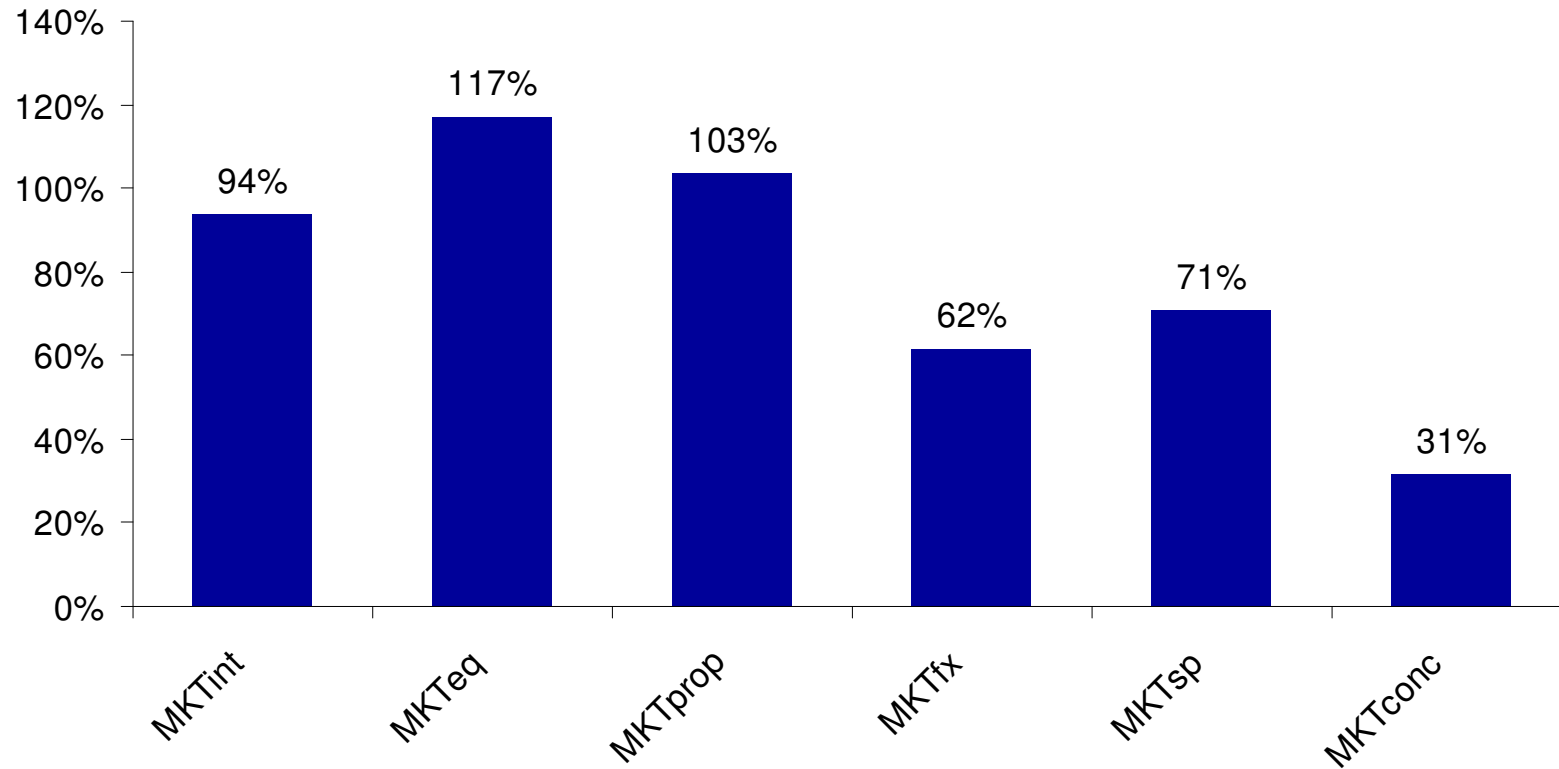
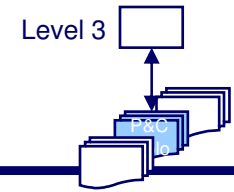


■ For the Sum of Net Risk Sub-Modules, the Risk Sub-Modules of the specific Risk Module have been added.



- The breakdown of Market Risk capital charges by risk sub-module is on EEA level broadly similar under QIS4 and Internal Models.
- However, there is some variation between countries.

# Solo P&C Market Risk Sub-Modules Internal Model to QIS4

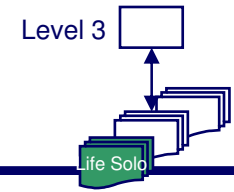


- Interest rate risk and property risk charges are broadly similar for Internal Models and QIS4.
- Equity risk charges are higher in Internal Models than in QIS4.
- For the less significant market risks such as Spread, Foreign Exchange and Concentration Risk, the charges are much lower in Internal Models but this might be due to the fact that Internal Model risk charges are partly captured in other components.

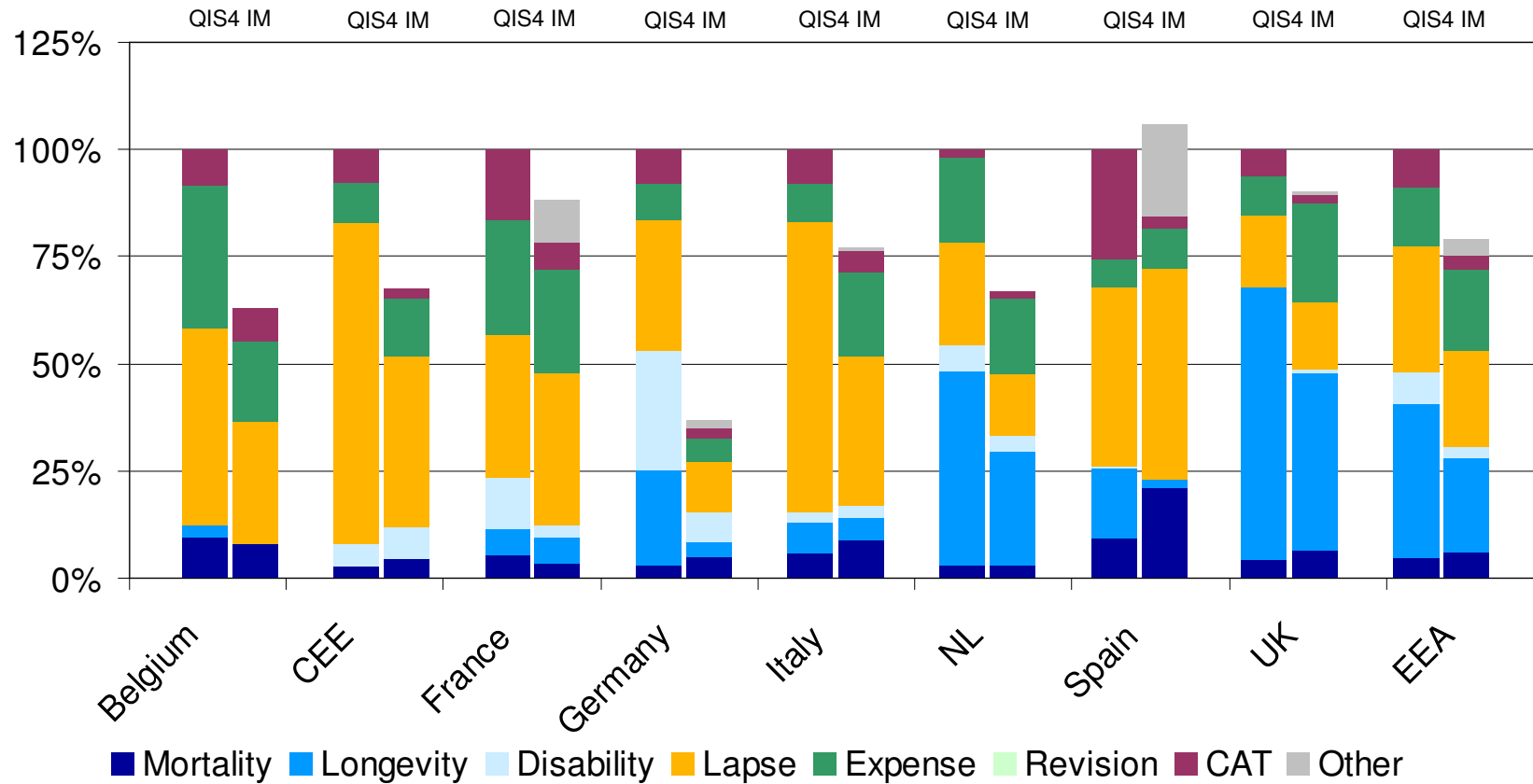
# Solo Life

## Life underwriting Risk – Breakdown by Risk Sub-Module

### Net Risk Sub-Modules as % of QIS4 Sum of Net Risk Sub-Modules



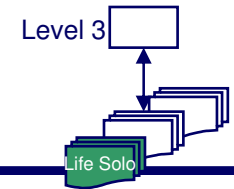
■ For the Sum of Net Risk Sub-Modules, the Risk Sub-Modules of the specific Risk Module have been added.



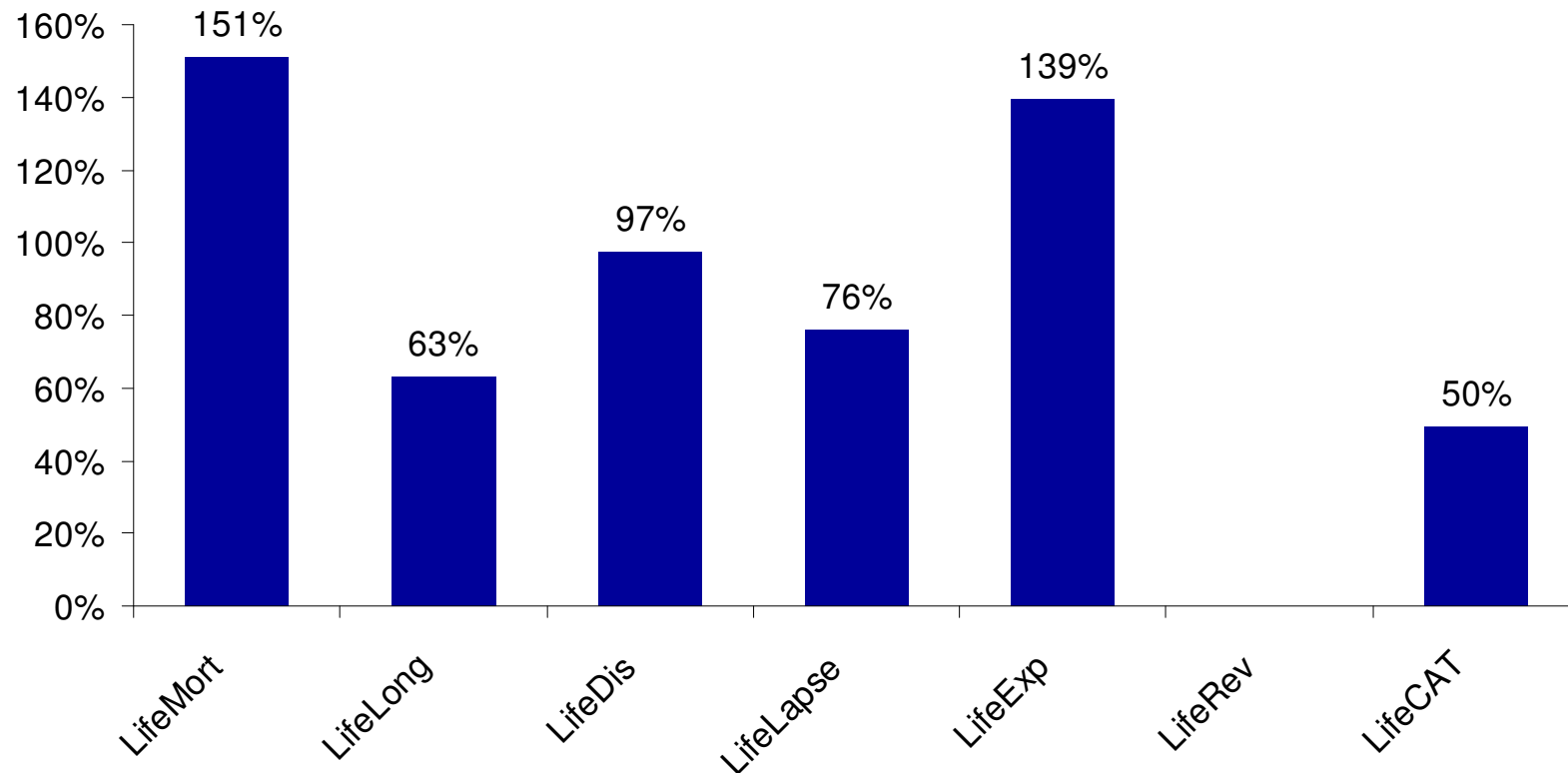
# Solo Life

## Life underwriting Risk Sub-Modules

### Internal Model to QIS4



■ Please note that CRO Forum companies classify life underwriting risks in a variety of ways in their internal models. For example, stress tests for mortality parameter risk cannot always be separated from mortality calamity risks.



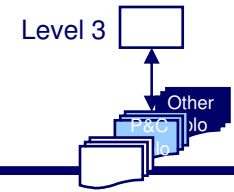
■ At EEA level, for mortality and expense risk, the Internal Models capital charges are higher than under QIS4.  
■ For longevity, catastrophe and lapse risk, Internal Models exhibit substantially lower capital charges than QIS4.



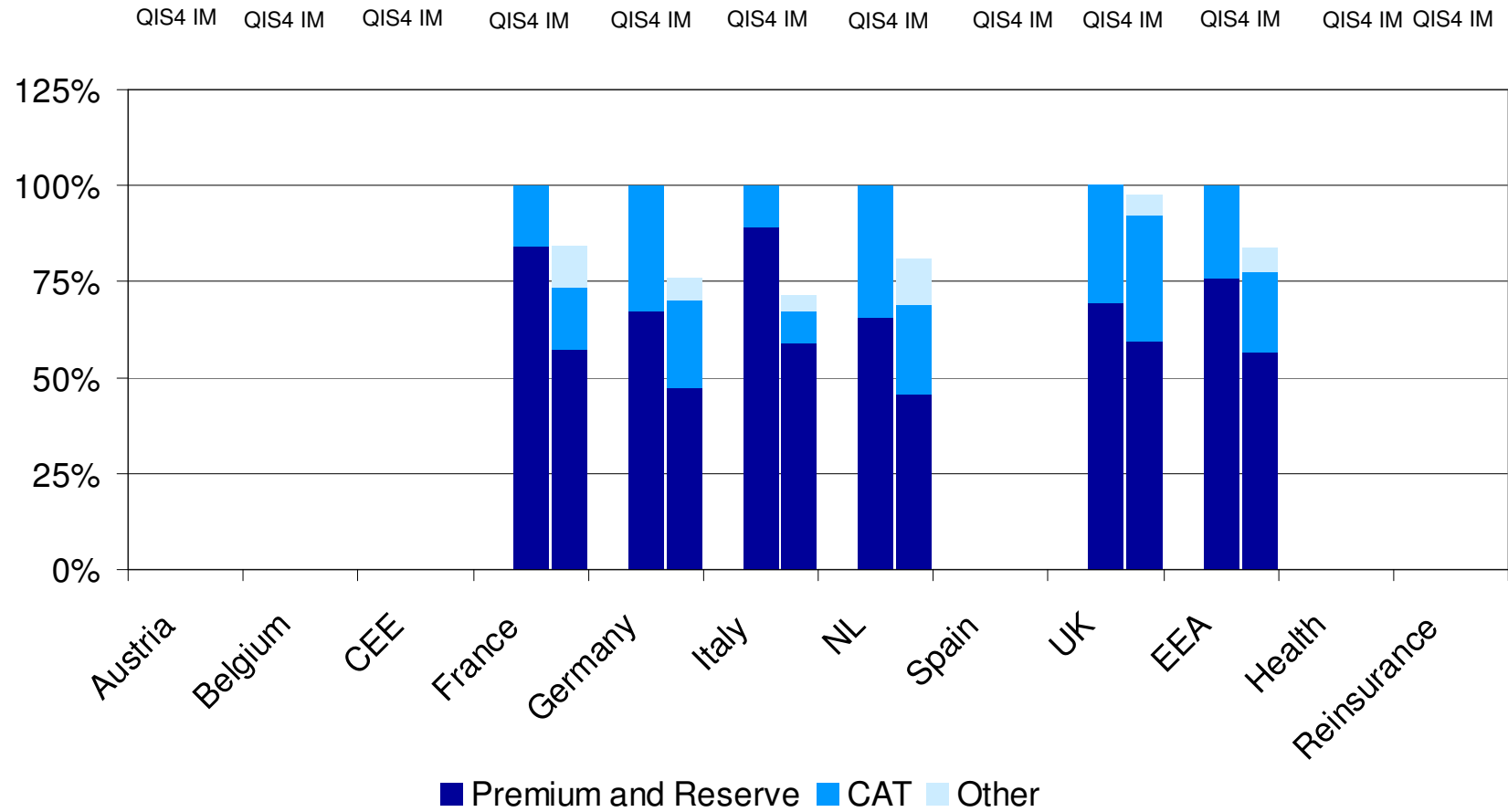
# Solo P&C and Other

## Non-Life underwriting Risk – Breakdown by Risk Sub-Module

### Net Risk Sub-Modules as % of QIS4 Sum of Net Risk Sub-Modules



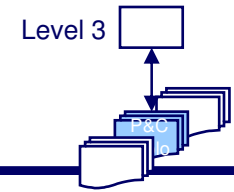
■ For the Sum of Net Risk Sub-Modules, the Risk Sub-Modules of the specific Risk Module have been added.



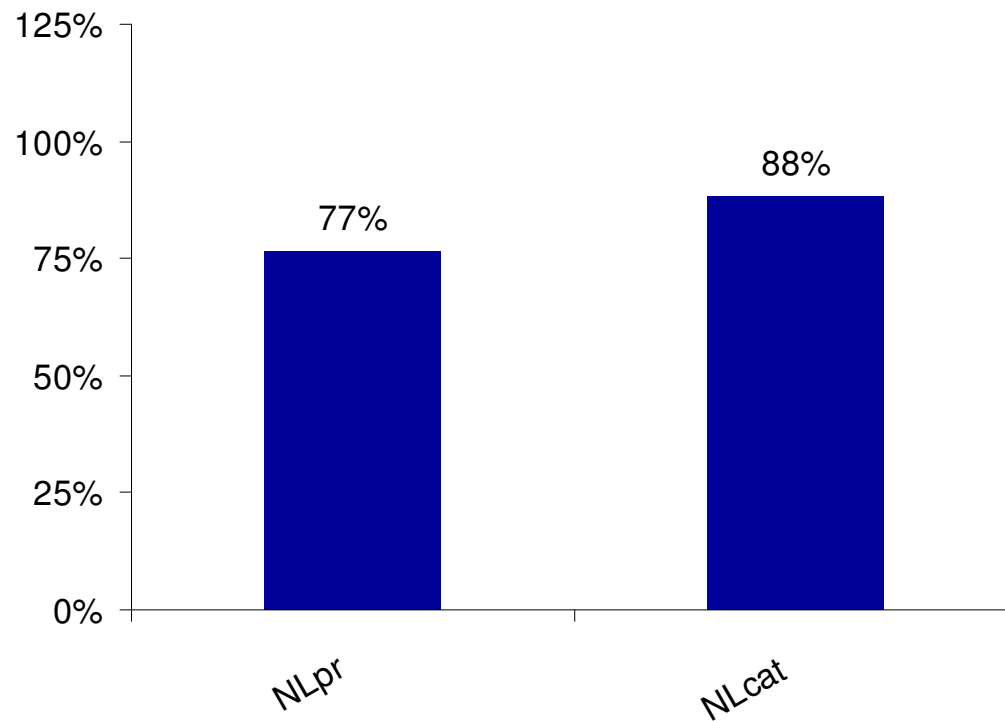
# Solo P&C

## Non-Life underwriting Risk Sub-Modules

### Internal Model to QIS4



- NLpr is the capital charge for Non-life underwriting premium and reserve risk as defined in the TS.XIII.A.2 where either the Default or Standardized Method has been used. The Default Method for the Non-Life Premium and Reserve Risk refers to TS.XIII.B.17-38 whereas the Standardized Method refers to TS.XVII.D.
- NLcat is the capital charge for Non-Life underwriting catastrophe risk.

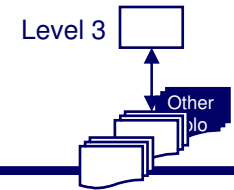


- At EEA level, capital requirements for Premium and Reserve Risk substantially lower in Internal Models; this is supported by the analysis of volatility parameters for both Premium Risk and Reserve Risk.
- Catastrophe Risk seems to be better aligned between Internal Models and QIS4, but this is probably due to the fact that companies can use personalised scenarios under Option 3, which are akin to using an internal model.

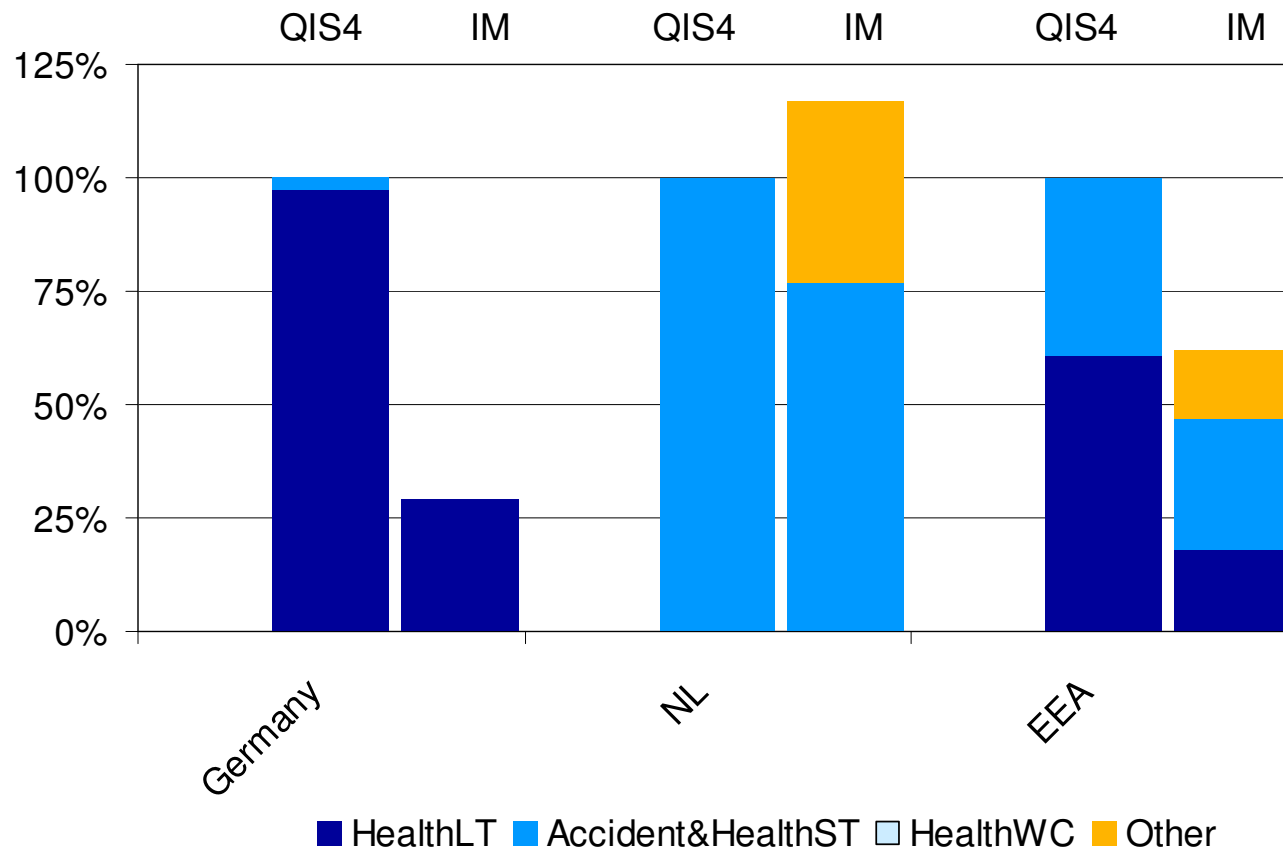
# Solo Health

## Health underwriting Risk – Breakdown by Risk Sub-Module

### Net Risk Sub-Modules as % of QIS4 Sum of Net Risk Sub-Modules



- For the Sum of Net Risk Sub-Modules, the Risk Sub-Modules of the specific Risk Module have been added.
- QIS4 results may be based on different approaches as Germany and the Netherlands have developed guidance for calculations which may result in differences in the application, even within the same country.



- The breakdown of capital charges by risk sub-module varies across countries due to different business models.
- However, the results within the countries appear to be quite different between Internal Models and QIS4.

# Agenda

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Introduction

Executive Summary

Solo Analysis

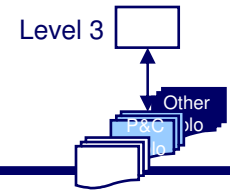
Capital Charges

Calibrations

Group Analysis

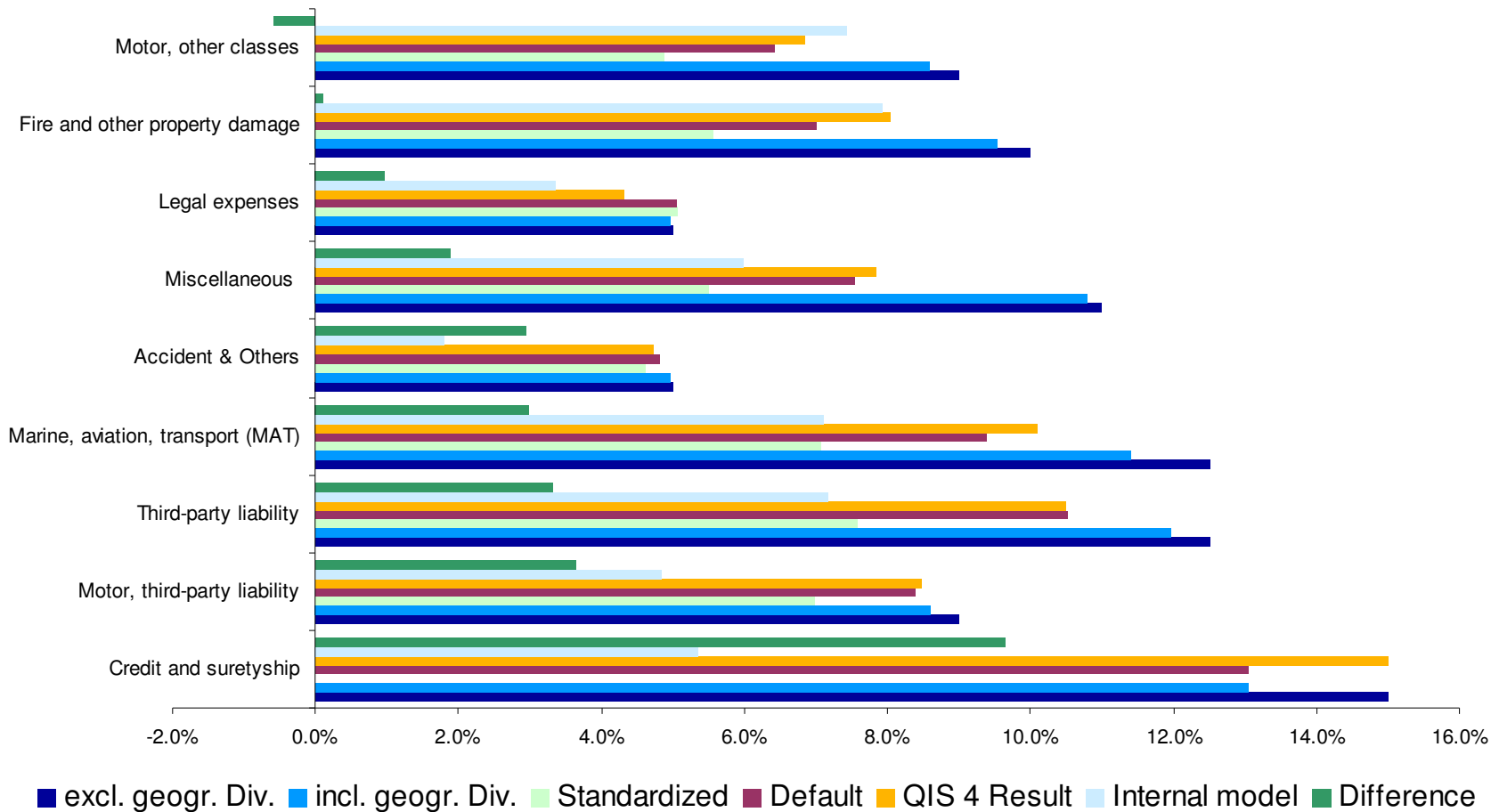
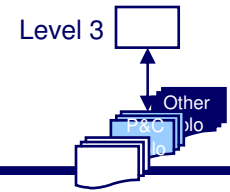


# Solo All Segments Premium Risk / Reserve Risk



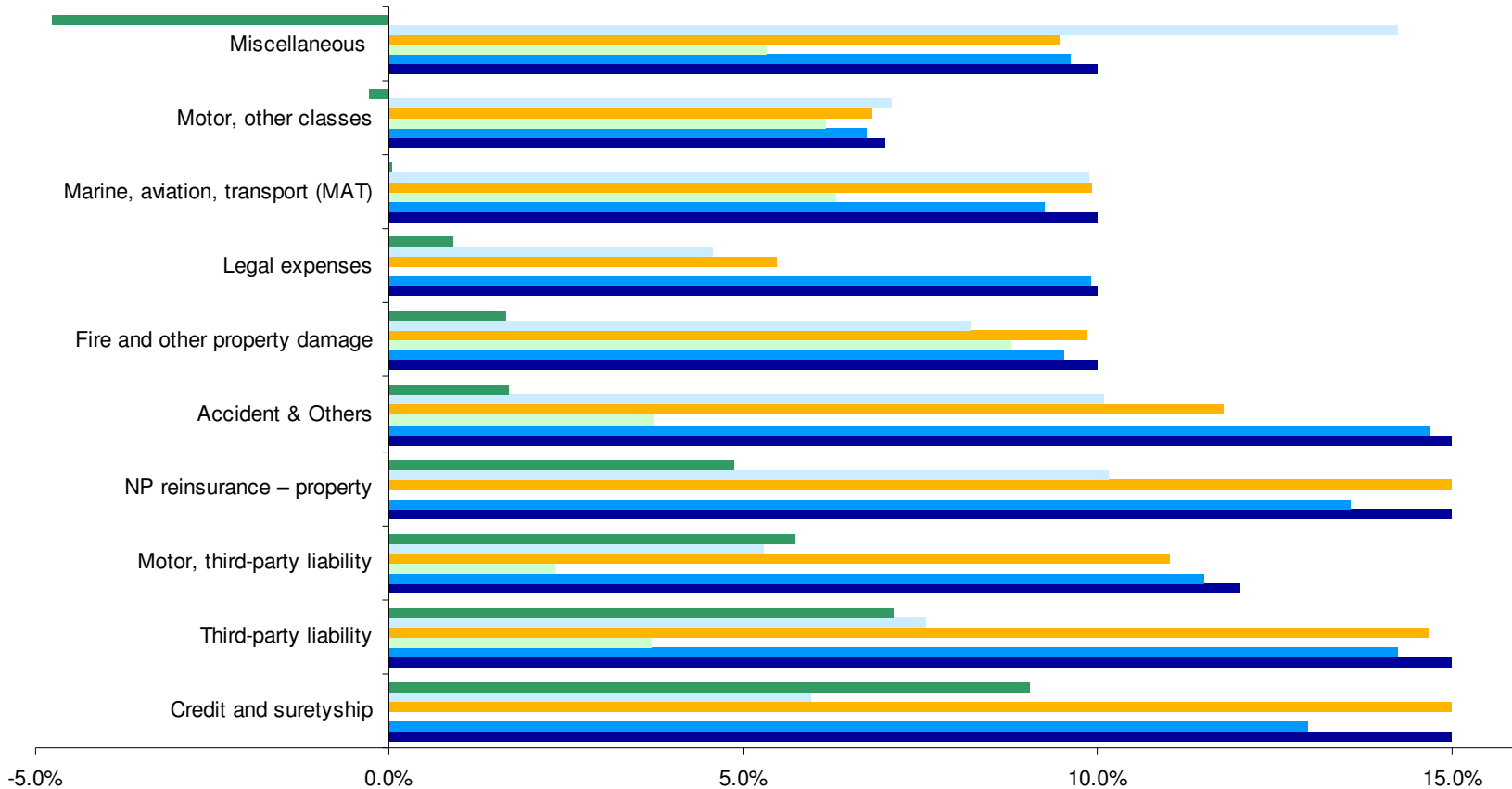
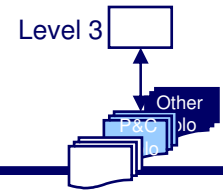
- QIS 4 offers a wide range of partial results and of options how parameters covering the volatility for the premium risk, reserve risk and premium and reserve risk can be calculated.
- For the premium risk and as a consequence also for the premium and reserve risk geographical diversification is included at two different parts of the calculation:
  - Within the volume measures via the Herfindahl index
  - By calculating combined loss ratios over all geographical regions
- In the following slides, the bars labelled
  - “excl. geogr. Div.” show the market parameters selected by CEIOPS, TS.XIII.B.25 and TS.XIII.B.27.
  - “incl. geogr. Div.” show the market parameters geographically diversified via applying the Herfindahl index on the corresponding volume measures, benchmarking study specific estimate.
  - “Standardized” show the results of the standardized methods defined in the Annexes of the Technical Specifications, TS.XVII.D.
  - “Default” show the results of the default methods defined in the Technical Specifications, TS.XIII.B21 – B34, but the market-wide estimate of the standard deviation for premium risk is based on geographical diversified market figures (please refer to “incl. geogr. Div.”). For reserve risk, the default method is simply the application of the market parameters.
  - “QIS4 Result” show the companies’ selected QIS4 results. This result is expected to be within the range of the results above.
  - “Internal Model” shows the companies’ Internal Model results.
  - “Difference” is the difference between the QIS4 result and the Internal Model result.
- All parameters are weighted by the corresponding geographically diversified volume measure, i.e. the premiums/reserves after the application of the Herfindahl index.
- Please note that the comparison may be distorted by differences in risk classification and lines of business used for analysis in internal models.

# Solo All Segments Premium Risk Volatility



- For many lines of business sample size < 3.
- Impact of geographical diversification only small, exceptions: MAT, Credit and Suretyship.
- Internal Model parameters for most lines of business significantly lower than QIS4 parameters.

# Solo All Segments Reserve Risk Volatility



■ excl. geogr. Div. 
 ■ incl. geogr. Div. 
 ■ Standardized 
 ■ QIS 4 Result 
 ■ Internal model 
 ■ Difference

- For many lines of business sample size < 3.
- Impact of geographical diversification only small, exception: NP reinsurance property, Credit and Suretyship.
- Internal Model parameters for most lines of business significantly lower than QIS4 parameters, exception: Miscellaneous, Motor other classes.

## **Agenda**

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**Introduction**

**Executive Summary**

**Solo Analysis**

**Group Analysis**





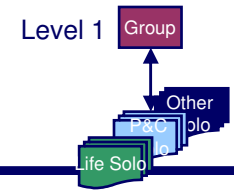
## Summary of findings – Group analysis\*

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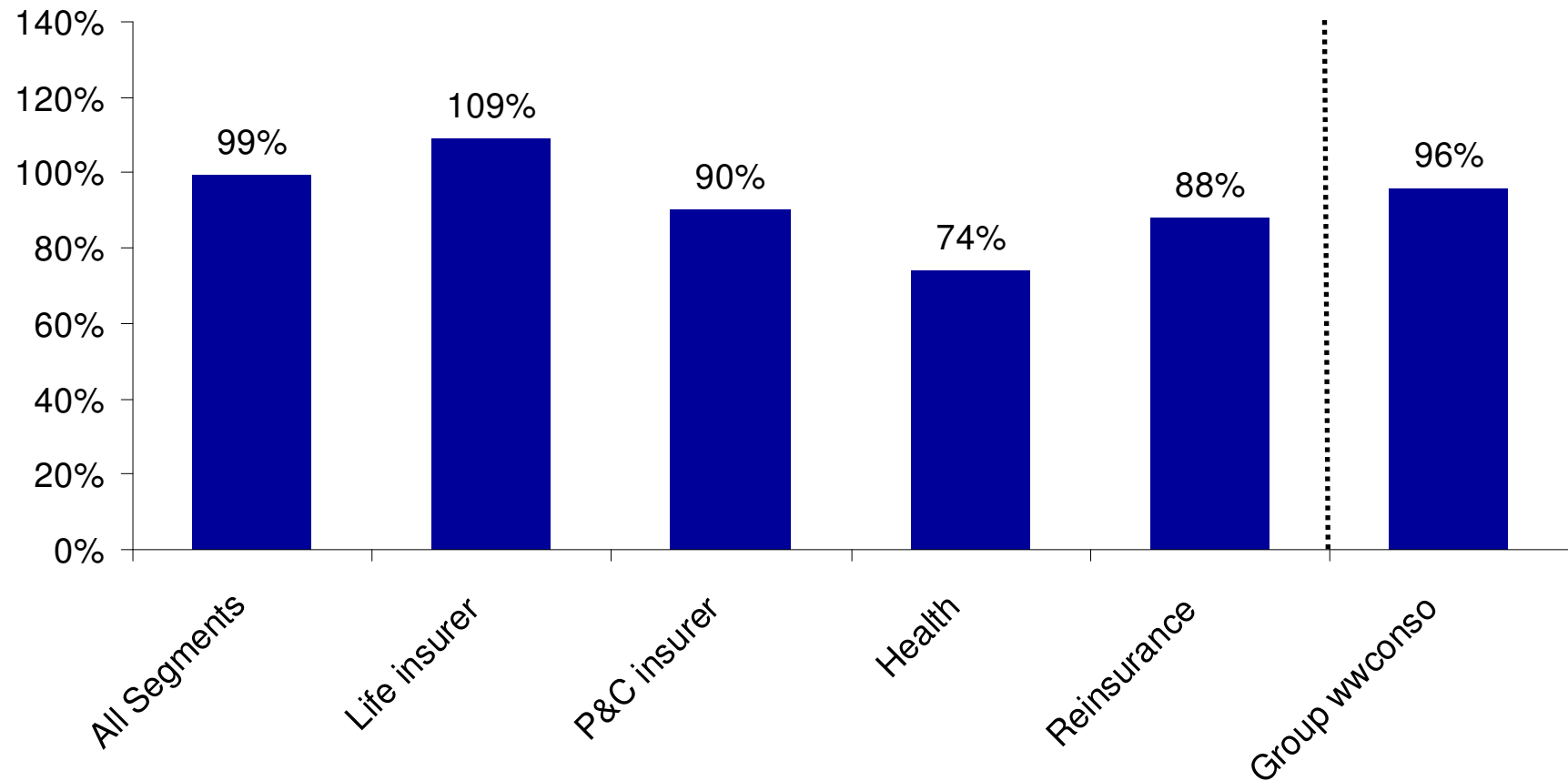
- The analysis shows that internal model requirements and those resulting from QIS4 are comparable using the default method (i.e. Worldwide Consolidated approach)
  - The CRO Forum recommends the Default Method as being the most meaningful to calculate the group capital requirements.
  - Other methods tested in QIS4 do not allow for the proper economic treatment of group diversification effects.
- The overall diversification impacts arising within a group are similar.
  - Some of the analysis points to an understatement of the impact of diversification for life companies between With-Profit business and other businesses.
- Although not shown in the graphs, we note that the capital charge on Other Financial Sector Entities is much higher in Internal Models than in QIS4 (about 24% vs. 14% as percentage of the QIS4 Worldwide Consolidated Capital Charge  $SCR_{wwconso}$ ).
  - This may be because the capital requirement under QIS4 is not valued on an economic basis.
  - The CRO Forum believes that there should be an economic evaluation and an allowance for diversification between the insurance sector charge and the Other Financial Sector Entities and the Non-Controlled Participations charges.

\* The group analysis is based on smaller sample sizes than the solo analysis (see slide 10 for participation numbers).

# Overview Solo and Group WW Consolidated Internal Model Required Capital to QIS Required Capital

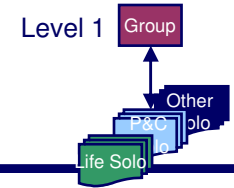


■ Solo data includes also companies which are not covered by the group analysis, i.e. solo and group results are not directly comparable.

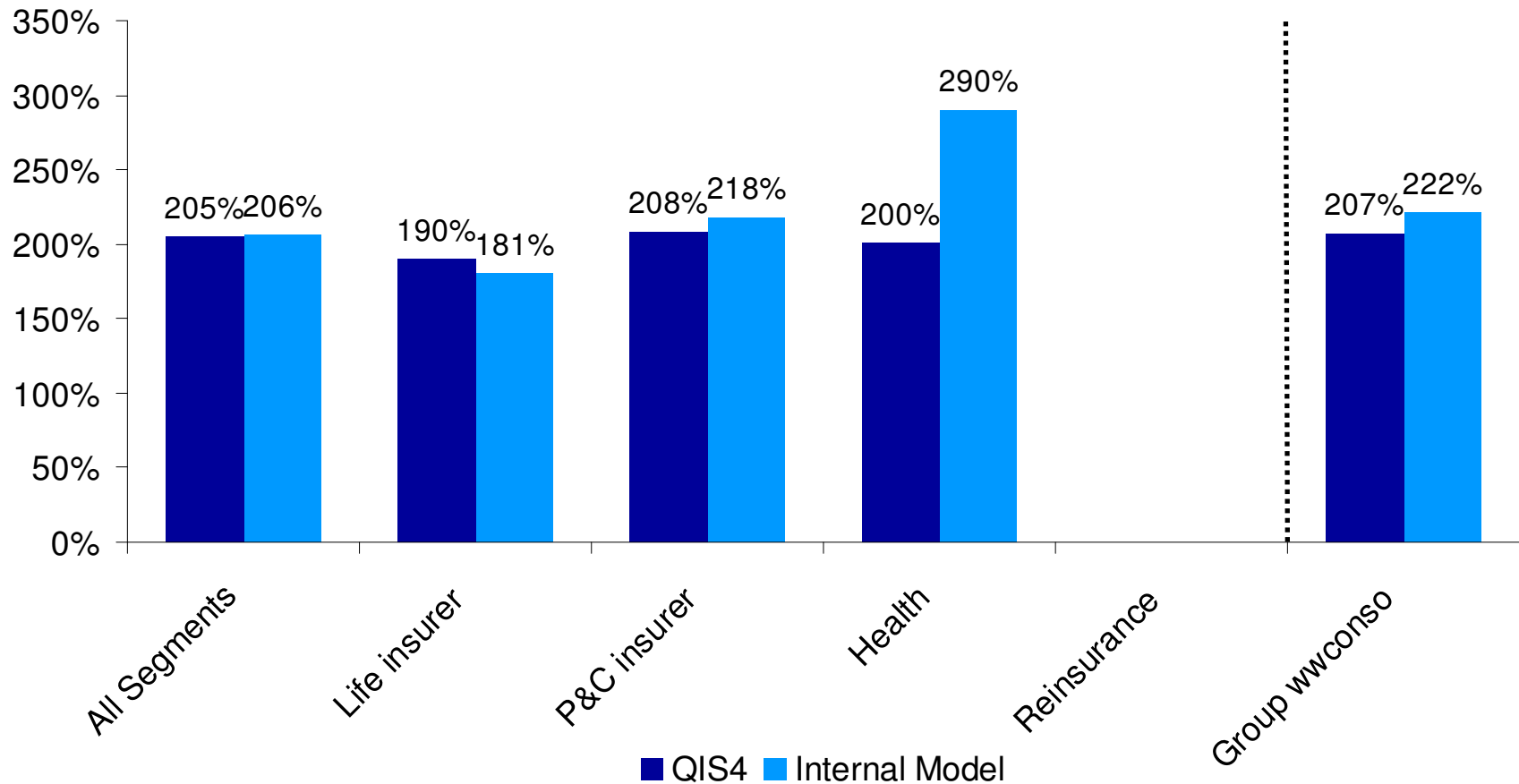


■ As Group capital requirements are broadly the same in Internal Models and QIS4, there appears no clear incentive, on average, for companies to use Internal Models given the current QIS4 calibration.

# Overview Solo and Group WW Consolidated Coverage Ratios Eligible to Required Capital



■ Solo data includes also companies which are not covered by the group analysis, i.e. solo and group results are not directly comparable.

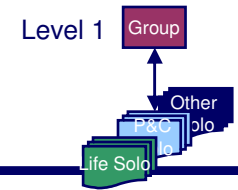


■ At group level, Coverage Ratios in Internal Models are slightly higher than those in QIS4.

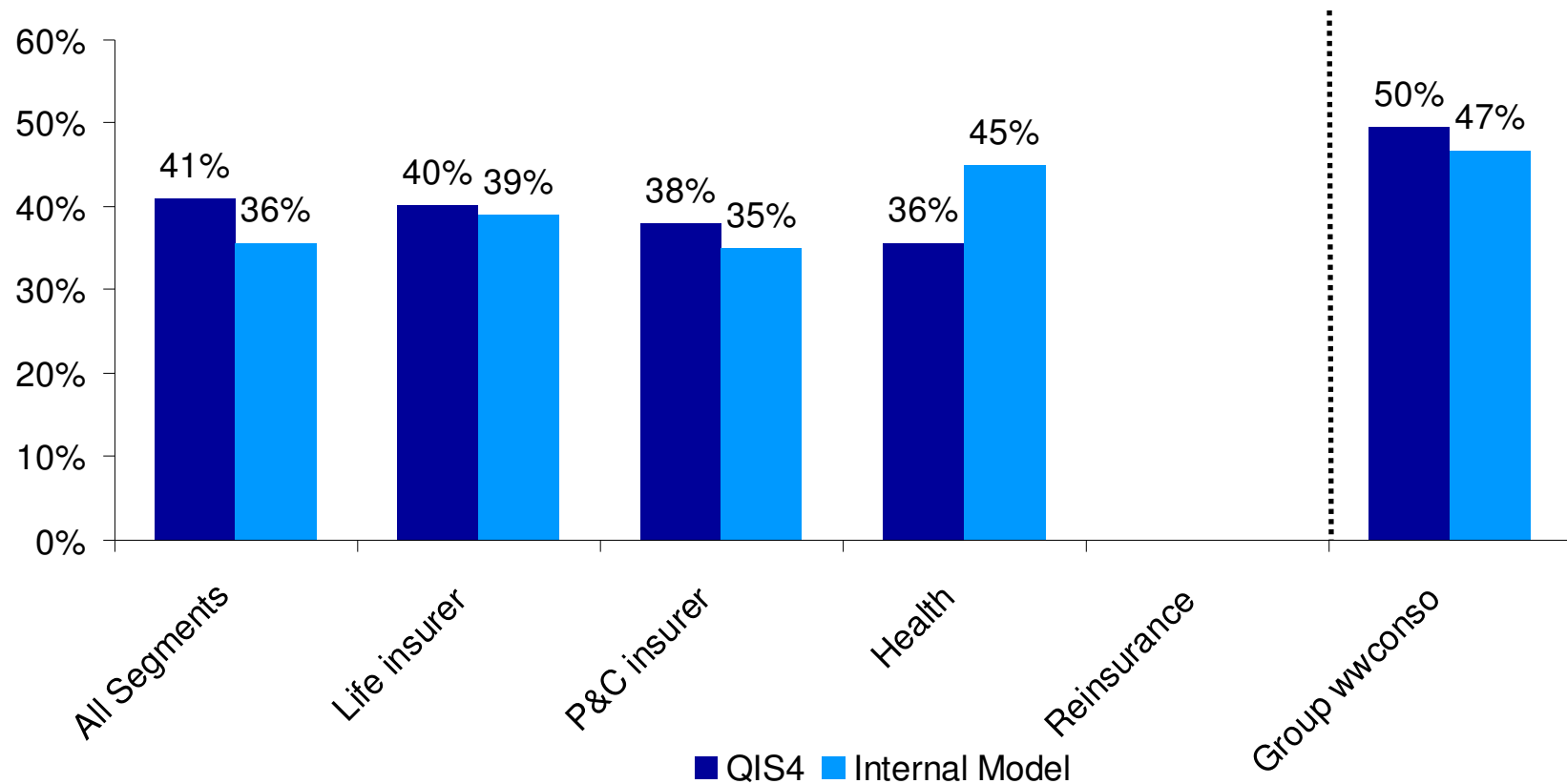
# Overview Solo and Group WW Consolidated

## Impact of Diversification

as % of QIS4 Sum of Risk Sub-Modules

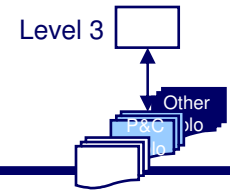


- Solo data includes also companies which are not covered by the group analysis, i.e. solo and group results are not directly comparable.
- Diversification is between sum of risk sub-modules, not including operational risk and aggregated Required Capital (e.g. for QIS4 gross results, aggregated Required Capital is defined as "BSCR"). However, diversification within risk sub-modules is not captured here.

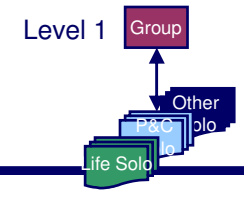


- Impact of diversification is similar in Internal Models and QIS4.

## Movement of QIS4 Group Required Capital as % of worldwide consolidated Group Required Capital

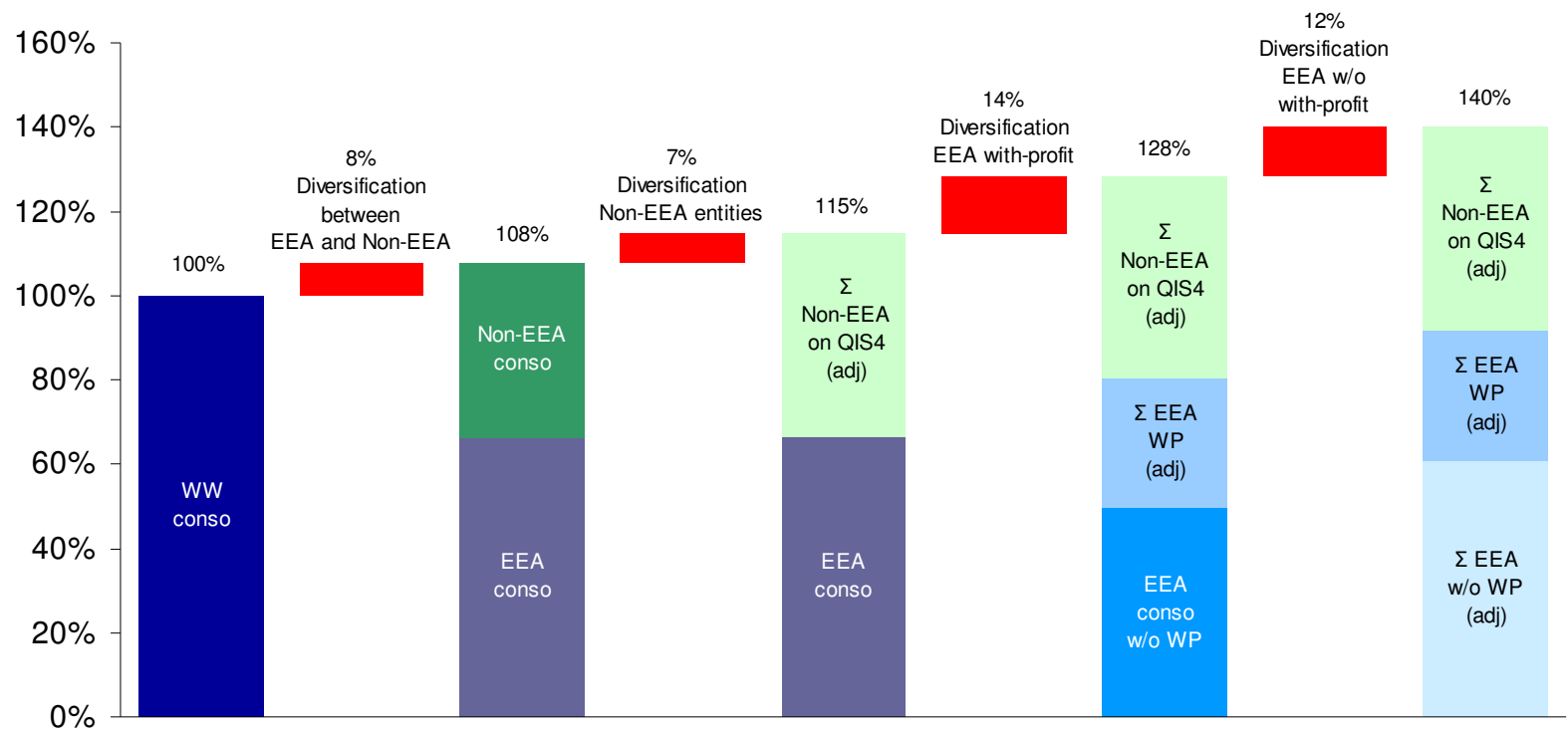


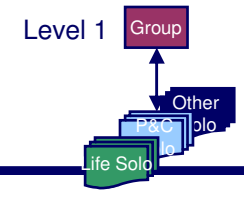
- In the following slides, the extent of diversification which arise from the following components is analysed and compared to Internal Models:
  - between EEA and Non-EEA;
  - Non-EEA entities;
  - with-profit business;
  - EEA business without with-profit business.
- Therefore, a movement of the Group Required Capital is presented; starting point is the worldwide consolidated group required capital which is unfolded step by step within the movement analysis to derive the diversification effect as requested.
- The labels on the bars are defined as follows:
  - “WW conso” – worldwide consolidated group required capital (“ $SCR_{wwconso}$ ” for QIS4, TS.XVI.B.3);
  - “EEA conso” – consolidated group required capital at EEA level (“ $SCR_{EEAconso}$ ” for QIS4, TS.XVI.C.4);
  - “Non-EEA conso” – consolidated group required capital at Non-EEA level calculated on QIS4 basis and Internal Model basis respectively;
  - “ $\Sigma$  Non-EEA on QIS4 (adj)” / “ $\Sigma$  Non-EEA on IM (adj)” – sum of the Non-EEA operations which are adjusted for intra-group transactions and calculated on QIS4 basis and Internal Model basis respectively;
  - “EEA conso w/o WP” – consolidated group required capital at EEA level excluding with-profits business (TS.XVI.D.7);
  - “ $\Sigma$  EEA WP (adj)” / “ $\Sigma$  EEA w/o WP (adj)” – sum of the EEA with-profit funds / sum of the EEA operations excluding with-profits funds which are adjusted for intra-group transactions.
- Please note that the figures do not contain the capital charges for non-controlled participations and other financial sectors (“ $SCR_{ncp}$ ” and “ $SCR_{ofs}$ ” as described in TS.XVI.B.4) as they do not deliver additional information in this exercise. As Internal Models would allow for diversification between the insurance sector and other sectors, this additional extent of diversification in Internal Models is not being captured here.



# Movement of QIS4 Group Required Capital as % of QIS4 worldwide consolidated Group Required Capital

- Please note that figures do not contain SCRncp and SCRofs as they do not deliver additional information in this exercise.
- The single bars were determined on data from all groups having submitted data both for WWconso and the respective bar.
- Missing data from just one of two different levels of consolidation (e.g. “Non-EEA conso” and “Sum Non-EEA (adj)”) were interpolated by scaling the submitted data by the average relation between those groups having submitted data for both blocks.





# Movement of Internal Model Group Required Capital as % of Internal Model worldwide consolidated Group Required Capital

- Please note that figures do not contain SCRncp and SCRofs as they do not deliver additional information in this exercise.
- The single bars were determined on data from all groups having submitted data both for WWconso and the respective bar.
- Missing data from “EEA conso w/o WP” were interpolated by scaling “Sum EEA w/o WP (adj)” by the average relation between those groups having submitted data for both blocks.

