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13 12 2017

# **2017 IORP Stress Test Report**

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## **Executive Summary**

1. This report presents the results of the second EU-wide stress test exercise of Institutions for Occupational Retirement Provision (IORPs). EIOPA is required by its founding regulation to perform stress tests on a regular basis in order to assess the resilience of financial institutions to adverse market developments. In addition, this exercise elaborates on the conclusions of the 2015 IORPs stress test report, in particular with regards to deepening the understanding of the second-round effects of an adverse scenario on financial stability and the real economy.
2. Like in the IORP Stress Test 2015, the resilience of the Defined Benefit (DB)/hybrid segment of the IORP sector is assessed by applying an adverse market scenario to both the national and common, market-consistent, balance sheet taking into account the available security mechanisms (i.e. sponsor support as well as pension protection schemes) and benefit adjustment mechanisms. New in the 2017 exercise is that the Defined Contribution (DC) part assesses the impact of the same adverse market scenario on the market value of assets, recognising that for DC IORPs the value of liabilities moves in tandem with assets since all risks are borne by the plan members.
3. The 2017 IORP Stress Test assesses the potential transmission of shocks from IORPs to the real economy. The DB/hybrid part of the exercise analyses the impact on sponsoring companies through the effect of the adverse scenario and describes to what extent national recovery mechanisms distribute sponsor support and benefit reductions over time. The DC part assesses the impact of the adverse scenario on future retirement income, based on the results for three representative plan members.
4. The adverse market scenario is developed in cooperation with the European Systemic Risk Board (ESRB) and reflects an up-to-date assessment of macro-financial risks and vulnerabilities of the IORP sector in Europe, taking into account the latest developments on the asset allocation of IORPs and the various risk factors stemming from the economic developments over the past two years.

### **Participation**

5. The 2017 IORP stress test includes all countries in the European Economic Area (EEA) with IORP sectors exceeding EUR 500 million in assets. As a consequence, 19 countries (AT, BE, CY, DE, DK, ES, FI, GR, IE, IT, LI, LU, NL, NO, PT, SE, SI, SK and UK) took part in the exercise, while IS participated on a voluntary basis in the DC part of the stress test. National supervisory authorities (NSAs) were requested to aim to achieve a representative sample of IORPs in their country.
6. EIOPA aimed at reaching a 50% coverage rate in terms of total assets of each national IORP sector in the EEA. NSAs had the option to distinguish between DB/hybrid IORPs and DC IORPs by targeting coverage rate of at least 50% of assets of the total DB/hybrid sector and 50% of members of the total DC sector in their country.
7. Target participation rates were not reached in some Member States, particularly in IE and the UK, with respect to the DB sector, which the respective authorities mainly attributed to a lack of powers to require participation in the exercise. In EIOPA's view, these inadequate supervisory powers in certain jurisdictions are one of the key findings of this exercise and may be a source of risk as national and EU authorities may not be able to assess all relevant information and vulnerabilities of the sector during adverse events.

8. EIOPA expects that the recast IORP II Directive (EU) 2016/2341, which entered into force on 12 January 2017, will ensure enhanced participation in these countries in future exercises following its transposition in national law by 13 January 2019. IORP II contains new provisions extending the powers of national supervisors. Article 49 ('Supervisory review process') lays down that Member States shall ensure that competent authorities have the necessary powers to conduct supervisory reviews of IORPs, including "an assessment of the risks the IORP faces" as well as "an assessment of the ability of the IORP to assess and manage those risks". Article 50 ('Information to be provided to the competent authorities') prescribes that Member States shall ensure that competent authorities have the necessary powers to require IORPs "to supply at any time information about all business matters". EIOPA will be monitoring the implementation of IORP II to ensure a consistent, efficient and effective application.

### **Scenario**

9. The pre-stress situation refers to 2016 end of year balance sheets, reflecting the impact of lower yields but also higher equity prices relative to the first EU-wide exercise with end 2014 as the reference date. An analysis of DB/hybrid IORPs participating in both exercises shows that aggregate shortfalls persisted at levels comparable to the first stress test, both in the national and common balance sheet.
10. The adverse scenario, triggered by a shock to EU equity markets, combines a fall in prices of fixed income – due to a widening of spreads – and risk assets with a drop in risk-free rates ('double hit'), resulting in a deterioration of IORPs' funding positions. The instantaneous shock is applied to the national and common balance sheet of DB/hybrid IORPs as well as the investment assets of DC IORPs at the reference date of end 2016.

### **Defined Benefit & Hybrid schemes**

11. European IORPs providing DB/hybrid schemes have, in aggregate, insufficient assets to cover their liabilities based on the national balance sheet. The funding ratio of all IORPs included in the sample amounts to 97% corresponding to a 3% shortfall of assets relative to liabilities (EUR -49 bn).
12. The adverse market scenario leads to a decline of the aggregate national funding ratio from 97% to 79% of liabilities. This corresponds to a fall in the excess of assets over liabilities from -3% to -21% of liabilities or from EUR -49 bn to EUR -301 bn.
13. Funding and valuation standards exhibit high levels of heterogeneity among countries. The IORP Directive does not contain requirements on the valuation of assets and provides high-level principles on the valuation of technical provisions only. In most countries IORPs report the market (or marked-to-market) values of assets on their national balance sheets. In contrast, national valuation standards for technical provisions differ substantially, especially due to variations in discount rates. Also, national discount rates are often fixed and insensitive to changing market conditions.
14. In order to be able to provide comparisons and to present an EU-wide picture of the DB/hybrid IORP sector, EIOPA uses the so called "common balance sheet" methodology. Both sides of the common balance sheet are valued on a market-consistent basis and include all available security mechanisms (sponsor support, pension protection schemes), types of benefits (unconditional, conditional and discretionary) as well as benefit reductions. This methodology ensures a consistent and transparent view of IORPs' pension obligations. The market value of

(unconditional) benefits on the common balance sheet is in aggregate 16% higher than technical provisions on the national balance sheets.

15. The excess of assets over liabilities, excluding security and benefit reduction mechanisms, can be utilised to measure a possible deficit on the common balance sheet. At the aggregate European level, the pre-stress deficit amounts to 20% of liabilities (EUR 349 bn). Ten countries exhibit a deficit on the common balance sheet compared to three on the national balance sheet. This is mainly driven by a substantial increase of the value of the unconditional benefits when applying a market-consistent valuation of liabilities. The shortfall is attributed to a value of 17% (EUR 287 bn) sponsor support and benefit reductions of 4% of liabilities (EUR 77 bn).<sup>1</sup>
16. The negative impact of the adverse scenario on the market value of investment assets equals, in aggregate, 20% of the pre-stress value, mainly driven by the fall in equity values, representing one third of overall investments. The excess of assets over liabilities (excl. security and benefit reduction mechanisms) in the adverse scenario corresponds to a deficit of 38% of liabilities at the aggregate European level (EUR 702 bn) when applying the common balance sheet. The shortfall is covered by a market value of sponsor support of 24% (EUR 445 bn) and benefit reductions of 14% of liabilities (EUR 262 bn).<sup>2</sup>

### **Impact on sponsors and plan members**

17. National prudential mechanisms often allow sponsor support and benefit reductions to be spread over considerable timeframes. Recovery plans usually span many years and often allow IORPs to take into account future asset performance, diminishing the urgency for additional sponsor support or benefit reductions. Also, discount rates higher than the risk-free rate reduce the need for recovery plan measures. These prudential mechanisms may contribute to mitigating the short-term spill-over effects to the real economy and financial stability. However, adjustments may be postponed too far, putting the burden of resolving the shortfalls disproportionately on the younger cohorts, especially if the envisaged asset performance does not materialise.
18. Over a quarter of IORPs reflected in their valuation, by limiting the value of sponsor support to the maximum value of sponsor support, that their sponsor would not be able to fulfil its pension obligations following the adverse scenario. The value of sponsor support in the common balance sheet was compared with the market values of sponsoring companies. This revealed that some sponsors may not be able to provide support to the IORP when it is needed, at least not to the full extent required. In particular, for 25% of participating IORPs the value of sponsor support on the common balance sheet exceeded 42% of the sponsors' market value under the pre-stress and 66% under the adverse scenario. Additionally, for 10% of the sponsors the value of the support exceeded even 169% in the baseline and 266% in the adverse scenario.
19. The outcomes are more modest for sponsors from the financial sector. Still, for 10% of financial institutions the ratio increases from 28% in the pre-stress

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<sup>1</sup> The values of sponsor support and benefit reductions do not exactly add up to the shortfall on the common balance sheet, excluding security and benefit reduction mechanisms. The reason is that the excess of assets over liabilities, including security and benefit reduction mechanisms, is not zero but rather +1% of liabilities (EUR 15 bn).

<sup>2</sup> The values of sponsor support and benefit reductions (in EUR bn) do not exactly add up to the shortfall on the common balance sheet, excluding security and benefit reduction mechanisms. The reason is that the excess of assets over liabilities, including security and benefit reduction mechanisms, is slightly positive (EUR 5 bn).

situation to 51% in the adverse scenario, warranting further scrutiny since financial institutions are more prone to propagate shocks during stress events.

20. Vulnerabilities of the DB/Hybrid IORP sector could spill over to the real economy either through the adverse impact on sponsors or on beneficiaries through benefit reductions. Where sponsor support is legally enforceable and the total value of sponsor support is high compared to the market value of the sponsors' equity, pension liabilities may be a strain on the companies' future growth prospects with possible negative implications on the economic growth and employment levels. On the other hand, significant benefit reductions may have similar negative effects on the real economy by reducing income, consumption and trust in the occupational pension system.

### **Defined Contribution schemes**

21. The DC sector represents approximately 16% of the total European pension sector in terms of total assets. On average, the asset allocation of the DC IORPs sample shows a high exposure towards fixed income assets, nearly two thirds of the investment assets being allocated to bonds

22. The adverse scenario results in a fall of 15% in the market value of investment assets of DC IORPs compared to the pre-stress situation. This reduces the individual account values of DC members which, if the effect of the adverse scenario persists, results in lower future retirement income.

23. The DC part of the exercise assessed the impact of the adverse scenario on future retirement income of three representative plan members (35, 20 and 5 years before the expected retirement date), using common, market-sensitive return assumptions. The pre-stress projections of future retirement income served as a benchmark against which to measure the effects of the adverse scenario.

24. At European level, the weighted average replacement rate - expressing retirement income derived from an inflation-linked annuity as a percentage of final salary - for the 35 years-to-retirement member amounts to 9.4% with the country averages for the pre-stress replacement rate ranging from 3% to 43%. The target replacement rates in DC schemes very much depend on other sources of retirement income, most notably the generosity of the state pension pillar, but total replacement rates were not considered in this exercise.

25. The impact of the adverse scenario on replacement rates at European level is heterogeneous. The stress scenario has a more severe impact on older members closer to retirement due to higher accumulated pension wealth and, hence, higher sensitivity to asset price shocks. In this case, the accumulated assets for the 5 years-to-retirement member drop, on average, by 11.4% while the replacement rate decreases by 14.9%. The impact is more modest in DC schemes with high allocations to fixed income assets for members close to the retirement age, usually through the use of life-cycle approaches.

26. The impact of the adverse scenario on the overall retirement income was assessed by extrapolating the projected retirement income of the three representative members to the overall membership at European level. The adverse scenario impacts retirement income gradually over time as current active members start to receive pension income with the maximum impact being reached when most active members have retired (i.e. around 2060). Whether this affects the real economy in the short term depends on the extent to which DC members consider projected declines in retirement income in current consumption-saving decisions.

## **Second rounds effects and impact on financial stability**

27. Financial stability effects may be exerted by both direct and indirect channels. In principle, the direct channel may originate from the failure of a systemically relevant institution or the collective failure of several institutions generating a 'domino' effect. With the 'indirect' channel, potential externalities may be created by institutions engaging in specific activities or through common reactions of institutions to exogenous shocks.
28. The IORP sector does not seem to impact financial stability in the same way and to the same extent as banking or insurance. The conventional assessment of the impact of a failure of an institution seems to be less relevant for IORPs. However, our analysis suggests that the adverse effects on sponsors and/or on beneficiaries may have an indirect impact on the real economy and, hence, taking a holistic view, financial stability.
29. Furthermore, as IORPs are large institutional investors and play an important role in financial markets, it is important to investigate the impact on financial stability through their investment behaviour. The 2017 exercise includes an assessment of the potential investment behaviour following the adverse market scenario.
30. The results show a variety of responses from IORPs, both DB/hybrid and DC, to the adverse market scenario. Rebalancing behaviour dominates further de-risking among IORPs that responded to the part of the questionnaire addressing envisaged investment behaviour, while many IORPs follow a buy-and-hold strategy. Consequently, these IORPs may alleviate selling pressure during stressed market conditions. However, it is difficult to draw firm conclusions as a substantial proportion of IORPs failed to provide information, compromising the representativeness of the sample.

## **Conclusions**

31. European IORPs providing DB/hybrid schemes have on average insufficient assets to cover their liabilities based on the national balance sheet. This is driven by three countries in the baseline and seven countries in the adverse scenario. These vulnerabilities are even more pronounced on the common market-consistent balance sheet, using market (risk-free) curves for the valuation of liabilities. The revealed shortfalls would need to be addressed, in line with national arrangements, by mitigating mechanisms, such as sponsor support, benefit reductions and, where available, pension protection schemes. Those results confirm the findings of the 2015 exercise.
32. As most of the IORPs within the sample would use mitigating tools to cover for the shortfall under the common balance sheet, the assessment of the effects on the real economy has been one of the main objectives of this stress test exercise. A significant portion of sponsors may not be able to fully support the pension promise when it is needed signalling that pension obligations may exert substantial pressure on the solvency and future profitability of businesses and, hence, could have an effect on the European economy. Consequently, EIOPA sees benefits in deepening its future analyses in to assess the effects of sponsor support on the real economy.
33. The impact exerted through potential benefit reductions will depend on the individual characteristics of the national pensions sectors and frameworks. Where overall future retirees' income is highly dependent on the occupational pensions sector, the impact of an adverse, persistent market developments may dampen economic activity, depending on the extent to which households adjust current consumption and saving, but also reduce trust in the IORP system.

34. It needs to be acknowledged that IORPs in financial difficulties are usually subject to recovery plans, in accordance to their long-term obligations and payment horizons, often relying on uncertain future asset performance. Such prudential tools consequently smoothen the effects on the IORP itself, the sponsoring entities, members and beneficiaries and, hence, the real economy. The downside is that the necessary adjustments to resolve shortfalls may fall disproportionately on future, younger generations, especially if investment returns fall short of expectations. It is therefore of paramount importance to continue assessing relevant shortfalls using market-sensitive methodologies, the feasibility of sponsor support and benefit reduction mechanisms, also further enhancing the cash flow analysis in order to gain further insights into the time element of the vulnerabilities.
35. Going forward, an assessment of the implications of specific activities and common behaviours – a ‘horizontal assessment’ – of potential systemic risk drivers such as search for yield, flight to quality or herding behaviour would provide further insights into the indirect impact that may be posed to financial stability. Further, market-wide stress tests could provide a powerful tool for the assessment of the externalities potentially generated by IORPs towards the rest of the financial system and the real economy. Environmental, social and governance (ESG) aspects including climate change will also be of growing importance for the pensions sector and will require cautious assessment of any financial stability implications.



# 1. Introduction

## 1.1. Background

36. This report provides the results of the second EU-wide stress test exercise of Institutions for Occupational Retirement Provision (IORPs) subject to Directive (EU) 2016/2341<sup>3</sup>. As stated in its Regulation, EIOPA, in cooperation with the ESRB, is required to initiate and coordinate Union-wide stress tests to assess the resilience of financial institutions to adverse market developments<sup>4</sup> and to assess the potential of systemic risk that may be posed by financial institutions in times of stress.<sup>5</sup>
37. IORPs are pension institutions with a social purpose that provide financial services.<sup>6</sup> They operate occupational pension schemes for employers, in order to provide retirement benefits to their employees (the scheme members and beneficiaries).<sup>7</sup> IORPs are, however, only a subset of all private pension scheme arrangements available in Europe.<sup>8</sup> The FSB Regional Consultative Group for Europe estimates that IORPs account for 36% of private pension scheme assets, while the remaining 64% are held by non-IORPs, such as insurance undertakings (48%), pension funds not subject to the IORP Directive (5%) and other providers, like banks and asset managers.<sup>9</sup>
38. EIOPA conducted its first stress test for IORPs in 2015 based on end 2014 data, exposing the risks and vulnerabilities of the European IORP sector.<sup>10</sup> The outcomes showed in aggregate substantial pre- and post-stress shortfalls for DB/hybrid IORPs when comparing assets and liabilities in both the national and common balance sheet. Assessing the resilience of expected retirement income of three representative DC members demonstrated that older plan members that are close to retirement are relatively more vulnerable to an instantaneous fall in asset prices, while younger DC members are more sensitive to a prolonged period of low returns.
39. This exercise elaborates on the 2015 IORPs stress test report's conclusions, in particular with regards to deepening the understanding of the second-round effects of adverse scenarios on financial stability and the real economy. The 2015 report highlighted the need to assess further how national prudential mechanisms absorb shocks over time and the consequences of the additional pressure put on sponsors to increase their (future) payments to secure benefits. Furthermore, the ECB and

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<sup>3</sup> Directive (EU) 2016/2341 of the European Parliament and of the Council of 14 December 2016 on the activities and supervision of institutions for occupational retirement provision (recast), Official Journal L 354, 21/12/2016 P. 37 – 85.

<sup>4</sup> Art. 32(2) EIOPA Regulation No 1094/2010 states that EIOPA shall, in cooperation with ESRB, initiate and coordinate Union-wide assessments of the resilience of financial institutions. Recital 42 EIOPA Regulation (EU) No 1094/2010 explains that "Union-wide assessments" should be interpreted as "Union-wide stress test": "EIOPA should also, "in cooperation with the ESRB, initiate and coordinate Union-wide stress tests to assess the resilience of financial institutions to adverse market developments, [..]"

<sup>5</sup> Art. 23(1) EIOPA Regulation No 1094/2010

<sup>6</sup> Recital 32 IORP II Directive (EU) 2016/2341

<sup>7</sup> European Commission – Memo/14/320 on the Revision of the Occupational Pensions Directive (frequently asked questions): [http://europa.eu/rapid/press-release\\_MEMO-14-239\\_en.htm](http://europa.eu/rapid/press-release_MEMO-14-239_en.htm)

<sup>8</sup> Please see for an overview of private pension scheme arrangements EIOPA's database on pension plans and products in the EEA: <https://eiopa.europa.eu/regulation-supervision/pensions/database-of-pension-plans-and-products-in-the-eea>

<sup>9</sup> See Financial Stability Board Regional Consultative Group for Europe, Working Group on Private Pension Scheme Resilience, Report on European Private Pension Schemes: functioning, vulnerabilities and future challenges, 17 October 2017: <http://www.fsb.org/wp-content/uploads/P171017.pdf>

<sup>10</sup> EIOPA, IORPs Stress Test Report 2015, 26 January 2016:

<https://eiopa.europa.eu/Publications/Surveys/EIOPA%20IORPs%20Stress%20Test%20Report%202015%20bookmark.s.pdf>

ESRB proposed to investigate the potential impact of IORPs on the real economy in their joint report on macro-prudential policy issues arising from low interest rates and structural changes in the EU financial system<sup>11</sup>. The 2017 IORP stress test report intends to address these proposals for further work.

40. The report also provides an up-to-date view of the risks and vulnerabilities of the European occupational pensions sector. The 2017 stress test uses end of 2016 as the reference date, taking into account the impact of the macro-financial developments since the first IORP stress test in 2015. The decline in interest rates and, in some Member States, the increase in the breakeven inflation rates<sup>12</sup> has potentially exerted pressure on DB/hybrid IORPs by increasing their financial obligations. At the same time, the rise in bond and equity prices may have increased asset values for both DB/hybrid and DC IORPs. In addition, this exercise takes into account the developments in the exposures of IORPs to the various risk factors due to changes in asset allocations and hedging strategies over the past two years.

## 1.2. Objectives

41. The 2017 IORP stress test has two main objectives. First, it aims at assessing the resilience of IORPs to an adverse market scenario, taking into account, where available, security mechanisms (i.e. sponsor support and pension protection schemes) and benefit adjustment mechanisms. In addition, the second-round effects on the real economy and financial markets are analysed.

42. Similar to the IORP Stress Test in 2015, the resilience of the DB/hybrid segment of the IORPs sector is assessed against an adverse market scenario. The assessment is based on both the national balance sheet and the common, market-consistent balance sheet<sup>13</sup>. Furthering the 2015 analysis, the resilience is analysed in terms of the internal rate of return as an alternative measure of the financial situation of IORPs, using the cash flows for unconditional benefits reported by participating DB/hybrid IORPs. Also new in this year's exercise is that DC IORPs had to assess the impact of the adverse market scenario on the market value of assets, acknowledging that for DC IORPs the value of liabilities moves in tandem with assets, since all financial risks are borne by the plan members.

43. IORPs may transmit shocks to the real economy through sponsor support and/or benefit adjustments, which may affect the solvency and profitability of companies and/or disposable income of households. Elaborating further on the 2015 IORP stress test, the DB/hybrid-part of the stress test is assessing, in a qualitative manner, how and to what extent national recovery plans and other mechanisms allow sponsor support and pension benefit reductions to be distributed over time. Insights into the indirect impact of the adverse scenario on sponsoring companies are obtained by comparing the value of sponsor support on the common balance sheet with the market value of the sponsor. The DC part of the exercise

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<sup>11</sup> ECB/ESRB, Macroprudential Policy Issues Arising from Low Interest Rates and Structural Changes in the EU Financial System, November 2016:

[https://www.esrb.europa.eu/pub/pdf/reports/161128\\_low\\_interest\\_rate\\_report.en.pdf?0e7740d64f9aac67eb8d7e89e3282b70](https://www.esrb.europa.eu/pub/pdf/reports/161128_low_interest_rate_report.en.pdf?0e7740d64f9aac67eb8d7e89e3282b70)

<sup>12</sup> Breakeven inflation is a market-based measure of expected inflation. In the stress test breakeven inflation rates are derived from the zero-coupon inflation swap curve, i.e. the fixed rate paid by one party in the swap contract in exchange for receiving a floating rate based on an inflation index from the other party in the contract.

<sup>13</sup> The common balance sheet approach entails a market-based, risk-sensitive valuation for IORPs' balance sheets and is an essential part of EIOPA's Opinion to EU institutions on a common framework for risk assessment and transparency for IORPs: [https://eiopa.europa.eu/Publications/Opinions/EIOPA-BoS-16-075-Opinion\\_to\\_EU\\_Institutions\\_Common\\_Framework\\_IORPs.pdf](https://eiopa.europa.eu/Publications/Opinions/EIOPA-BoS-16-075-Opinion_to_EU_Institutions_Common_Framework_IORPs.pdf). The common balance sheet approach enables EU-wide comparisons of the stress test results across Member States and participating institutions.

investigates the impact of the adverse scenario on expected retirement income based on the calculations for three representative plan members.

44. IORPs are large institutional investors with assets amounting to EUR 3,573 bn in the EEA<sup>14</sup>. As such, IORPs have the potential to significantly influence financial markets through their investment behaviour. The data analysis of the 2008 financial crisis, which was included in the 2015 IORPs stress test report, showed differences in the IORPs' reactions to the crisis in terms of investment behaviour. On an asset-weighted basis, IORPs tended to have a (slight) net stabilising effect by moderately buying equities during a falling stock market, implying counter-cyclical behaviour.<sup>15</sup> Both the DB/hybrid and DC parts of this exercise are addressing the expected investment behaviour of participating IORPs following the adverse market scenario.

### **1.3. Process**

45. In the first half of April 2017, EIOPA collected valuable input from EU pension stakeholders, including the EIOPA Occupational Pensions Stakeholder Group (OPSG), on the clarity and consistency of the stress test package ahead of the launch of the second IORP stress test on 18 May 2017. On that date, EIOPA also organised a launch event which aimed at providing participants with additional practical information for participating and completing the stress test exercise. Building on the stress test package developed for the 2015 exercise, the technical specifications, reporting tools, templates and questionnaires were further refined and designed in a user-friendly way. During the launch event the stress test package was explained in further detail. The main topics addressed in the workshop were:

- An overview of the content, process and timeline of the exercise;
  - Background on the adverse market scenario developed by the ESRB;
  - Practical introduction to the specifications, templates and tools for both the DB- and DC-part of the stress test.
46. To facilitate high quality data submissions, throughout May to July 2017, a Q&A procedure was organised in which EIOPA answered 28 questions from participating IORPs. The deadline for the first data submissions of the IORPs to the NSAs was scheduled for 13 July 2017. Subsequently, the data were validated at national level and submitted to EIOPA by the end of August 2017.
47. During September and October 2017, data were further validated at EIOPA with the contribution of the participating NSAs. In that period, two central validation meetings were organised to further check the quality of the data and to ensure the consistency of results and outcomes between and within the participating Member States.

### **1.4. Coverage and participation**

48. EIOPA's objective was to reach a 50% coverage rate of the total IORP sector per country in the EEA in terms of total assets. NSAs were requested to target a representative sample of IORPs in their country.

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<sup>14</sup> See EIOPA, 2016 Market development report on occupational pensions and cross-border IORPs, EIOPA-BoS-16/222, 10 March 2017.

<sup>15</sup> Although it should be noted that the cursory analysis had a relatively low statistical significance.

49. NSAs had a choice to distinguish between DB/hybrid IORPs and DC IORPs by aiming to reach a coverage rate of at least 50% of assets of the total DB/hybrid sector and 50% of members of the total DC sector in their country.
50. The IORP stress test took place in EEA countries with material IORP sectors. 'Material' means, for the purpose of this exercise, that the sector exceeds EUR 500 million in assets. As a consequence, the stress test was conducted in 19 countries (AT, BE, CY, DE, DK, ES, FI, GR, IE, IT, LI<sup>16</sup>, LU, NL<sup>17</sup>, NO, PT, SE, SI, SK and UK) with IS participating on a voluntary basis in the DC part of the stress test.
51. Target participation was achieved in most countries, with the notable exception of IE and the UK (Figure 1.1). In IE, the coverage rate was insufficient in terms of overall assets for both the DB/hybrid and DC segment. In the UK the target participation was achieved in the DC segment, measuring coverage by number of members, but not in the DB/hybrid segment, measuring coverage by assets. In both IE and the UK, despite the efforts of the NSAs, the lack of supervisory powers was the main reason for not meeting the target as an insufficient number of IORPs responded positively to the call for participation.

Figure 1.1: Coverage of national IORP sectors in 2017 IORP stress test, % assets or % members (2016 data)

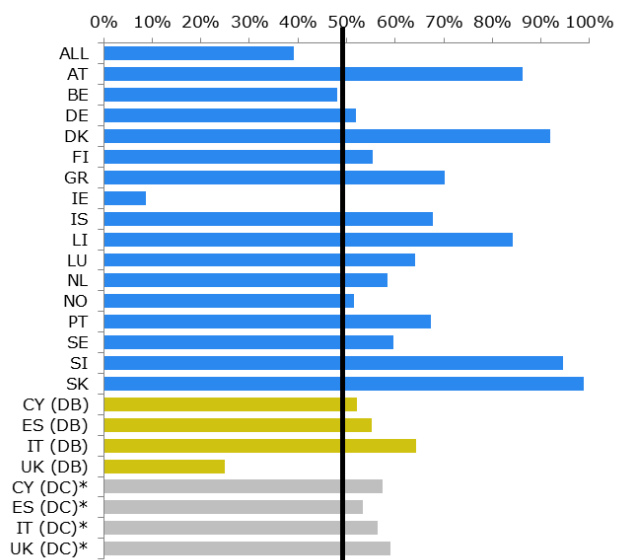
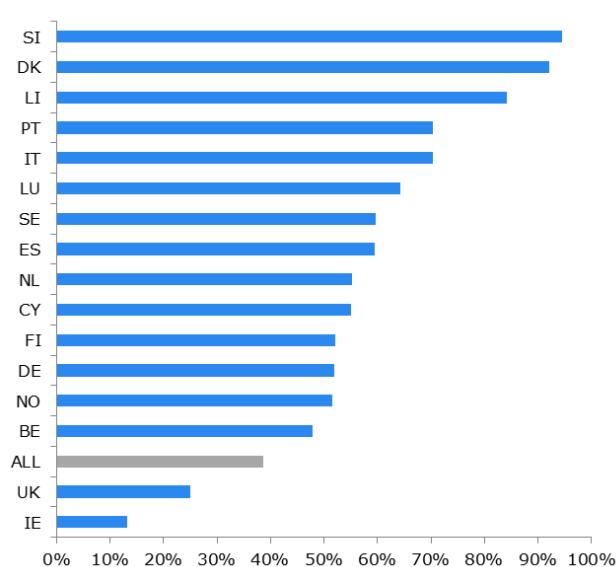


Figure 1.2: Coverage of national DB IORP sectors in 2017 IORP stress test, % assets (2016 data)



Note: Blue bars refer to total coverage in % of total assets for both the DB/hybrid and DC sectors. Yellow bars refer to coverage in % of total assets of the DB/hybrid sector only. Grey bars refer to coverage in % of total members of the DC sector only.

<sup>16</sup> LI is excluded from the country-level data presentation in the DB/hybrid section of the report in order to ensure the confidentiality of individual IORPs' data, but is included in the European DB/hybrid sample aggregates.

<sup>17</sup> NL is excluded from the country-level data presentation in the DC section of the report in order to ensure the confidentiality of individual IORPs' data, but is included in the European DC sample aggregates.

52. The overall participation rate in the 2017 IORP stress test amounts to 39% of assets (Figure 1.1), compared to 43% in the 2015 IORP stress test. All in all, 195 IORPs participated in the exercise, of which 130 in the DB/hybrid part and 65 in the DC part. The overall coverage rate of the DB/hybrid sector equals 39% of assets (Figure 1.2). The overall coverage rate of the DC sector equals 35% of assets (Figure 1.3) and 58% of members (Figure 1.4). The discrepancy between the DC coverage rate in terms of assets and in terms of members is due to the overrepresentation of relatively recently established schemes, especially in the UK, which dispose of relatively low amounts of assets but high numbers of members. Although achieving satisfactory total participation rates, the low participation of the DC segment in the NL and PT<sup>18</sup> may limit the representativeness of the DC sample when discussing the corresponding results.

Figure 1.3: Coverage of national DC IORP sectors in 2017 IORP stress test, % assets (2016 data)

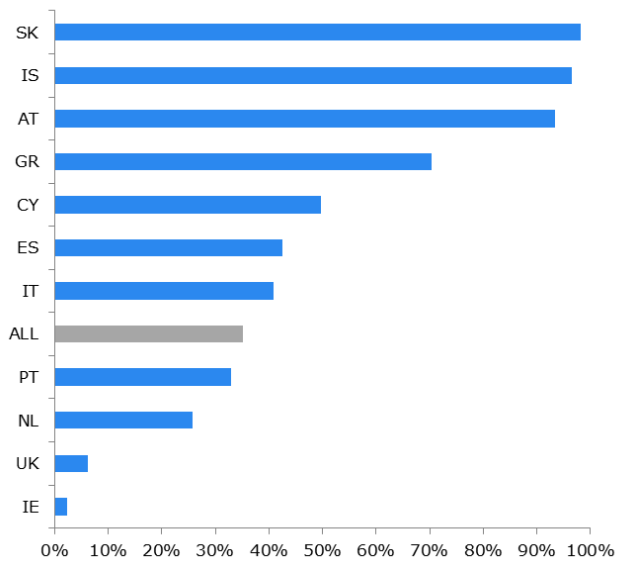
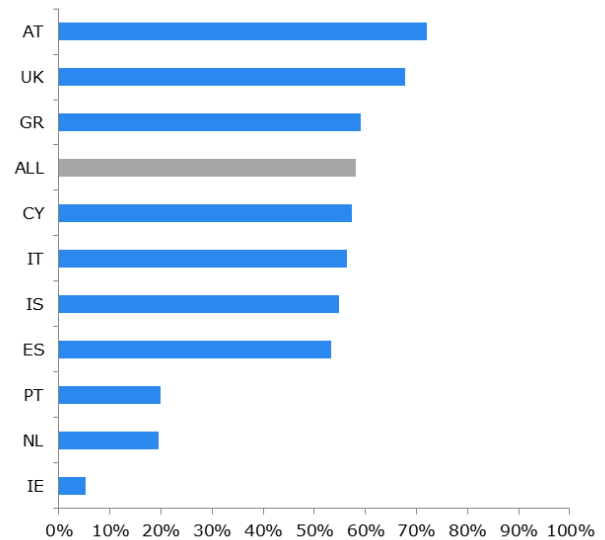


Figure 1.4: Coverage of national DC IORP sectors in 2017 IORP stress test, % members (2016 data)



<sup>18</sup> In PT it is difficult to achieve a higher coverage rate for the total DC sector because DC schemes tend to be small both in terms of assets and of members. Therefore, an increase of coverage would imply the inclusion of a large number of schemes.

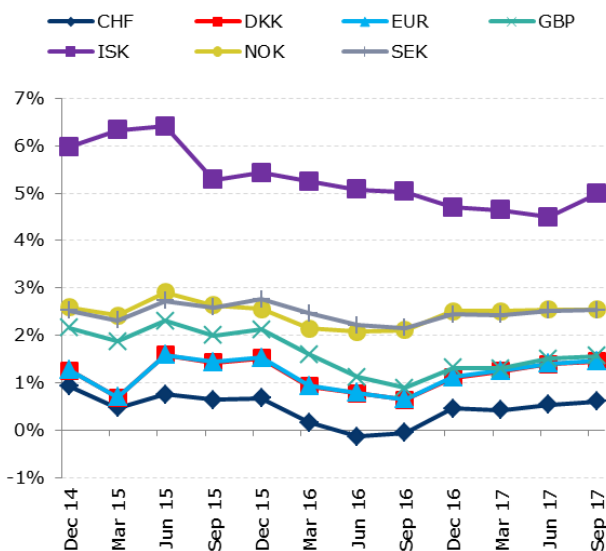
## 2. Baseline and adverse scenario

### 2.1. Financial market developments

53. Since the 2015 IORP stress test, the external economic and financial environment has remained challenging for IORPs. Risk-free interest rates have decreased in the first half of 2016 (Figure 2.1) with a rebound towards end-2016 for most currencies. In the UK, the largest IORP market in Europe, yields decreased substantially in mid-2016.

54. The low risk-free interest rates in combination with tightening credit spreads have resulted in higher bond prices. Also global equity prices have increased by around 20% (Figure 2.2) measured in EUR from the end of 2014 to the end of 2016. Finally, the GBP exchange rate has depreciated against the EUR by approximately 10% since the year-end 2014<sup>19</sup>.

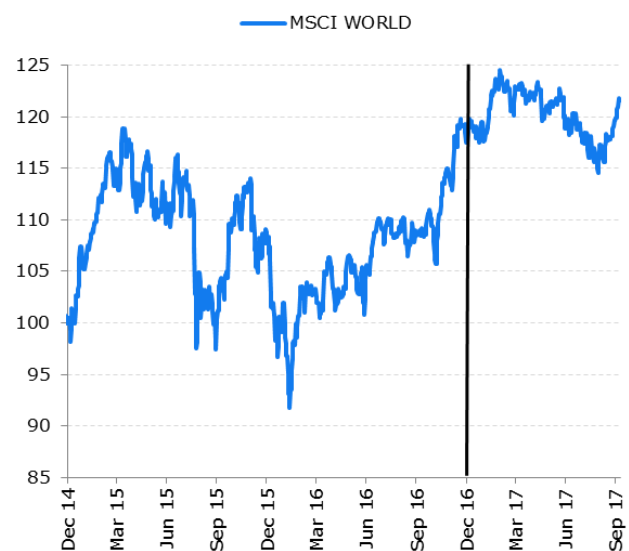
Figure 2.1: Development of risk-free rates by currency, end-2014 to Q3-2017



Source: EIOPA.

Note: Basic risk-free interest rates with a 20 year maturity, as published monthly on EIOPA's website: <https://eiopa.europa.eu/regulation-supervision/insurance/solvency-ii-technical-information/risk-free-interest-rate-term-structures>

Figure 2.2: Development of MSCI world stock market index, end-2014 to Q3-2017



Source: MSCI.

Note: Index: 31/12/2014=100, based on the EUR value index.

<sup>19</sup> Between end-2014 and end-2016 the EUR appreciated vis-à-vis the GBP from 0.7789 GBP/EUR to 0.85618 GBP/EUR. Source: ECB.

## 2.2. Adverse market scenario

### Overall Description

55. The ESRB, in collaboration with the ECB, has developed the narrative and the methodology determining the adverse financial scenario for the exercise. The scenario was approved by the ESRB General Board and subsequently transmitted to EIOPA<sup>20</sup>.
56. The scenario for the individual risk factors used for this exercise is a set of one-off, instantaneous shocks to asset prices and yields, relative to their levels as at 31 December 2016. It includes 257 individual risk factors designed to cover the investment exposures of IORPs' assets. The scenario combines a fall in risk-free interest rates with an abrupt and large drop in the price of assets held by IORPs (a "double hit" scenario). In view of their sizable investment portfolios and long-term liabilities, DB/hybrid IORPs are particularly vulnerable to a "double hit" scenario, resulting in a deterioration of their funding ratios.
57. The adverse scenario is triggered by a shock to EU equity markets. This assumption is motivated by signs of overvalued equity prices in some regions, both within and outside Europe, and by the fact that IORPs' equity exposures are large compared with other invested asset classes. In response to the equity market shock, risk premiums would increase for a number of other asset classes, to which IORPs are exposed. The scenario results in a deterioration of financing conditions in corporate and sovereign debt markets as well as real estate and commodity markets.

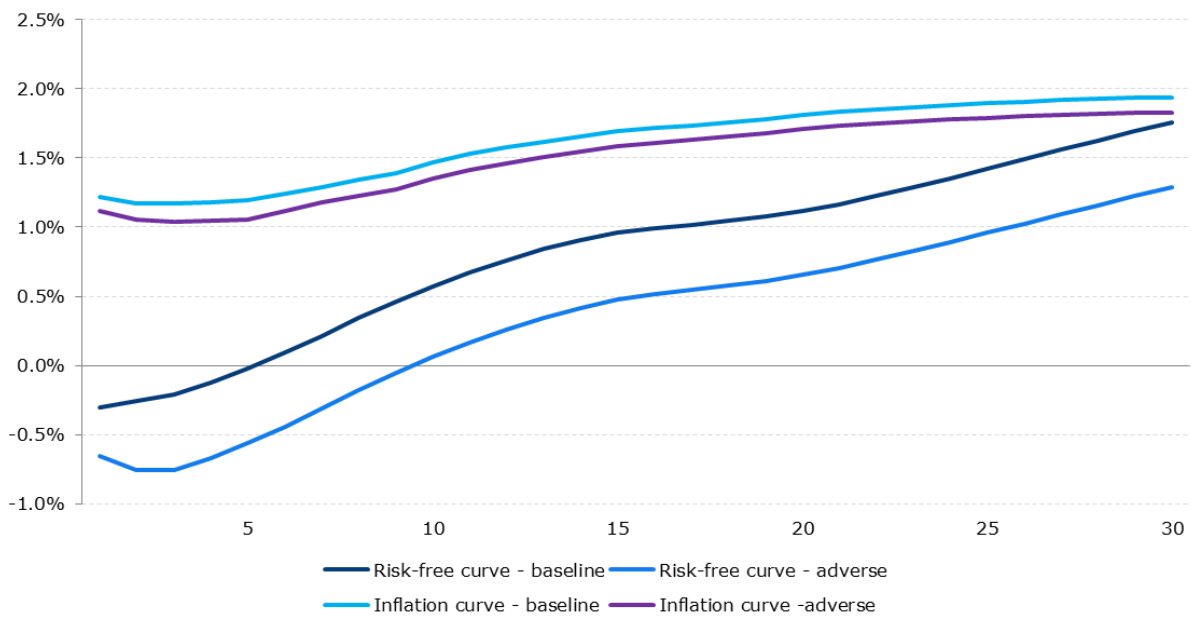
### Specifics of the scenario

58. The interest rate swap and inflation swap curves for the EUR were stressed relative to the end-2016 levels. The interest rate and inflation stresses were applied to the basic risk-free interest rate curves and inflation curves for the EUR - which have been derived using the Smith-Wilson method including the Ultimate Forward Rate (UFR) - (Figure 2.3) as well as the other relevant currencies (CHF, DKK, GBP, ISK, NOK, SEK).
59. The government bond stresses are expressed as changes in the 2, 5 and 10-year yields (Figure 2.4). As a consequence, the stress captures the combined effect of lower swap rates and higher credit spreads in basis points over the swap rate. The yield change for bonds issued by supranational institutions and government bonds issued by non-EEA countries is assumed to be zero for all maturities. This implies that lower swap rates are exactly compensated by higher credit spreads on these bonds.
60. The corporate bond stresses are similarly expressed as changes in the yield and are assumed equal for all maturities (Figure 2.4). Participating IORPs had to apply the corporate bond stresses to corporate bonds issued by companies in all countries in all currencies. Additionally, the stresses for financial corporate bonds (covered) had to be applied to collateralised securities, loans and mortgages.

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<sup>20</sup>See ESRB, Adverse scenario for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test in 2017, 23 March 2017: <https://eiopa.europa.eu/Publications/Surveys/2017-03-23%20Scenario%20approved%20by%20General%20Board.pdf>

Figure 2.3: Risk-free rate and inflation swap curve for the euro in the baseline and adverse market scenario, %



61. Property, listed equity and alternative investment stresses are expressed in terms of the percentage change in the value of these asset classes. The percentage changes in value are measured in the reporting currency (Figure 2.5).

Figure 2.4: Change in yields on government and corporate bonds in adverse market scenario, adverse market scenario, basis points

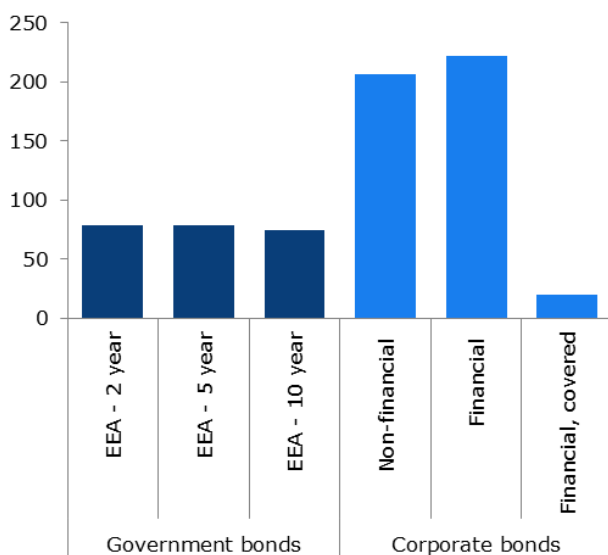
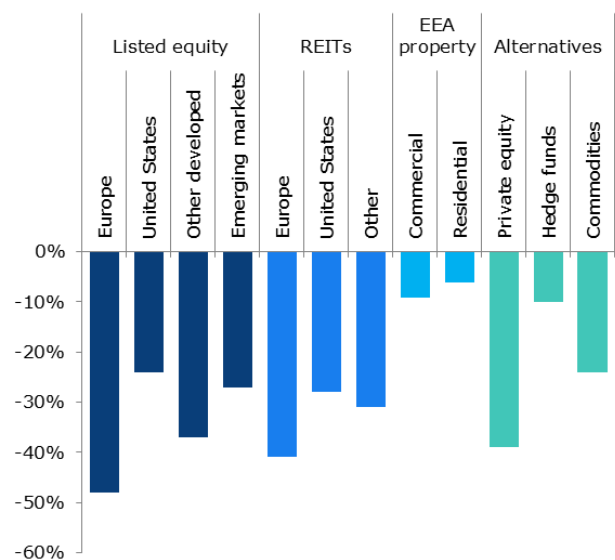


Figure 2.5: Changes in non-fixed income asset prices in adverse market scenario, %



Note: The figures show the aggregate government bond and property stresses for the EEA, but the adverse scenario distinguished the individual EEA countries. In addition, the adverse scenario set out 7 credit steps for the non-financial, financial and financial (covered) corporate bonds. IORPs were asked to apply these detailed, underlying stresses to their bond and property exposures. However, the aggregate stresses could be used as a simplification, if the IORP's bond and property holdings were invested in line with these aggregates.

The more detailed government bond, corporate bond and property stresses can be found in the IORP Stress Test 2017 Specifications:

[https://eiopa.europa.eu/Publications/Surveys/BoS-17-075v2\\_IORP\\_Stress\\_Test\\_2017\\_Specifications.pdf](https://eiopa.europa.eu/Publications/Surveys/BoS-17-075v2_IORP_Stress_Test_2017_Specifications.pdf)



62. The property stress were to be applied to direct and indirect as well as listed and unlisted real estate investments (including property held for own use). The property stresses included shocks for global Real Estate Investment Trusts (REITs) as well as its geographical components: EU and non-EU REITs. The REITs shocks had to be applied to 1) listed real estate investments, 2) unlisted, indirect real estate investments that employ financial leverage and 3) non-EEA direct property investments and non-EEA indirect real estate investments without leverage (specifically, the non-EU REIT aggregate shock had to be applied in this case) (Figure 2.5).
63. The listed equity stresses comprised shocks for developed and emerging markets aggregates as well as the geographical components of the developed markets aggregate: EU, US and other. IORPs had to apply the listed equity stresses - i.e. aggregate versus underlying components - which are most appropriate for their situation. The private equity shock was also to be applied to participations (Figure 2.5).

### **2.3. Expected return and risk premium assumptions**

64. The adverse market scenario was designed to be applied to the common balance sheet in the DB/hybrid part of the stress test and to the market value of assets in the DC part. The adverse scenario does not contain information on long-term risk premiums. EIOPA specified the assumptions for long-term risk premiums for IORPs to assess the impact of the scenario on national balance sheets in the DB/hybrid part of the stress test and the impact on future retirement income in the DC part.
65. In a number of countries the discount rate for the valuation of technical provisions in the national balance sheet is based on the expected return on assets defined as a market interest rate plus a risk premium. The stress test specifications prescribed that IORPs in such circumstances should assume that the risk premiums do not change in the adverse market scenario compared to the baseline scenario.<sup>21</sup>
66. To assess the impact of the adverse scenario on future retirement income of three representative DC members, expected return assumptions are necessary to project the development of future asset values. The expected returns were assumed to be equal to the risk-free (forward) rates plus a risk premium:
- The forward risk-free rates are derived from EIOPA's risk-free interest rate term structure for the relevant currency. Forward risk-free interest rates decrease in the adverse scenario due to the downward shift in the risk-free interest rate spot curve.
  - The risk premiums are specified for the six asset categories depicted in Table 2.1. The risk premiums do not change in the adverse market scenario, i.e. no mean reversion of asset returns is assumed. This is consistent with the aim of the stress tests to assess severe, low-probability events which are nonetheless plausible.

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<sup>21</sup> See paragraph 3.6 in EIOPA, IORP Stress Test 2017 Specifications, EIOPA-BoS-17/075v2, 18 May 2017.

*Table 2.1: Risk premium assumptions in baseline and adverse scenario for the DC part of the stress test, basis points*

Fixed income assets	
Government bonds	30 bps
Corporate bonds (and other excl. cash and deposits)	90 bps
- non-financial	60 bps
- financial	110 bps
Cash and deposits	0 bps
Non-fixed income assets	
Equities, property, alternatives and other	300 bps

67. To assess the impact of the adverse scenario on future retirement income also assumptions about future wage growth are needed. It is assumed that future nominal wage growth equals a constant real wage growth of 1% plus the forward inflation rates derived from the inflation swap curve for the relevant currency. Although real wage growth does not change in the adverse scenario<sup>22</sup>, future nominal wage growth declines due to the (slight) downward shift in the (spot) inflation curve.

68. The methodology for establishing expected returns ensures a common, risk-sensitive approach to the DC part of the stress test. However, it is important to emphasise that such a common methodology implies that the expected returns and, hence, expected retirement income are likely to deviate from the assumptions underlying pension projections at national level for the purpose of informing plan members.

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<sup>22</sup> The assumption that real wage growth does not decline in the adverse scenario mitigates the negative impact on projected retirement income. Since contributions to DC schemes are linked to members' salaries, pension savings are higher in the absence of a reduction in real wage growth. In contrast, the negative impact on projected retirement income as a percentage of final salary – i.e. the replacement rate – is amplified, as a decline in real wage growth will lower the denominator of the replacement ratio.

### 3. DB/hybrid part stress test

#### 3.1. Sample description of DB/hybrid sector

69. The European DB/hybrid IORP sector is dominated by IORPs from the UK and the NL, representing respectively 52% and 37% of the market in terms of assets, with DE, IE and NO completing the top 5 at a considerable distance (Figure 3.1)<sup>23</sup>. Due to the low participation rates of IORPs in IE and the UK, the share of these countries in the stress test sample is substantially lower, while the share of the other countries is considerably higher. The weights of the DB/hybrid IORP sectors in the NL and the UK are more or less reversed with the NL comprising 53% of the sample and the UK 34% (Figure 3.2). This is important to realise when interpreting the stress test results in this section. The European aggregate ('All') presented in most charts reflects the composition of the sample which differs significantly from the composition of the overall European IORP sector.

Figure 3.1: Assets DB/hybrid IORP sector by country (2016 data), %

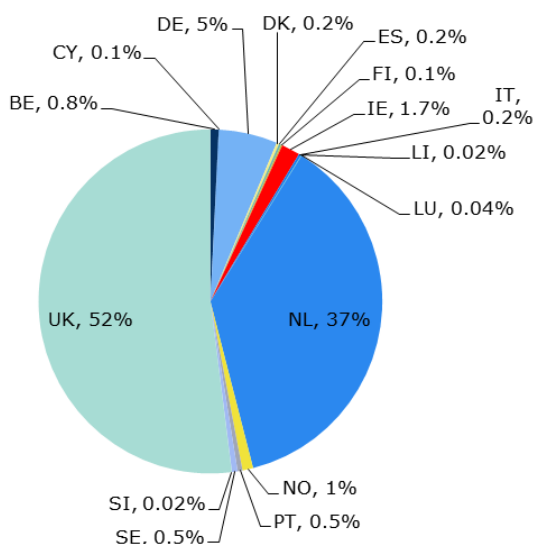
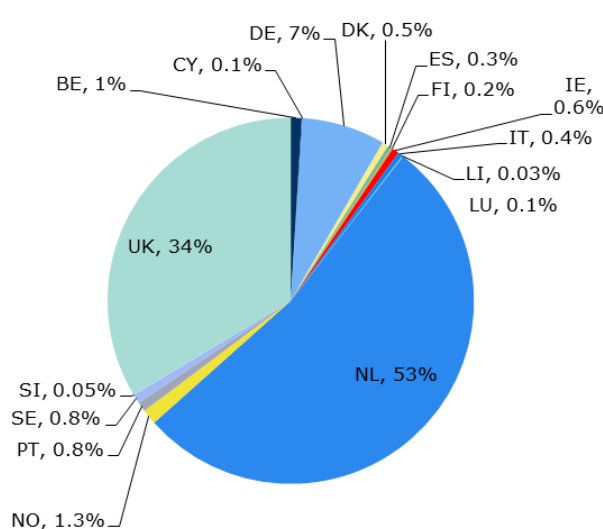


Figure 3.2: Assets DB/hybrid IORP sample by country (2016 data), %



#### 3.2. Resilience of DB/hybrid IORPs

##### 3.2.1. Baseline scenario

##### 3.2.1.1. National balance sheet

70. The national balance sheet at the reference date of end 2016 serves as the baseline for assessing how the adverse scenario affects the ability of IORPs to meet their funding requirements. Funding requirements and the corresponding valuation standards are to a large extent determined at the national level. As a result, funding and valuation standards exhibit a lot of variation between Member States and are therefore difficult to compare, as explained further below.

71. European IORPs providing DB/hybrid schemes have in aggregate insufficient assets to cover liabilities based on the national balance sheet. The funding ratio of all IORPs included in the sample amounts to 97% (Figure 3.3). This is equivalent to an excess of assets over liabilities of -3% of liabilities or EUR -49 bn.

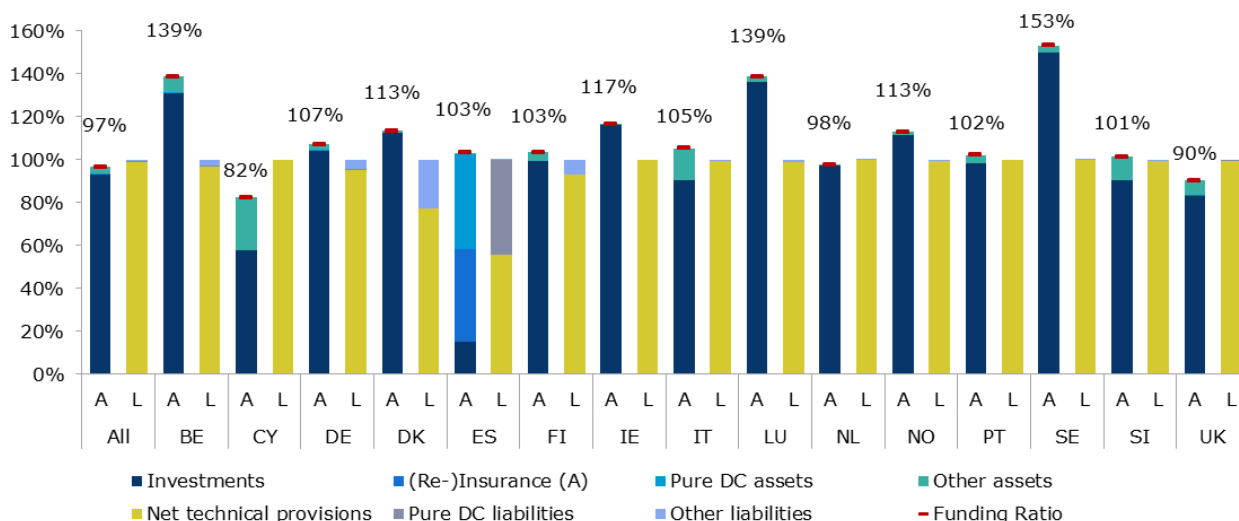
<sup>23</sup> In Figure 3.1 only countries participating in the stress test are taken into account.

72.Despite the aggregate shortfall, assets exceed liabilities in most countries. BE, LU and SE stand out with aggregate assets ranging from 139% to 153% of liabilities. CY, the NL and the UK have funding ratios below 100% based on their national valuation standards. This variance may be explained in part by the sample size and participant population and also explains the funding shortfall at the European level given the dominance of IORPs from the NL and the UK in the stress test sample.

73.Assets and liabilities on the national balance sheet consist to a large extent of investment assets and technical provisions for DB/hybrid schemes. In CY other assets amount to a quarter of total assets. IORPs from CY have traditionally substantial allocations to cash at bank, which have been classified under the other assets category.

74.IORPs participating in the DB/hybrid part of the stress test may – besides DB and/or (part of) hybrid schemes – also provide pure DC schemes.<sup>24</sup> IORPs in ES have sizeable assets for pure DC schemes and corresponding pure DC liabilities, making up almost 45% of the balance sheet total. The DB/hybrid schemes provided by IORPs from ES are mostly reinsured with insurance undertakings.

Figure 3.3: Assets (A) and liabilities (L) on the national balance sheet in baseline scenario by country, % liabilities<sup>25,26</sup>



### National valuation standards

75.The values of assets and liabilities on the national balance sheet are not comparable between countries due to different valuation standards. The IORP Directive does not contain requirements on the valuation of assets, only high-level principles on the valuation of technical provisions. Discount rates have to be determined by taking into account the market yields of high-quality or government bonds, the yield on IORPs' projected future investment returns or a combination of both. Member States may supplement these principles by specifying more detailed valuation requirements in national prudential regulation.

76.In most countries IORPs report the market (or marked-to-market) values of assets on their national balance sheets. Exceptions are Pensionskassen in DE, part of IORPs in IT and IORPs in FI and SI, where (part of) assets are reported using

<sup>24</sup> IORPs only providing pure DC schemes are not within the scope of the DB/hybrid part of the stress test but included in the DC part.

<sup>25</sup> In the FI national balance sheet assets and liabilities are always equal. Part of IORPs in FI deviated from the national valuation standard which explains the funding ratio of 103%.

<sup>26</sup> The 'other assets' category in IT includes sponsor support.

measurement approaches like acquisition costs, book value or allocated according to IFRS in the category 'hold to maturity'. IORPs in these four countries reported assets on the national balance sheet amounting to on average 88-95% of the corresponding market value.

77. National valuation standards for technical provisions are more heterogeneous, especially due to differences in discount rates (Annex 1). The majority of IORPs in the sample employ an expected return on assets, most notably in BE, ES, IT and the UK (Figure 3.4). The expected return on assets can either be determined as a long-term estimate or as a (risk-free) market yield plus a risk premium. Almost one-third of IORPs use a fixed discount rate, especially in DE, FI, IE, LU, NO and SI.<sup>27</sup> In DK, the NL and SE IORPs have to use a risk-free interest rate curve based on a so-called ultimate forward rate (UFR) approach.<sup>28</sup> IORPs in PT valued technical provisions on the national balance sheet with a high-quality bond yield.

78. The heterogeneity in discount rate conventions results in substantial differences in discount rates between and sometimes within countries. Weighted average discount rates vary from 1.2% in the NL, similar to EIOPA's risk-free rate, to 4.2% in ES, representing a mark-up of 3.3% over the risk-free rate (Figure 3.5). The average national discount rate for all IORPs amounts to 2.1%, almost twice as high as the corresponding risk-free interest rate, which consequently leads to a lower value of liabilities when compared to a mark-to-market approach.

Figure 3.4: Type of discount rate used to establish technical provisions by country, % respondents

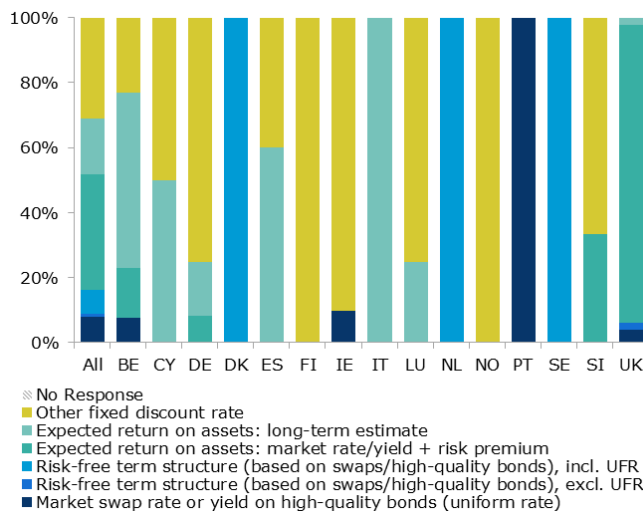
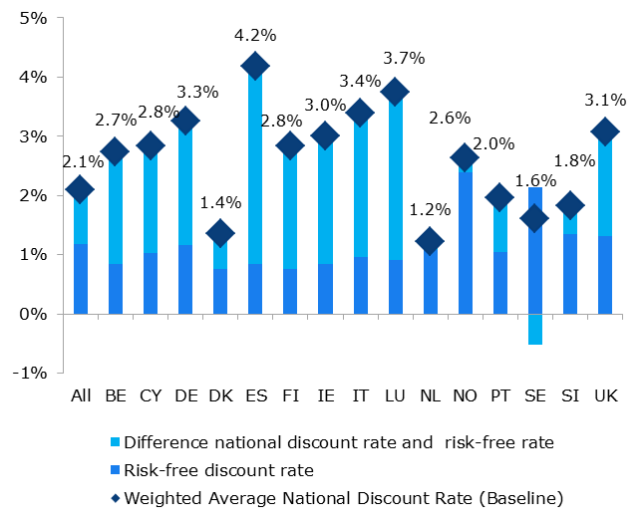


Figure 3.5: National discount rate in baseline scenario by country, liability weighted average, %



Note: The liability-weighted average national discount rate is compared to the risk-free spot rate for the relevant currency at the maturity corresponding to the average duration of pension liabilities.

<sup>27</sup> The discount rates for IORPs in NO and the majority of IORPs in DE (Pensionskassen) depend on the starting date/year of pension contracts/schemes, mostly because they are equal to the agreed interest rate. In IE the discount rate depends on whether technical provisions relate to active/deferred members or retired persons. In SI the technical provisions are calculated as the accumulated value of paid contributions, which should not be smaller than the value calculated using the guaranteed interest rate. A minority of IORPs in LU also indicated through the questionnaire that the fixed discount rate varies by plan member.

<sup>28</sup> This means that risk-free rates with maturities beyond the last liquid point are derived under the assumption that forward rates converge towards the UFR.

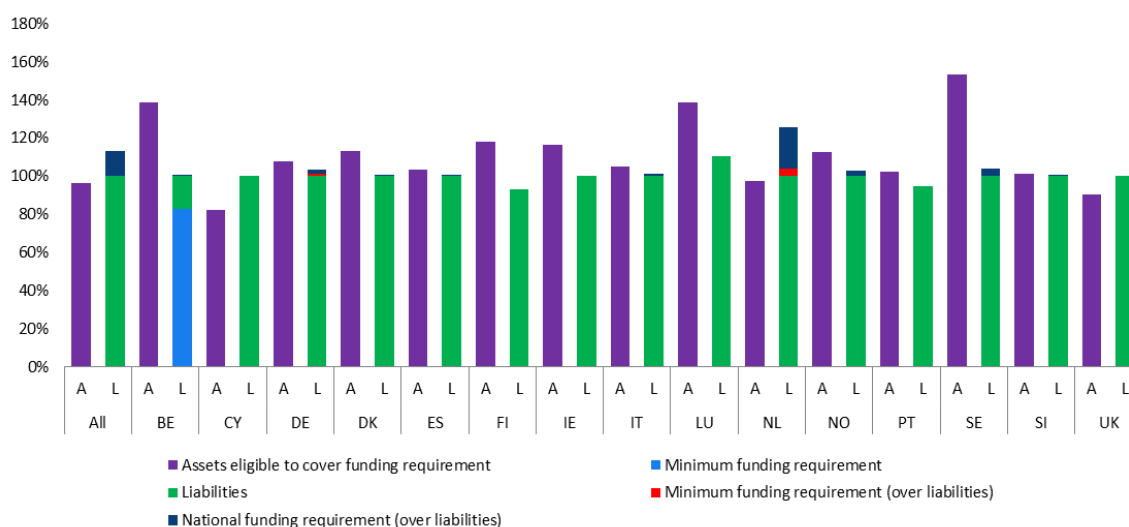
## Surplus over funding requirement

79. National prudential regulations in Europe do not only feature a variety of valuation standards but also differences in funding requirements (and accompanying supervisory responses as elaborated in section 3.3.1) across and within countries. The IORP Directive stipulates that IORPs should have sufficient assets to cover technical provisions. IORPs that bear the risk of providing DB/hybrid schemes themselves, instead of the sponsor, are subject to the regulatory own funds requirement in Art. 15(1), representing over 4% of technical provisions. However, Art. 15(3) allows Member States to specify additional buffer requirements through national prudential regulation.

80. All IORPs in DK<sup>29</sup>, the NL, NO, SE and SI<sup>30</sup> are subject to the Art. 15(1) regulatory own funds requirement yet not any IORPs from BE, CY, DE, ES, FI, IE, LU, PT and the UK. In IT some IORPs have to meet this regulatory own funds requirement and some IORPs do not, depending on the strength and availability of sponsor support. In BE, DE, ES, IE<sup>31</sup> and NL, some or all IORPs have to comply with additional national buffer requirements in line with Art. 15(3) (see Annex 1).

81. The aggregate funding requirement over liabilities amounts to 13% of liabilities (Figure 3.6). Since eligible assets to cover the funding requirement amount to 97% of liabilities, IORPs carry a shortfall of 17% of liabilities in aggregate. IORPs in most countries have in aggregate sufficient eligible assets to cover the funding requirement. Only IORPs in CY, the NL and the UK are on average not able to meet the funding requirement. As a result, most IORPs in these three countries are subject to a recovery plan (see Section 3.3.1).

Figure 3.6: Assets, liabilities, national funding requirement (over liabilities) and, where available, the minimum funding requirement in baseline scenario by country, % liabilities



Note: For FI and PT the value of liabilities corresponds to the national funding requirement, which is lower than the amount of liabilities presented on the national balance sheet. In FI the reason is that liabilities on the national balance sheet also include capital and reserves and may include some other liabilities. Part of the sample in LU reported projected benefit obligation (PBO) liabilities for the national funding requirement, which is higher than the accumulated benefit obligation (ABO) liabilities presented on the national balance sheet.

<sup>29</sup> Part of IORPs in DK did not include the regulatory own funds requirement in the funding requirement reported in the stress test.

<sup>30</sup> Most IORPs in SI have conducted the stress test at the level of the pension fund instead of the pension company/IORP, which bears the risk of guaranteeing the minimum investment return. As a result, these IORPs have not included the Art 15(1) regulatory own funds requirement in the reported funding requirement.

<sup>31</sup> IORPs in IE did not include the national risk-based reserve requirement in the funding requirement reported in the stress test.

82. IORPs in three Member States reported a minimum funding requirement (Figure 3.6).<sup>32</sup> The minimum funding requirement in BE is related to the so-called short-term technical provisions, which amounts to about 80% of long-term technical provisions. In DE, the minimum funding requirement is set in line with (former) Art. 17c of the IORP I Directive. The NL imposes the regulatory own funds requirement from Art 15(1) of the IORP Directive as a minimum funding requirement. IORPs in BE and DE have a surplus of respectively 56% and 6% of liabilities, while IORPs in the NL have a shortfall of 6% of liabilities relative to the minimum funding requirement.

### 3.2.1.2. Common balance sheet

83. The common balance sheet – in contrast to the national balance sheets – provides a comparable and transparent view on the financial situation of IORPs in the EEA. It is established using uniform and market-consistent valuation standards and includes all available security and benefit adjustment mechanisms, like sponsor support, pension protection schemes, conditional and discretionary benefits as well as benefit reductions.<sup>33</sup>

84. The amounts recognised for these items on the common balance sheet should be interpreted to constitute their market value, i.e. the value that would be established on financial markets if the security and benefit adjustment mechanisms were to be exchanged at current (end 2016) prices. Market values are generally estimated as the discounted value of future cash flows<sup>34</sup>, like sponsor payments and benefit reductions, but do not as such reveal the size and distribution of these cash flows over time. Section 3.2.2 discusses how national prudential mechanisms determine the size and timing of future sponsor support and benefit reductions.

85. IORPs had to employ a look-through approach to investment fund assets on the (national and common) balance sheet to apply the detailed stresses in the adverse market scenario in a consistent manner. IORPs also had to report the market value of investment fund assets on the common balance sheet using the look-through approach.

86. At the European level, the fixed income exposure is 46% of investment assets (Figure 3.7). For DE, DK, LU and SI this exposure is in excess of 70% or more. The exposure to property together with equity at the European level is 40% of investment assets, while for BE, FI, NL, NO and SE this exposure is higher and in the range of 42% to 45%. In FI and IT, the property exposure alone is approximately 20% of investment assets, which is almost double the exposure at the European level. The exposure at European level of 14% to other investments, like private equity, hedge funds and commodities, is mainly determined by allocations of IORPs from the NL and the UK.

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<sup>32</sup> The part of the LU sample that used PBO liabilities as the funding requirement (see note Figure 3.6) reported the ABO liabilities as the minimum funding requirement.

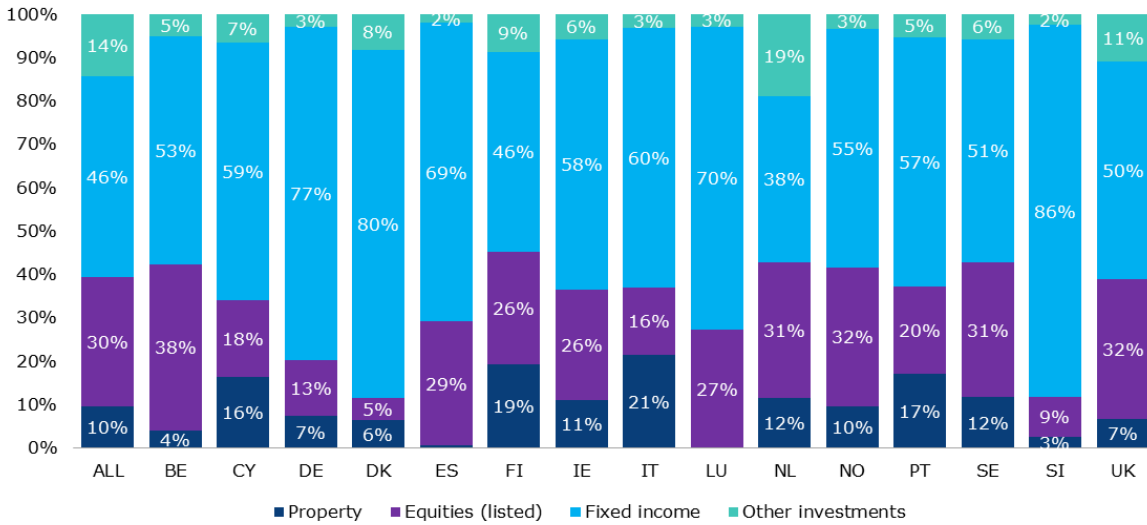
<sup>33</sup> See EIOPA, Annex to IORP Stress Test 2017 Specifications – Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017:

[https://eiopa.europa.eu/Publications/Surveys/BoS-17-076v2\\_Annex\\_TS\\_IORP\\_Stress\\_Test\\_2017.pdf](https://eiopa.europa.eu/Publications/Surveys/BoS-17-076v2_Annex_TS_IORP_Stress_Test_2017.pdf)

<sup>34</sup> According to the stress test specifications, IORPs had to establish the market value of security and benefit adjustments mechanisms as the discounted value of projected cash flows, consistent with existing pension arrangements. The market value of one security or benefit reduction mechanism could be established using the so-called balancing item approach. Subject to some conditions, either the market value of sponsor support, pension protection schemes or benefit reductions could be established as the amount needed to balance the assets and liabilities on the common balance sheet. IORPs could also adopt simplifications for the valuation of the common balance sheet, provided that these simplifications are proportionate to the nature, scale and complexity of the underlying risk, but recognising that the nature of the stress test exercise requires a lower degree of accuracy than financial and supervisory reporting. Moreover, IORPs were requested to perform the calculations on a best effort basis within the limited time available and it was recognised that, as a result, IORPs may have to accept material model-error due to time constraints or in order to avoid excessive costs.



Figure 3.7: Allocation investment assets (excl. pure DC) in baseline scenario, %



Note: Cash is not included under investment assets but is part of the category 'other assets'.

87.A more detailed breakdown of the categories 'listed equities', 'fixed income', 'property' and 'other investments' is given in the Figures 3.8 – 3.11 below.

Figure 3.8: Breakdown of listed equities in baseline scenario by region, %

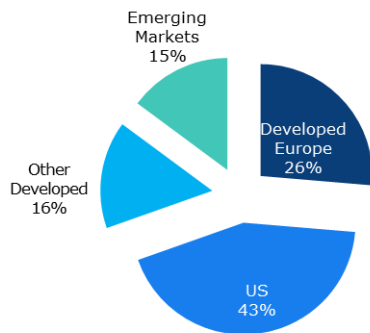


Figure 3.9: Breakdown of fixed income investments in baseline scenario, %

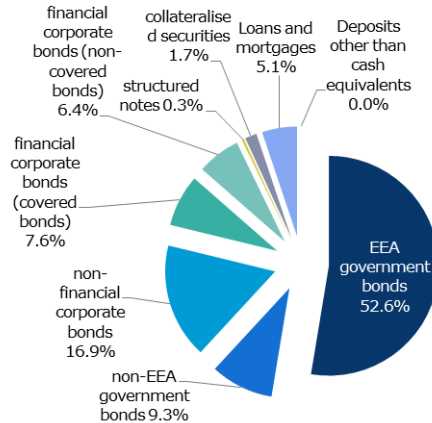


Figure 3.10: Breakdown of property investments in baseline scenario, %

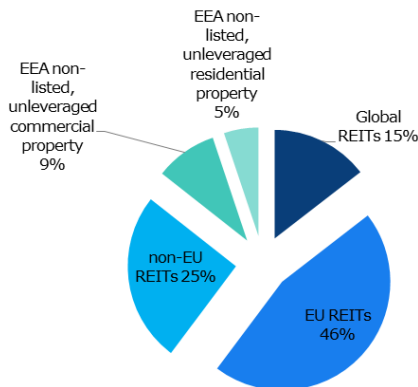
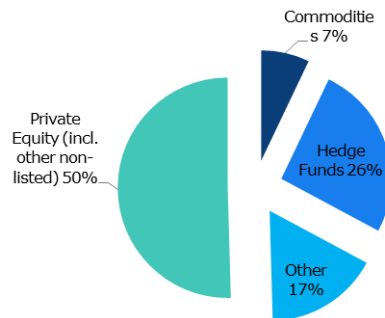


Figure 3.11: Breakdown of other investments in baseline scenario, %

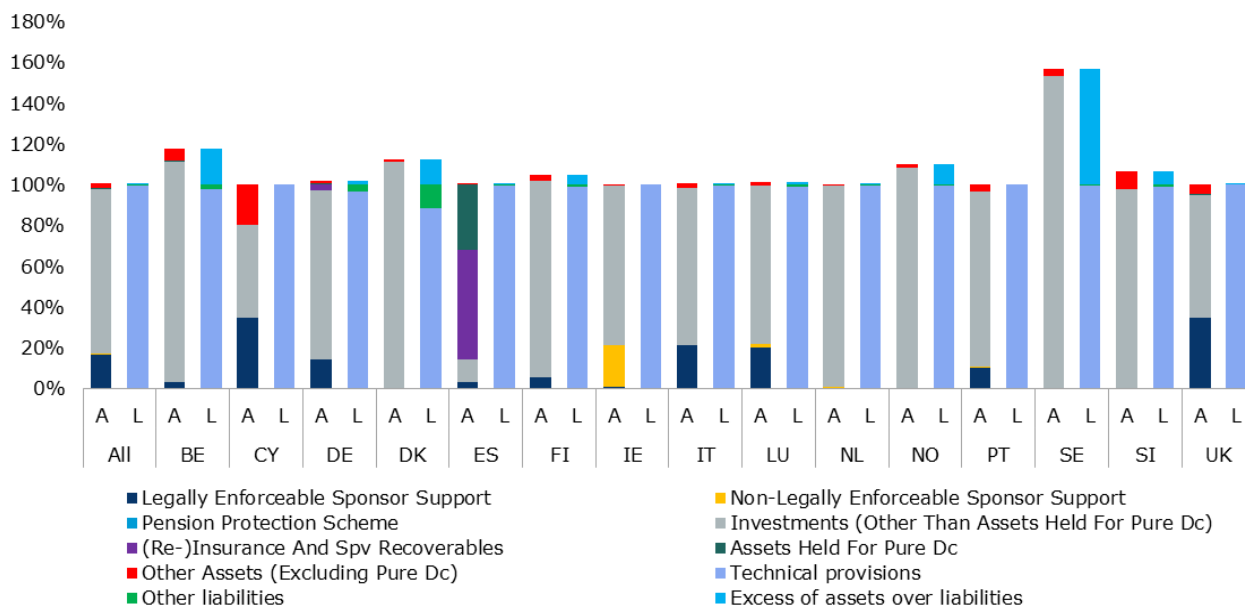




88. At European level, investment assets cover about 80% of liabilities. In BE, DK, NO and SE, the value of investments exceeds liabilities, resulting in an aggregate excess of assets over liabilities ranging from 10% in NO to 57% of liabilities in SE. In SI, the combined value of investment and other assets exceeds the value of liabilities by 7%. In DE, ES, FI, IT and LU, part of IORPs have financial assets in excess of liabilities, explaining the slight aggregate surpluses in these countries.

89. Unlike most national balance sheets<sup>35</sup>, the common balance sheet contains also the value of sponsor support and pension protection schemes on the asset-side (Figure 3.12). At European level 17% of liabilities need to be covered by legally enforceable sponsor support. In CY and UK, this percentage is more than twice as much due to the lower level of financial assets in both countries. In IT and LU, about 20% of the liabilities is covered by legally enforceable sponsor support. Non-legally enforceable sponsor support is negligible at European level, but covers slightly more than 20% of liabilities in IE. Pension protection schemes only exist in DE and the UK, but IORPs in these countries did not report significant values for this security mechanism. Recoverables from (re)insurance are very significant in ES, covering more than half of the liabilities.

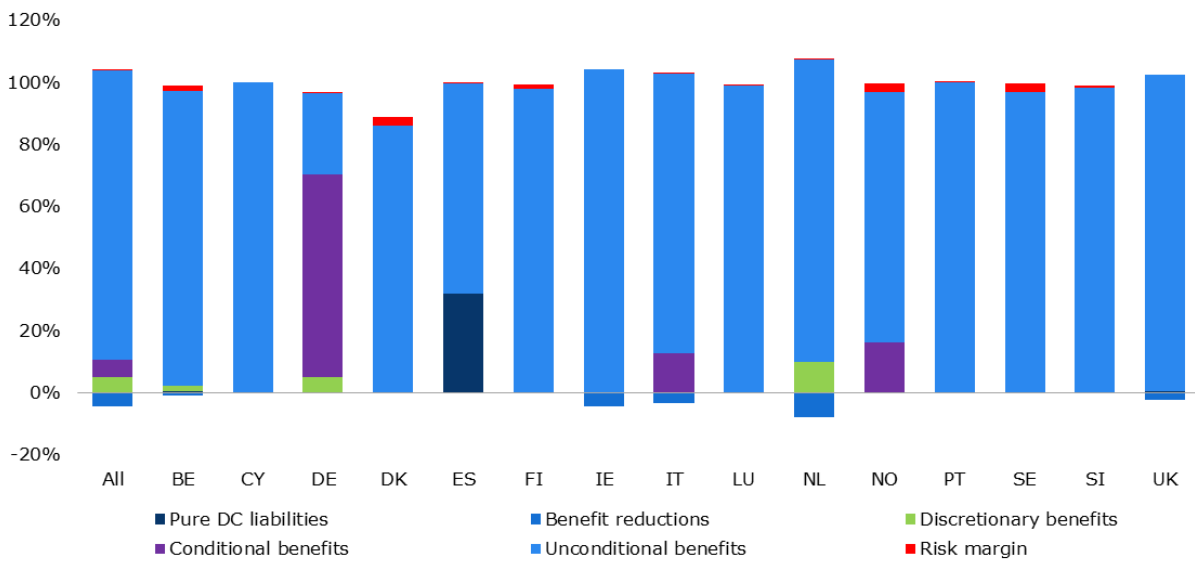
Figure 3.12: Assets (A) and liabilities (L) on the common balance sheet in baseline scenario by country, % liabilities



90. The common balance sheet includes the value of conditional and discretionary benefits as well as benefit reductions on the liability-side, contrasting with most national balance sheets (Figure 3.13). In DE, a large part (65%) of the liabilities consists of conditional benefits that are subject to an ex-ante benefit reduction mechanism. In the other countries the unconditional benefits dominate the balance sheet with around 70% or more of liabilities, compared to a European aggregate level of 93%. In ES, 32% of liabilities belong to pure DC arrangements. On the balance sheets of IE, IT and the NL, the value of benefit reductions ranges from 3% to 8% of liabilities and in BE and the UK the value ranges from 1% to 2% of liabilities.

<sup>35</sup> IORPs in IT have recognised sponsor support in the national balance sheet under 'other assets'.

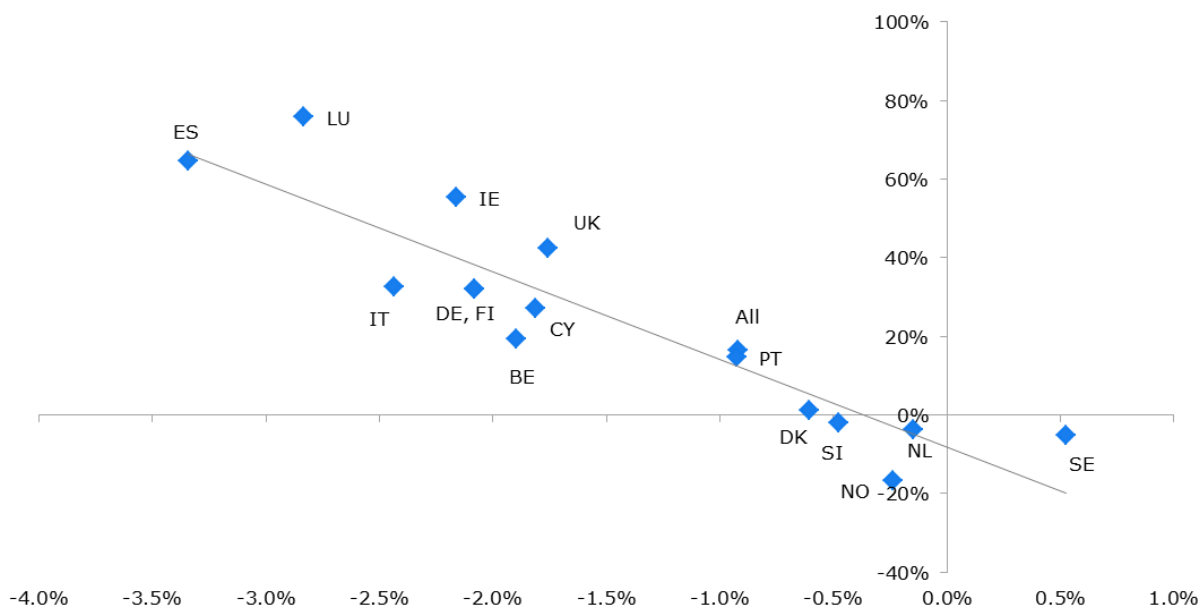
Figure 3.13: Technical provisions on common balance sheet in baseline scenario by country, % liabilities



Note: The category "benefit reductions" includes ex post benefit reductions and benefit reductions in case of sponsor default. Ex ante benefit reductions are part of conditional benefits.

91. The value of unconditional benefits on the common balance sheet is substantially higher than the value of technical provision on the national balance sheets (Figure 3.14). This is mainly due to the use of the risk-free discount rate on the common balance sheet (combined with a relative high duration of the liabilities), which is lower than the discount rate used for most national balance sheets. In aggregate for all countries, the value of unconditional benefits on the common balance sheet is 16% higher compared to technical provisions on the national balance sheet. In nearly all countries the aggregate value of unconditional liabilities is higher with the exception of the NL, NO, SE and SI.

Figure 3.14: Percentage difference between unconditional benefits in the common balance sheet compared to national technical provisions (vertical axis) and the absolute difference in percentage points between the discount rate used in the common and national balance sheet valuation (horizontal axis) in baseline scenario



Note: The markers for DE and FI cannot be distinguished in the chart as the data points for both countries are virtually the same.

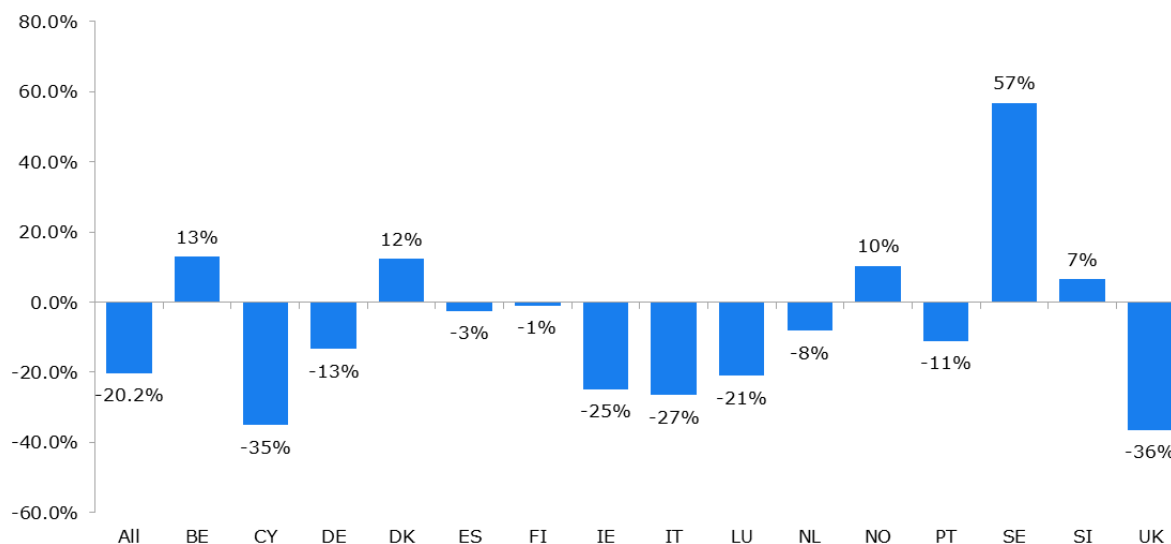
## Excess of assets over liabilities

92. The excess of assets over liabilities (EAL) on the common balance sheet is by construction non-negative. Any shortfall between financial assets and liabilities (excl. benefit reductions) needs to be covered by sponsor support, pension protection schemes and/or benefit reductions. Like the stress test in 2015, if available security and benefit adjustment mechanisms are insufficient to solve a possible deficit on the balance sheet, it is assumed that the assets and liabilities are balanced by including a value for ex post benefit reductions.<sup>36</sup>

93. An indication of the current value of sponsor support, pension protection schemes and benefit reductions that would be required to absorb a possible deficit on the common balance sheet can be given by considering the EAL excluding these mitigating tools.

94. At the aggregate European level this measure of the EAL amounts to -20% of liabilities or EUR -349 bn (Figure 3.15). The variation between the countries' samples ranges from a deficit of 36% in the UK to a surplus of 57% of liabilities in SE. Ten countries carry an aggregate deficit on the common balance sheet when not considering sponsor support, pension protection schemes and benefit reductions in contrast to only three countries on the national balance sheet. This is mainly caused by a substantial increase in the value of the unconditional benefits due to the change in discount rate. In some countries, compared to the national balance sheet, the inclusion of conditional and discretionary benefits on the common balance sheet also plays a role.

Figure 3.15: Excess of assets over liabilities (excl. sponsor support, pension protection schemes and benefit reductions) in baseline scenario, % liabilities (excl. benefit reductions)



Note: Assets include all assets on the common balance sheet except sponsor support and pension protection schemes and liabilities include all liabilities, including conditional and discretionary benefits, except benefit reductions.

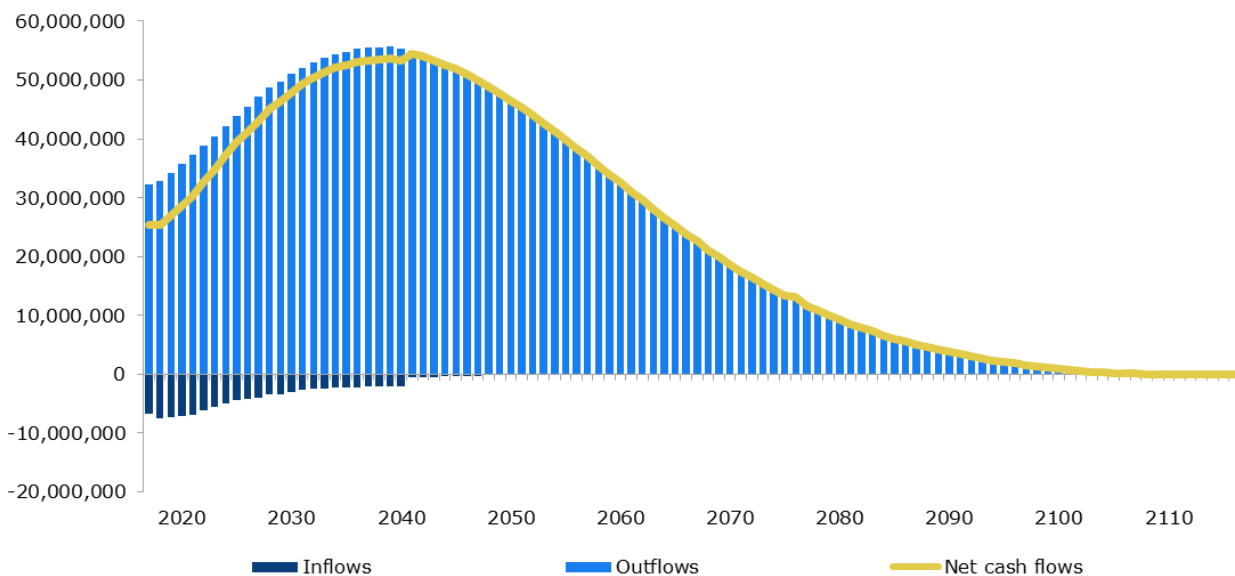
<sup>36</sup> See paragraph 1.1.9 of EIOPA, Annex to IORP Stress Test 2017 Specifications – Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017.

### 3.2.1.3. Cash flows unconditional benefits

95. Participating IORPs were asked to report projected cash flows underlying the value of unconditional benefits on the common balance sheet.<sup>37</sup> The technical specifications for the common balance sheet prescribe that these cash flows should only relate to current members and beneficiaries.<sup>38</sup> The specifications also define in which circumstances IORPs should include future pension accruals and accompanying contributions. In principle, future accruals and contributions should not be taken into account when the IORP or the sponsor has the unilateral right to terminate them.

96. The aggregate net cash flows for unconditional benefits in Figure 3.16 are broken down by cash inflows, i.e. contributions received by the IORP, and cash outflows, i.e. unconditional benefits. More than half of IORPs distinguished between cash inflows and outflows, particularly in DE, DK, IT, SI and the UK. However, the UK IORPs inadvertently reported recovery plan contributions which are part of sponsor support instead of unconditional benefits.

Figure 3.16: Aggregate cash flows for unconditional benefits in baseline scenario, EUR thousand



97. The reported cash flows are not fully reconcilable with the value and duration of unconditional benefits on the common balance sheet. However, the discounted value of future cash flows is in aggregate only -0.7% lower than the value of unconditional liabilities and the deviation does not exceed -5% in any country except DK (Figure 3.17). Part of IORPs in DK reported real cash flows instead of the nominal cash flows. The calculated duration of cash flows exceeds the reported duration of unconditional pension liabilities by 1 year, where the higher duration in SI is most striking (Figure 3.18).

98. Both values do not necessarily have to be the same since IORPs were allowed to use simplifications in establishing the value of unconditional benefits on the

<sup>37</sup> IORPs that do not report unconditional benefits on the common balance sheet but rather pure conditional benefits with an ex ante benefit reduction mechanism had to report the cash flows for pure conditional benefits excluding the ex-ante benefit reduction mechanism.

<sup>38</sup> See paragraphs 2.5.8-2.5.9 in EIOPA, Annex to IORP Stress Test 2017 Specifications – Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017.

common balance sheet. A frequently applied simplification is to derive the common balance sheet value by adjusting the national value of technical provisions for the difference between the risk-free rate and the national discount rate using the duration of technical provisions.<sup>39</sup> Some IORPs also indicated that discretionary benefits were not recognised separately on the common balance sheet, but included under unconditional benefits. Many IORPs valued unconditional liabilities by discounting projected cash flows. However, in some cases, more granular cash flows were used rather than the annual cash flows that the reporting template distinguished. IORPs used for example monthly/quarterly cash flow data or took into account current (t=0) cash flows that are not subject to discounting.

Figure 3.17: Difference between discounted value reported cash flows and value of unconditional liabilities on the common balance sheet in baseline scenario, %<sup>40</sup>

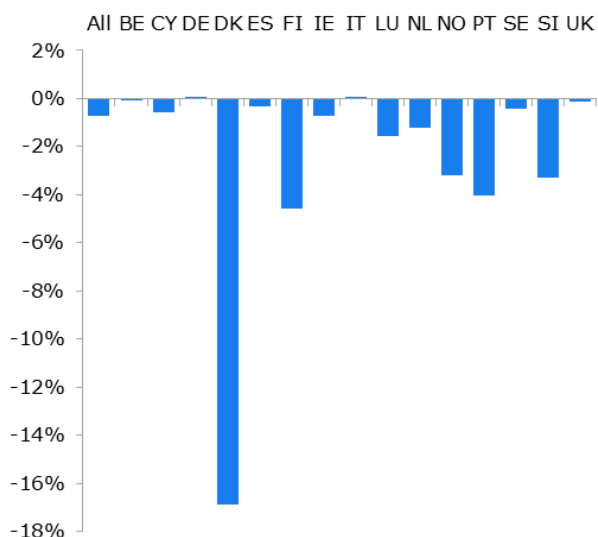
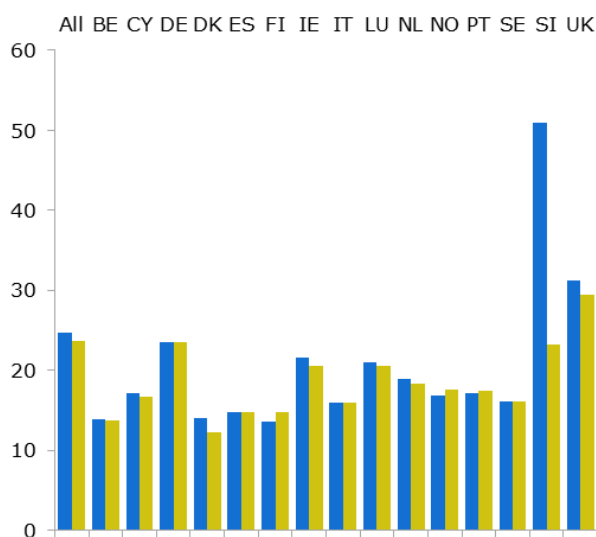


Figure 3.18: Duration of reported cash flows and reported duration of unconditional liabilities on the common balance sheet in baseline scenario, years

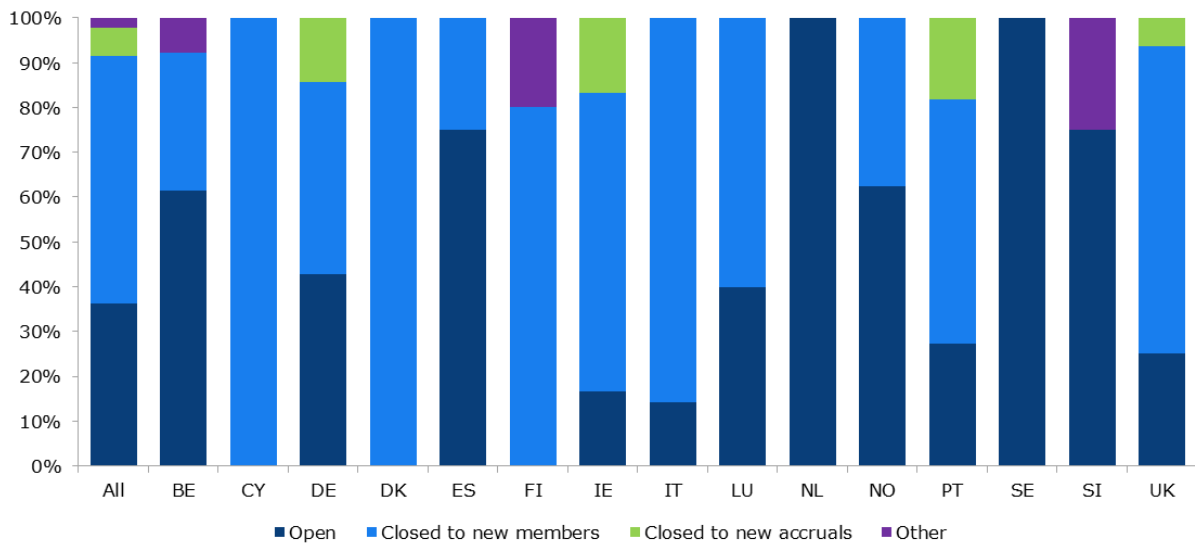


99. Only 36% of non-DC schemes provided by IORPs in the sample are still open (Figure 3.19). The remaining schemes are either closed to new members (55%), or closed to all new accruals (6%) or have an 'other' status. IORPs' pension payments are in aggregate projected to continue rising during the next twenty-five years (Figure 3.16). The total annual net cash outflows will reach a peak of EUR 54 bn around 2040, after which pensions in payment will begin to decline as new pensioners will be outnumbered by pensioners passing away. However, it should be reiterated that the projected cash flows only consider existing plan members and that, depending on the pension contract/scheme, future contributions and accruals of existing plan members may not be included.

<sup>39</sup> This simplification was explicitly allowed for in paragraph 2.4.9 of the Annex to IORP Stress Test 2017 Specifications – Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017.

<sup>40</sup> Part of IORPs in DK reported real cash flows instead of nominal cash flows, ref. paragraph 96

Figure 3.19: Status of non-DC pension schemes provided by IORPs, % non-DC schemes provided by IORPs



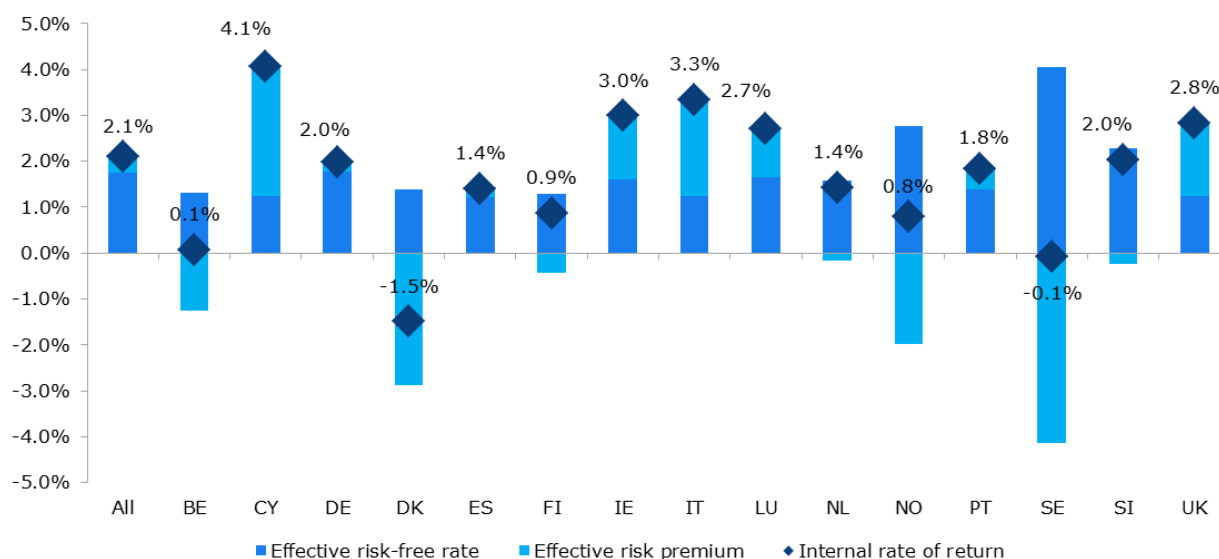
100. The cash flow patterns vary considerably across countries (see Annex 4). The DB/hybrid IORP sectors in DK and IT have already reached the top of the bell-shaped curve and pension payments in FI are even declining. Especially in BE, CY and ES, the maximum level of net outflows is projected to occur sooner than for the full European aggregate. IORPs in SI will still experience net inflows until 2030 as projected contributions exceed retirement benefits.

101. The reported cash flows allow for an assessment of the financial situation of IORPs in terms of the internal rate of return, i.e. the return that is needed so that all future unconditional benefits can be paid with current financial assets. This is necessarily a partial analysis, assuming that all financial assets are available to cover unconditional benefits. It does not take into account future sponsor support and benefit reductions and, depending on the specification of the contract, future contributions and accruals.

102. The internal rate of return is in aggregate 2.1%, which is 0.3%-point higher than the effective risk-free rate (Figure 3.20). IORPs in seven countries (BE, DK, FI, NL, NO, SE and SI) dispose of an internal rate of return below the risk-free rate. These countries also have a positive excess of assets over liabilities (excl. sponsor support, pension protection schemes and benefit reductions) on the common balance sheet with the exception of FI and the NL (Figure 3.15 in section 3.2.1.2).<sup>41</sup> The internal rate of return calculation yields more favourable results for the NL because cash flows for discretionary benefits are not considered. The explanation for FI is that the present value of cash flows for unconditional benefits is slightly lower than the value recognised on the common balance sheet.

<sup>41</sup> The calculation solves for the internal rate return ( $r_{IRR}$ ) which ensures that assets in the year (T) of the last cash flow ( $A_T$ ) are 0 using the equation:  $A_T = (1 + r_{IRR})^T (A_0 - PV_0^{IRR}(CF)) = 0$  where  $A_0$  is the current value of assets and  $PV_0^{IRR}(CF)$  the present value of future cash flows using the internal rate of return as discount rate. In other words, the internal rate of return ensures that the cumulative return on assets equals the cumulative return on liabilities evaluated at the internal rate of return. If the value of assets equals the market value of liabilities, i.e. discounted with the risk-free rate, then the internal rate of return is equal to the risk-free rate. In case of an excess of assets over the market value of liabilities the internal rate of return is lower than the risk-free rate, in case of a shortfall of assets relative to the market value of liabilities the internal rate of return is higher than the risk-free rate.

Figure 3.20: Internal rate of return in baseline scenario expressed as effective risk premium over effective risk-free rate



### 3.2.1.4. Comparison with 2015 IORP stress test

103. The aggregate excess of assets over liabilities (EAL) on the national balance sheet increased from -5.4% in the 2015 IORP stress test to -3.5% of liabilities in the 2017 IORP stress test or from EUR -78 bn to EUR -49 bn (Table 3.1). This improvement can partly be attributed to a genuine improvement of the financial position of IORPs and partly to changes in the composition in the sample:

- The increase in the EAL of IORPs that participated in both exercises contributed 1.6%-point (EUR 17 bn) to the overall increase of 2.0%-point (EUR 29 bn). For these IORPs, asset growth (11.1%) outpaced the increase in national technical provisions (9.4%) as a consequence of lower interest rates. This was particularly the case for IORPs in the UK which carry a substantial weight in the sample.
- Changes in the composition of the stress test sample contributed 1.4%-point (EUR 21 bn) to the overall decline in the shortfall. In particular, the share of NL IORPs in the sample increased at the expense of UK IORPs. Since the national funding position of NL IORPs is relatively stronger compared to UK IORPs, this shift in country weights has a positive effect on the aggregate deficit.

104. The aggregate EAL (excluding sponsor support, pension protection schemes and benefit reductions) on the common balance sheet increased from -24.2% in the 2015 IORP stress test to -20.2% of liabilities in the 2017 IORP stress test or from EUR -432 bn to EUR -349 bn.<sup>42</sup> This improvement is mainly due to changes in the composition of the sample and only for a very small part to an actual improvement in the funding position of IORPs:

- The increase in the EAL of IORPs participating in both exercises contributed only 0.7%-point to the overall increase of 3.9%-point. The common liabilities are more sensitive to the decline in risk-free rates between end 2014 and end 2016 than national liabilities. For these IORPs, asset growth (10.8%) was in aggregate just able to exceed liability growth (10.0%). Since IORPs carry aggregate shortfalls (in

<sup>42</sup> The IORPs Stress Test Report 2015 presented an EAL (excluding sponsor support, pension protection schemes and benefit reductions) of EUR - 428 bn which is slightly less negative than EUR -432 bn. The difference can be attributed to ex ante benefit reductions which were included in the IORPs Stress Test Report 2015 but excluded here.



% liabilities), the increase in liabilities compared to the 2015 stress test results in a negative contribution of the common sample of EUR 15 bn to the overall increase of the EAL measured in EUR.

- Changes in the composition of the national samples and the country-weights in the European sample contributed 4.0%-point (EUR 72 bn) to the overall increase. In the 2015 IORP stress test, IE submitted an aggregate pension scheme with a shortfall of almost 50% of liabilities, while IORPs from IE participating in the current stress test dispose of a shortfall of 25% of liabilities. The increase in the relative weight of NL IORPs and the decrease in the weight of UK IORPs also contributed to reducing the aggregate shortfall.

105. The change of the EAL measured in EUR also depends on the size of liabilities. The lower overall coverage rate in the 2017 stress test reduces the amount of liabilities and, hence, positively influences the EAL on the national balance sheet (EUR +7 bn) and common balance sheet (EUR +42 bn).

*Table 3.1: Decomposition of change in excess of assets over liabilities on national and common balance sheet in baseline scenario compared to 2015 IORP stress test*

	EAL, national balance sheet		EAL, common balance sheet	
	% liabilities	EUR bn	% liabilities	EUR bn
<b>Level 2015 ST</b>	-5.4%	-78	-24.2%	-432
<b>Difference 2017 and 2015 ST</b>	+2.0%	+29	+3.9%	+83
- change common sample	+1.6%	+17	+0.7%	-15
- composition sample	+1.4%	+21	+4.0%	+72
- coverage/size sample	-	+7	-	+42
- interaction terms	-1.1%	-15	-0.8%	-16
<b>Level 2017 ST</b>	-3.5%	-49	-20.2%	-349

Note 1: The change in the aggregate EAL (in % liabilities) can be written as:  $\Delta eal = eal^{17} - eal^{15} = \sum(eal_i^{17} - eal_i^{15})w_i^{15} + \sum(w_i^{17} - w_i^{15})eal_i^{15} + \sum(w_i^{17} - w_i^{15})(eal_i^{17} - eal_i^{15})$ , where  $eal_i^{year}$  denotes the excess of assets over liabilities of IORP/country i and  $w_i^{year}$  the weight of IORP/country i in either the 2015 or 2017 stress test. Using the above equation the change in the EAL (in % liabilities) can be attributed to the change in the EAL for the common sample (1<sup>st</sup> term), the composition of the sample at country/European level (2<sup>nd</sup> term) and an interaction effect (3<sup>rd</sup> term).

Note 2: The change in the aggregate EAL (in EUR bn) can be written as:  $\Delta EAL = EAL^{17} - EAL^{15} = (eal^{17} - eal^{15})LIAB^{15} + (LIAB^{17} - LIAB^{15})eal^{15} + (eal^{17} - eal^{15})(LIAB^{17} - LIAB^{15})$ , where  $LIAB^{year}$  is the size of liabilities in either the 2015 or 2017 stress test. The change in the aggregate EAL (in EUR bn) can hence be attributed to the change in the EAL in % liabilities (1<sup>st</sup> term), the change in the size of liabilities (2<sup>nd</sup> term) and an interaction effect. In the decomposition in the above table, the effect relating to the size of liabilities is split into the contribution of the size of liabilities in the common sample and the contribution of the overall coverage rate.

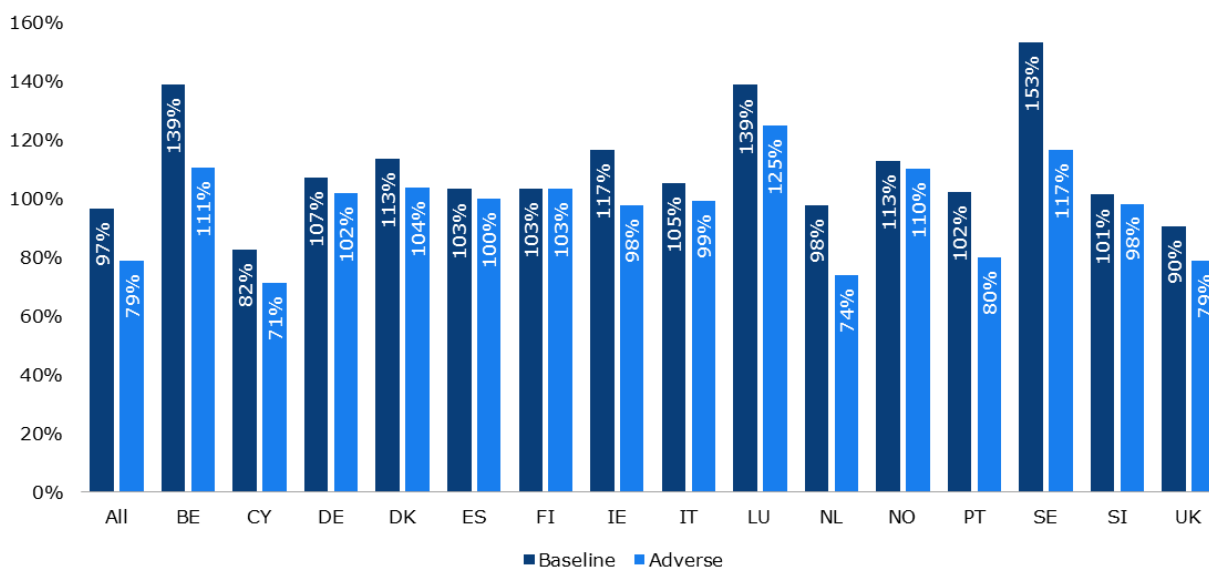


## 3.2.2. Adverse market scenario

### 3.2.2.1. National balance sheet

106. The adverse market scenario leads to a decline of the aggregate national funding ratio from 97% to 79% of liabilities (Figure 3.21). This corresponds to a fall in the excess of assets over liabilities from -3% to -21% of liabilities or from EUR -49 bn to EUR -301 bn.

Figure 3.21: Funding ratio in baseline and adverse market scenario, % liabilities<sup>43</sup>



107. In eight countries, IORPs have in aggregate sufficient assets to cover liabilities following the adverse scenario. This is particularly true in BE, LU and SE, where IORPs have substantial buffers to absorb the negative impact of the stress. The positive excess of assets over liabilities turns into a shortfall in IE, IT, SI and most notably PT. CY, the NL and the UK already experience aggregate funding ratios below 100% in the baseline scenario and these further deteriorate in the adverse market scenario.

108. The fall in the aggregate funding ratio by 18%-point is in aggregate fully explained by a fall in the value of investments (Figure 3.22). The increase in technical provisions in the majority of countries – having a negative impact on the funding ratio – is offset by the decrease in technical provisions in other countries, most notably in NO and the UK.

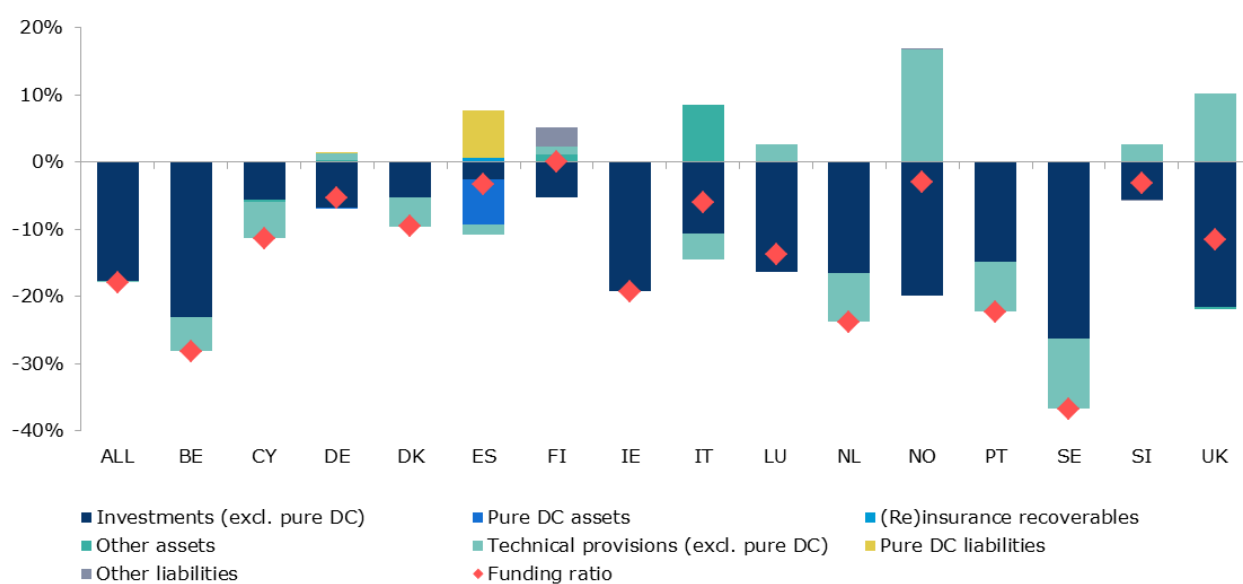
109. There is a clear relationship between the risk exposure to fixed income assets and the impact on investment assets. The impact is relatively low in countries with high aggregate exposures to bonds and loans (CY, DK, DE, ES, IT, SI) and relatively high in countries with low fixed income exposures (BE, NO, SE, UK). IORPs in the NL have the lowest allocations to fixed income assets, but experience an average impact on investment assets. This is due to the substantial gains on derivative hedging positions, such as interest rate swaps. IORPs in FI have the second lowest exposure to fixed income assets while the effect on investments is

<sup>43</sup> In the FI national balance sheet assets and liabilities are always equal. Part of IORPs in FI deviated from the national valuation standard which explains the funding ratio of 103% in both the baseline and adverse scenario.

relatively benign. IORPs in FI (partly) recognise book values on the national balance which reduces the impact of the adverse scenario by almost 7%-points compared to full market valuation. Similarly, the absence of full market valuation of assets on the national balance sheet in DE, IT and SI mitigates the effect on investments by 2-4%-points.

110. In ES, the decrease in pure DC assets is mirrored by a decrease in pure DC liabilities. The negative impact of lower investment assets and higher technical provision on the aggregate funding ratio in IT is to a substantial degree compensated by the rise in other assets, containing the value of sponsor support on the national balance sheet.

Figure 3.22: Decomposition impact adverse market scenario on funding ratio, %-points



111. The impact of the adverse scenario on technical provisions depends to a large extent on how the scenario affects national discount rates. In the majority of countries, the downward risk-free rate stress of approximately 50 bps results in an equivalent decline of the national discount rate. This is the case in DK, the NL, PT and SE, where IORPs use risk-free rates or yields on high-quality bonds but also in BE, CY, ES and IT, where long-term expected returns/fixed discount rates have been adjusted downwards (Figure 3.23). The increase in technical provisions ranges from 2.5% to 8.5% and the variation between these countries can be explained to some extent by the differences in the duration of national pension liabilities (Figure 3.24). In DE, FI, IE, LU, NO and SI, IORPs establish technical provisions using mainly fixed discount rates which do not change as a result of the adverse scenario. In these countries, national technical provisions remain more or less the same with NO being a notable exception. In NO, technical provisions also contain conditional benefits which are adjusted downwards in response to the adverse scenario. In the UK, the national discount rate increases by on average 40 bps, resulting in a decline of technical provisions by 11%. For most UK IORPs, the discount rate is based on UK Gilt yields that increase in the adverse market scenario with an additional risk premium.

112. In the UK, the discount rate depends on the claim on the sponsor and its strength. However, the number of IORPs that took this effect into account in establishing the discount rate in the adverse scenario is negligible.

Figure 3.23: Impact adverse market scenario on technical provisions (vertical axis, %) compared to change in national discount rate (horizontal axis, %-points)

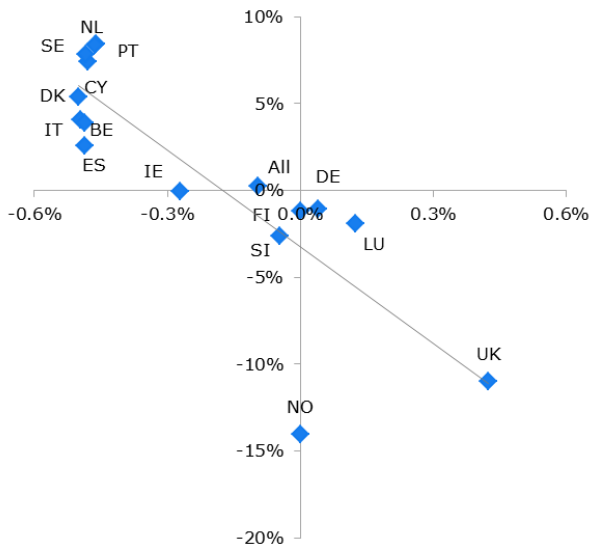
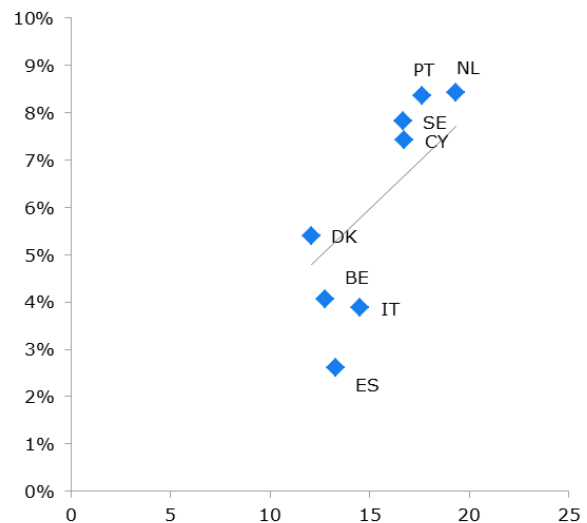


Figure 3.24: Impact adverse market scenario on technical provisions (vertical axis, %) compared to duration of national pension liabilities (horizontal axis, in years)

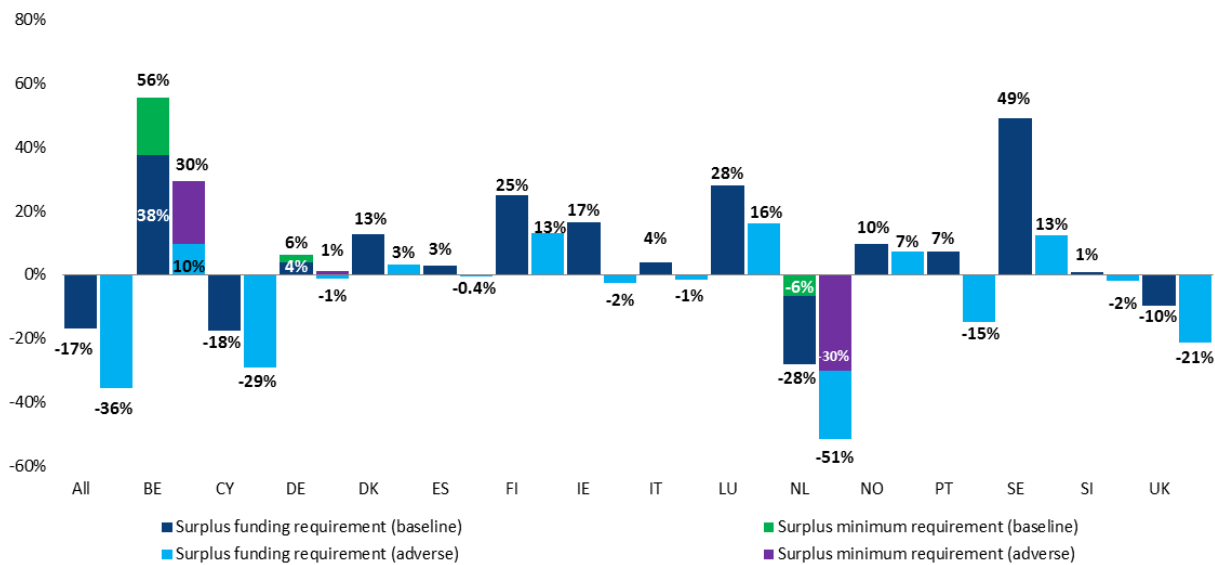


### Surplus over funding requirement

113. The aggregate shortfall relative to the funding requirement at the European level increases from 17% to 36% of liabilities following the adverse scenario (Figure 3.25). IORPs in six countries (BE, DK, FI, LU, NO and SE) in aggregate continue to comply with the national funding requirement. In six countries the existing surpluses reverse in a minor (DE, ES, IE, IT and SI) or more substantial (PT) aggregate deficit. The shortfalls in CY, the NL and the UK in the baseline scenario further deteriorate in the adverse market scenario.

114. In BE, the aggregate surplus relative to the minimum funding requirement (30% of liabilities) is substantially higher than the surplus over the funding requirement (10% of liabilities) under the adverse scenario, while in the NL the shortfall is considerably smaller (-30% versus -51% of liabilities). In aggregate IORPs in DE still have a slight surplus over the minimum funding requirement (1% of liabilities), instead of a slight deficit relative to the funding requirement (-1% of liabilities).

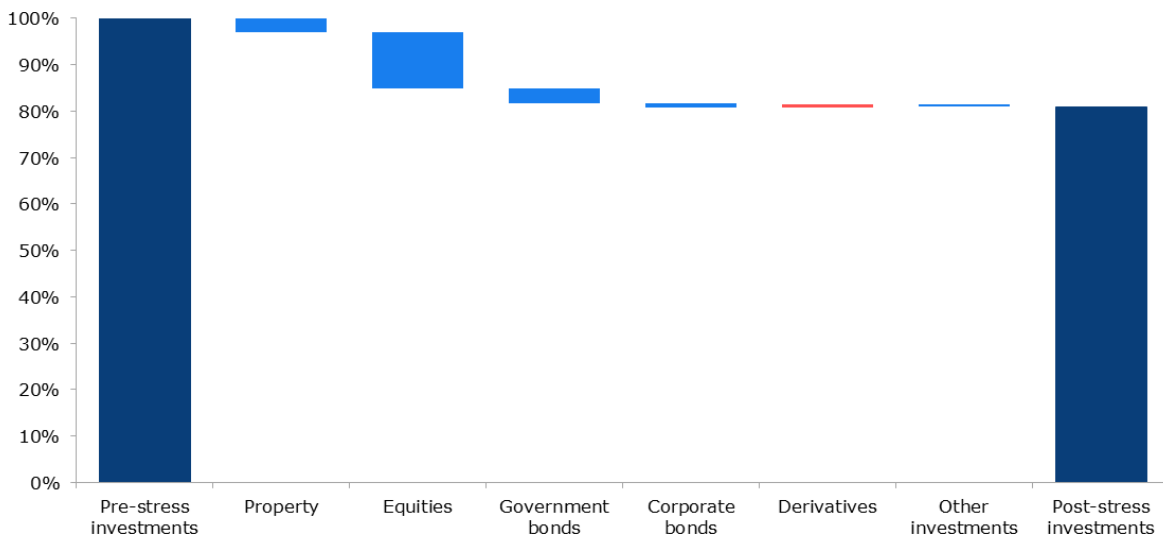
Figure 3.25: Surplus over funding requirement and, where available, minimum funding requirement in baseline and adverse scenario, % liabilities



### 3.2.2.2. Common balance sheet

115. The negative impact of the adverse scenario on the market value of investment assets amounts to 19% of the pre-stress value at the aggregate European level, mainly caused by the negative effect on listed and unlisted equities (12%-point). The negative effects on property and on government bonds contribute each 3%-point to the total impact (Figure 3.26). The positive effect of derivative positions is marginal at the aggregate level (less than 1%) but of relatively more significance in DK (2%) and the NL (1%) (Figure 3.27).

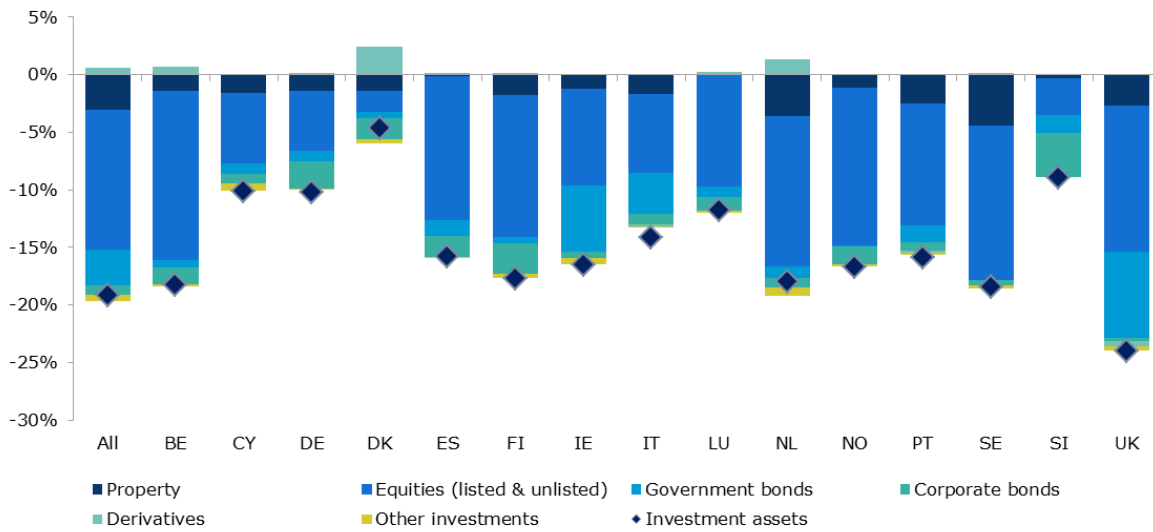
Figure 3.26: Impact adverse market scenario on investment assets (excl. pure DC), pre-stress value = 100%



116. The negative impact on investment assets varies from 5% of the pre-stress value in DK to 24% in the UK. The negative impact on equities (listed and unlisted) varies from 2% of the pre-stress value in DK to 15% in BE. Countries with relatively high exposure to government bonds and low exposure to equities have a significantly lower total impact on investment assets in this adverse scenario. Although the negative effect on investment assets of government bonds at the aggregate level is relatively small (3%), in IE and the UK this effect is at least

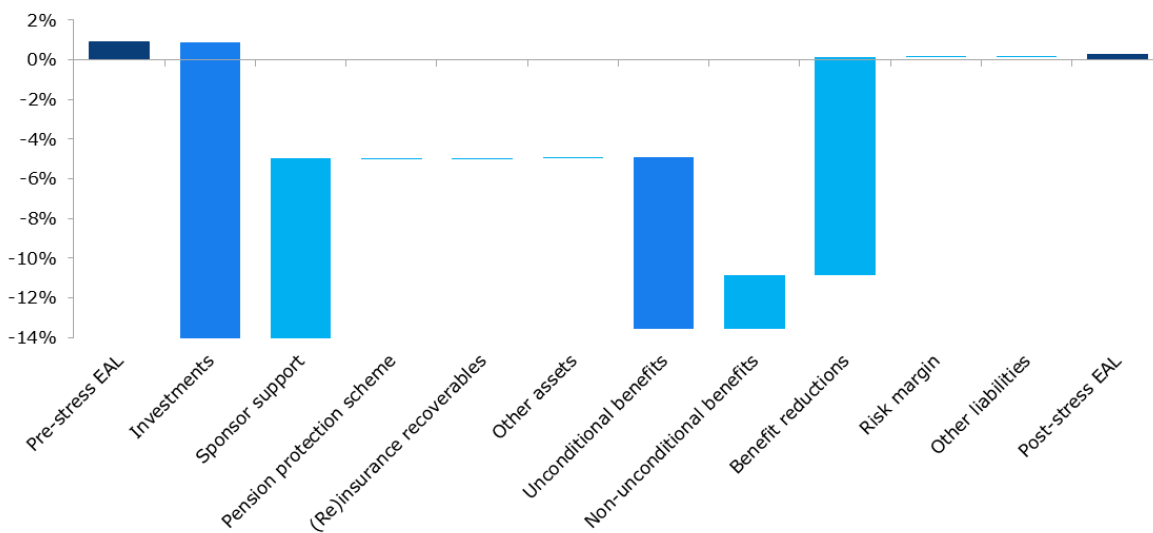
twice as large. The contribution of corporate bonds to the negative effect on investment assets is most significant in FI (3%) and SI (4%).

Figure 3.27: Impact adverse market scenario on investment assets (excl. pure DC) by country, %



117. At the aggregate European level, the pre-stress EAL and the post-stress EAL both stay slightly positive (Figure 3.28). The adverse scenario decreases the investment assets by an amount equal to 15% of baseline-liabilities. On the asset-side this effect is mainly compensated by future sponsor support (10%-point). On the liability-side the adverse scenario increases the unconditional benefits by 9% of baseline-liabilities. At this side of the balance sheet the shock is absorbed by lower (post-stress) conditional and discretionary benefits (3%-point), but mainly by changes to the value of benefit reductions of 11%-point.

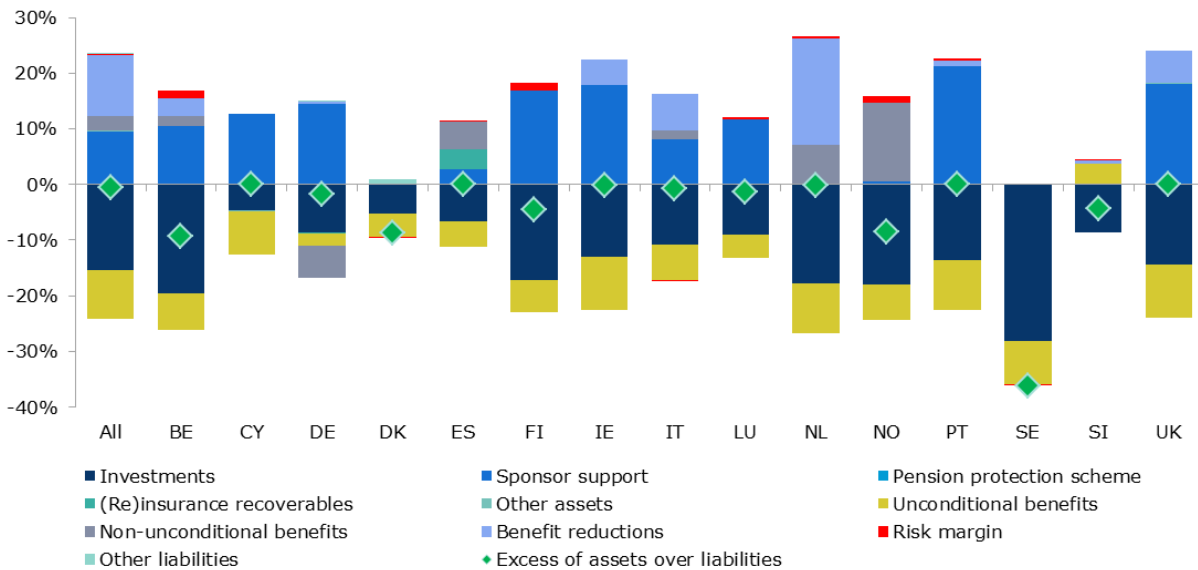
Figure 3.28: Impact adverse market scenario on items common balance sheet, % liabilities baseline



118. IORPs in different countries absorb the detrimental effects of the adverse scenario in different ways (Figure 3.29). In nine countries (BE, CY, DE, FI, IE, IT, LU, PT and the UK) out of fifteen countries sponsor support plays a substantial role. The increase of sponsor support as a percentage of baseline liabilities ranges from 8% in IT to 21% in PT. In the NL, the increase in the value of benefit reductions largely absorbs the effects of the adverse scenario, in NO the reduction

of conditional benefits. DK and SE are able to bear the impact of the adverse scenario entirely through their own funds.

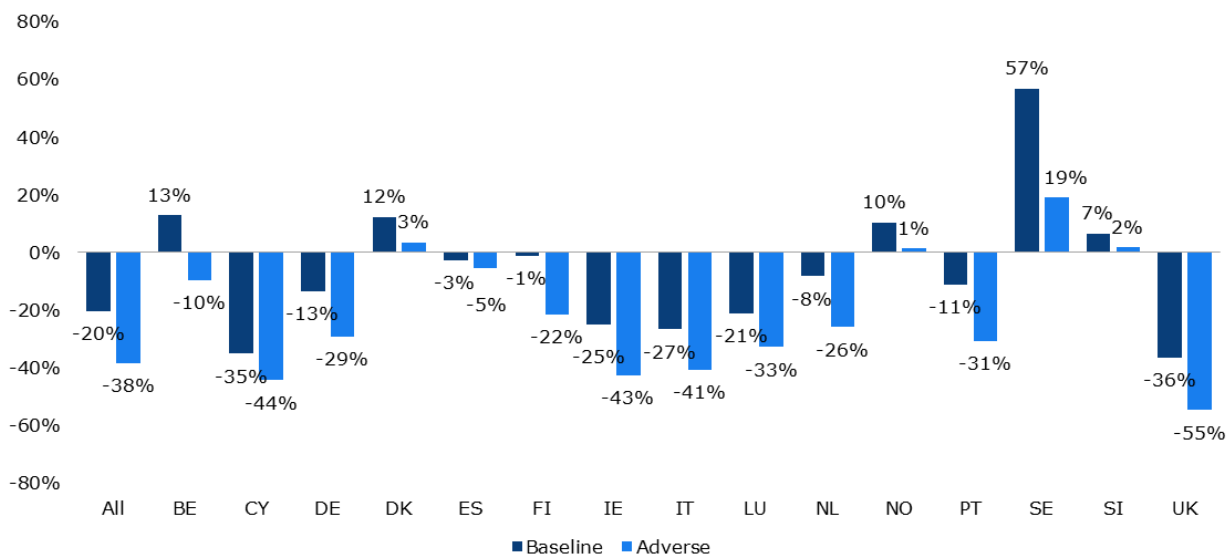
Figure 3.29: Impact adverse market scenario on items common balance sheet by country, % liabilities baseline



### Excess of assets over liabilities

119. At the European level, the EAL amounted to -20% of liabilities or EUR -349 bn in the baseline scenario when not taking into account sponsor support, pension protection schemes and benefit reductions (Figure 3.30). The shortfall almost doubles in the adverse scenario to -38% of liabilities or EUR -702 bn when not considering security and benefit reduction mechanisms. This again highlights the reliance of the aggregate European IORP sector on sponsor support and benefit reductions in the baseline scenario as well as in absorbing the impact of the adverse market scenario.

Figure 3.30: Excess of assets over liabilities (excl. sponsor support, pension protection schemes and benefit reductions) in baseline and adverse market scenario, % liabilities (excl. benefit reductions)



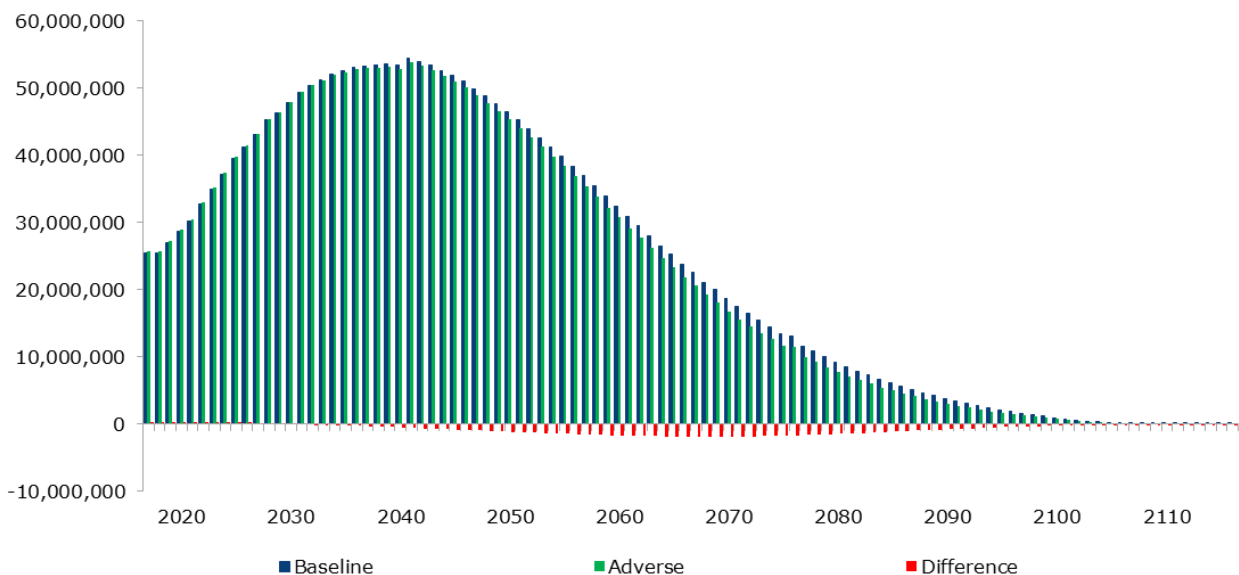
Note: Assets include all assets on the common balance sheet except sponsor support and pension protection schemes and liabilities include all liabilities, including conditional and discretionary benefits, except benefit reductions.

120. The EAL varies from -55% of liabilities in the UK to +19% in SE in the adverse market scenario, compared to the range of -36% of liabilities in the UK to +57% of liabilities in SE in the baseline scenario.

### 3.2.2.3. Cash flows unconditional benefits

121. Cash flows for unconditional benefits are barely impacted by the adverse market scenario (Figure 3.31). Unconditional benefits constitute pension promises to members and beneficiaries that are independent of financial market conditions or the IORP's financial position. The projected (nominal) cash flows can only change through a change in future inflation rates, if unconditional benefits, contributions and/or expenses are linked to inflation. Through this channel, the slight drop in break-even inflation rates (about -10 bps) in the adverse market scenario results in a slight decrease of aggregate net cash flows.

Figure 3.31: Net cash flows for unconditional benefits in baseline and adverse market scenario, EUR thousand



122. The adverse scenario does result in a substantial decline in the value of financial assets. As a result, the internal rate of return increases from 2.1% in the baseline to 2.9% in the adverse scenario, which is 1.8%-point higher than the risk-free rate (Figure 3.32). IORPs in DK, NO, SE and SI have an internal rate of return below the risk-free interest rate. These four countries have in aggregate also a positive excess of assets over liabilities (excl. sponsor support, pension protection schemes and benefit reductions) on the common balance sheet (Figure 3.25 in section 3.2.2.2).

Figure 3.32: Internal rate of return in baseline and adverse market scenario, %

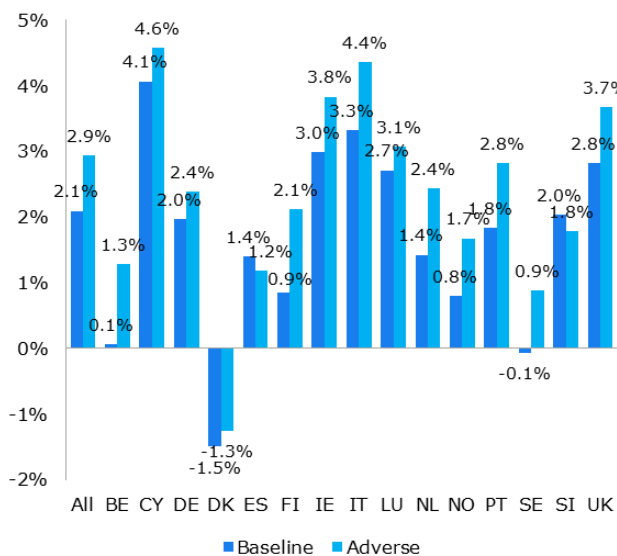
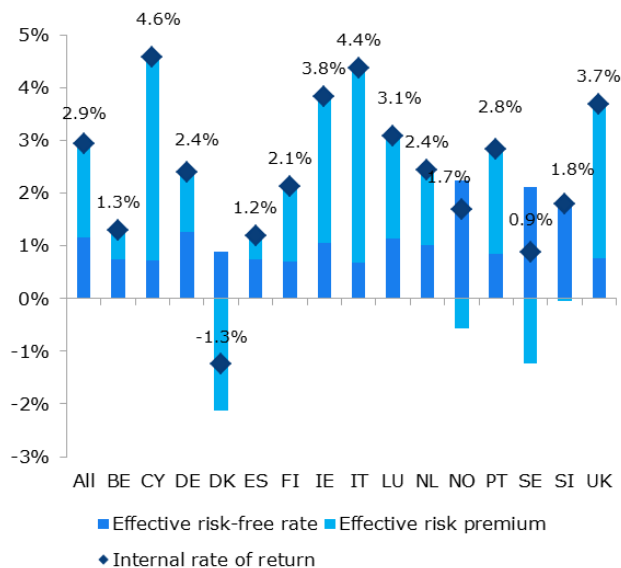


Figure 3.33: Internal rate of return in adverse market scenario expressed as effective risk premium over risk-free rate, %



### 3.3. Second round effects on real economy and financial markets

#### 3.3.1. Recovery plans

123. IORPs that do not meet the national funding requirement usually have to draw up a recovery plan to be approved by the NSA. The recovery plan outlines how compliance with the funding requirement is restored within a given period of time. The shortfall may be resolved by reducing risk through changes in the asset allocation or derivative hedging, additional sponsor contributions, suspension of conditional or discretionary benefits and/or benefit reductions. The extent to which IORPs will be able to implement the various measures depends crucially on national prudential regulation and the nature of the pension arrangement.

124. The level of assets at which IORPs have to submit a recovery plan depends on national funding requirements and valuation standards. These funding requirements and valuation standards vary substantially between countries (see Section 3.2.1.1). A number of countries have minimum funding requirements or trigger points in place (see Annex 1). These usually serve as backstop by requiring IORPs to implement a short-term recovery plan (BE and SI) or to resolve a shortfall within a limited period of time. The latter has to be achieved by an immediate injection of assets (DE for Pensionsfonds, PT) but can also lead to benefit reductions (NL). Pensionskassen in DE have to be fully funded at all times, meaning that a breach of the funding requirement does not necessarily lead to a recovery plan. In FI, IORPs can be underfunded if the calculation rules for pension liabilities have been changed due to changes in legislation, demography or economic conditions, but not through a decline in assets. This means that a recovery plan is only possible in case of an increase in liabilities. In contrast, IORPs in some Member States may be obliged to draw up a recovery plan despite meeting the funding requirement. For example, in BE a recovery plan is also required in case there is a funding deficit in one of the compartments of the IORP or for one of the sponsoring employers and in SI when it is expected that the capital requirement will be breached within the next 3 months.



125. In many countries, the (maximum) length of recovery periods is specified in national regulation, often with the provision that NSAs may extend the recovery period under specific circumstances. In a substantial number of other countries, the length of the recovery period is subject to approval of the NSA, taking into account the specific circumstances of the IORP. Typical recovery periods vary considerably between countries, ranging from relatively short (< 1 year) in DK, NO and SI, medium (3-5 years) in BE, ES and PT and relatively long (up to 10 years) in CY, FI, IE, IT, the NL, and UK (see Annex 1). For Pensionsfonds in DE, the maximum length of the recovery period of either 3 or 10 years depends on the type of product being offered.
126. If recovery periods span multiple years, it is relevant whether IORPs are allowed to take into account the expected return on assets in drawing up their recovery plan. The investment return on assets may contribute to restoring the financial position of the IORP during the recovery period, reducing the need for additional sponsor contributions or potential benefit reductions. This is particularly the case when the expected return on assets exceeds the "expected return" - i.e. the discount rate - on liabilities. In all countries with relatively long recovery periods IORPs may take into account the expected investment returns.<sup>44</sup> Pensionsfonds in DE may include an allowance for expected returns, but the recovery plan always has to include additional sponsor contributions.

### **Recovery plans in the baseline and adverse market scenario**

127. Almost 40% of IORPs indicated through the questionnaire that they are currently subject to a recovery plan in the baseline scenario, predominantly in CY, the NL and the UK (Figure 3.34). IORPs in these countries were, in aggregate, not able to meet the national funding requirement with shortfalls ranging from 10% to 28% of liabilities (see Section 3.2.2.1). IORPs in the NL experienced an aggregate shortfall of 6% of liabilities relative to the minimum funding requirement (around 104%). Despite the aggregate surpluses relative to the national funding requirement, one IORP in BE and 20% of IORPs in IE are currently covered by a recovery plan.
128. The average length of recovery plans is about 9 years of which almost 2 years have passed and over 7 years remain (Figure 3.35). In the NL a rolling recovery period is applied - each year starting a new period of maximum 10 years - which explains why the past length of the recovery plan is very small. However, in the NL a backstop mechanism is also imposed when the (12-months moving average) policy funding ratio is below the minimum funding requirement for five consecutive years. In that case, IORPs would have to restore compliance with the minimum funding requirement within 6 months, if necessary by implementing unconditional benefit reductions.
129. A majority of IORPs would be subject to a recovery plan following the adverse market scenario. The number of countries where IORPs in aggregate do not meet the funding requirement increases to nine with deficits ranging from 0.4% in ES to 51% of liabilities in the NL. In the NL, also the aggregate shortfall relative to the minimum funding requirement would deteriorate from 6% in the baseline to 30% of liabilities in the adverse scenario.
130. Although BE in aggregate has a surplus over the national funding requirement, one-third of IORPs have a deficit in the adverse scenario and would have to draw

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<sup>44</sup> In BE no expected return on assets may be taken into account in recovery plans, although BE allows recovery periods for up to 5 years.

up a recovery plan. While also experiencing a shortfall, a substantial proportion of IORPs in DE, PT and SI indicated that they would not be subject to a recovery plan.

131. The expected length of the recovery plans declines from on average 9 years to 6 years. In particular IORPs in IE and the UK foresee shorter recovery periods. However, it should be noted that only a small proportion of UK IORPs indicated the expected length of the recovery period under the adverse scenario through the questionnaire.

Figure 3.34: Recovery plans in baseline scenario and following adverse market scenario, % participating IORPs

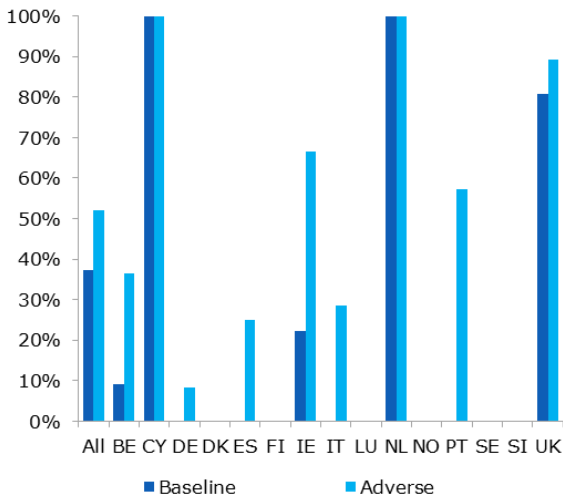
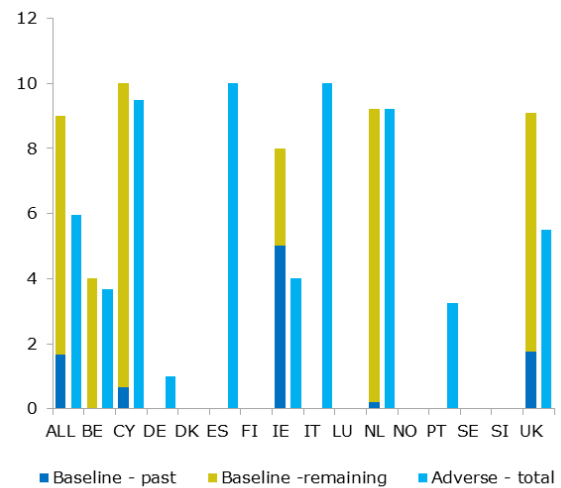


Figure 3.35: Average length of recovery plans in baseline scenario and additional recovery plans following adverse market scenario, years



132. In most countries IORPs participating in the stress test rely on additional future sponsor contributions in their recovery plan, both in the baseline and the adverse scenario (Figure 3.36). All participating IORPs in the NL resort to a suspension of discretionary benefits in the baseline and adverse scenario and, following the adverse scenario, benefit reductions to restore compliance with the funding requirement. Also a number of IORPs in BE and all IORPs with a recovery plan in IT indicated to include benefit reductions (Figure 3.37).

Figure 3.36: Incidence of additional sponsor contributions in recovery plans in baseline scenario and adverse scenario, % participating IORPs with recovery plan

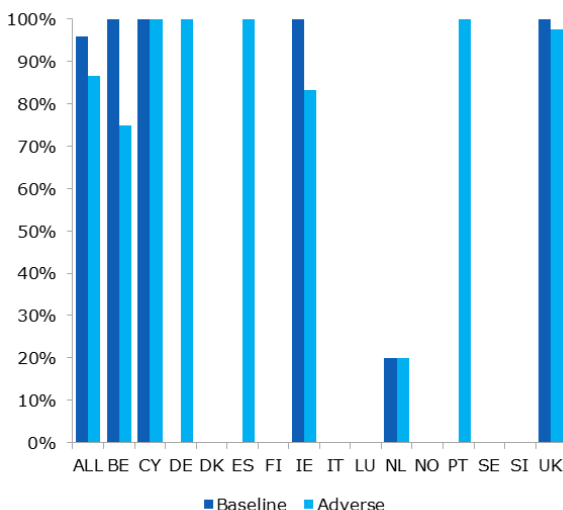
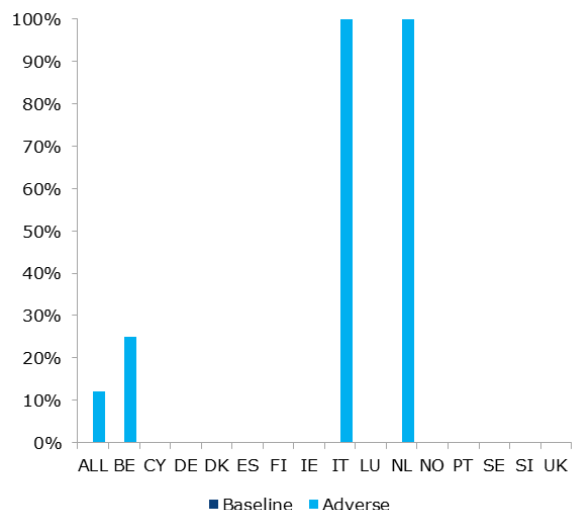
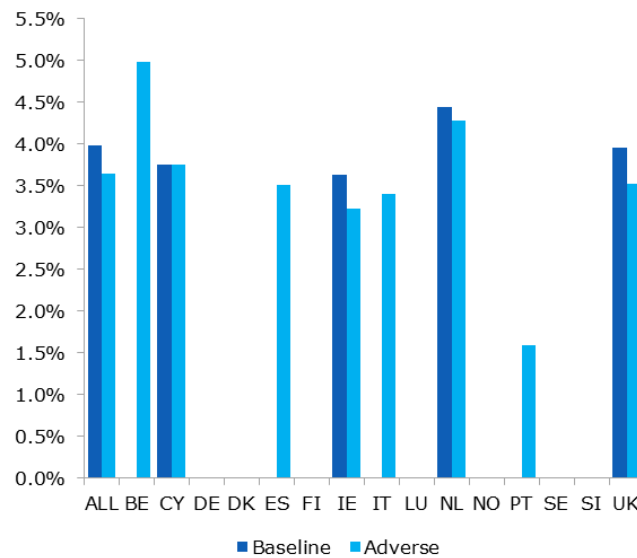


Figure 3.37: Incidence of benefit reductions in recovery plans in baseline scenario and adverse scenario, % participating IORPs with recovery plan



133. The average expected return included in recovery plans amounts to 4% in the baseline and 3.5% in the adverse scenario (Figure 3.38). Expected returns exceed the national discount rate in CY (+1%), IE (+0.5%), the NL (+3%) and the UK (+1%). This contributes to restoring the financial position during the recovery period and, hence, reduces the need to include additional sponsor contributions or benefit reductions. In ES, IT and PT the average expected returns included in recovery plans are in line with the national discount rate.

Figure 3.38: Average expected return on assets if included in recovery plans in baseline scenario and additional recovery plans following adverse market scenario, %



Note: Some IORPs in BE provided their current expected return on assets, although this expected return is not taken into account in recovery plans.

### 3.3.2. Distribution of sponsor support and benefit reductions over time

134. In most Member States, substantial market values of sponsor support and/or benefit reductions are reported on the (aggregate) common balance sheet in the baseline and (even more so) in the adverse scenario (Figures 3.39 and 3.40):

- The aggregate value of sponsor support increases from 17% to 24% of liabilities or from EUR 287 bn to EUR 445 bn.
- The aggregate value of benefit reductions increases from 4% to 14% of liabilities or from EUR 77 bn to EUR 262 bn.

Figure 3.39: Value of sponsor support in baseline and adverse market scenario, % liabilities excl. benefit reductions

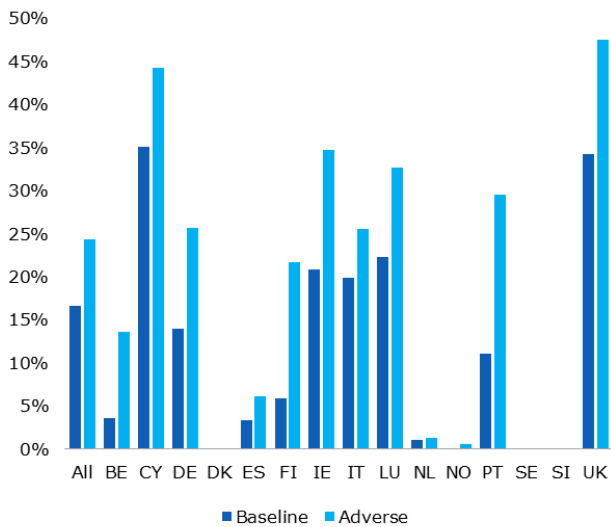
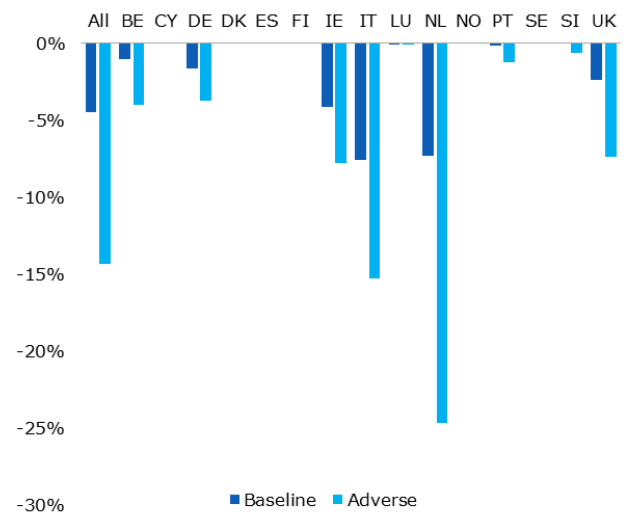


Figure 3.40: Value of benefit reductions in baseline and adverse market scenario, % liabilities excl. benefit reductions



135. These market values should be interpreted as the estimated amount of compensation financial markets would require in exchange for taking over the security and/or benefit reduction mechanisms, if this were possible.<sup>45</sup> For example, following the adverse scenario, the aggregate sponsor would have to pay an amount equal to EUR 445 bn to sell its commitment to support the IORP on financial markets. Similarly, the aggregate IORP or plan member would have to pay an amount equal to EUR 262 bn to buy protection to prevent future benefit reductions. Although there is a relation between the market values and future sponsor payments and benefit reductions, the market values do not reveal the size and distribution over time. Actual size and timing are determined by national law. Member States have different mechanisms in place to smooth additional sponsor support and benefit reductions over time.

136. National law often allows sponsor support and benefit reductions to be distributed over considerable time frames<sup>46</sup>. Distributing sponsor support and benefit reductions over time means that they are not impacting instantaneously to the full extent on sponsors and members/beneficiaries, but that the impact is smoothed over a longer period of time. Therefore, the impact is not as direct, and in particular smaller in a given period of time, as would otherwise be the case.

137. Distribution over time can apply to sponsor support or benefit reductions, which may occur in the baseline scenario, but can also dampen the effect of an adverse scenario.

138. Sponsor support and benefit reductions can have an impact on sponsors and members/beneficiaries over time in different ways:

- When a benefit reduction is triggered, as stipulated in national law, it can be implemented in different ways: there could be an across-the-board reduction of accrued pensions/pensions in payment. Active/deferred members will then not be affected directly until they retire. Current beneficiaries will be affected instantly, as the pension payment they receive will be reduced, resulting in lower retirement benefits during their remaining years in retirement. In order to even further reduce

<sup>45</sup> See also paragraph 84 in section 3.2.1.2.

<sup>46</sup> An overview of different approaches in Member States is provided in Annex 2.

the immediate impact on current beneficiaries, a benefit reduction of for example 5% could be implemented as a reduction of 1% per year over a period of five years. In all cases described, however, technical provisions of the IORP will decline instantly when the reduction is implemented, since they represent the present value of future pension payments;

- When sponsor support is triggered, as stipulated by national law, it can also be implemented in different ways: sponsor support may take the form of additional contributions to the IORP. These additional contributions could either be paid at once, for example to achieve an instant recovery of a funding shortfall. They could also be distributed over an appropriate period of time, which would reduce the immediate impact on the sponsor, while still allowing the IORP to pay full benefits and resolve a shortfall in the time allowed. In some countries sponsor support takes the form of a subsidiary liability towards the members and beneficiaries. This means that when an IORP cuts benefits, as stipulated by national law, the sponsor will have to take over paying the difference between the full and cut benefits when benefits are due. This means that sponsor support is distributed over the remaining period in which the benefits will be paid. Members and beneficiaries will receive full benefits, just partly from a different debtor, i.e. the sponsor instead of the IORP.<sup>47</sup>

139. When sponsor support is part of a recovery plan, the maximum period of time over which it can be distributed depends on the maximum length of a recovery plan allowed under national law.

140. The actual distribution of sponsor support and benefit reductions over time will also depend on national prudential and accounting rules, in particular national discount rate conventions and the allowance of expected returns in recovery plans:

- Higher national discount rates result in a more favourable view of the IORP's financial position, reducing the (apparent) need for additional sponsor support and benefit reductions. This may mean that sponsor support and benefit reductions are implemented later and distributed over a longer period of time than would be the case with lower national discount rates, which would also dampen the effect on sponsors of having to provide support to the IORP.
- The allowance for future expected returns in a recovery plan means that the level of sponsor support and benefit reductions included in the recovery plan will be lower than when this is not the case.

141. Smoothing of sponsor payments and benefit reductions over time will limit the short-term impact on labour costs and retirement income. This means that long-term recovery plans and other mechanisms contribute to mitigating the second round effects on the real economy and financial stability, depending on the extent to which companies and households reflect future cost increases and pension decreases in current investment and consumption-saving decisions. In many countries IORPs make use of expected return assumptions in setting discount rates and establishing recovery plans. This may prevent that in hindsight too high sponsor payments or benefit reductions have been imposed when investment returns meet or even exceed expectations. However, any excess returns over the risk-free rate – i.e. the risk premium – represent a compensation for risk. This means there is also a chance that actual investment returns will fall short of

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<sup>47</sup> Besides increases in contributions and subsidiary liability of the IORPs, the technical specifications distinguished two other forms of sponsor support: contingent assets of the sponsor and claims on the sponsor. Contingent assets of the sponsor are still in the possession of the sponsor, but are locked in a legally binding way for the purpose of supporting the IORP under a predefined set of circumstances. Claims on the sponsor on discontinuance of the IORP would be available to the IORP if the link between the IORP and the sponsor is broken.

expectations. In this case, the measures taken to address solvency issues would turn out to be insufficient, implying that younger plan members would bear the brunt of the burden. As such, a proper balance has to be found between ensuring the beneficial effects on financial stability and preventing that shortfalls are disproportionately shifted to younger generations of plan members.

142. The above analysis is based on a mapping of the various security and benefit adjustment mechanisms in the different Member States. No cash flow projections for sponsor support and benefit reductions were collected in this exercise, but the intention is to further pursue this in the next stress test exercise to enhance (quantitative) insight in the timing of these mechanisms. The cash flow analysis relating to unconditional benefits presented in sections 3.2.1.3 and 3.2.2.3 should be considered a first step in that direction.

### 3.3.3. Impact on sponsors

143. The distribution of the nature of sponsors of IORPs participating in the stress test reveals that the sponsors operate practically in all economic sectors with a focus on industry (except construction) and financial services/insurance (Figure 3.41). The majority of participating IORPs has only one sponsor, yet there is a significant number of IORPs with multiple sponsors ranging from 2 to more than 10 thousand (Figure 3.42).

Figure 3.41: Economic sector of the sponsor(s), % of IORPs

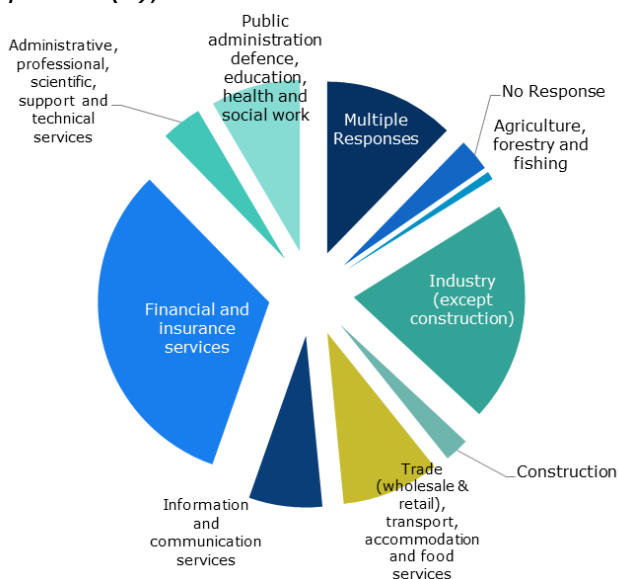
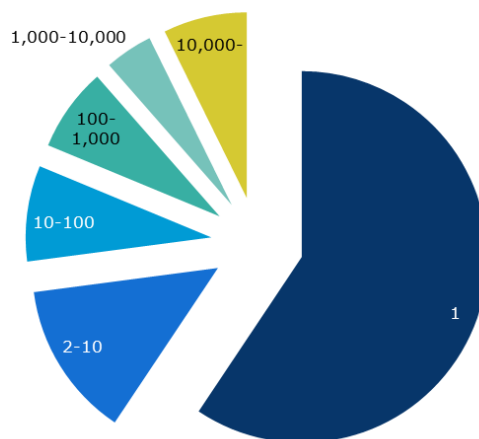


Figure 3.42: Distribution of number of sponsors per IORP, % of IORPs



144. While participating IORPs were selected by NSAs to be representative for the IORP sector, the representativeness of sponsors was not targeted. However, as participating IORPs have a significant number of sponsors, some conclusions regarding second round effects can be drawn, taking into account all limitations for the conclusions obtained.

145. The following analysis only includes 75% of participating IORPs, covering those IORPs which recognised sponsor support on the common balance sheet. A number of these IORPs are supported by the same sponsoring undertaking. As a result, 98

IORPs are covered by 85 unique sponsors, of which 32% are financial institutions and 68% are non-financial companies.

146. Sponsors may be impacted directly by the economic downturn underlying the adverse scenario. Participating IORPs were asked for their assessment of the sensitivity of their sponsors' business activities to a (severe) economic recession (high, medium or low) and an explanation of their assessment (Figure 3.43 and Figure 3.44). Around two-thirds of IORPs responded and most of them consider that the impact will be either low or medium. The assessments are mainly based on past experience, characteristics of the sector(s) the sponsor(s) are operating in, and the diversification of any impact due to a large number of sponsors and/or the diversification of the activities of the sponsor(s).

Figure 3.43: IORPs' assessment of the sensitivity of the sponsor to economic conditions, % IORPs

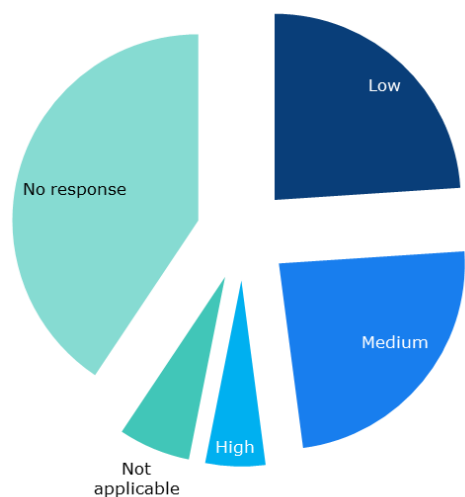
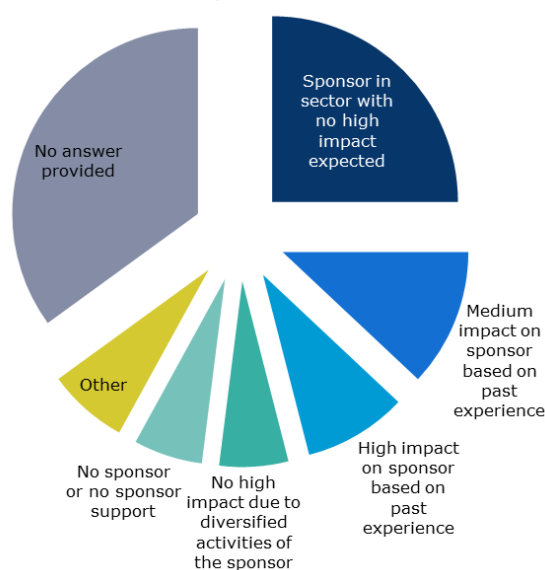


Figure 3.44: IORPs' considerations in assessing the sensitivity of the sponsor to economic conditions, % IORPs



147. In addition, sponsors would be impacted indirectly by the adverse scenario applied in the stress test through an increase in the market value of pension obligations and the need to make additional (future) payments to support the IORP or the pension commitment. In order to analyse the extent to which sponsors are impacted, IORPs were requested to provide data concerning their sponsor(s):

- Net cash flow data for the last three years, like EBITDA, PBT or net income;
- Shareholders' equity or book value;
- Liabilities of the sponsor towards the IORP;
- Total balance sheet value;
- Total wages paid;
- Market value.

148. Most IORPs were able to provide most of the sponsor data requested in the questionnaire. For example, 92% provided some measure of cash-flow data, 93% the book value and 56% the market value of the sponsor. Main reasons for not providing financial reporting data, as reported by IORPs, were that either certain types of data (e.g. market value) were not available (e.g. due to non-observable market data), or the number of sponsors was too large for IORPs to be able to obtain the data from all sponsors. However, other IORPs in a similar situation were able to provide these data, e.g. by providing an estimate of the market value, using observed price/earnings or price/book ratios, as described in the stress test

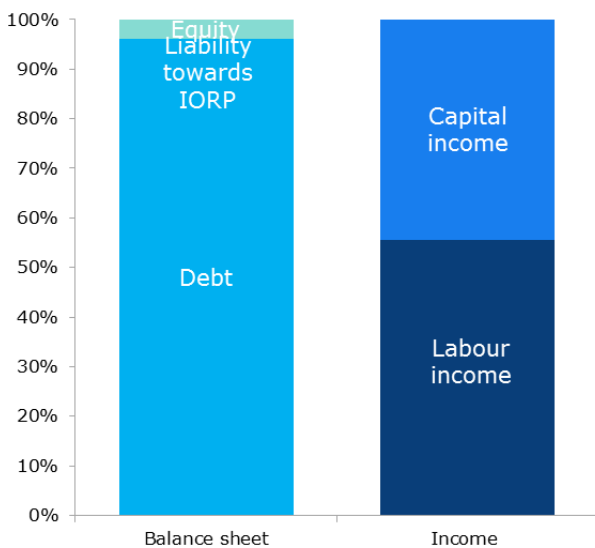
specifications. In addition, IORPs with a large number of sponsors used sector data from the national statistics office.

149. Some key financial statistics of the sponsors are provided in Figures 3.45-48, distinguishing financial institutions with a total balance sheet value of EUR 9,197 bn and non-financial sponsors with a total balance sheet value of EUR 3,462 bn. The aggregate balance sheet of financial institutions is more leveraged than the balance sheet of non-financial sponsors. Moreover, the financial institutions are more capital intensive, whereas the non-financial companies are more labour intensive.

150. The aggregated data on sponsors show that the values of the liability towards the IORP are rather small and barely visible. These values are more substantial when compared to the value of sponsor support on the common balance sheet in the baseline scenario. For financial institutions the liability towards the IORP is 14% and for non-financial institutions 23% of the value of sponsor support. However, the reported data strongly depend on national accounting standards and, hence, only limited conclusions based on these data can be drawn.

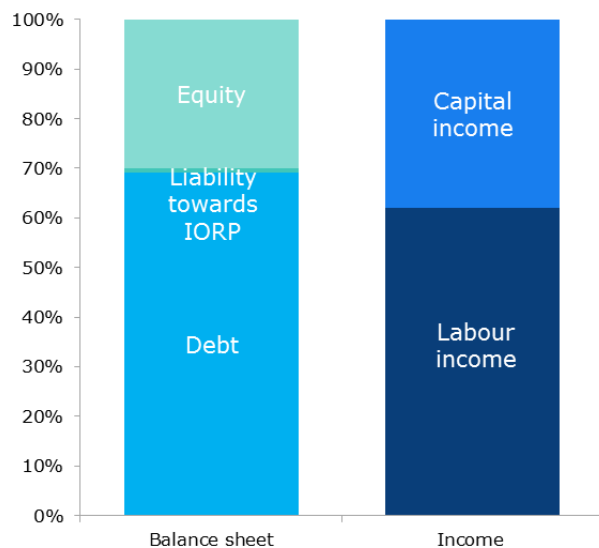
151. Median market valuations for non-financial sponsors with a price/earnings ratio of 15 and a price-to-book ratio of 1.9 exceed those for financial institutions with a price/earnings ratio of 12 and a price-to-book ratio of 1.0.

*Figure 3.45: Aggregate liability-side of the sponsors' balance sheet and breakdown of value added in capital and labour income, sponsors financial sector, %*



Note: The balance sheet data cover 100% of financial institutions included in the sample. The value of the liability towards the IORP cannot be clearly distinguished because of its small relative size. The income data cover 89% of financial institutions for which both cash flow data and wages were reported.

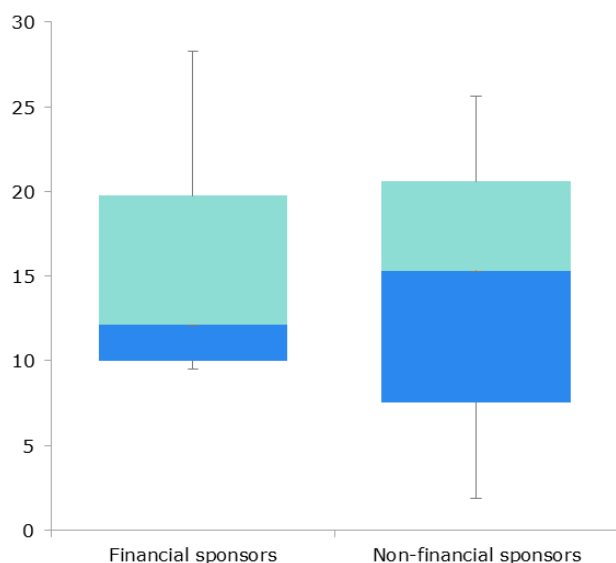
*Figure 3.46: Aggregate liability-side of the sponsors' balance sheet and breakdown of value added in capital and labour income, sponsors excluding financial sector, %*



Note: The balance sheet data cover 83% of non-financial sponsors for which both shareholders' equity and total balance sheet data were reported. The value of the liability towards the IORP cannot be clearly distinguished because of its small relative size. The income data cover 66% of non-financial sponsors for which both cash flow data and wages were reported.

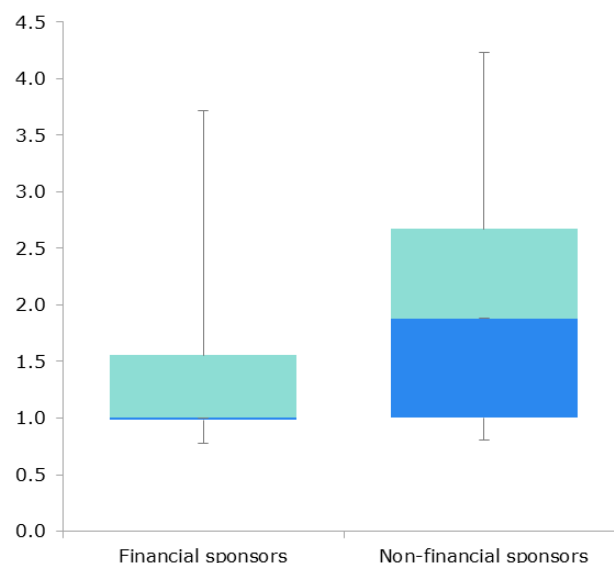


Figure 3.47: Distribution price/earnings ratio based on sponsor data reported by IORPs



Note: The data cover the 67% of financial institutions and 50% of non-financial sponsors for which both market values and earnings data were reported.

Figure 3.48: Distribution of price/book ratio based on sponsor data reported by IORPs



Note: The data cover the 67% of financial institutions and 52% of non-financial sponsors for which both market values and book values were reported.

Note: The intersection of the dark and light blue boxes constitutes the median percentage, while the bottom of the dark blue box represents the 25th percentile and the top of the light blue box the 75th percentile. The lines denote the 10th and 90th percentiles.

152. In order to obtain insight into the potential size of the indirect impact of the adverse scenario on the sponsor, the market value of sponsor support included in the common balance sheet in the baseline and adverse scenario is compared with the market value of the sponsor. In case IORPs did not report the market value, the book value is used instead.

- The recognised market value of sponsor support on the common balance sheet is limited, where relevant, to the amount the sponsor is able to afford ("maximum sponsor support"). More than a quarter of IORPs believed that the sponsor would not be able to support the full pension commitment following the adverse scenario and capped the value of sponsor support to the maximum value of sponsor support.<sup>48</sup>
- The analysis and the figures on the impact on sponsors are based on sponsor data provided by IORPs for the purpose of this analysis. It is assumed that these data do not change as a result of the adverse scenario. In particular, this means that the market values of the sponsor are assumed to stay the same and not to fall in line with the drop in European equity markets of 48%.

153. The aggregate value of sponsor support in the baseline (EUR 219 bn) and adverse scenario (EUR 343 bn) as a percentage of the aggregate market value of all sponsors included in the analysis (EUR 2,784 bn) increases from 8% to 12%. For financial institutions the value increases from 13% in the baseline to 21% of the aggregate market value in the adverse scenario. For non-financial sponsors the value increases from 7% to 11%. However, the aggregate estimations may be misleading by suggesting that all sponsors are jointly supporting all pension

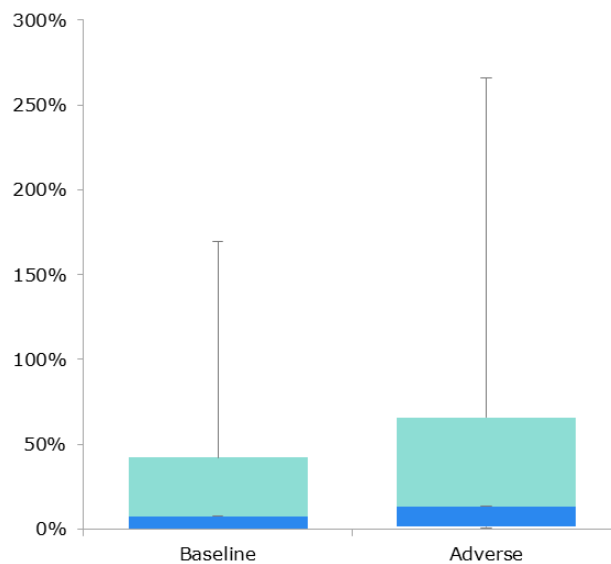
<sup>48</sup> More information about the valuation of sponsor support in the stress test is included in Annex 3

promises. Moreover, the aggregates hide the underlying variation between individual sponsors.

154. When considering the distribution of individual sponsors, the employed indicator reveals that the value of sponsor support as a percentage of the market value of the sponsor increases from 8% to 14% for the median sponsor. Since the market value of the sponsor can be interpreted as a measure of the future (discounted) profits of the sponsor, this means that for 50% of participating IORPs the expected future profits of the sponsor(s) exceed by far the value of sponsor support included in the common balance sheet of those IORPs, in the baseline as well as in the adverse scenario.

155. The share of sponsor support strongly increases towards the tail of the distributions. The ratio is 42% and 66% for the 75<sup>th</sup> percentile sponsor in respectively the baseline and adverse market scenario and 169% and 266% for the 90<sup>th</sup> percentile sponsor. This means that future sponsor payments for these 25% of sponsors will either cover a substantial part or exceed future profits.

*Figure 3.49: Distribution of sponsor support in the baseline and adverse market scenario, in % of the market value of the sponsor, all sponsors*

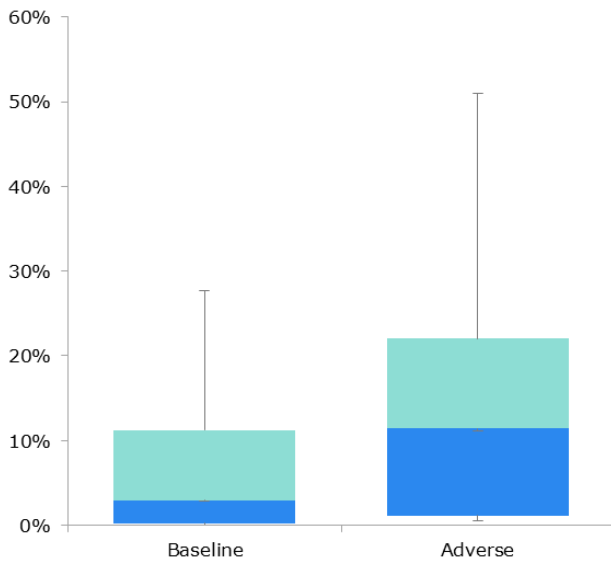


Note: The data cover 93% of all sponsors in the sample: 56%-point with market values and 37%-point with book values. The intersection of the dark and light blue boxes constitutes the median percentage, while the bottom of the dark blue box represents the 25th percentile and the top of the light blue box the 75th percentile. The lines denote the 10th and 90th percentiles.

156. The impact on non-financial sponsors is more severe than for financial institutions:

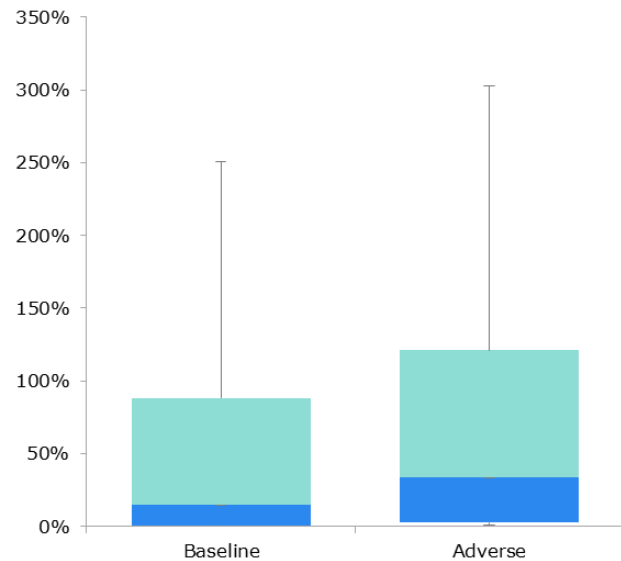
- For the median financial institution in the sample, the value of sponsor support as a percentage of the market value of the sponsor increases from 3% in the baseline to 11% in the adverse scenario (Figure 3.50), which is slightly lower than for the overall sample. For the 90<sup>th</sup> percentile financial institution the ratio increases from 28% in the baseline to 51% in the adverse scenario.
- For the median non-financial sponsor in the sample, the value of sponsor support as a percentage of the market value of the sponsor increases from 14% in the baseline to 33% in the adverse scenario (Figure 3.51), which is higher than for the overall sample. For the 75<sup>th</sup> and 90<sup>th</sup> percentile non-financial sponsors the ratio increases from respectively 88% and 250% in the baseline to respectively 121% and 302% in the adverse scenario, substantially higher than for the overall sample.

Figure 3.50: Distribution of sponsor support in the baseline and adverse market scenario, in % of market value of sponsor, sponsors in financial sector



Note: The data cover 100% of financial institutions in the sample: 67%-point with market values and 33%-point with book values.

Figure 3.51: Distribution of sponsor support in the baseline and adverse market scenario, in % of market value of sponsor, sponsors excluding financial sector



Note: The data cover 90% of all sponsors in the sample: 52%-point with market values and 38%-point with book values.

Note: The intersection of the dark and light blue boxes constitutes the median percentage, while the bottom of the dark blue box represents the 25th percentile and the top of the light blue box the 75th percentile. The lines denote the 10th and 90th percentiles.

157. The conducted analysis suggests that the indirect impact of the adverse scenario on the average sponsor is relatively modest. The value of sponsor support increases from 8% to 14% of the market value of the median sponsor. Alternatively, since the market value of the sponsor can be thought of as a measure of future (discounted) profits, this can be thought of as the share of future profits that will be needed to support the sponsors' IORP(s). However, following the adverse scenario, for a substantial (minority) share of sponsors the ratio covers more than half or even exceeds the market value, putting a strain on their solvency position and future profitability, impacting the real economy. The impact on sponsors from the financial sector is considerably lower than the impact on non-financial sponsors. Still, the risk to financial stability is also more severe, as the increase in pension liabilities of financial institutions may directly spill over to other parts of the financial sector.

158. For a considerable share of (non-financial) sponsors, the value of sponsor support well exceeds the market value, even in the baseline scenario. Still, the participating IORPs considered that the sponsor would be capable of providing this amount of support by recognising it on the common balance sheet. A possible explanation is that IORPs took into account the expected return on assets – as allowed for under various national prudential regimes – in assessing the affordability to the sponsor. Future excess returns will diminish the sponsor's pension obligations over time. However, since such excess returns are a compensation for risk, there is also a chance of disappointing returns, leading to even higher pension obligations for the sponsoring company. If excess returns do not materialise, the sponsor may have to increase its contributions to fund its

pension obligations, immediately or through longer recovery plans where that is possible under national frameworks, or, if this is not possible, scheme members may have to face benefit cuts at that point in the future, unless there is a pension protection scheme in place that guarantees the full amount of pension benefits.

### **3.3.4. Impact on financial markets**

159. There are several aspects that might limit contagion risk from IORPs to other financial institutions, at least for those IORPs that are not sponsored by a financial institution. IORPs have long-term pension liabilities, which usually cannot be redeemed as a cash lump-sum. Moreover, direct interconnectedness with the rest of the financial sector is relatively limited. This is, among other reasons, due to the fact that IORPs are prohibited from borrowing by the IORP Directive.

160. Since IORPs are large institutional investors and play an important role in financial markets, it is still paramount to analyse their investment behaviour and investigate the impact on financial stability. In the event of an adverse scenario materialising, were IORPs to respond to the shock in a convergent manner, this may exacerbate movements and volatility in the markets. Whether IORPs behave in this manner, or whether they act as stabilisers in times of financial turmoil, is a central question in this analysis. Broadly speaking, IORPs may react in three different ways to an adverse scenario as applied in this stress test:

- IORPs may rebalance their asset allocation back to its strategic asset allocation;
- IORPs may keep the resulting post-stress asset allocation unchanged, thereby following a buy-and-hold strategy;
- IORPs may reduce the allocation of assets that declined in price, aiming to prevent a further deterioration of the financial position.

161. In the 2015 stress test report, a first analysis has been carried out to explore whether IORPs can be attributed a stabilizing role or not. This analysis included both the responses to a questionnaire as well as the actual investment behaviour during the 2008 financial crisis. Although the analysis was hindered by data limitations, it was concluded with caution that moderately rebalancing the strategic asset allocation after a shock is, on average, more likely than a buy-and-hold strategy or further reducing the allocation of declining assets. This means that IORPs' investment behaviour was on aggregate and on average counter-cyclical.

162. The relevance of investigating the investment behaviour of IORPs stems from the significant impact of the adverse scenario on the asset mix and the relative size of asset classes after the shock. The impact of the adverse scenario on the strategic asset allocation can be summarized by a higher proportion of fixed income assets and a lower proportion of non-fixed income assets. More precisely, the listed equity allocation declined from 39% to 25% and at the same time, the fixed income allocation increased from 47% to 53%. As a result, the relative weight of equities in the portfolio decreased and the relative weight of fixed income increased. The category of 'other investments' contains alternative asset classes like private equity and hedge funds, as well as property, which also undergo substantial stress, resulting in a decrease in the allocation to this category from 24% to 22%.

163. As part of the DB/hybrid stress test, the expected investment behaviour in response to the adverse scenario was analysed. Also in this exercise EIOPA was not able to collect a representative data set with only two-thirds of IORPs providing responses to the investment behaviour questionnaire. In particular, most UK IORPs did not complete these questions, while the UK represents more than half of the DB/hybrid sector in terms of assets and one-third of the stress test sample.

164. IORPs were asked if and to what extent they expected to change their asset allocation after the shock. The number of IORPs that expects to buy non-fixed income after the adverse scenario is larger than the number of IORPs expecting to de-risk further after the shock (Figure 3.52). This difference is the most pronounced for listed equity and less for illiquid asset classes. Similarly, the number of IORPs expecting to sell fixed income assets after the adverse scenario is larger than the number of IORPs expecting to buy. The results are much more distinctive when responses are weighted with assets (Figure 3.53). In this case, the proportion of IORPs expecting to perform a buy-and-hold strategy is significantly lower. A large majority of IORPs weighted by assets expects to buy equity and property and sell fixed income assets. This also implies that the larger IORPs in the sample are, on average, exhibiting a stronger rebalancing behaviour than smaller IORPs.

Figure 3.52: Buying and selling of assets within one year of adverse market scenario, % responding IORPs (unweighted)

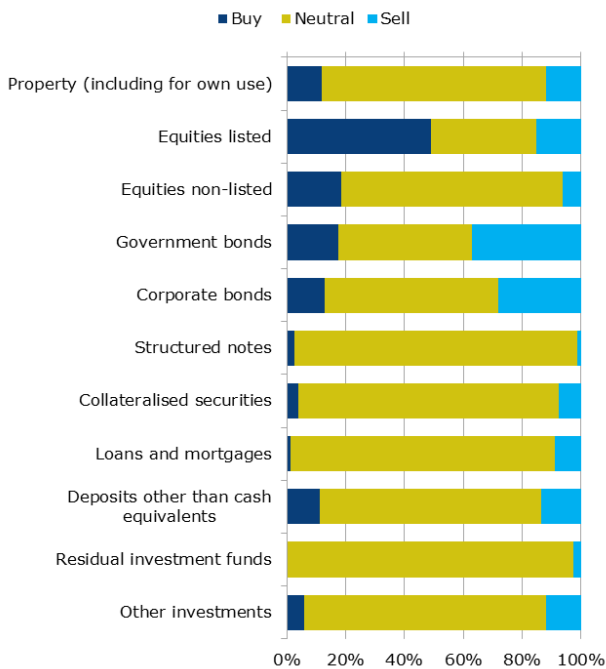
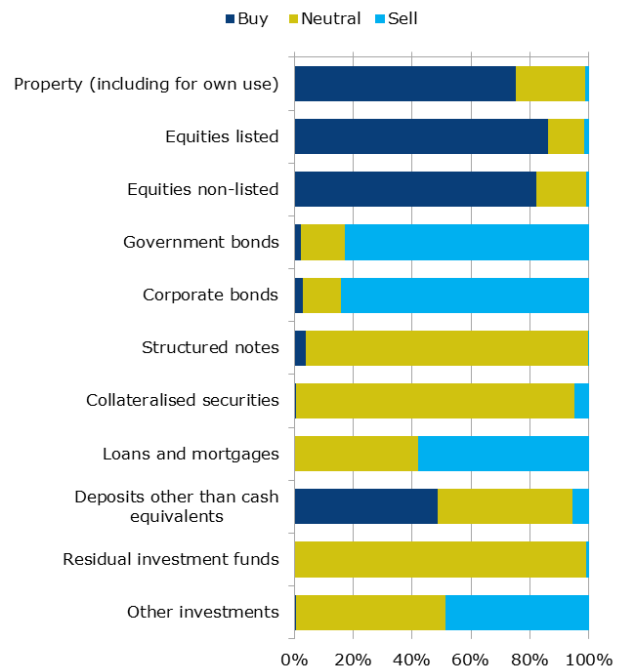


Figure 3.53: Buying and selling of assets within one year of adverse market scenario, % responding IORPs (asset weighted)

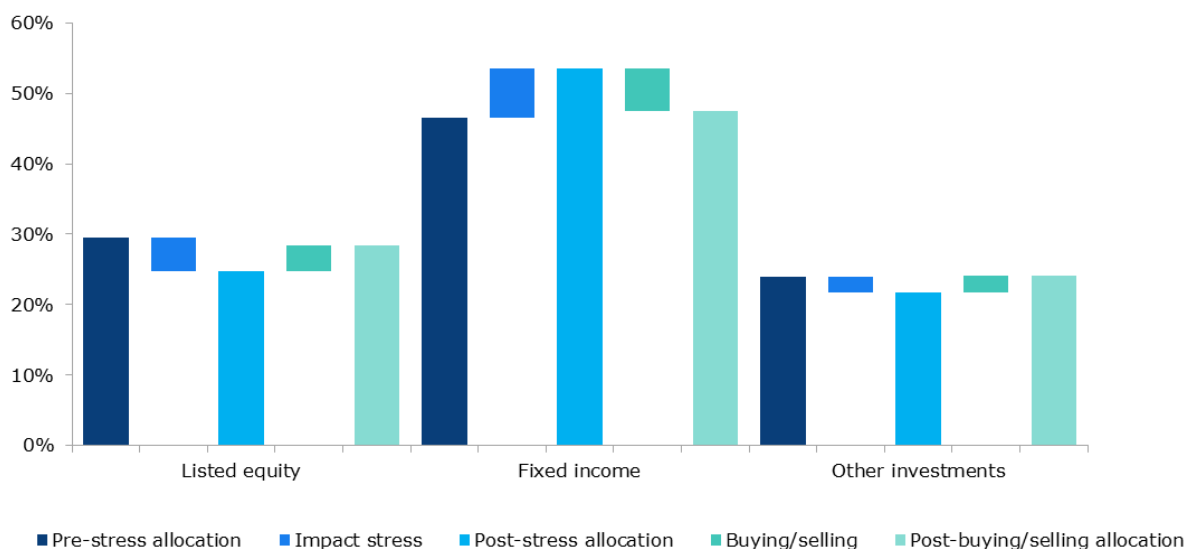


165. Additionally, participating IORPs were asked to provide a more quantitative estimate concerning changes in their asset allocation following the adverse market scenario. The answers suggest that rebalancing behaviour after the adverse scenario causes the asset allocation for listed equity, fixed income and other investments to revert to the pre-stress allocation (Figure 3.54). Although the post-stress allocation deviates significantly from the pre-stress situation, the post-buying/selling allocation almost matches the pre-stress allocation. This implies a nearly full rebalancing of the investment portfolio following the stress, and, hence, that IORPs would have a stabilising role on financial markets, being buyers of assets that are hit hardest in the stress scenario.

166. Comparison of the results of this questionnaire with the actual decisions of IORPs on their asset allocation during the financial crisis (year-end 2007 to 2008) leads to a mixed picture. As already shown in the 2015 Stress Test Report, the

actual investment behaviour in reaction to the financial crisis was different between countries and IORPs and indicated on average only moderate rebalancing. It was not strongly dominated by either rebalancing, buy-and-hold or a de-risking strategy. This means that investment behaviour was on average slightly counter-cyclical, but to a lesser extent than indicated by IORPs in the questionnaire. This illustrates the difficulties of drawing firm conclusions from investment responses in a hypothetical scenario. At the same time, the financial crisis from a decade ago may not be representative for any future adverse scenario.

Figure 3.54: Change in aggregate asset allocation following adverse market scenario, % total investments



167. Besides adjusting the asset allocation, IORPs can also implement other instruments in reaction to the stress scenario (e.g. increasing contributions, reducing indexation, reduce future accrual, reduce accrued pensions, etc.). Among IORPs indicating to implement other actions (which is the case for 38% of responding IORPs), a majority would increase contributions.

168. IORPs were asked if they would expect changes to their asset allocation in the longer term following the adverse market scenario and assuming that yields remain low for several years after that. A small majority of IORPs indicated they would not amend their investment strategy. Among the IORPs that indicated they would amend their asset allocation, most IORPs would invest in assets with higher yields, for example by increasing the equity allocation, increasing the exposure to illiquid assets or by investing in bonds with a higher duration.

169. Based on the obtained results, it could be concluded that, on average (unweighted), IORPs tend to buy equity and property at the cost of (corporate and government) bonds when yields remain low for several years after the shock (Figure 3.55). This would suggest IORPs are inclined to search for yield in this scenario. However, based on the asset-weighted results, the basis for this conclusion is thin (Figure 3.56). Only a small percentage of the asset-weighted responding IORPs indicate their intention to buy return seeking assets at the cost of fixed income. Moreover, it is not certain whether this longer-term investment behaviour includes the direct reaction after the shock (as described above) or whether it is additional to this reaction.

Figure 3.55: Longer term changes to asset allocation following adverse market scenario and assuming yields remain low for several years, % responding IORPs (unweighted)

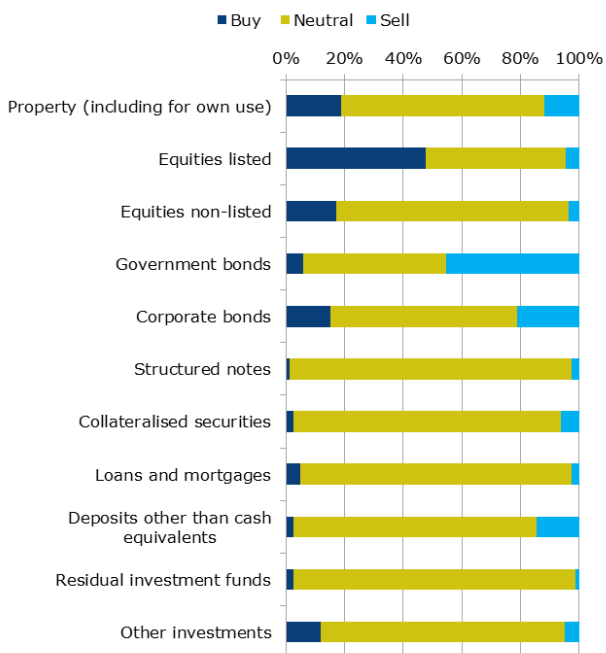
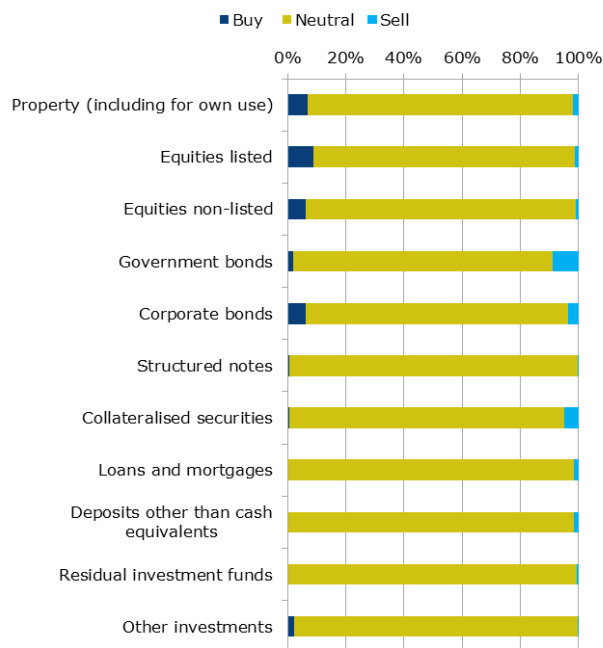


Figure 3.56: Longer term changes to asset allocation following adverse market scenario and assuming yields remain low for several years, % responding IORPs (asset weighted)



170. IORPs were also asked if they would expect to increase the duration of their portfolio. 20% of the IORPs that filled in the questionnaire indicated that they would indeed do this, but the vast majority answered not to increase duration.

171. As a conclusion of the analysis of the impact on financial markets, it can be stated that there is a variety of responses from IORPs to the stress scenario. Rebalancing behaviour dominates further de-risking among IORPs who responded to the questionnaire, while many IORPs follow a buy-and-hold strategy. Consequently, these IORPs alleviate selling pressure during stressed market conditions. However, it is difficult to draw firm conclusions as a substantial proportion of IORPs failed to provide data, compromising the representativeness of the sample.

## 4. DC part stress test

### 4.1. Sample description

172. The DC sector represents approximately 16% of the total European pension sector in terms of assets. IE, IT and the UK have the largest DC sectors in the EEA in terms of assets (Figure 4.1). The stress test sample contains 65 IORPs from 11 European countries (AT, CY, ES, GR, IE, IS, IT, the NL, PT, SK and the UK). Countries like AT, GR and SK are overrepresented in the sample by reaching more than 70% of total market coverage. Some countries have chosen to target a market coverage of above 50% in terms of members (CY, ES, IT and the UK) which was achieved by all countries which targeted the membership coverage rate. IE and the UK and IE did not reach a 50% market coverage by assets in the sample (Figure 4.2). The total size of the DC sample in terms of assets is approximately 35% of the participating countries' total DC sectors.

Figure 4.1: Assets DC IORP sector by country in 2016, %

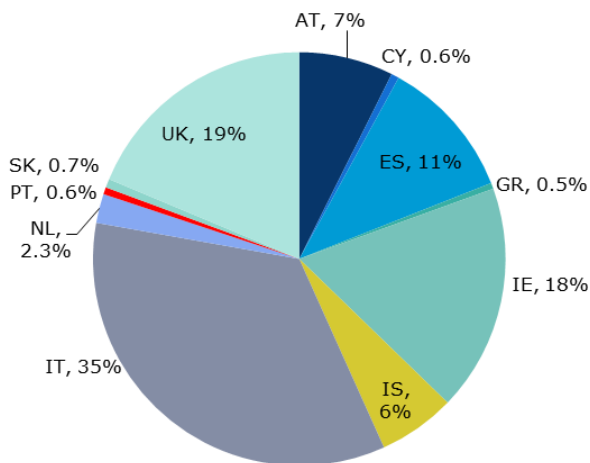


Figure 4.2: Assets DC IORP sample by country (2016 data), %

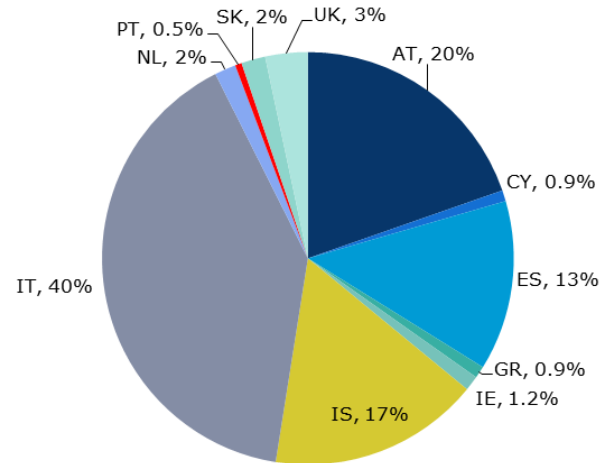


Figure 4.3: Members DC IORP sector by country in 2016, %

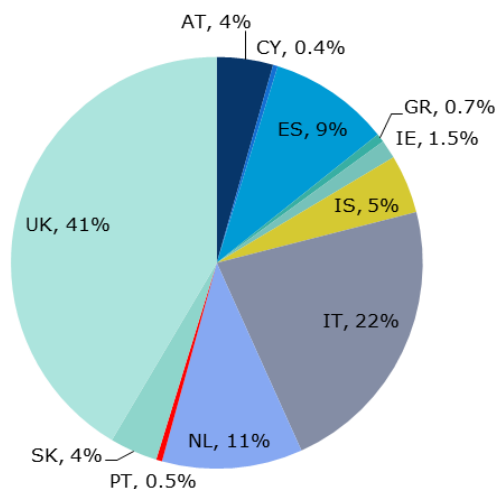
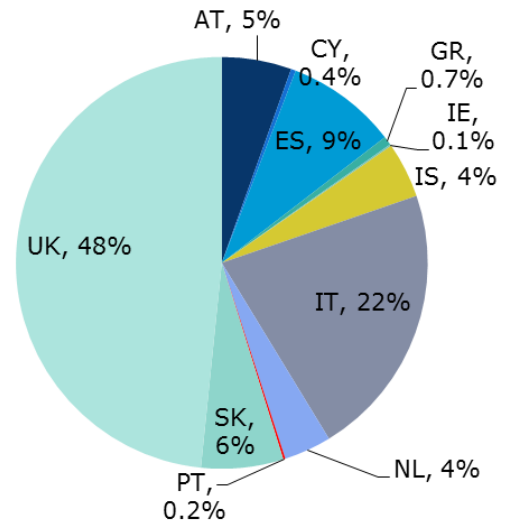


Figure 4.4: Members DC IORP sample by country, %



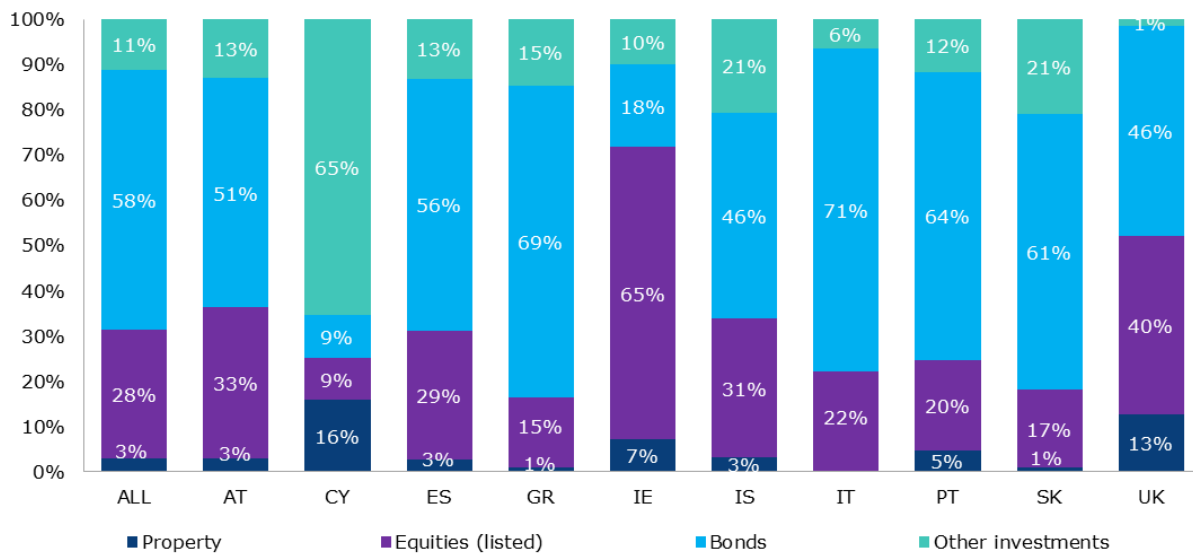


## 4.2. Resilience of DC IORPs

### 4.2.1. Baseline scenario

173. The asset allocation of DC IORPs in the sample shows, on average, a high exposure towards fixed income assets, 58% of the investment assets being allocated to bonds (Figure 4.5). IT and GR have the highest exposure towards bonds, allocating 71% and 69% respectively, to this category. On the other hand, CY and IE have the lowest exposures to bonds, with 9% and 18%. Overall, the equity exposure, which may be expected to deliver higher returns but also higher volatility, is on average around 28% of total investment assets. IE IORPs allocate 65% of their assets to equities while CY IORPs are 65% invested in other investments, predominantly deposits other than cash equivalents.

Figure 4.5: Allocation investment assets in baseline scenario, %



174. Fixed income assets are mostly comprised of government bonds (59%) and corporate bonds (26%) (Figure 4.7). DC plans in the UK have the highest share of corporate bonds (82%) in the fixed income portfolio. Deposits other than cash equivalents represent approximately 52% of the DC IORPs' assets in CY and 85% of the fixed income category. CY DC plans have around 14% of their investments allocated towards property. At the aggregate level, private equity accounts for 1% of total investment assets with IS IORPs having the highest allocation (5%).

Figure 4.6: Breakdown listed equities in baseline scenario by region, %

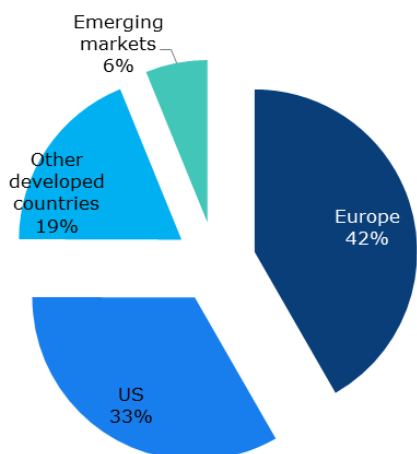


Figure 4.7: Breakdown fixed income investments in baseline scenario, %

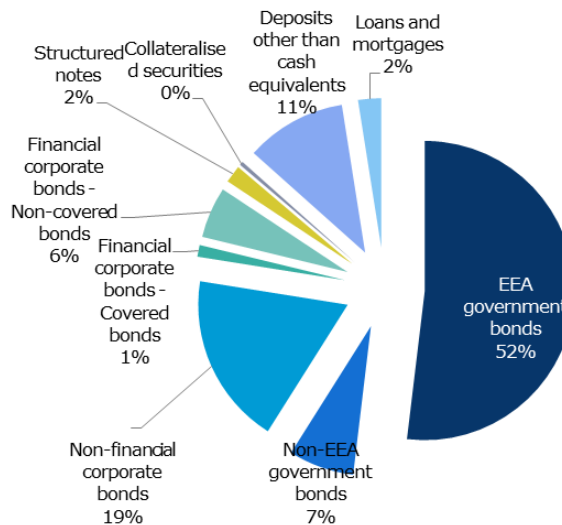


Figure 4.8: Breakdown property investments in baseline scenario, %

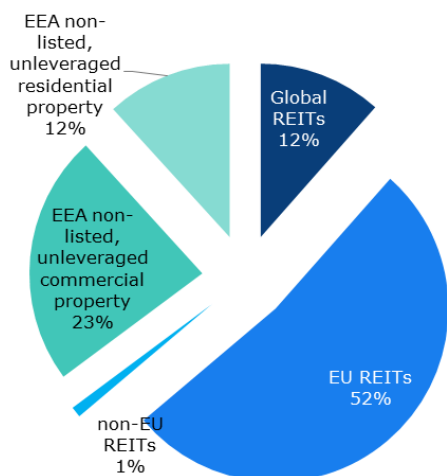
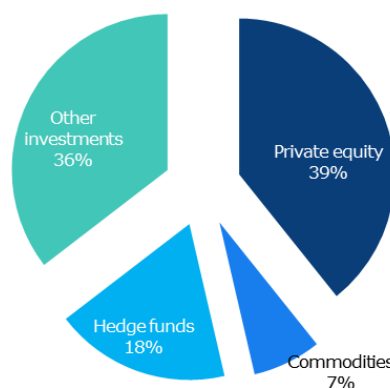


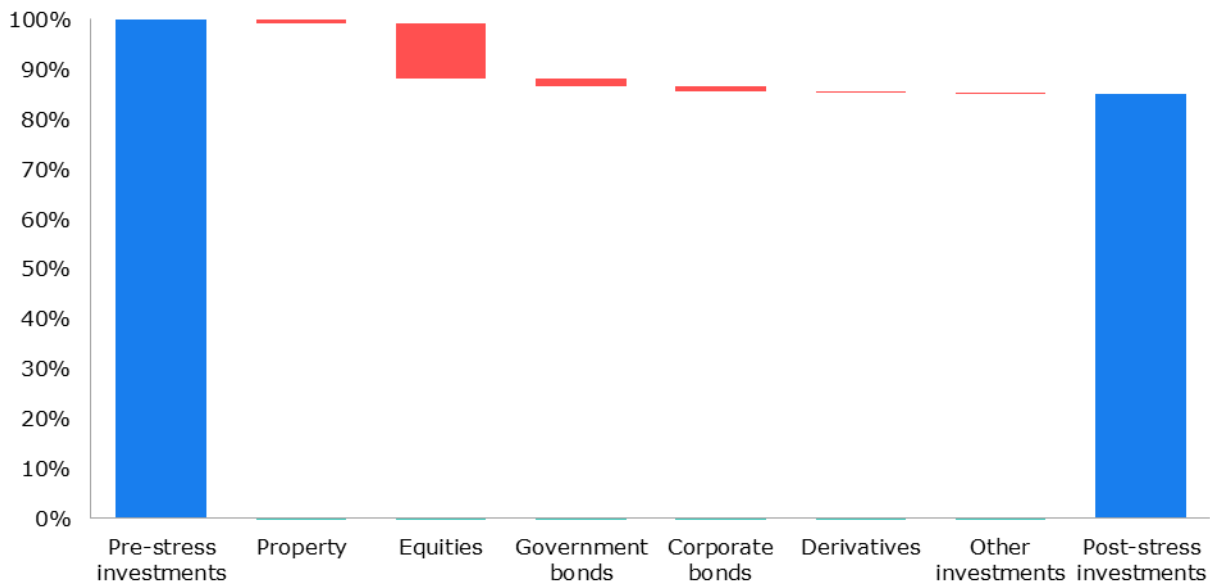
Figure 4.9: Breakdown other investments in baseline scenario, %



#### 4.2.2. Adverse market scenario

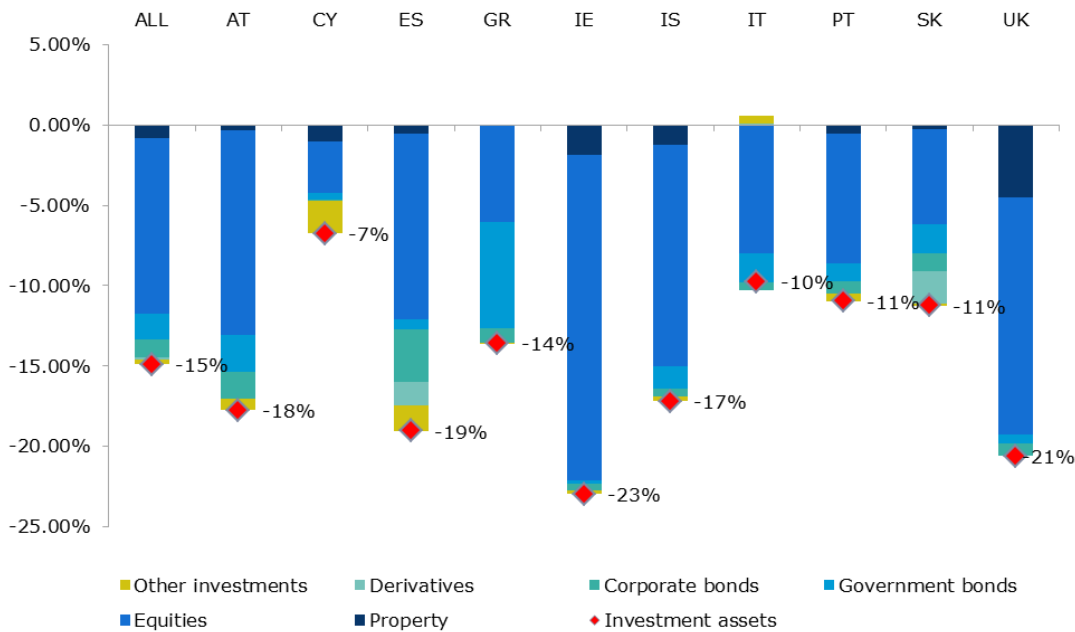
175. The adverse market scenario leads to fall in the market value of investment assets of DC IORPs by 15% compared to the baseline scenario. The main drivers of the drop are equities (11%) followed by the fixed income assets (3%) (Figure 4.10). The contribution to the overall fall in the value of investment assets depends on the allocation to the asset category and its value change. In terms of changes in values in the adverse scenario, government bonds drop by 4% while corporate bonds drop by 7%. The listed equities value falls by 37% in the adverse scenario compared to the baseline, where European listed equities are the most affected by the shocks (-48%). The impact of the adverse scenario on non-listed equities is equally high with a decrease of 39% in total value compared to the baseline, but with a small impact on total assets as this category represents around 1% of total investment assets.

Figure 4.10: Impact adverse market scenario on investment assets, pre-stress value = 100%



176. At country level, the IE DC plans are the most affected as they allocate almost two thirds of their investment portfolio to equities, leading to a contribution of 20% to the total decline of investment assets (-23%) (Figure 4.11). On the other hand, CY DC IORPs are the least affected by the adverse scenario (-7%) due to a higher exposure towards property and bank deposits. The impact on IORPs from AT, ES, IE, IS and the UK exceeds the overall aggregate (ALL) as their portfolio encompasses above average allocations to non-fixed income assets.

Figure 4.11: Impact adverse market scenario on investment assets by country, %



## **4.3. Second round effects on real economy and financial markets**

### **4.3.1. Impact on plan members**

177. The fall in the value of DC IORPs' investment assets will lower the amounts in the individual accounts of DC members. If the adverse scenario persists, this will reduce expected retirement income with potentially negative consequences for consumption and the real economy. This section discusses the second round effects of the adverse scenario on retirement income of DC members, analysing the size of the impact as well as the distribution over time.
178. To that end, IORPs were requested to estimate future retirement income for three representative plan members in the baseline scenario, serving as a benchmark against which to measure the effects of the adverse scenario. Projected retirement income depends on the features of the representative DC members, such as the expected retirement age and career salary growth, but also on the design and characteristics of the DC scheme, like (future) contribution rates, investment strategy during the accumulation phase and costs and charges.
179. For this exercise, the projected outcomes for the representative members were extrapolated by EIOPA to the overall membership of the DC sample to estimate the impact of the adverse scenario on aggregate retirement income over time.

#### **4.3.1.1. Representative plan members**

180. Participating IORPs in the sample provided data for three representative plan members which - at the reference date of end 2016 - are respectively 35 years, 20 years and 5 years before the expected retirement date. The information on representative plan members covers the expected retirement age, initial salary and career salary growth.
181. The expected retirement age (Figure 4.12) of the representative members determines the country-specific life expectancy at retirement, based on the Eurostat population projection 2015, and, hence, the number of years the DC pension would have to last. In ES, IT and GR life expectancy at 65 is higher than for the eleven country average, in AT, IE and in particular SK it is lower.
182. There is a positive correlation between life expectancy and the expected retirement age reported by IORPs for the three representative plan members. Overall, the expected retirement age for the 35 years before the expected retirement date member is 67.6 years while the life expectancy for the same representative member is 90.1. IT has the highest expected retirement age in the sample (69.2 years) while SK has the lowest one (62 years) (Figure 4.12). In a few countries (e.g. IT, PT and to a lesser extent in AT and GR) the retirement age of the representative members is expected to increase in line with the number of years remaining to retirement.
183. Annual earnings' development of the representative plan members determines the amount of contributions paid into the DC plan and the level of the replacement rate, which expresses retirement income as a percentage of final earnings. Annual salaries are assumed to grow in line with inflation and real wage growth of 1% in all countries, plus a career salary growth (evolution of career salary growth in Figure 4.13). Participating IORPs had to provide an estimate of the career-growth component of salary growth (reflecting career development) for the three representative plan members as well as their starting salaries.
184. An important determinant of replacement rates is career salary growth. Higher rates of salary growth lead to higher contributions and final pension assets, and

therefore higher retirement income, but on the other hand it can also result in lower replacement rates in situations of steep career salary growth during the last years before retirement. In particular, AT and UK IORPs have assumed high career salary growth during the last decade before retirement (Figure 4.13).

Figure 4.12: Expected retirement age and life expectancy at retirement of three representative members by country, members weighted average, years

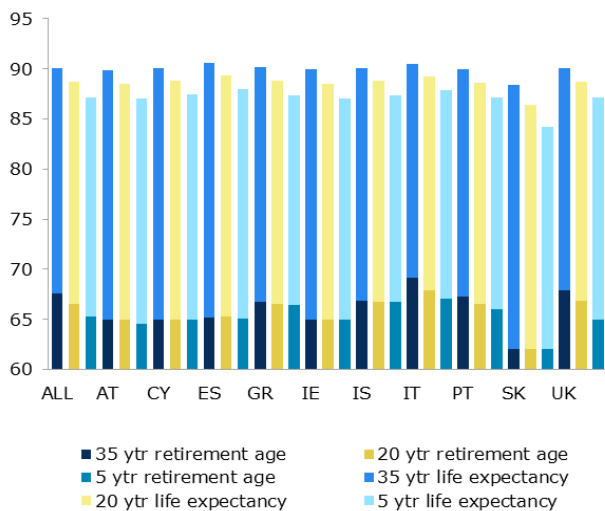
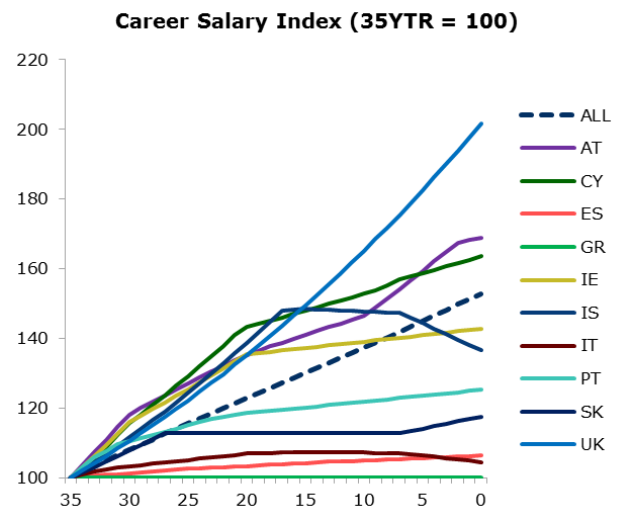


Figure 4.13: Career salary growth over life-cycle of 35 years-to-retirement member by country, members weighted average, 2016=100



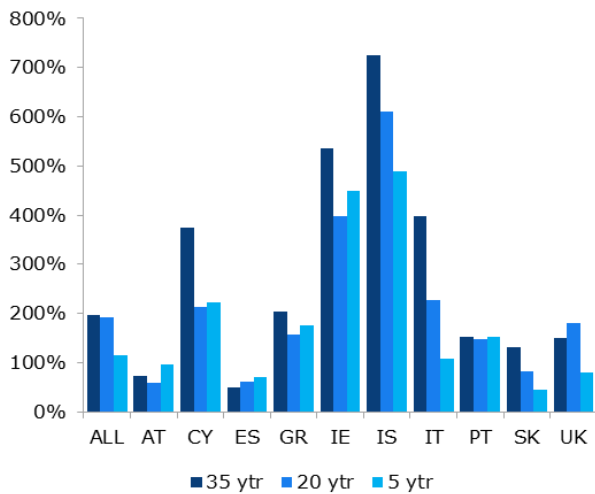
Note: The career salary index reflects only the career salary growth component of annual earnings but not the real wage and inflation components.

185. The career salary growth over the life-cycle of the 35 years-to-retirement member (Figure 4.13) is assumed to increase on average 53% for the whole sample. Cumulative career salary growth rates of DC plan members from AT, CY and the UK are situated above the sample's average. Members from ES and IT face modest increases, whereas GR members are assumed to have no career salary growth over the life-cycle.
186. The highest starting annual salaries can be found in IE and IS, followed by AT, while CY, GR and SK assumed relatively low starting salaries.
187. Participating IORPs also provided information on the characteristics of the representative members' typical DC plan as contribution rates over the life cycle, any caps/floors on salaries to which contribution rates are applied as well as the starting wealth representing past contributions and returns and asset allocation over the life-cycle of the representative members and costs and charges of the DC plan.
188. Based on these characteristics of the representative members and their typical DC plan together with the expected return assumptions described in section 2.3, projections can be made for accumulated assets at retirement as well as retirement income and the replacement rate, depending on the pay-out method assumed/chosen.

#### **4.3.1.2. Replacement rates in baseline scenario**

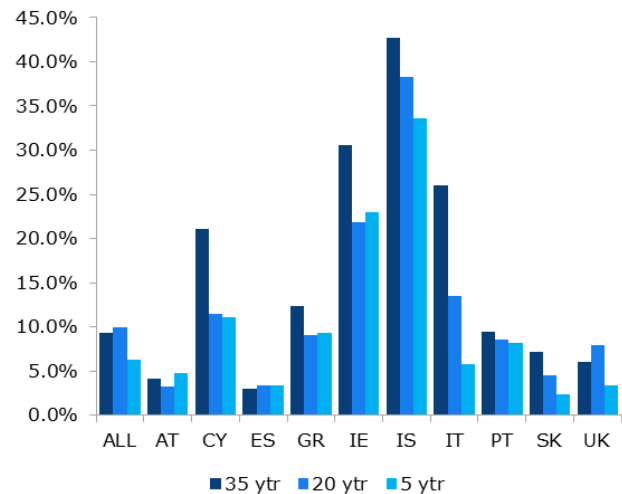
189. The expected replacement rates at country level have to be considered in relation with other sources of pension income. The DC plan's role is usually to supplement the state pension in the first pillar, whereas the reported replacement rates show the income without the first pillar pension. Moreover, especially the older DC members may receive pension income from multiple IORPs if they worked for different companies in the past, whereas the reported replacement rate gives the pension income from one such IORP. As state pensions and other sources of retirement income will differ, the expected DC replacement rates are difficult to compare between countries.
190. The replacement rates, computed as the retirement income at the start of the retirement period as a proportion of the final salary just before retirement, are presented in this section with the aim of establishing a baseline scenario for measuring the impact of the adverse scenario. Replacement rate calculations are based on common, risk-sensitive return assumptions used for the purpose of the stress test which may differ from the assumptions underlying national pension projections (see section 2.3). In consequence, replacement rates at country level in this stress test exercise may differ significantly from those published at the national level.
191. Replacement rates are calculated with respect to different pay-out options: a lump-sum payment (where the 'replacement rate' simply measures the lump sum as a proportion of final salary) and a flat real annuity. For a consistent comparison among IORPs, pension outcomes have been evaluated under the assumption that the lump sum is converted in a life annuity which is indexed to inflation, irrespective of the typical pay-out method used by members of the IORP.
192. At European level, the accumulated assets at retirement reach 196% of the final salary for the 35 years-to-retirement member, 193% for 20 years-to-retirement member and 116% for the 5 years-to-retirement member, but vary considerably across countries (Figure 4.14). The accumulated assets at retirement can be relatively low because of a low level of (past) contribution rates or because the DC IORPs started operating relatively recently. The latter is the case in the UK where a substantial part of the IORPs in the sample were established shortly before the introduction of auto-enrolment in 2012. In IT, the other large DC market, auto-enrolment was introduced in 2007. In IS and IE followed by IT and CY, the accumulated assets at retirement are above the European average, while in AT and ES accumulated assets are below 100% of the final salary. Furthermore, in ES the accumulated assets for the 35 years-to-retirement member are less than the ones accumulated for the other two representative members.
193. The average replacement rates exhibit significant variation between the participating countries as well as the three representative plan members within countries. At European level, the weighted average of the replacement rate for the 35 years-to-retirement member is 9.4% with the weighted average replacement rate at country level ranging from 3% in ES to 43% in IS (Figure 4.15). The level of the real annuity depends on accumulated assets at retirement (Figure 4.14), but also on country-specific life expectancy at retirement (and hence the retirement age) and currency-specific forward interest and inflation rates. In most countries the expected replacement rate increases with the number of years remaining to retirement. The older members have likely not been participating in the DC scheme during their entire life-cycle, as most DC IORPs have not been around for a sufficiently long time.

Figure 4.14: Accumulated assets at retirement of three representative members in baseline scenario by country, members weighted average, % final salary



Note: Weighted average accumulated assets at retirement divided by weighted average final salary using number of members in relevant years-to-retirement category as weights: 0-10 years for 5 ytr, 15-25 years for 20 ytr and 30+ years for 35 ytr members.

Figure 4.15: Replacement rate inflation-linked annuity of three representative plan members in baseline scenario by country, members weighted average, % final salary



Note: Weighted average real retirement income divided by weighted average final salary using number of members in relevant years-to-retirement category as weights: 0-10 years for 5 ytr, 15-25 years for 20 ytr and 30+ years for 35 ytr members.

### Drivers of replacement rates

194. The most important drivers – other than the characteristics of the representative DC members – of the projected assets and replacement rates in the participating countries are initial assets, contribution rates, interest and inflation rates, asset allocations as well as costs and charges, which are further elaborated below.
195. There are significant differences among countries regarding the initial assets of the three representative members as a percentage of the initial salary. Figure 4.16 shows a trend for all members according to which the initial assets increase as the years to retirement of the member decrease. The individual accounts of DC members grow during their working life by accumulating contributions that are compounded by the realised investment returns.
196. The average EU contribution rate begins at nearly 7% for the 35 years-to-retirement member and increases gradually over the life cycle until retirement (Figure 4.17). Contributions of representative members from countries like IS, IE and CY start at relatively high levels (above the EU average), but follow a relative stable evolution over time. In contrast, for example in the case of the GR representative members, there is a significant jump at 25 years-to-retirement.

Figure 4.16: Initial assets of three representative members by country, members weighted average, % initial salary

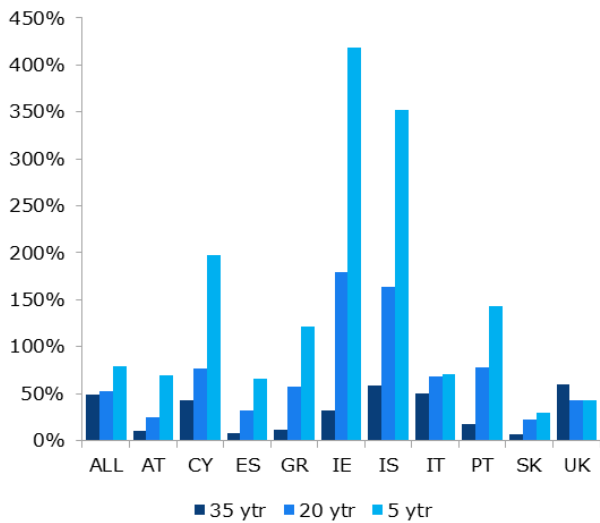
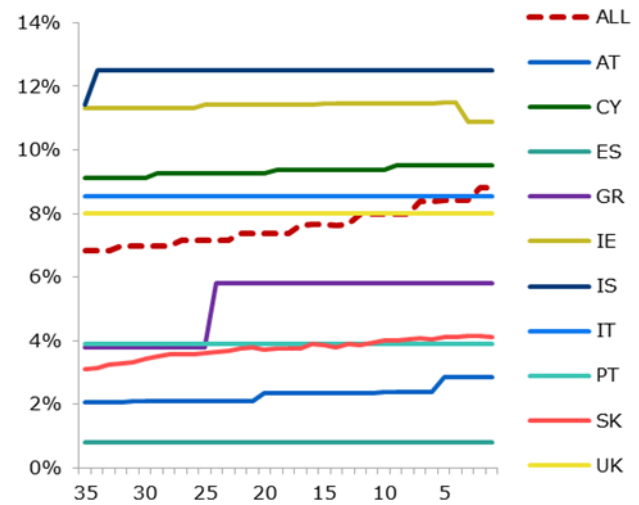


Figure 4.17: Contribution rate over life-cycle of 35 years-to-retirement member by country, members weighted average, % pensionable salary



197. Returns on initial assets/contributions are based on forward interest rates which differ for EUR, GBP (higher first 20 years, lower thereafter) and ISK (higher). The conversion rate to annuity depends also on currency-specific interest rates as well as inflation rates. The final salary - serving as the denominator of the replacement rate - also depends on forward inflation rates which differ between EUR (1-2%), GBP (around 3.5%) and ISK (1.5%).

198. In addition, the expected return depends on the risks premiums that can be earned on the various asset classes: fixed income assets are assumed to have relatively low risk premiums compared to non-fixed income assets (see Section 2.3). At European level, the initial asset allocation of the 35 years-to-retirement member suggests a slightly higher percentage of total investments allocated to equities (46%) than to fixed income assets (45%) (Figure 4.18). Initial investments in real estate and alternative investments are around 10% of total investments. Over the life-cycle of the 35 years-to-retirement member, the asset allocation becomes more conservative before retirement with fixed income assets reaching almost 86% of the portfolio.

199. The asset allocation is heterogeneous at country level. Some countries have a relatively aggressive investment approach, such as IE, which has initial investments in equities of 71% or CY, which invests 29% of initial assets in real estate (see Annex 5). On the opposite side, GR allocates 79% of the portfolio to fixed income assets. In the majority of countries the accumulation phase takes a life-cycle approach with allocations to risk assets being reduced as the DC member gets closer to retirement.

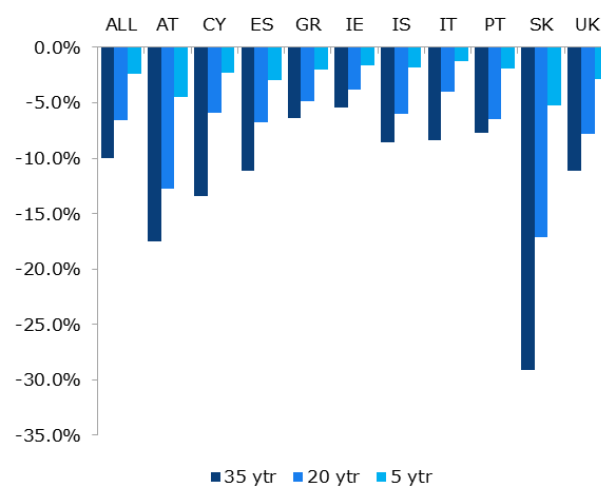
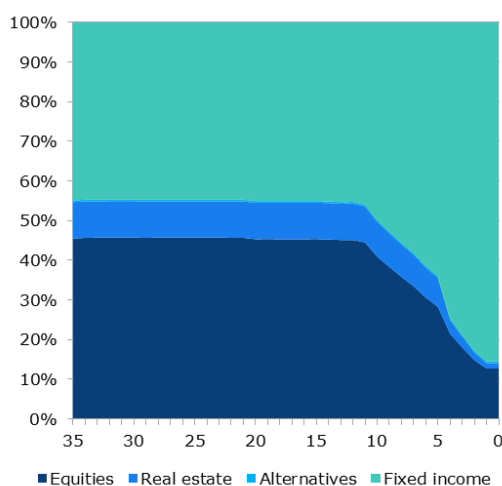
200. The impact of costs and charges on the replacement rates of the inflation-linked annuity of the three representative members varies by country (Figure 4.19), where all costs and charges have been combined into one metric. The best estimates of costs and charges impact pension outcomes by transforming gross investment returns into net investment returns, gross contributions into net contributions and/or gross final pension wealth into net final pension wealth, where "gross" excludes and "net" includes the effect of costs and charges. Administrative and investment costs (excl. transaction costs) are IORP specific and could be specified in different ways: fixed sum, percentage of contributions, percentage of



final pension wealth, percentage of total assets, percentage of assets of a specific asset category and/or a percentage of returns, including a possible threshold.

201. Costs and charges reduce the projected replacement rate of the 35 years-to-retirement members by 10% on average. However, the analysis only takes into account future costs and charges. Countries where members have larger starting wealth will therefore appear to be less affected by costs and charges compared to those with large numbers of newer DC members with smaller initial wealth. Moreover, when comparing the impact of costs and charges across countries, differences in investment and risk management strategies, product features, returns or guarantees or national specificities should be considered. For example, the impact of costs and charges on the replacement rate in SK is very high compared to other countries. However, the specific fee system in SK - called high-water-mark system (HWMS) - will result in lower costs in the adverse scenario.

Figure 4.18: Asset allocation over life-cycle of 35 years-to-retirement member in baseline scenario, members weighted average, % total investments

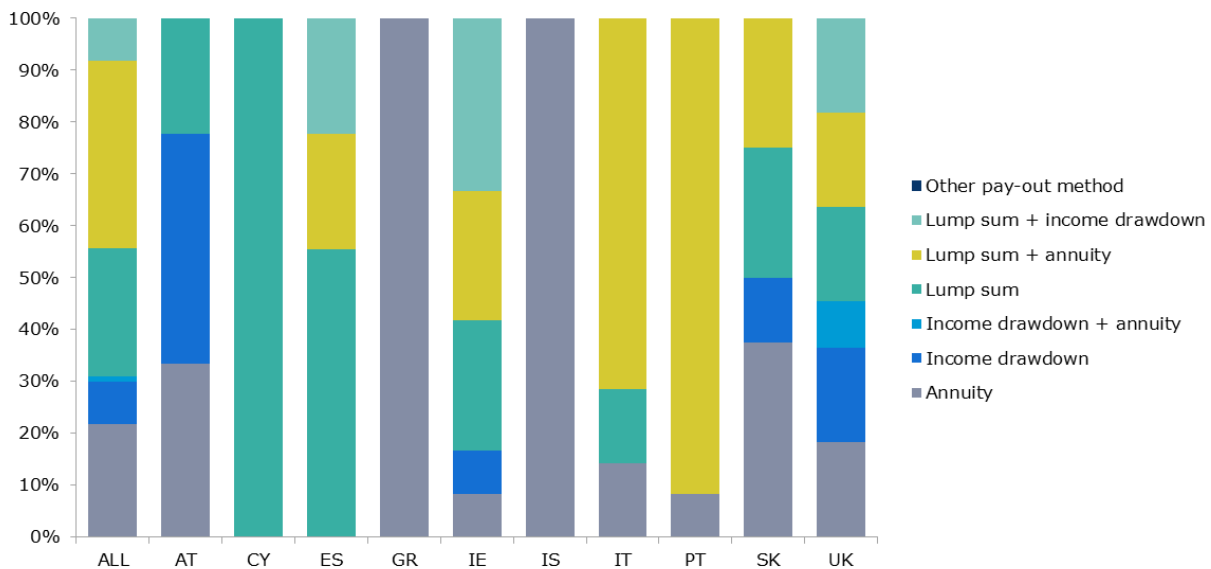


### Typical pay-out methods used by plan members

202. Even though two types of pay-out methods have been considered (lump sums and a flat real annuity), for comparability reasons the pension outcomes have been evaluated under the assumption that the lump sum is converted in a life annuity which is indexed to inflation, irrespective of the typical pay-out method used by members of the IORP. Inflation-linked annuities generally result in lower replacement rates than nominal annuities or income drawdowns.

203. The typical pay-out methods differ considerably between countries (Figure 4.20). The sampled IORPs in GR and IS selected an annuity as the common pay-out method while IORPs in CY selected a lump sum payment. In other countries, DC members typically use different (or combinations of) approaches, including annuities, income drawdowns and lump sums. It is important to mention that when a lump sum is provided, the plan members still have to decide on their own preferred decumulation method.

Figure 4.20: Expected pay-out method typically used by representative members by country, % IORPs



204. Where an annuity was put forward as the typical pay-out method, IORPs were asked to further specify the type of annuity. The vast majority indicated the annuity usually concerned a life annuity (78%) followed at a distance by a temporary annuity (20%) and a deferred annuity (2%). Moreover, nominal annuities were more frequently mentioned than real annuities (only in IE and IS) and variable annuities.

205. The heterogeneity in pay-out methods between countries can be attributed to a large extent to differences in national regulation of the decumulation phase. Most DC IORPs (85%) indicated that the pay-out phase is subject to legal and tax constraints and only 15% of IORPs indicated that there are no constraints, predominantly in ES and the UK.

#### 4.3.1.3. Comparison with 2015 IORP stress test

206. Accumulated assets and replacement rates in the baseline scenario exceed the projections of the 2015 IORP stress test. The increase in aggregate accumulated asset as a percentage of final salary ranges from 16% for the 35 years-to-retirement member, to 23% for the 5 years-to-retirement member and 51% for the 20 years-to-retirement member (Table 4.1). Aggregate replacement rates show an increase in the range of 1.0-2.8%.

207. The higher levels of accumulated assets and replacements can to some extent be attributed to the DC IORPs that participated in both the 2015 and 2017 stress test exercise. In particular, accumulated assets and the replacement rate of the 20 years-to-retirement member are higher in a number of countries, especially in IS, PT and the UK. Since the last stress test, asset prices have increased, resulting in higher projected assets and replacement rates. However, the further decline in interest rates, especially in IS and the UK, has a negative effect on (assumed) future investment returns and an upward effect on the price of annuities. In any case, it is difficult to conclude on the actual contribution of financial market developments, since participating IORPs may also have re-defined the characteristics of the representative DC members.

208. An important reason for the rise in accumulated assets and replacement rates for all three representative members is the change in the composition of the sample. The weight in the sample of DC IORPs from IS, IT and the NL increased.

Since DC schemes from these countries target relatively high replacement rates, this has a positive influence on the aggregate projections. This was reinforced by a decrease in the sample-weight of DC IORPs from AT and UK, which have below-average replacement rates.

*Table 4.1: Decomposition of change compared to 2015 IORP stress test of accumulated assets and real replacement rate for three representative plan members in baseline scenario, % final salary*

	Accumulated assets			Replacement rate inflation-linked annuity		
	35 ytr	20 ytr	5 ytr	35 ytr	20 ytr	5 ytr
Level 2015 ST	180%	142%	93%	8.4%	7.2%	5.1%
Difference 2017 and 2015 ST	16%	51%	23%	1.0%	2.8%	1.2%
- common sample	-4%	34%	0%	-0.9%	1.3%	-0.3%
- composition sample	20%	17%	22%	1.9%	1.5%	1.6%
Level 2017 ST	196%	193%	116%	9.4%	10.0%	6.3%

Note: The change in the aggregate accumulated assets at retirement (in % final salary) for a given representative plan member (i.e. 35 ytr, 20 ytr or 5 ytr) can be written as:  $\Delta aa = aa^{17} - aa^{15} = \sum(aa_i^{17} - aa_i^{15})w_i^{15} + \sum(w_i^{17} - w_i^{15})aa_i^{15} + \sum(w_i^{17} - w_i^{15})(aa_i^{17} - aa_i^{15})$ , where  $aa_i^{year}$  denotes the accumulated assets (in % final salary) of representative member/country  $i$  and  $w_i^{year}$  the weight of representative member/country  $i$  in either the 2015 or 2017 stress test. Since the aggregate accumulated assets at retirement (in % final salary) at country/European level is defined as the member-weighted accumulated assets divided by the member-weighted final salary, the weights correspond to the proportion of representative member/country  $i$  in the member-weighted average final salary. Using the above equation the change in the accumulated assets can be attributed to the change in the accumulated assets for the common sample (1<sup>st</sup> term), the composition of the sample at country/European level (2<sup>nd</sup> term) and an interaction effect (3<sup>rd</sup> term). In the table the contribution of "composition sample" includes both the composition effect (2<sup>nd</sup> term) and the interaction effect (3<sup>rd</sup> term). The decomposition of the aggregate replacement rate (in % final salary) was made in an equivalent way.

#### 4.3.1.4. Impact of adverse scenario on replacement rates

209. The impact of the adverse scenario on accumulated assets and real replacement rates at European level is heterogeneous among the participating IORPs and representative members.

210. The stress scenario has a more severe impact for older members closer to retirement due to higher accumulated pension wealth and, hence, higher sensitivity to asset price shocks. The accumulated assets for the 5 years-to-retirement member drop, on average, by 11.4% (Figure 4.21) while the replacement rate of the inflation-linked annuity decreases by 14.9% (Figure 4.22). Nonetheless, the impact on young plan members is also substantial as the downward shift of the interest rate curve implies lower forward interest rates and, hence, lower future returns. Accumulated assets for the 35 years-to-retirement member fall by 7.8% and the replacement rate by 11.2%.

211. The impact on the replacement rate is more severe than the impact on accumulated assets at retirement. The reason for this higher impact on the replacement rate is that in addition to lower pension wealth at retirement also the annuity conversion rate will be lower due to a decline in interest rates. This is only partly compensated by the slight decrease in inflation rates.

Figure 4.21: Impact of adverse market scenario on accumulated assets at retirement as a percentage of final wage of representative members by country, members weighted average, % change compared to baseline

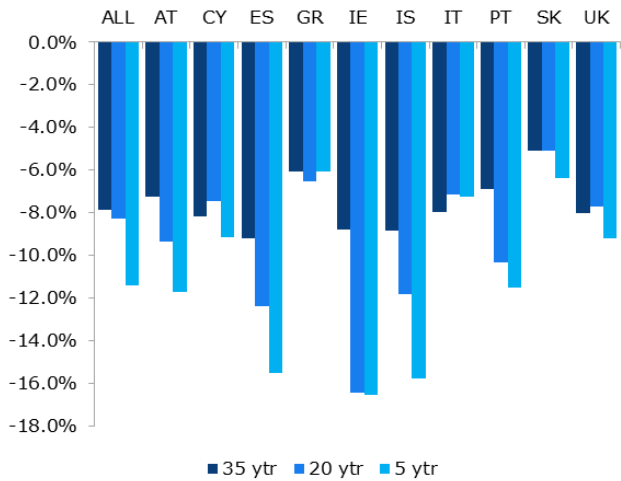
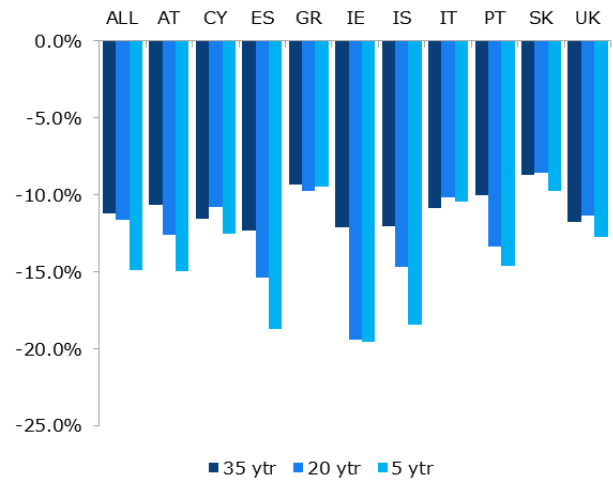


Figure 4.22: Impact of adverse market scenario on replacement rate inflation-linked annuity of representative members by country, members weighted average, % change compared to baseline



212. The impact of the adverse market scenario on the DC member closest to retirement depends to a large extent on the allocation to non-fixed income assets (Figure 4.23 and 4.24). The allocation to non-fixed income assets for the 5 years-to-retirement member is the lowest in GR, IT and SK. This also explains why the impact on the level of accumulated assets and the replacements rate for the older member in these countries is more in line with the impact on the younger members.

Figure 4.23: % change replacement rate of 5 years-to-retirement members (vertical axis) allocation to non-fixed income assets in % (horizontal axis) by IORP

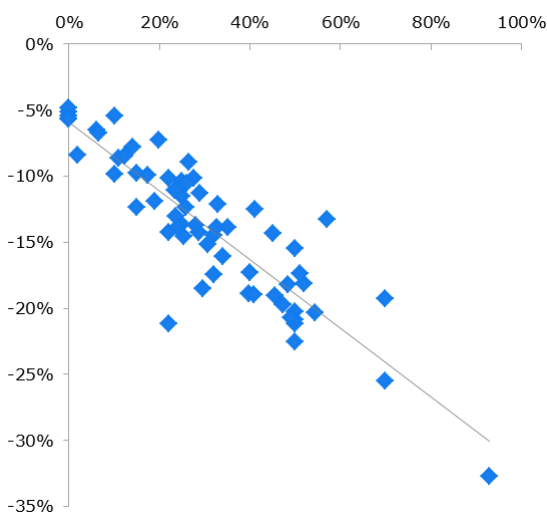


Figure 4.24: % change replacement rate of 5 years-to-retirement members (vertical axis) allocation to non-fixed income assets in % (horizontal axis) by country



213. The calculation for assessing the impact of the adverse scenario assumes that contribution rates over the life-cycle of the representative members and the expected retirement age(s) remain unchanged. Participating IORPs were provided with the opportunity to alter the asset allocation over the life-cycle of the representative members following the materialisation of the adverse scenario to

accommodate dynamic asset allocation strategies of DC IORPs. However, none of the participating IORPs made use of this possibility. IORPs could also include the effects of the adverse scenario on the value of derivative hedging positions. Only 14% of IORPs (all in IT and PT) included the effects of equity derivatives and 5% of all IORPs (all in IT and SK) the effects of interest rate derivatives. The aggregate positive effect of the equity derivatives ranged from 0.1% for the 5 years-to-retirement and 35 years-to-retirement members to 0.3% of initial wealth for the 20 years-to-retirement members. The effect of the interest rate derivatives was not material at the aggregate level.

#### 4.3.1.5. Impact on overall retirement income

214. The impact on overall retirement income over time was assessed by extrapolating the projected retirement income of the three representative members to the overall membership.

215. The projected retirement income in the baseline and adverse scenario was expressed as a percentage of initial wealth and subsequently log-linearly interpolated/extrapolated. This resulted in expressing the expected retirement income as a percentage of initial wealth for all DC members from 40 to 0 years to retirement in both the baseline and adverse scenario.

216. Furthermore, the expected retirement income as a percentage of initial assets was converted to amounts of retirement income by multiplying the total initial assets of DC members with different years to retirement. The participating IORPs provided total assets for 5-year year-to-retirement categories (Figure 4.25). The assumption made was that these amounts are uniformly distributed over the 1-year sub-categories.

217. The amounts of retirement income were subsequently transformed into a cash-flow pattern over time (Figure 4.26). To construct the cash-flow pattern, life expectancy at retirement - during which retirement income is paid - is determined by linearly interpolating/extrapolating life expectancy of the three representative members. Since projected retirement income is based on a real annuity, it is increased with the inflation rates in the baseline and the adverse scenario.

Figure 4.25: Overall IORP assets by plan members' remaining years to retirement, EUR billion

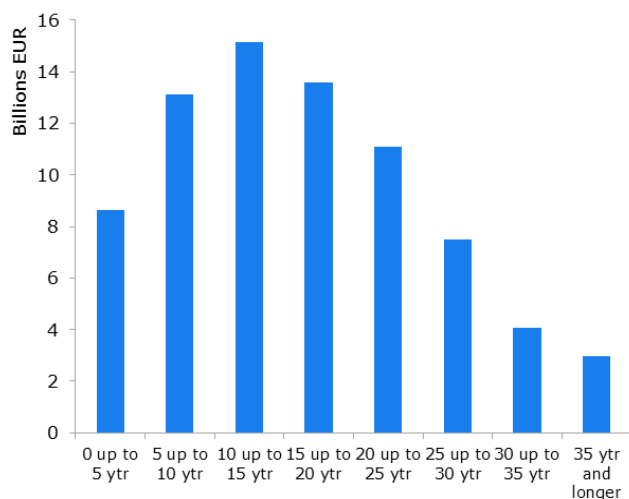
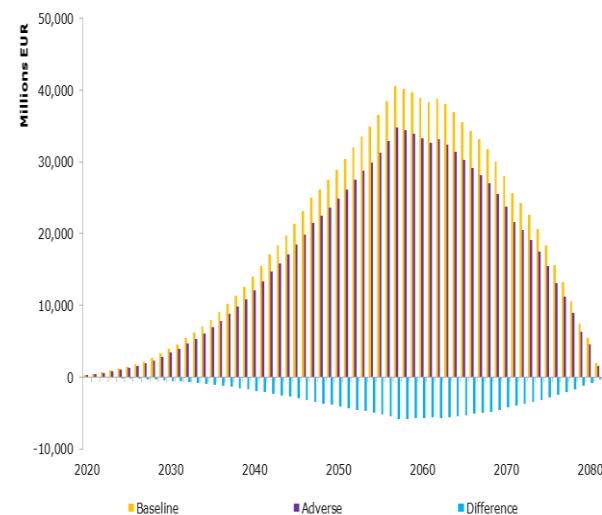


Figure 4.26: Overall future retirement income provided to current active members in baseline and adverse market scenario, EUR million



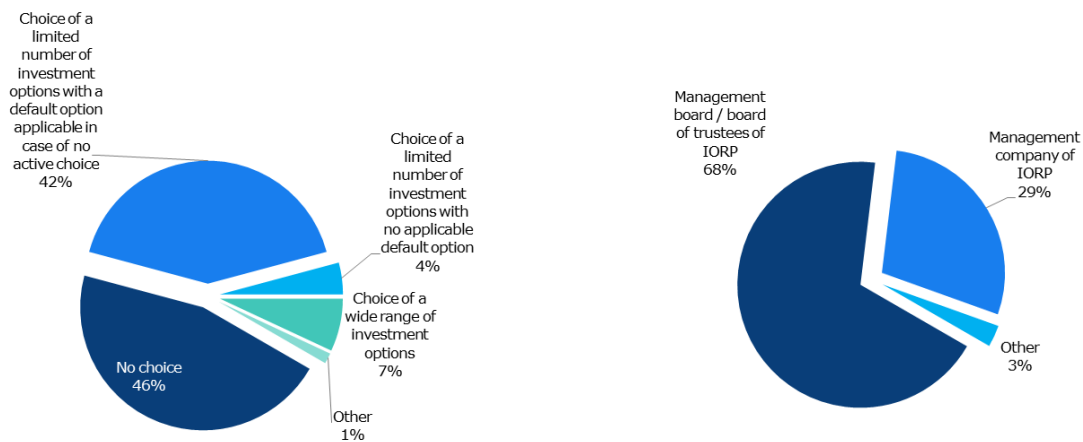
218. The cash-flow projection shown in Figure 4.26 includes only existing members and not future members and does not take into consideration current retired persons. The latter appears not to be a significant omission for DC. The proportion of retired persons is only 1.6% of DC members and beneficiaries in the sample. Many DC members will not have reached the pay-out phase and DC members often cease to be members once they retire. Accumulated assets may be distributed as lump sum or members may switch to another provider for the pay-out phase. About half of participating IORPs provide for retirement income (other than a lump sum payment at retirement) during the decumulation phase, one-third of IORPs mentioned that the members have to approach other providers while the remaining IORPs in the sample indicated that both options are possible.

219. The conclusion that can be drawn from Figure 4.26 is that the adverse scenario impacts retirement incomes gradually over time as current active members start to receive pension income with the maximum impact being reached when most active members have retired (i.e. around 2060). Whether this affects the real economy in the short term depends on the extent to which DC members consider projected declines in retirement income in their current consumption-saving decision.

### 4.3.2. Impact on financial markets

220. It is important to analyse investment behaviour following the adverse market scenario, since IORPs' reactions may have counter-cyclical or pro-cyclical effects, with implications for financial stability. We refer to section 3.3.4 for further background, as this is similar to the DB/hybrid stress test analysis.

Figure 4.27: Plan member choice of investment options in DC plan, % IORPs      Figure 4.28: Responsibility for the asset allocation of DC IORP or investment options



221. To analyse the investment behaviour after the adverse shock, it is in principle important to consider to which extent plan members are enabled to make a choice for a certain investment option. For a large part of the participating IORPs (46%), plan members do not have a choice concerning the investment allocation (Figure 4.27). Another large part of participating IORPs offer a limited number of investment options, in which case a default option is applicable (42%). Only a small part of the responding IORPs offer a limited choice without default option (4%) or even a wide range of investment options (7%). However, even when members do have a choice, it would be important to assess whether and how they actually react to shocks, or whether they are more prone to inertia, as suggested by behavioural economics.

222. For two-thirds of participating IORPs, the management board or the board of trustees decides on the asset allocation of the default fund or the investment options (see Figure 4.28). In most other cases it is the DC IORP’s management company.

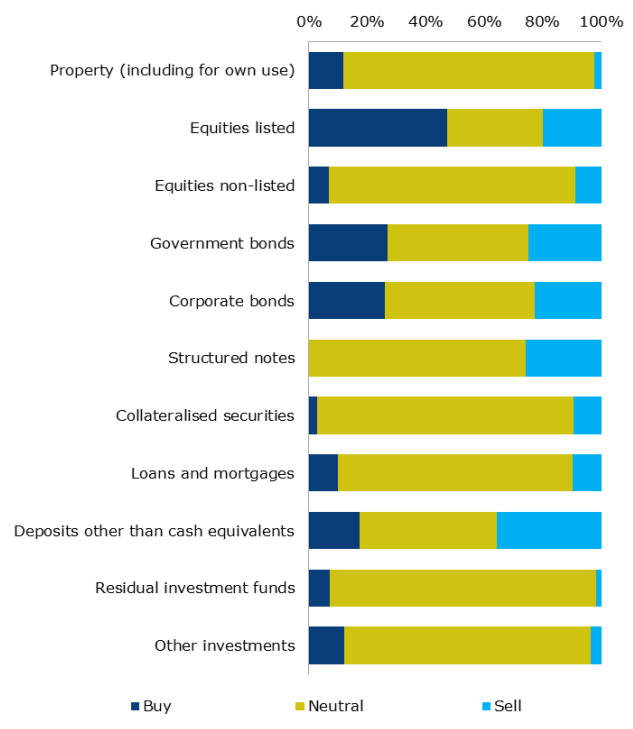
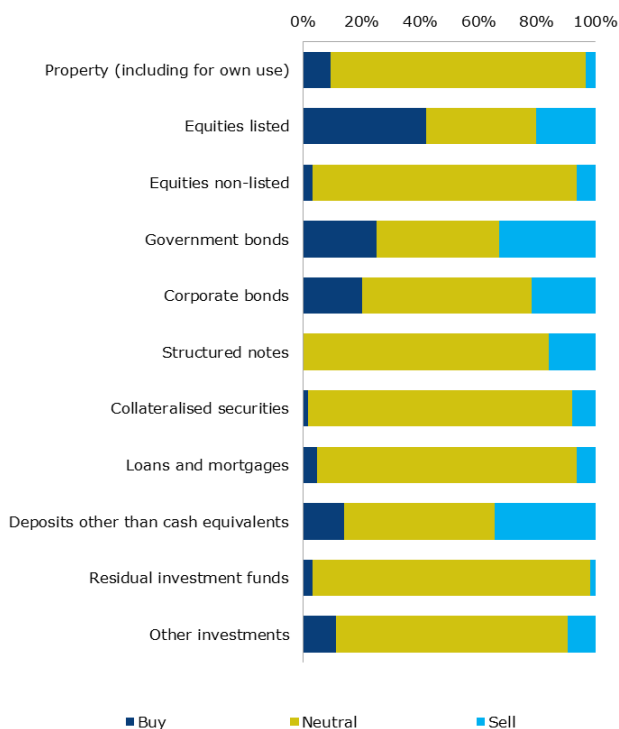
223. For the analysis of the impact of investment behaviour, participating IORPs were provided with the option to submit data and answers with respect to the investment portfolio of DC IORPs as a whole or the largest investment option. 72% of the DC IORPs filling in the questionnaire did this for the IORP as a whole. Therefore, the answers are to be interpreted as predominantly relating to the investment behaviour of the whole IORP.

224. The adverse scenario itself results in an endogenous decrease in non-fixed income assets (mainly equity and property), as the asset classes are hit by the materialisation of market risk. Similarly, the impact of the adverse scenario implies an increase in allocations to fixed income assets. The scenario causes the listed equity allocation to decrease from 28% to 21%, whereas the fixed income allocation increases from 66% to 75%. The allocation to the ‘other investments’ category slightly decreases from 5% to 4%.

225. Figure 4.29 shows that a significant part of the responding IORPs indicate their intention to buy listed equity after the shock. It seems buying equities would be the dominant strategy to selling suggesting that at aggregate level there is a net buying effect. A considerable percentage of the responding IORPs expect to buy as well as sell government bonds after the shock, but in this case it is the selling that dominates. For corporate bonds, buying and selling intentions seem to balance. The percentage of IORPs expecting to sell bonds is roughly of the same size. The asset weighted results (Figure 4.30) are comparable to the unweighted results.

Figure 4.29: Buying and selling of assets within one year of adverse market scenario, % responding IORPs (unweighted)

Figure 4.30: Buying and selling of assets within one year of adverse market scenario, % responding IORPs (asset weighted)

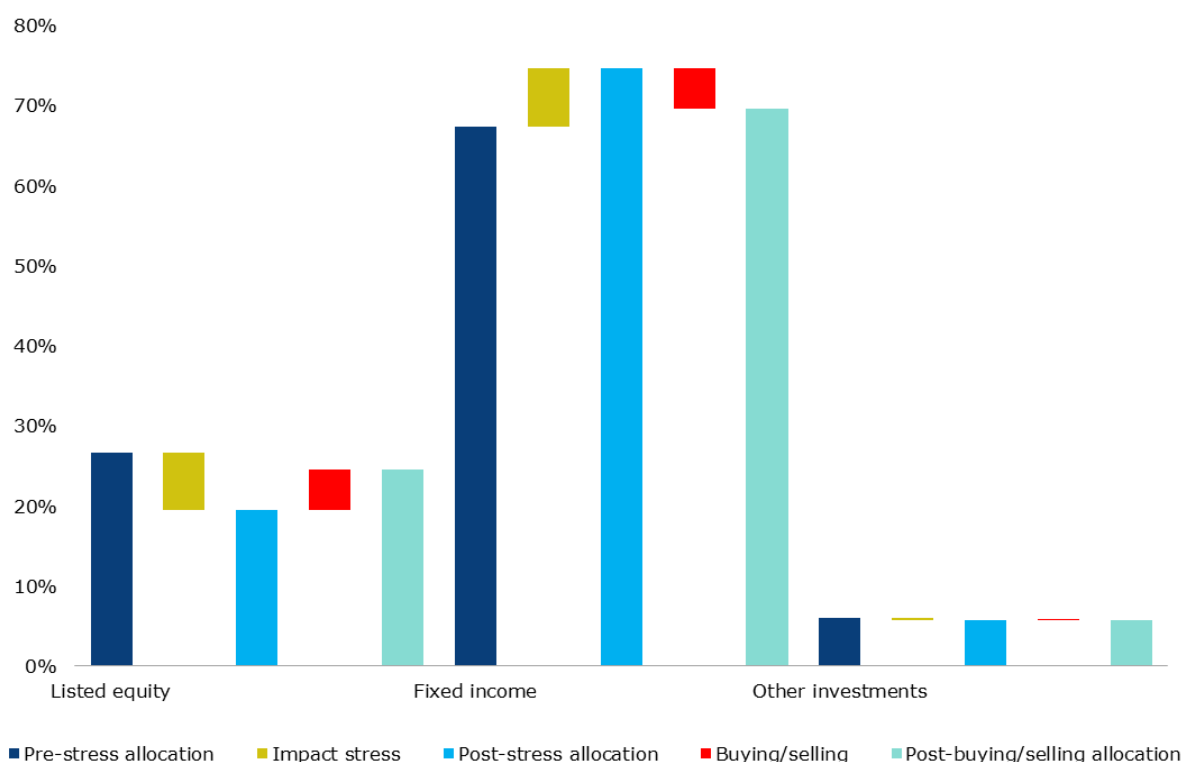




226. 25% of the IORPs filling in the questionnaire indicated that they employ an automatic rebalancing approach. The frequency of rebalancing differs among this group of IORPs, varying from daily to annually.

227. The rebalancing behaviour after the adverse scenario reverts the asset allocation for listed equity, fixed income and other investments to the pre-stress allocation (Figure 4.31). The results show that the post-stress allocation deviates significantly from the pre-stress situation, as described above, but that the post-buying/selling allocation moves towards the pre-stress allocation. For listed equity, the allocation moves back from 20% after the shock to 25% (where the pre-stress allocation was 27%), which is mirrored by the partial rebalancing of the fixed income allocation from 75% after the shock to 70% (where the pre-stress allocation was 67%).<sup>49</sup>

Figure 4.31: Change in aggregate asset allocation following adverse market scenario, % total investments



228. Besides adjusting the asset allocation, IORPs can implement other actions in reaction to the stress scenario. 23% of the IORPs indicated to implement other short-term actions. Among these IORPs one cannot find a majority opting for a certain reaction.

229. IORPs were also asked if they would expect changes to their asset allocation in the longer term following the adverse market scenario and assuming that yields remain low for several years. About half of the IORPs (51%) indicated they would not amend their investment strategy, whereas the other half (49%) would expect to do so. Among the IORPs that indicated to amend their asset allocation, most IORPs would invest in assets with higher yields, for example by increasing the equity allocation, increasing the exposure to illiquid assets or by investing in bonds

<sup>49</sup> The pre-stress and post-stress allocations slightly deviate from the allocations specified in paragraph 224. The reason is that the allocations relate to the IORPs which completed the investment behaviour questionnaire, comprising slightly less IORPs than the full DC sample. Moreover, part of these IORPs completed the questionnaire for the largest investment option instead of the IORP as a whole to which the allocations in paragraph 224 refer.



with a higher duration. Also, several IORPs providing multiple investment options mention that members themselves can decide to switch between schemes with different risk profiles.

230. Based on the unweighted figures it could be concluded that, on average, IORPs tend to buy equity and property at the cost of government bonds when yields remain low for several years after the stress scenario occurs (Figure 4.32). This would suggest IORPs are inclined to search for yield in this scenario. The results are similar (yet slightly more pronounced) for the asset weighted answers (Figure 4.33). However, it is not certain whether this longer-term investment behaviour includes the direct reaction after the shock (described above) or whether it is additional to this reaction.

Figure 4.32: Longer term changes to asset allocation following adverse market scenario and assuming yields remain low for several years, % responding IORPs (unweighted)

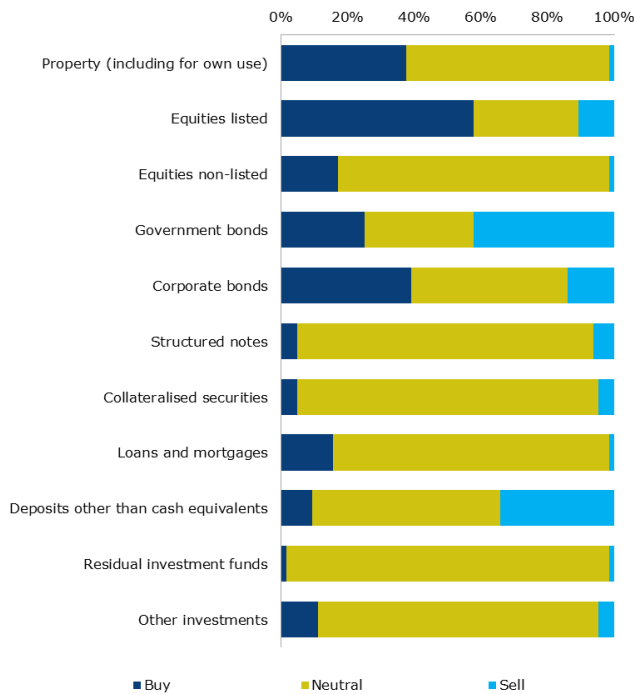
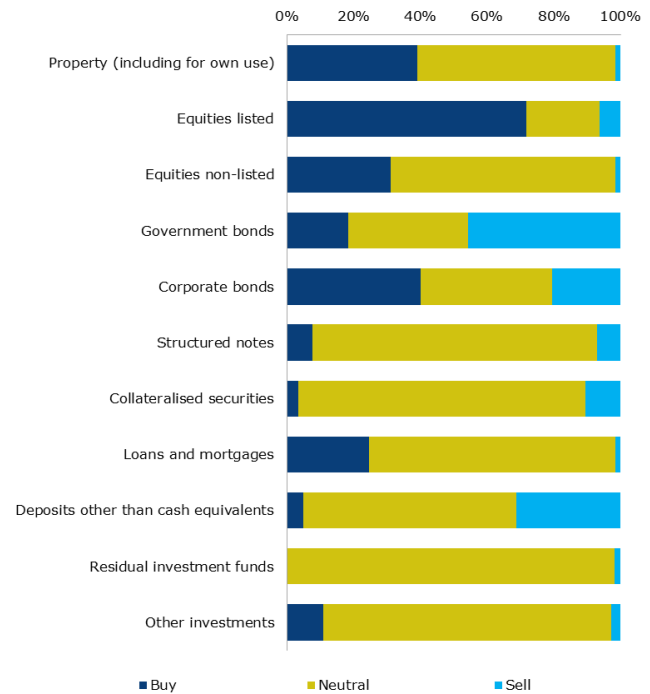


Figure 4.33: Longer term changes to asset allocation following adverse market scenario and assuming yields remain low for several years, % responding IORPs (asset weighted)



231. IORPs were also asked if they would expect to increase the duration of their portfolio if yields remain low for several years. 30% of the IORPs that filled in the questionnaire indicated that they would indeed do this, but the vast majority answered they would not increase the duration.

232. As a final remark on the analysis of the impact on financial markets, it is difficult to draw conclusions, due to possible inconsistencies between the evidence collected on the quantitative changes in aggregate asset allocations and the answers collected by individual IORPs on their intentions in reacting to crises. However, the aggregate data for DC plans show very similar results to those of DB plans, suggesting a prevalent counter-cyclical behaviour at the aggregate level, including the possible reaction of individual members.

## 5. Conclusion

233. The 2017 IORP stress test assessed the resilience of a relevant, representative sample of European IORPs to a severe, yet plausible, market scenario, which can be characterised as a 'double hit' scenario - i.e. the most relevant adverse market development for a long-term investor/debtor: an instantaneous fall in prices of fixed income assets, due to an increase in spreads, and risk assets combined with declining risk-free rates. The target participation rates were not reached in some Members States mainly attributed to the lack of powers of the respective authorities to require participation in the exercise.
234. The stress test exercise was conducted against the background of a challenging external environment for the European IORP sector. Demographic changes, in particular significantly increasing life expectancy, paired with a historically and persistently low interest rate environment, have put funding positions of DB/hybrid IORPs under severe pressure resulting in substantial shortfalls even under pre-stress conditions. Further, national prudential frameworks used in order to calculate quantitative funding or capital requirements continue to be remarkably divergent, and often insensitive towards changing market conditions, therewith rendering national valuations simply incomparable and often incapable of portraying changing valuation assumptions throughout Europe.
235. The European DB/hybrid IORP sector has, on average, insufficient assets to cover liabilities based on the national balance sheet. This is driven by shortfalls in three countries under the baseline and in seven countries under the adverse scenario. These vulnerabilities are even more pronounced using the common market-consistent balance sheet valuation. The revealed shortfalls would need to be addressed, in line with respective national law, by mitigating tools, such as sponsor support, benefit reductions and, where available, pension protection schemes. Those results are very similar to the 2015 stress test results. The DC IORP sector would experience a drop in asset values in the adverse scenario, reducing the individual accounts of DC members and, if the scenario persists, leading to lower future retirement income.
236. Further, in order to draw relevant conclusions regarding the impact on the real economy and on financial markets, it is necessary to be highlighted that the impact of an adverse scenario on the IORP sector will depend on the individual characteristics of the national sectors and the national pension frameworks.
237. Lower retirement income derived from DC schemes has the potential to affect plan members that rely on these pensions to have a decent standard of living in retirement. However, the impact of lower replacement rates on a member's income in retirement depends on a number of factors including the time between the materialisation of an adverse scenario and the member's retirement date, the plan member's ability to adjust personal savings to offset the projected declines in replacement rates as well as the member's other sources of income and assets. The adverse scenario affects aggregate retirement income only gradually, over several decades, due to the time lag between the shock and expected retirement dates. The extent to which this affects real economic activity in the short-term depends on whether DC members take into account the lower projected replacement rates in current consumption-savings decisions.
238. As most of the DB/hybrid IORPs within the sample would use mitigating tools to cover for the shortfall under the tested adverse market conditions, the effects on the real economy have been assessed more in detail during this stress test exercise. IORPs in financial difficulties are usually subject to recovery plans, acknowledging the long-term planning and payment horizons of IORPs, often

relying on (uncertain) future asset performance. Long-term recovery plans as well as other mechanisms consequently smooth the effects on the IORP itself, the sponsoring entities and the members and beneficiaries. As such, these mechanisms contribute to the resilience of IORPs and dampen the effects on the real economy and financial stability in the wake of an adverse scenario. The downside is that the necessary adjustments to resolve shortfalls may fall disproportionately on future generations, especially if investment returns fall short of expectations.

239. More in detail, similar to DC schemes, there will be an extensive time lag between the materialisation of an adverse scenario and the effects of benefit reductions on retirement income, unless senior active members and even beneficiaries are affected. The mitigation tools available to DB/hybrid IORPs allow for further smoothing of the effects of benefit reductions over time. Where overall retirement income highly depends on the IORP sector, benefit reductions may dampen economic activity, depending on the extent to which households adjust current consumption and saving, but also reduce trust in the IORP system. Not only pension arrangements without (significant) sponsor support are susceptible to declines in future retirement income, but also IORPs covered by legally enforceable sponsor support, if the sponsor can no longer afford its commitments.
240. More than a quarter of IORPs providing DB/hybrid schemes revealed through their valuation, by limiting the value of sponsor support to the maximum value of sponsor support, that their sponsor would not be able to fully support the pension promise following the adverse scenario. The conducted analysis compared the market value of sponsor support with the market value of the sponsors, signalling that pension obligations may exert substantial pressure on the solvency and future profitability of businesses. The strain on sponsors from the non-financial sector could spill over to the real economy, having an indirect impact on financial stability, while vulnerabilities of IORPs sponsored by financial institutions could directly be transmitted to the financial sector.
241. Consequently, EIOPA sees benefits in deepening its future analyses to assess the effects of benefit reductions and sponsor support on the real economy, including widening the cash flow analysis to gain further insight in their time element, focussing on the interconnectedness of the IORP sector with the other financial sectors.
242. Notwithstanding the potential impact on sponsors and/or plan members, the IORP sector does not seem to exert direct financial stability effects in the same way and to the same extent as banking or insurance. The conventional assessment of the impact of a failure of an institution seems to be less relevant for IORPs.
243. Still, IORPs are sizeable institutional investors with the ability to influence asset markets. The stress test results indicate that IORPs, both DB/hybrid and DC, might alleviate selling pressure on financial markets by rebalancing asset portfolios during stressed market conditions. However, this conclusion is based on investment behaviour information of a limited part of the sample, largely excluding the DB sector in the UK.
244. Going forward, an assessment of the implications of specific activities and common behaviour - a 'horizontal assessment' - of potential systemic risk drivers such as search for yield, flight to quality or herding behaviour would provide further insights to the indirect impact that may be posed to financial stability. Further, market-wide stress tests could provide a powerful tool for the assessment of the externalities potentially generated by IORPs towards the rest of the financial system and the real economy. Environmental, social and governance (ESG)

aspects including climate change will also be of growing importance to the pensions sector and will require cautious assessment of any financial stability implications.

## Annex 1: Overview national approaches to funding requirements and recovery plans

	Funding requirement/ trigger point	Discount rate	Recovery plan	Length of recovery plan	Allowance expected return
<b>BE</b>	100% TP + regulatory own funds in line with Art 15(1) and calculated in accordance with Art 15(2) IORP Directive, if the IORP underwrites the liabilities or guarantees an investment return (i.e. obligation of means). Special solvency margins also apply under Art 15(3) for IORPs without sponsors and for IORPs when they provide cover for biometric risks to protect against catastrophic events.	Mostly expected return: long-term expected return/fixed discount rate or market yields plus risk premium with a margin for prudence, which can also be added to technical provisions.	Yes	Maximum of 5 years, but can be shortened/extended by NSA under specific circumstances	No
	100% short-term TP ( $\approx$ 80% long-term TP)	"	Yes	Maximum of 1 year	"
<b>CY</b>	100% TP	Expected return: market yield plus risk premium.	Yes	To be agreed by IORP and sponsor and subject to NSA approval.	Yes, to be decided by the appointed actuary in consultation with investment adviser.

<b>DE - Pensionsfonds</b>	100% TP + regulatory own funds in line with Art. 15(3) IORP Directive	Expected return.	Yes, if assets cover at least 90% or 95% of technical provisions.	Maximum of 10 years in case the lower limit of 90% applies, maximum of 3 years in case the lower limit of 95% applies.	Yes, subject to NSA approval and recovery plan should always include additional sponsor payments.
	90% or 95% TP depending on the type of product the Pensionsfonds uses	"	No, immediate injection of assets to cover at least the limit of 90% or 95% of technical provisions.	Not relevant	Not relevant
<b>DE - Pensionskasse</b>	100% TP + regulatory own funds in line with Art 15(3) and calculated in accordance with Art 15(1) IORP Directive	Contractually agreed interest rate, often adjusted to reflect low interest rate environment	No	Not relevant	Not relevant
<b>DK</b>	100% TP + regulatory own funds in accordance with Art 15(1) IORP Directive.	Solvency II risk-free term structure, incl. volatility adjustment	Yes	No legal maximum, but typically 3-6 months.	Not relevant/specified
<b>ES</b>	100% TP + Solvency margin 2% + 0.3%, unless the IORP is completely insured.	Maximum discount rate is equal to government bond yield. Higher expected return possible, if used and complied with maximum discount rate in the past.	Yes	Maximum of 5 years, but can be extended by the NSA to maximum of 10 years.	Not relevant/specified
<b>FI</b>	100% TP	Fixed discount rate with a maximum of 3.5%	Yes, but underfunding and, hence, a recovery plan is only possible, if the calculation rules for the pension liability have been changed due to changes in legislation, demography or economic	Maximum of 10 years.	Yes, indirectly in determining contribution levels.

			conditions.		
<b>IE</b>	100% TP + risk-based reserve requirement	Market rates for pensions in payment, combination of fixed discount rates (7% blended with 4.5% with some adjustment for long-term bond yields) depending on the term to retirement for other obligations.	Yes	Maximum of 3 years, longer recovery period subject to NSA approval. Typical length 10 years.	Yes, with a maximum of 6% or 4.5% if the recovery plan includes benefit reductions.
<b>IT</b>	100% TP + regulatory own funds in accordance with Art 15, depending on the availability of sponsor support.	Expected return with maximum of 5%.	Yes, unless the IORP is covered by legally enforceable sponsor support and the sponsor is subject to supervision.	Maximum of 10 years, but can be extended by the NSA in specific situations.	Yes, with a maximum of 5%.
<b>LI</b>	100% TP + regulatory own funds in accordance with Art 15(1) IORP Directive	Expected returns on assets or yield on government or high-quality bonds.	Yes	Reasonable timeframe taking into account the specific situation.	Yes, provided the IORP can demonstrate to the NSA that the assumptions are prudent.
<b>LU</b>	100% TP (PBO)	Maximum discount rate of 5%.	Yes	To be assessed by the NSA, taking into account the size of the imbalance.	Yes, subject to assessment by the NSA.
	100% TP (ABO)	"	No, immediate funding required.	Not relevant	Not relevant
<b>NL</b>	100% TP + risk-based buffer requirement ( $\approx$ 20-25% of technical provisions).	Risk free term structure with UFR based on moving average forward rate.	Yes, if the so-called policy funding ratio (moving average over the past 12 months) is below the required funding ratio.	Rolling recovery period with a maximum of 10 years, i.e. each year a new period of maximum 10 years starts if the policy funding ratio is below the required	Yes, subject to maximum levels set in national regulation.

				funding ratio.	
	100% TP + regulatory own funds in accordance with Art 15(1) IORP Directive.	"	No, compliance to be restored within 6 months if the so-called policy funding ratio (moving average over the past 12 months) has been below the minimum funding requirement for 5 consecutive years.	Not relevant	Not relevant
<b>NO</b>	100% TP + regulatory own funds in accordance with Art 15(1) IORP Directive.	Contractual agreed interest rate	Yes	Limited period of time subject to permission of the NSA, unlikely to exceed a couple of months.	No
<b>PT</b>	100% TP or 100% present value of pensions in payment + 95% present value of liabilities relating to past service, depending on the IORP's sector.	Fixed discount rate of 4.5% or discount rate based on AA corporate bond yield, depending on the IORP's sector.	Yes	To be approved by NSA, considering the specific circumstances. Typically, no longer than 5 years.	Yes, to be decided by the appointed actuary.
	100% present value of pensions in payment.	"	No, immediate payment of additional contributions within 180 days.	Not relevant	Not relevant
<b>SE</b>	100% TP + regulatory own funds in accordance with Art	Risk-free term structure with UFR.	Yes.	To be decided by NSA, depending on circumstances.	Not specified



	15(1) IORP Directive.				
<b>SI</b>	100% TP + regulatory own funds in accordance with Art 15(1) IORP Directive.	Contractual agreed interest rate	Yes	Maximum 6 months, but can be extended by NSA under specific circumstances	Yes, provided that the NSA considers the recovery plan to be realistic.
<b>UK</b>	100% TP	Expected return: long-term expected return/fixed discount rate or market yields plus risk premium.	Yes	To be agreed by IORP trustees and the employer. On average 8 years.	Yes, to be agreed by IORP trustees and the employer.

## Annex 2: Overview national approaches to distribution of sponsor support and benefit reductions over time

To supplement information provided through the questionnaire by IORPs participating in the stress test, EIOPA asked national supervisory authorities (NSAs) for information regarding distribution of sponsor support and benefit reductions over time (see paragraph 1.28 of the IORP Stress Test 2017 Specifications). This annex provides an overview of the information received.

### Distribution of sponsor support over time

In 11 Member States, national regulation explicitly or implicitly allows sponsor support payments to be distributed over a certain period of time, in four Member States this is not the case (Table A2.1).

<b>Table A2.1: National regulation explicitly or implicitly allows sponsor support payments to be distributed over a certain period of time</b>	
Yes	BE, CY, DE, ES, IE, IT, LI, LU, NL, PT, UK
No	DK, FI, NO, SE
Not applicable (no sponsor support)	SI

In six of the 11 Member States where national regulation allows sponsor support payments to be distributed over time, this is allowed for legally enforceable as well as non-legally enforceable sponsor support. Four of those 11 Member States only have legally enforceable sponsor support, one only has non-legally enforceable sponsor support (Table A2.2).

<b>Table A2.2: Possibility of distributing sponsor support payments over time, depending on type of sponsor support</b>	
Legally enforceable sponsor support	BE, CY, ES, IT
Non-legally enforceable sponsor support	IE
Both types	DE, LI, LU, NL, PT, UK

The following Table A2.3 shows the maximum periods of time over which sponsor support can be distributed when it is part of a recovery plan. In cases where sponsor support is not part of a recovery plan, no maximum period is specified in Member States' national laws.

<b>Table A2.3: Maximum number of years over which sponsor support can be distributed (when included in a recovery plan)</b>	
5 years	BE
10 years	DE, NL
No maximum number of years specified	CY, IT, IE, LI, LU, PT, UK

The length of the period of time over which sponsor support is distributed is usually determined by the IORP in mutual agreement with the sponsor. In some cases approval by a third party (f.i. an appointed actuary) is required. When sponsor support is part of a recovery plan, the period of time over which it is distributed needs approval by the NSA in BE, DE, (in some cases) IE, LU, the NL and PT.

Four Member States provided a distribution of the length of the period of time over which sponsor support was distributed in cases where IORPs and sponsors had the freedom to determine this period. The following Table A2.4 shows the (unweighted) average distribution:

<b>Table A2.4: Distribution of the length of the period of time over which sponsor support was distributed, where IORPs and sponsors have the freedom to determine this period</b>	
1 year	4%
2-3 years	3%
3-5 years	25%
5-10 years	54%
10-15 years	13%
15+ years	3%

NSAs were also asked, whether there were any other relevant regulations in place, which constrain the payments of sponsor support, apart from the period over which the payments can (possibly) be distributed. The following Table A2.5 provides an overview of the answers received:

<b>Table A2.5: Regulations constraining the payments of sponsor support over time</b>	
No particular regulations	BE, CY, IT, LI, PT, UK
Payments shall be fixed or decrease over time	DE, ES, IE, NL
Other	LU

### **Distribution of benefit reductions over time**

In six Member States national regulation explicitly or implicitly allows benefit reductions to be distributed over a certain period of time, in ten Member States this is not the case (Table A2.6).

<b>Table A2.6: National regulation explicitly or implicitly allows benefit reductions to be distributed over a certain period of time</b>	
Yes	DE, ES, IT, LU, NL, SI
No	BE, CY, DK, FI, IE, LI, NO, PT, SE, UK

Smoothing of benefit reductions is allowed for the following types of benefit reductions (Table A2.7):

<b>Table A2.7: Possibility of smoothing of benefit reductions by type of benefit reduction mechanism</b>			
	Ex ante benefit reductions	Ex post benefit reductions	Benefit reductions in case of sponsor default
DE	Yes	N/A	N/A
ES	Yes	Yes	Yes
IT	Yes	Yes	Yes
LU	No	Yes	Yes
NL	N/A	Yes	N/A
SI	No	Yes	No

Only in the NL, national rules prescribe a maximum number of years over which benefit reductions can be smoothed: 10 years for ex post benefit reductions.

The decision about the number of years that will be allowed for the smoothing of benefit reductions is usually taken by the IORP, but requires approval by the NSA in some Member States (DE, LU, the NL).

Only in two Member States (DE, the NL), there are regulations in place which restrict the possibility of smoothing benefit reductions, apart from the period over which smoothing is (possibly) allowed. In DE, increasing rates of benefit reductions (for example 0% over the first five years and 10% starting in the sixth year) will not be accepted. In the NL, if the policy funding ratio of an IORP does not meet the minimum required funding ratio for five years in succession (and the funding ratio does not meet the minimum required funding ratio at the end of this period), the IORP must take measures within six months so that its funding ratio meets the minimum required funding ratio. In practice, this could imply a reduction of benefits. That reduction may also be smoothed over a maximum period of 10 years, but is unconditional, which means it immediately impacts on technical provisions

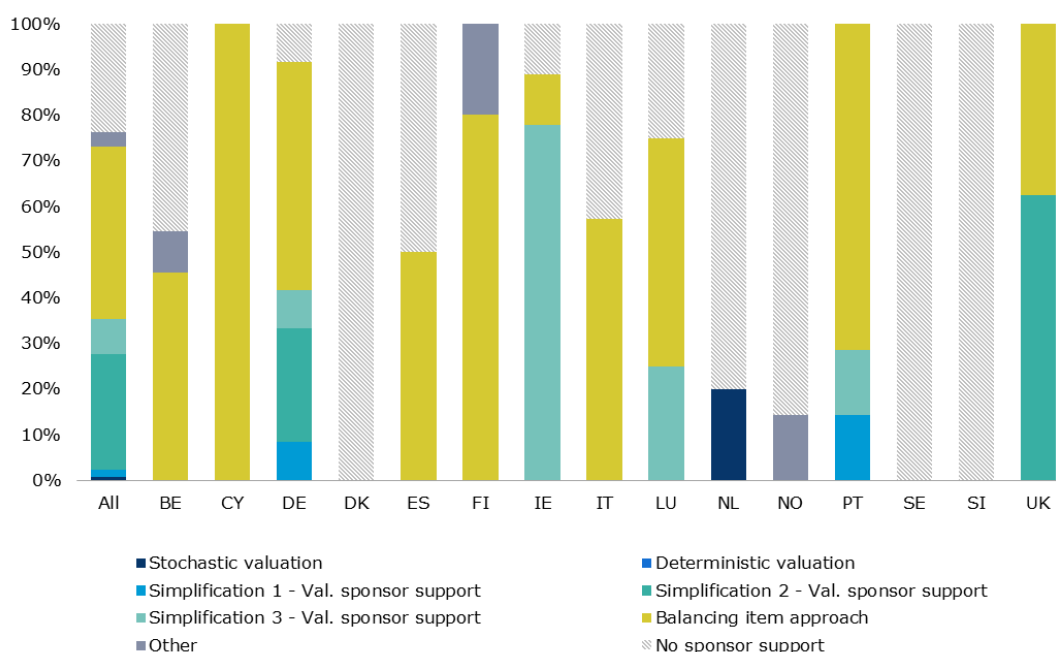
### Annex 3: Approaches used to valuation of sponsor support

At European level, 25% of IORPs did not recognise sponsor support on the common balance sheet (Figure A3.1), either because they do not dispose of sponsor support, or because it was not necessary to include it on the common balance sheet. Half of the 75% of IORPs which included a positive value of sponsor support on the common balance sheet applied the balancing item approach. The others mostly used simplification 2. Stochastic valuation was only applied in the NL.<sup>50</sup>

In most countries, most IORPs used the balancing item approach. Only in two countries (IE, UK), simplifications 2 and 3, respectively, were the methods used by a majority of IORPs. In three countries (BE, FI, NO) also “other” approaches were used by IORPs to value sponsor support.

65% of IORPs applying the balancing item approach complied (only) with condition 1, 8% complied (only) with condition 2, and 27% complied with both conditions.

Figure A3.1: Method used for the valuation of sponsor support, % IORPs



For determining the maximum value of sponsor support, 58% of IORPs used the simplification provided (Figure A3.2). Most other IORPs, which included sponsor support on the common balance sheet, used an own method. The descriptions provided of the own methods used are often rather concise. It can be stated, though, that the “own methods” are usually quite similar to the simplification provided, and also used similar sponsor data.

<sup>50</sup> See section 2.7 of EIOPA, Annex to IORP Stress Test 2017 Specifications – Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017 for the specifications, incl. principles, approaches, methods and simplifications, for the valuation of sponsor support on the common balance sheet.

Figure A3.2: Method used to value maximum sponsor support, % IORPs

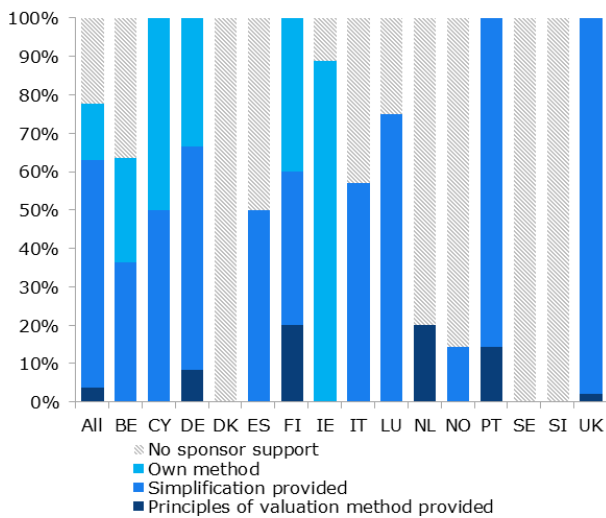


Figure A3.3: Sponsor data used to establish maximum value of sponsor support, % IORPs recognising sponsor support

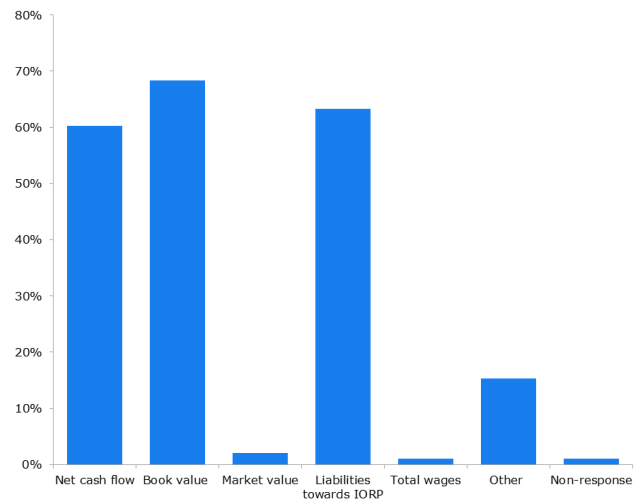


Figure A3.4 below shows the distribution of the maximum value of sponsor support in % of the value of sponsor support in the common balance sheet in the adverse scenario. The boundaries >1x and >2x correspond to conditions 1 and 2 of the balancing item approach. Maximum sponsor support cannot be smaller than the value of sponsor support on the stressed balance sheet. 26% of IORPs restricted the value of sponsor support to the maximum value of sponsor support in the adverse scenario. For 41% of IORPs recognising a positive value of sponsor support in the common balance sheet, the maximum value of sponsor support has more than twice the size of the value recognised in the common balance sheet in the adverse scenario.

Figure A3.5 below shows the distribution of the one-year default probability of the sponsor, as provided by participating IORPs. Almost 90% of IORPs recognising sponsor support on the common balance sheet reported a default probability of the sponsor of not more than 0.5%. This is the default probability for which the IORP qualifies for using the balancing item approach according to condition 2.

Figure A3.4: Distribution of maximum value of sponsor support as a proportion of sponsor support in the adverse market scenario, % IORPs recognising sponsor support

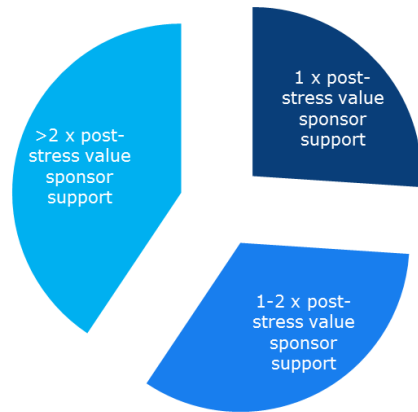
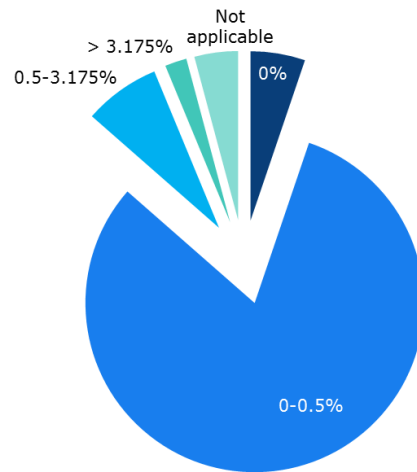


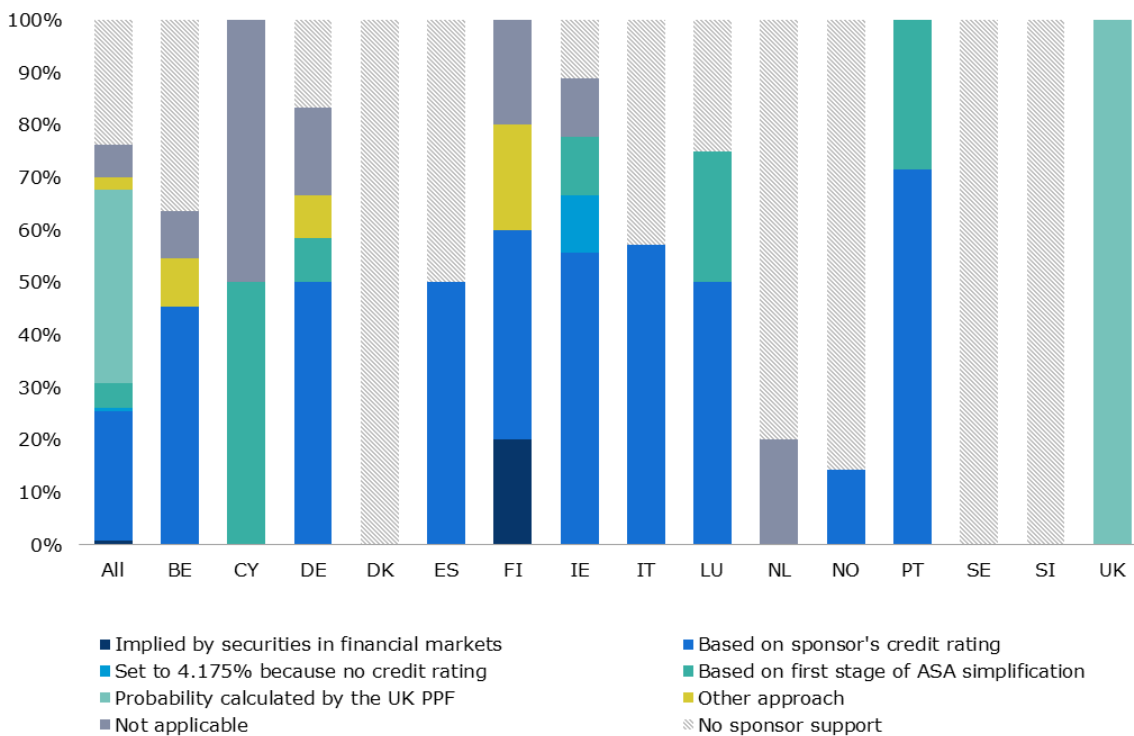
Figure A3.5: Distribution of one-year sponsor default probability, % IORPs recognising sponsor support



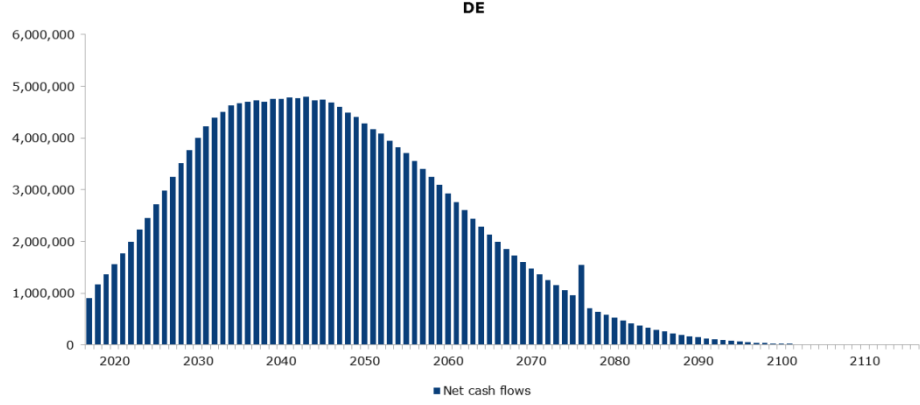
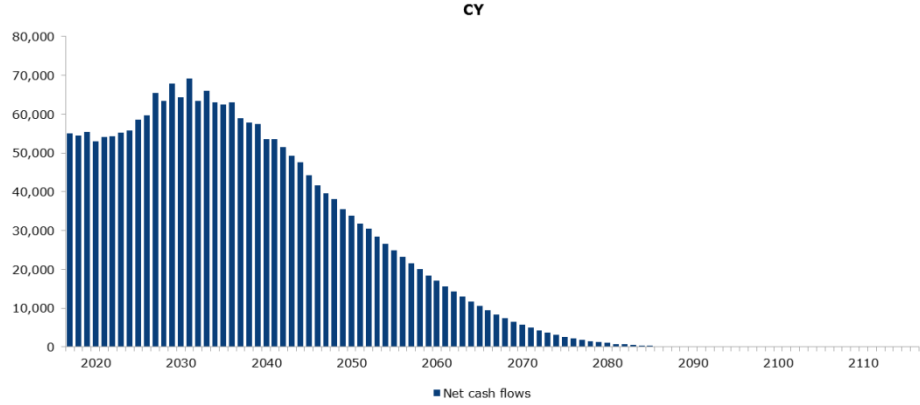
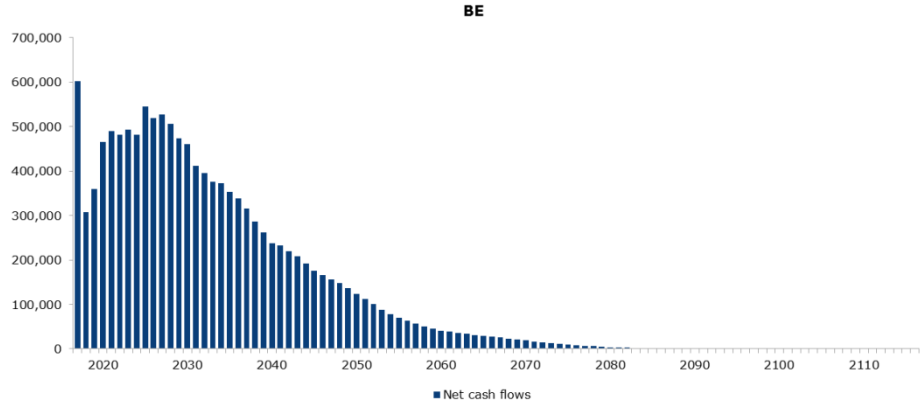
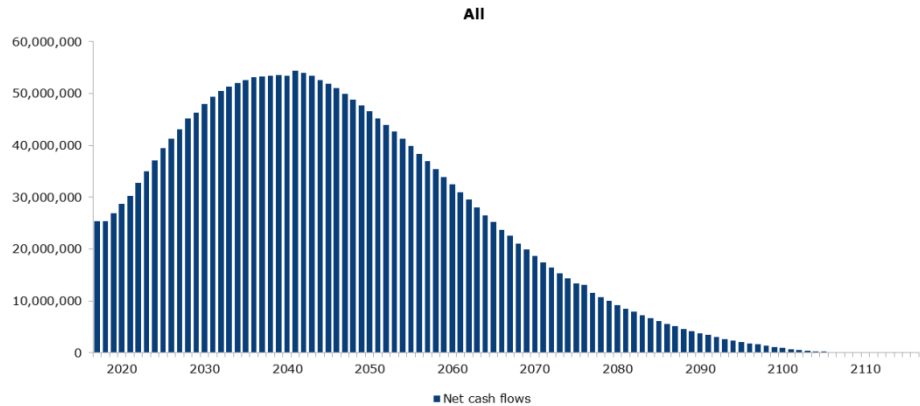
At European level, most IORPs which are not from the UK determined the probability of sponsor default based on the sponsor's credit rating. All UK IORPs used the default probability as calculated by the UK PPF.

The sponsor's credit rating was not used by IORPs in CY and the NL. In one country (FI) default probabilities implied by securities in financial markets were used to determine the probability of sponsor default. "Other" approaches were also used in three countries (BE, DE and FI).

Figure A3.6: Approach used to establish default probability of the sponsor, % IORP

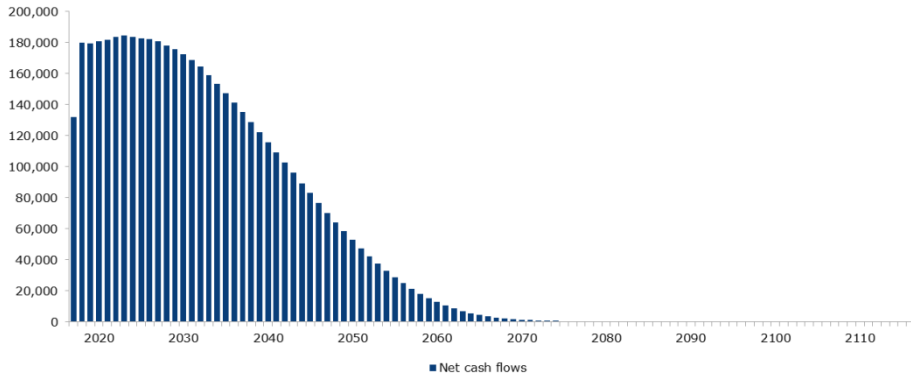


# Annex 4: Net cash flows for unconditional benefits by country

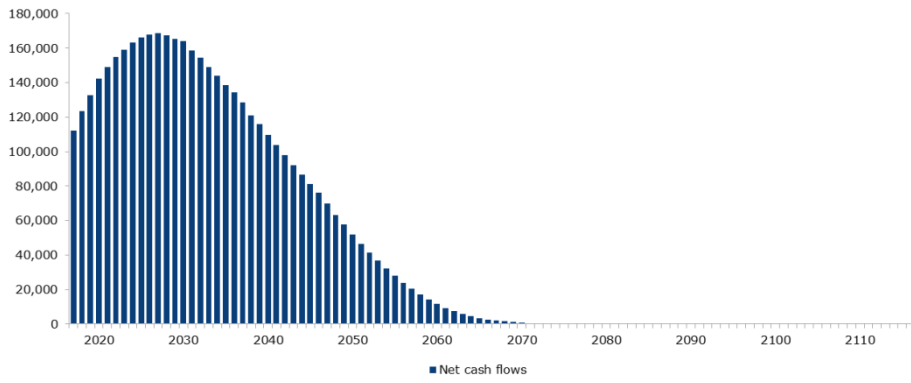




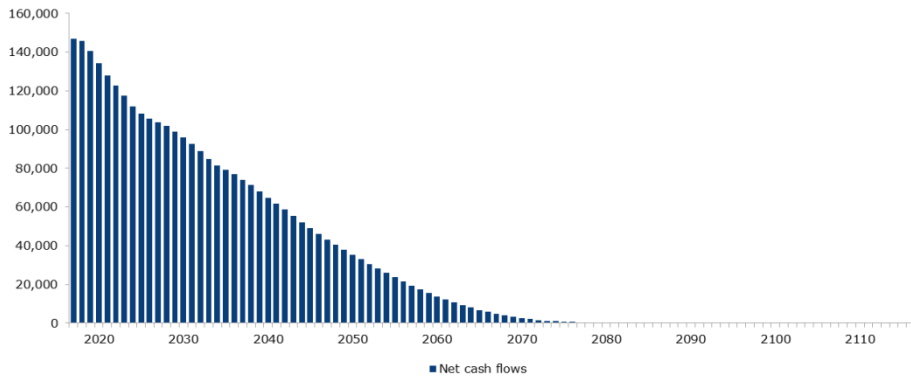
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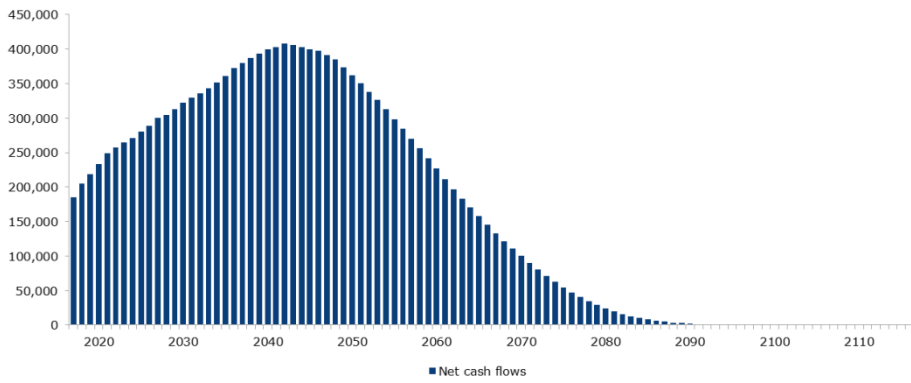
**ES**



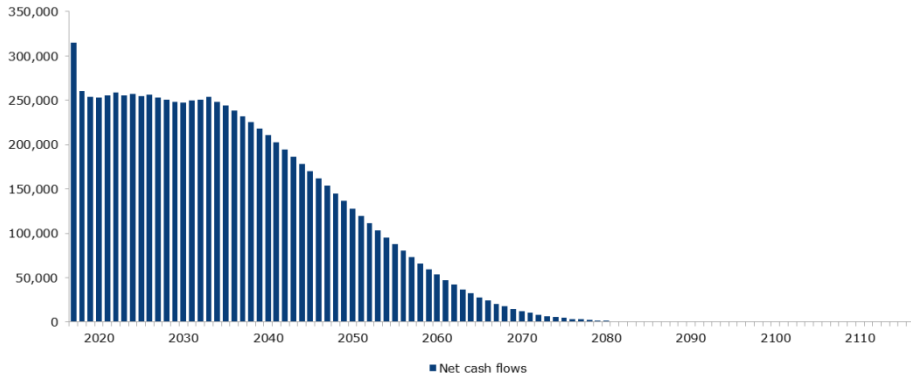
**FI**



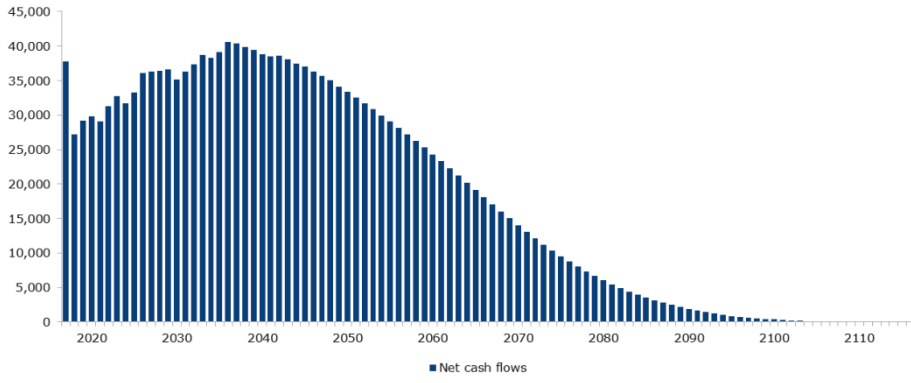
**IE**



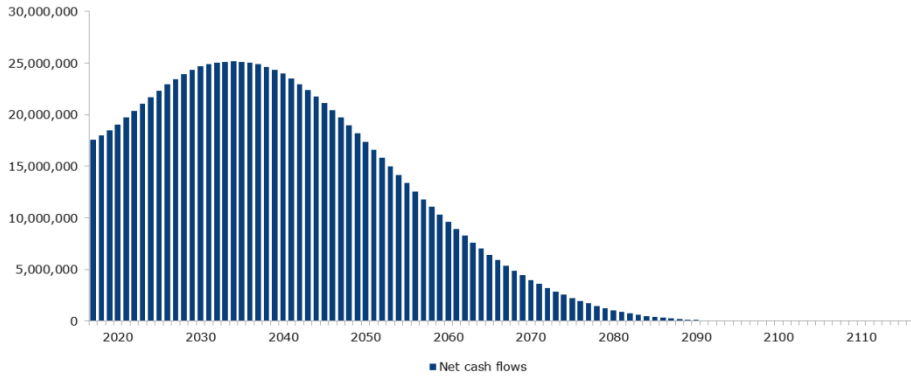
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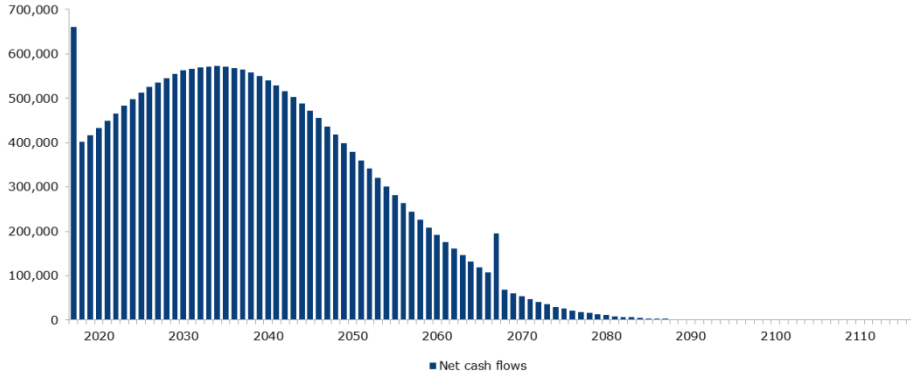
**LU**



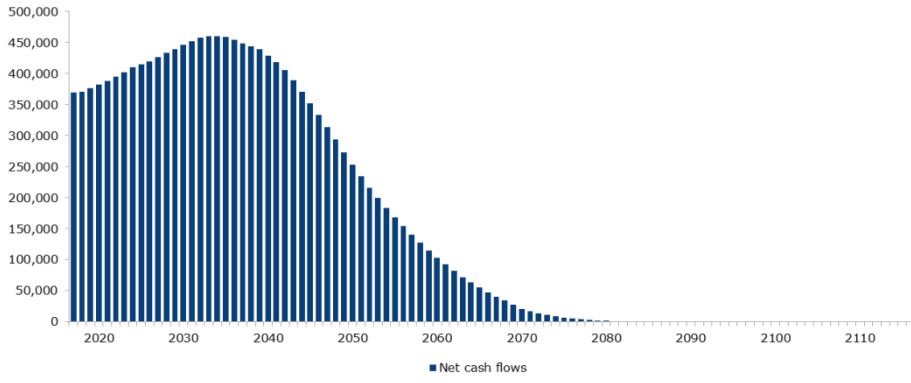
**NL**



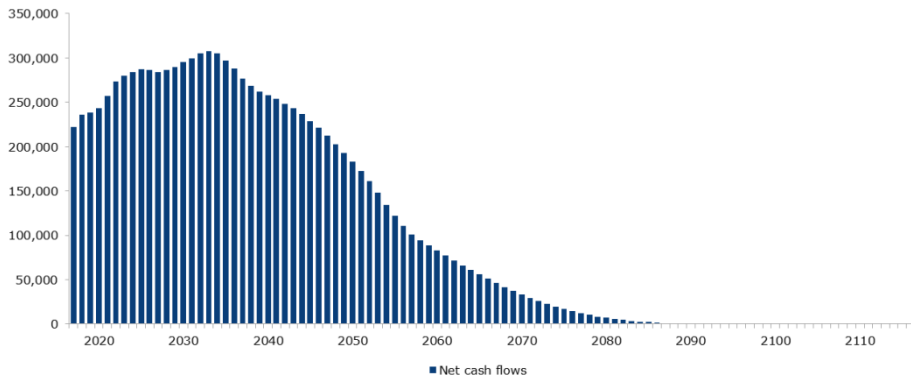
**NO**



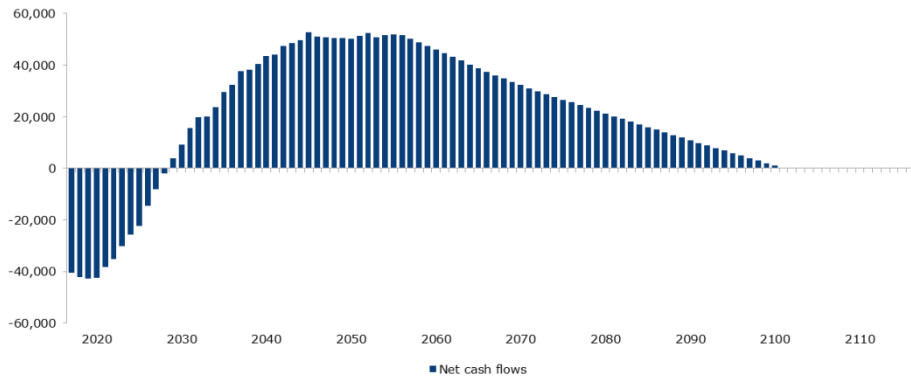
**PT**



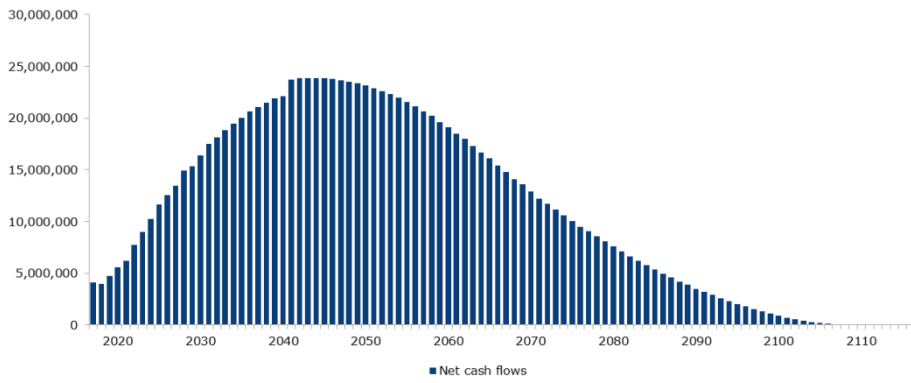
**SE**



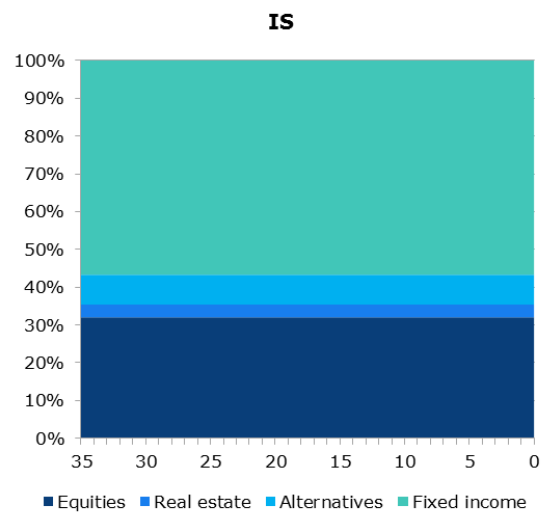
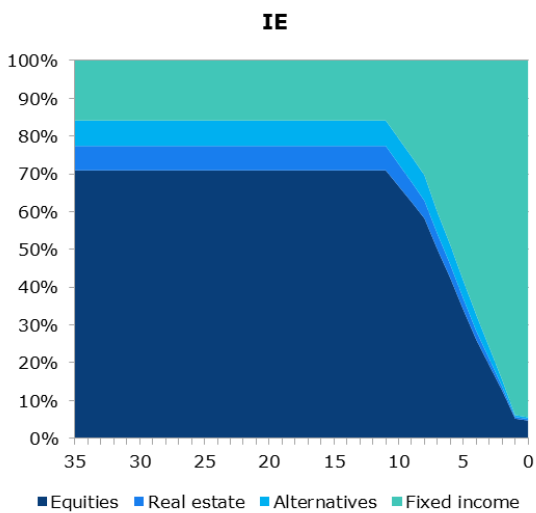
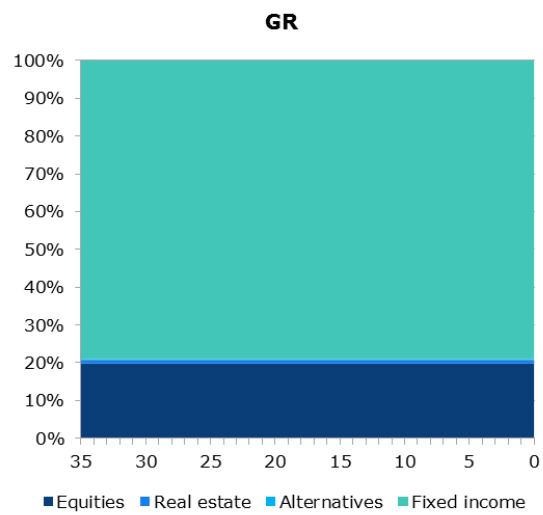
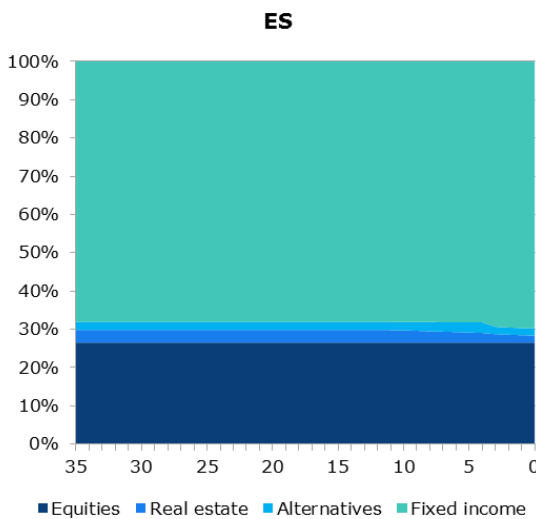
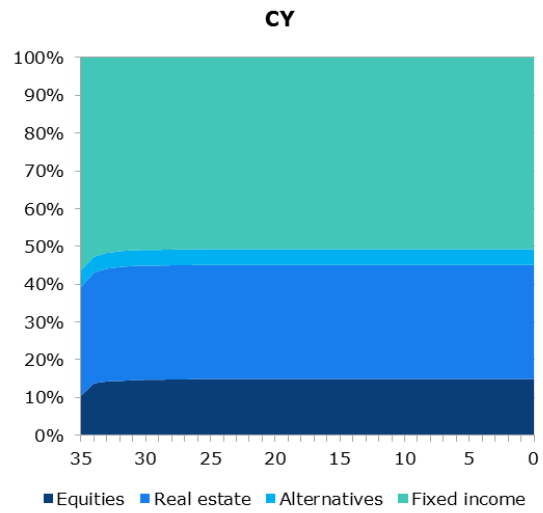
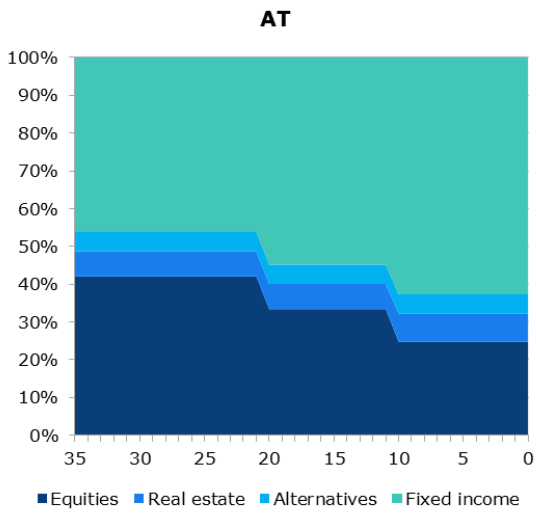
**SI**



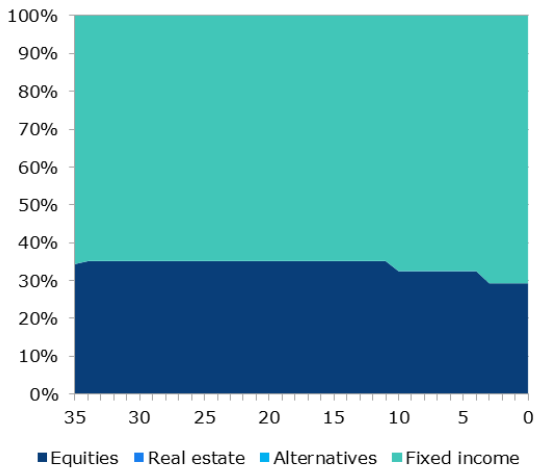
**UK**



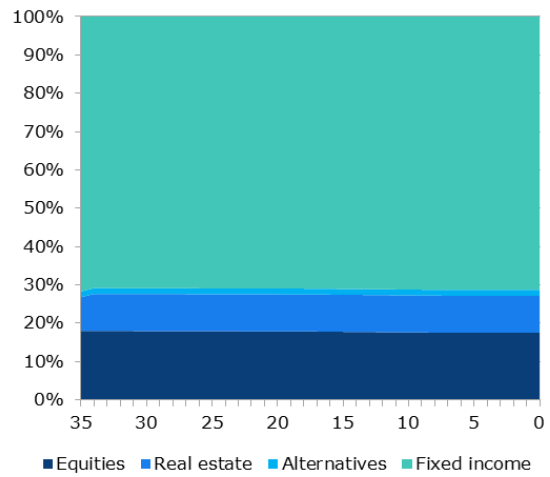
# Annex 5: Asset allocation over the life cycle of 35 years-to-retirement member by country



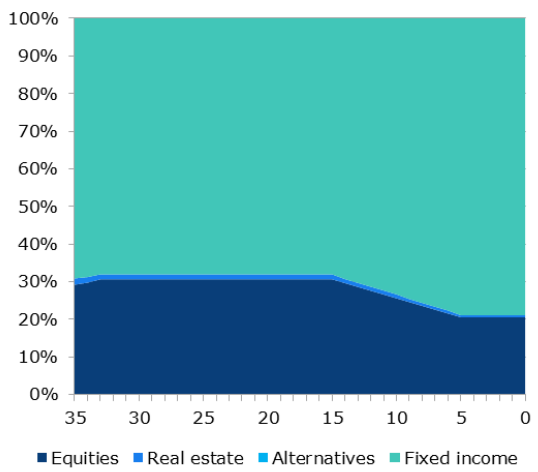
**IT**



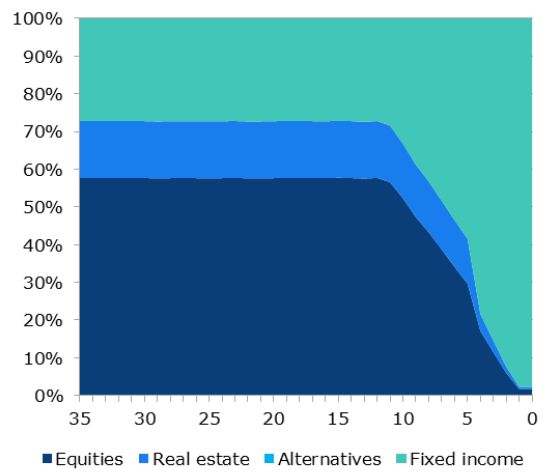
**PT**



**SK**



**UK**



## **Annex 6: List of country abbreviations**

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IS	Iceland
IT	Italy
LI	Liechtenstein
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom
US	United States (of America)

## **Annex 7: List of other abbreviations used**

A	Assets
ABO	Accumulated benefit obligation
bn	billion (10 <sup>9</sup> )
bps	Basis points
CHF	Swiss franc
DB	Defined benefit
DC	Defined contribution
DKK	Danish krone
EAL	Excess of assets over liabilities
EBITDA	Earnings before interest, taxes, depreciation and amortisation
ECB	European Central Bank
EEA	European Economic Area
EIOPA	European Insurance and Occupational Pensions Authority
ESG	Environmental, social and governance
ESRB	European Systemic Risk Board
EU	European Union
EUR	Euro
FSB	Financial Stability Board
GBP	Great Britain pound
HWMS	High-water-mark system
IFRS	International Financial Reporting Standards
IORP	Institution for Occupational Retirement Provision
ISK	Iceland krona
L	Liabilities
NOK	Norwegian krone
NSA	National supervisory authority
OPSG	Occupational Pensions Stakeholder Group
PBO	Projected benefit obligation
PBT	Profit before taxes
PPF	Pension Protection Fund
Q&A	Questions and answers
REIT	Real Estate Investment Trust
SEK	Swedish krona
ST	Stress test

TP	Technical provisions
UFR	Ultimate forward rate
ytr	Years to retirement