Risks and Financial Stability Department

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2019 IORP Stress Test Specifications

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1. Introduction

Aim of the document

1.1. This document describes the specifications for the 2019 stress test for Institutions for Occupational Retirement Provision (IORPs). EIOPA developed the 2019 IORP Stress Test Specifications and, as part of the cooperation prescribed by EU regulation, the European Systemic Risk Board (ESRB) provided the adverse market scenario. The stress test exercise launches on 2 April 2019 and participating IORPs will have to complete the exercise and submit the results to the relevant National Supervisory Authority (NSA) by 19 June 2019.

Background

1.2. EIOPA is required, in cooperation with the ESRB, to initiate and coordinate European stress tests of IORPs and insurance undertakings. The EIOPA Regulation[1] distinguishes two possible objectives of such stress tests, assessing:

(1) the resilience of IORPs and insurance undertakings to adverse market developments; [2]

(2) the potential for systemic risk that may be posed by financial institutions to increase in situations of stress. [3]

1.3. To that end, EIOPA shall develop the following, for application by the competent authorities:

(a) criteria for the identification and measurement of systemic risk;

(b) common methodologies for assessing the effect of economic scenarios on an institution's financial position;

(c) common approaches to communication on the outcomes of these assessments of the resilience of financial institutions.[4]

Previous stress tests

1.4. EIOPA carried out its first stress test for IORPs in 2015[5] and its second in 2017[6]. Both exercises assessed the impact of a so-called 'double-hit' scenario, which is a combination of a fall in asset prices with a decline in risk-free interest rates, resulting in an increase in the market value of pension obligations.[7]

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[1] Regulation (EU) No 1094/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Insurance and Occupational Pensions Authority), amending Decision No 716/2009/EC and repealing Commission Decision 2009/79/EC (OJ L 331, 15.12.2010, p. 48).

[2] Art. 32(2) of 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, [..]".

[3] Art. 23(1) of EIOPA Regulation (EU) No 1094/2010.

[4] Art. 23(1) and 32(2) of EIOPA Regulation (EU) No 1094/2010.

[5] EIOPA, IORPs Stress Test Report 2015, 26 January 2016: https://eiopa.europa.eu/Publications/Surveys/EIOPA%20IORPs%20Stress%20Test%20Report%202015%20bookmarks.pdf

[6] EIOPA, 2017 IORP Stress Test Report, EIOPA-BoS-17/370, 13 December 2017: https://eiopa.europa.eu/Publications/Reports/2017%20IORP%20Stress%20Test%20Report.pdf.

[7] The 2015 IORP stress test assessed two distinct double-hit scenarios: one triggered by a demand shock resulting in lower inflation swap rates and one triggered by commodity supply shock resulting in higher inflation swap rates. The 2015 exercise also investigated the effects of a longevity scenario with increased life expectancy as well as two low long-term return scenarios in the DC satellite module.

1.5. The previous EIOPA stress tests showed areas of risks and vulnerabilities of the occupational pensions sector in Europe. In particular the DB/hybrid IORP sector experienced in aggregate substantial pre- and post-stress shortfalls, both on the national and the common balance sheet. Such shortfalls would have to be covered by future sponsor support, which includes increased contributions by the sponsor or the member, and/or benefit reductions. The DC IORP sector would be confronted with a considerable drop in the market value of investment assets in the adverse scenario, reducing the individual accounts of DC pension scheme members and, in case the scenario persists, leading to lower pension income when the members enter retirement.

1.6. The 2017 IORP stress test indicated that more than a quarter of IORPs providing DB/hybrid pension schemes are covered by sponsor that may not be able to (fully) support the pension promise following the adverse scenario. Moreover, pension obligations may exert substantial pressure on the solvency and future profitability of companies with a potential spill-over to the real economy. 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. Benefit reductions would be expected to have similar effects on the real economy by reducing household income and consumption.

1.7. A mapping of national recovery mechanisms demonstrated that sponsor support and benefit reductions may be spread over substantial timeframes. IORPs in financial difficulties are usually subject to long-term recovery plans. Moreover, national discount rates exceeding the risk-free rate result in a favourable view of the funding situation of IORPs and act to delay recovery plan measures. As such, these prudential mechanisms will contribute to mitigating spill-over effects to the real economy and financial stability. However, in case the necessary adjustments are postponed too far, restoring the financial position of IORPs may only be achieved by imposing a disproportionate burden on the younger generations.

1.8. Since the last stress test in 2017, the external economic and financial environment has changed. World stock market prices have on balance slightly risen since the end of 2016. Long-term (risk-free) interest rates also exhibited slight, gradual increases, before losing some of the gains in the fourth quarter of 2018. Still, the prolonged low interest rate environment continues to pose significant challenges to IORPs. Moreover, the risk of a sudden reassessment of risk premiums has become more pronounced recently, following considerable political uncertainty and expressing itself through heightened financial market volatility.

Motivation for the 2019 IORP stress test

1.9. To stay close to the current macro-financial environment as well as to address new emerging risks and to arrive at an up-to-date risk assessment of the European occupational pensions sector, EIOPA has decided to carry out an IORP stress test in 2019 with corresponding features of the adverse market scenario. The 2019 stress test uses end-2018 as the reference date, taking into account the impact of the latest macro-financial developments characterised by increased likelihood of a sudden reassessment of risk premiums.

1.10. The 2019 IORP stress test allows to analyse the impacts of an up-to-date adverse market scenario of the IORP sector in Europe and to take into account changes

in the exposure of IORPs to the various risk factors capturing potential changes in asset allocations.

1.11. Moreover, an important reason for EIOPA to carry out this stress test is to follow up on the last exercise's conclusions and outstanding questions where the stress test results showed that the risks stemming from shocks on the European IORPs sector may spill-over into the real economy with negative implications on economic growth and employment, triggered by increased sponsor support or benefit reductions. Therefore, and continuing from the 2017 exercise, the stress test aims to quantify through an extended cash flow analysis how national prudential mechanisms absorb shocks over time through sponsor support and benefit reductions and the consequences of the additional pressure put on sponsors to increase their future payments to secure benefits. In their joint report on macro-prudential policy issues arising from low interest rates and structural changes in the EU financial system the ECB and ESRB also proposed to further investigate the potential impact of pension funds on the real economy.[8]

1.12. To gain further insights and to deepen supervisory understanding, the 2019 exercise assesses potential systemic risk drivers on financial markets, such as search for yield, flight to quality and herding behaviour. Environmental, social and governance (ESG) aspects including climate change will be of growing importance for the pensions sector and will require cautious assessment of any financial stability implications and are therefore included in the exercise.

Objectives of the 2019 IORPs stress test

1.13. The 2019 IORP stress test has three main objectives:

- To assess the vulnerability of IORPs and plan members to adverse scenario(s);
- To analyse the second-round effects on the real economy and financial stability, in particular:
  - A quantitative assessment of the impact on sponsor's projected additional contributions and benefit reductions over time, for which a relevant 'cash flow analysis' will be crucial;
  - Explore options for an qualitative/quantitative assessment of the implications of specific activities and common behaviours (for example search for yield, flight to quality, herding behaviour);
- To investigate the assessment of IORPs' exposure towards ESG risks.

Main features of the exercise

1.14. The IORP stress test constitutes a European-wide exercise, including all EEA countries with material IORP sectors and covering all types of IORPs. The stress test consists of a part for IORPs providing DB or hybrid schemes and a part for IORPs providing DC schemes.

[8] 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

Adverse market scenario

1.15. The resilience of both DB/hybrid and DC schemes and the subsequent second round effects on the real economy and financial markets is assessed using one adverse market scenario provided by the ESRB.[9]

1.16. The ECB, in cooperation with the ESRB has developed the narrative, the methodology and calibrated the adverse scenario for the stress test. The scenario includes an appropriate number of individual risk factors designed to cover the investment exposures of IORPs' assets and also includes the euro swap rate curve as a measure of risk-free interest rates that the common methodology developed by EIOPA will use to re-value IORPs' liabilities. The variables and shocks included in the stress scenario are provided in Annex 1. Aggregate shocks for sovereign and corporate bonds as well as commercial and residential property which IORPs may use as simplifications are provided in Annex 2.

1.17. The employed stress scenario captures a sudden reassessment of risk premia reflecting the observable trends in emerging markets and geopolitical risks. The increased risk premia would lead to increased yields and widening of credit spreads combined with an abrupt fall in stock prices. The risk free rate curve would move up mainly for the short-end and to a lesser extent for the long-end. Additionally, a significant increase in a few Euro sovereign bond spreads paired with a substantial impairment of those sovereign bond market values could be observed.

Resilience of IORPs

1.18. DB/hybrid IORPs have to assess their resilience to the adverse market scenario by applying the scenario to the national balance sheet and the common, market-consistent balance sheet including all security and benefit adjustment mechanisms. As provided for in the 2017 exercise, DC IORPs have to assess the impact of the 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.

Second round effects on the real economy

1.19. IORPs may transfer shocks to the real economy through sponsor support and benefit adjustments, which may affect labour costs and disposable income of households. Elaborating on the limited cash flow analysis in the previous stress test, the DB/hybrid-part of the exercise will assess how the adverse market scenario impacts on sponsor support and pension benefits over time. Moreover, similar to the 2017 exercise, the effects of the scenario on sponsoring companies will be investigated. The DC-part will assess the impact of the adverse market scenario on the future retirement income of three representative plan members.

1.20. The scope of the cash flow analysis will be limited to IORPs providing DB/hybrid pension schemes.

Horizontal assessment: second round effects on financial markets and analysis of ESG risks

1.21. IORPs are large institutional investors and as such, IORPs may have a significant influence on financial markets through their investment behaviour. The horizontal assessment addresses the expected investment behaviour of both DB/hybrid and DC IORPs following the adverse market scenario. In particular, the assessment

[9] See ESRB, Adverse scenario for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test and for the European Securities and Markets Authority's money market fund stress-testing guidelines in 2019, 21 March 2019.

aims to analyse whether the low interest rate environment in the past led to search for yield and whether a sudden rise in interest rates will induce a flight to quality, in terms of asset classes as well as geographical location of investments.

1.22. The horizontal assessment will analyse in a qualitative manner in how far IORPs contribute to mitigating ESG risks in society an in how far IORPs reduce their own exposure to ESG risks. Moreover, IORPs are requested to provide a breakdown of investment assets by economic activity. This will give a rough indication of the exposure of IORPs to 'brown' assets and the overall carbon footprint of their investment portfolios. As such, this quantitative part can be viewed as a first step towards a more comprehensive stress test, assessing the impact of transition scenarios towards a low-carbon economy.[10]

Overview of the DB/hybrid part

Resilience of DB/hybrid IORPs

1.23. IORPs providing DB/hybrid schemes have to assess the resilience to the adverse market scenario by applying the scenario to the national balance sheet as well as to the common balance sheet.

1.24. An important distinction between IORPs and other financial institutions is that funding requirements and valuation standards are largely determined at the national level. The IORP II Directive lays down minimum requirements with regard to the valuation of liabilities, the funding of technical provisions and regulatory own funds, which may be supplemented through national prudential regulation. In consequence, IORPs need to calculate the impact of the adverse scenario on their national balance sheet in order to assess compliance with the funding requirements.

1.25. National prudential regimes often do not require IORPs to explicitly take into account the security and benefit adjustment mechanisms in the valuation of assets and liabilities. Rather, the value of financial assets compared to the funding requirement is used as a trigger for a recovery plan, which may specify e.g. additional sponsor support and benefit adjustments. This means that the development of sponsor support payments and pension benefits over time will very much depend on national prudential regulation.

1.26. IORPs have to apply the adverse market scenario to the common balance sheet valued on a market-consistent basis. The common balance sheet includes all security and benefit adjustment mechanisms available to IORPs in the different Member States. As such, the common balance sheet will provide a comparable and transparent view of the extent to which pension obligations can be supported by financial assets, sponsor support and pension protection schemes and the extent to which benefit adjustments may be needed at some point in future, in the baseline as well as the adverse market scenario.

1.27. The common balance sheet corresponds to the common framework's balance sheet which EIOPA advised in its Opinion on a common framework for risk assessment and transparency of IORPs.[11] However, IORPs do not have to apply

[10] The Advisory Scientific Committee of the ESRB emphasises the potential for systemic risk of late and sudden carbon transition paths and proposed ways forward to assessing that risk, including future stress tests. See ESRB, Too late, too sudden: transition to a low-carbon economy and systemic risk, ASC Report No 6, February 2016: https://www.esrb.europa.eu/pub/pdf/asc/Reports_ASC_6_1602.pdf

[11] EIOPA, Opinion to EU Institutions on a Common Framework for Risk Assessment and Transparency for IORPs, EIOPA-BoS-16/075, 14 April 2016, https://eiopa.europa.eu/Publications/Opinions/EIOPA-BoS-16-075-Opinion_to_EU_Institutions_Common_Framework_IORPs.pdf

the standardised risk assessment, which is also part of the recommended framework.

Second round effects on the real economy

1.28. The DB/hybrid part of the stress test will consider the second round effects on the real economy by analysing how the adverse market scenario affects sponsor support and benefit reductions over time and - like in the 2017 IORP stress test - how it impacts on sponsors.

1.29. The values of sponsor support and benefit reductions on the common balance sheet do not provide information on the size and distribution over time of the underlying cash flows. To improve the insights in the application of security and benefit adjustment mechanisms, the common balance sheet assessment is supplemented with a cash flow analysis. [12] It elaborates on the cash flow analysis in the 2017 IORP stress test which was limited to unconditional benefits and assets as well as the mapping exercise of national prudential mechanisms to resolve shortfall of IORPs.

1.30. In this year's exercise IORPs are also requested to make projections and report cash flows for sponsor support and benefit reductions in the baseline and adverse market scenario. This will provide insight in their size and timing and benefit reductions and, hence, the impact on the real economy over time.

1.31. To ensure comparability of results, the cash flow projections should be consistent with the technical specifications for the common balance sheet. In particular, that means that IORPs should assume risk-free investment returns in the baseline and adverse scenario. Cash flows for sponsor support and benefit reductions are expected to be determined by national funding requirements, valuation standards and recovery mechanisms, which IORPs should, where relevant, take into account when making the projections.

1.32. Replacing the assumption of risk-free investment returns, IORPs are asked to carry out a second set of cash flow projections, which should be based on common expected return assumptions in the baseline and adverse scenario. Those common expected return assumptions are provided as part of the stress test package.

1.33. In addition, whereas the specifications for the common balance sheet consider cash flows under a closed modelling approach, IORPs may report - on a voluntary basis - cash flow projections based on an open modelling approach, i.e. assuming new future members and accruals, both under risk-free and expected investment returns.

Horizontal assessment

1.34. Besides the second round effects on the real economy, the stress test also considers the effects of IORPs' investment behaviour on financial markets and the exposure of IORPs to ESG risks. To that end, as part of the horizontal assessment, IORPs providing DB/hybrid schemes have to provide qualitative as well as quantitative information through the questionnaire.

[12] The EIOPA Occupational Pensions Stakeholder Group (OPSG) advocated cash flow analysis in its Position paper on EIOPA's Opinion to EU Institutions on a Common Framework for Risk Assessment and Transparency for IORPs, EIOPA-OPSG-17-02, 13 January 2017, https://eiopa.europa.eu/Publications/Stakeholder%20Opinions/EIOPA-OPSG-17-02%20Position%20Paper%20-%20Risk%20Assessment%20and%20Transparency%20for%20IORPs.pdf

Overview of the DC part

Resilience of DC IORPs

1.35. IORPs providing DC schemes have to assess the resilience to the adverse market scenario by calculating its impact on the market value of assets.

Second round effects on the real economy

1.36. The DC part of the stress test will consider the second round effects on the real economy by estimating the impact of the adverse market scenario on expected retirement income based on three representative plan members. That is particularly important as the devaluation of DC IORP's assets directly affect the accumulated savings of the members.[13]

1.37. As a starting point, the stress test will analyse how the adverse market scenario impacts on retirement income and replacement rates - i.e. expected pension income as a proportion of final earnings - of three representative plan members with respectively 35, 20 and 5 years to go before retirement. In a subsequent step, EIOPA will extrapolate the outcomes for the three representative members to the overall membership of the DC IORPs, although these impacts on income will be spread out over many years. To do so, DC IORPs are requested to provide data on the number of plan members and value of assets broken down by age category. In case the stress test is only conducted on ring-fenced compartments/schemes/sub-funds of the IORP, then the outcomes will be extrapolated to the membership that is covered by the exercise.

Horizontal assessment

1.38. Besides the second round effects on the real economy, the stress test also considers the effects of IORPs' common behaviours on financial markets and the exposure of IORPs to ESG risks. To that end, as part of the horizontal assessment, IORPs providing DC schemes have to provide qualitative as well as quantitative information through the questionnaire.

Spreadsheet tool

1.39. DC IORPs will have to report their own calculations regarding the impact of the adverse scenario on overall investment assets. As in the 2015 and 2017 IORP stress tests, IORPs are provided with a helper tool to assist with the calculations for assessing the impact of the stress scenario on retirement income of representative members.

1.40. Since the 2017 exercise, the tool has been adapted for current inputs and assumptions, yet the design and the functioning of the tool remained the same.

Proportionality and simplifications

1.41. EIOPA aimed to design a proportionate stress test exercise which is practical and contains appropriate simplifications to minimise the burden on IORPs, but which gathers sufficient data for meeting the objectives of the stress test and drawing informed conclusions. IORPs are requested to complete the stress test exercise on a best effort basis.

1.42. The DB/hybrid stress test specifications, including the technical specifications for the valuation of the common balance sheet, contain a number of simplifications

[13] This is also one of the main reasons why the International Organisation of Pension Supervisors (IOPS) concludes in its working paper (IOPS, Stress Testing and Scenario Analysis of Pension Plans, IOPS Working Paper on Effective Pensions Supervision No. 19, March 2014) that stress testing of DC schemes "should take into account the ultimate long-term goal of the pension funds, i.e. their ability to deliver adequate retirement income for its members."

and practical expedients, which IORPs may use, if appropriate. Besides the simplifications included in the specifications, IORPs may use their own simplifications as long as they are proportionate to the nature, scale and complexity of the underlying risks - and provides for a fair approximation to the exact results. The effects of using simplifications need to be explained and quantified or estimated, where possible.

1.43. The package relating to the DC-part of the stress test includes a calculation tool that perform most of the calculations for assessing the impact on future retirement income of three representative plan members. IORPs providing pure DC plans will only have to provide a number of input variables for this part of the exercise, concerning the features of the three representative plan members, information on current investments and costs and charges and the asset allocation of the representative plan members during the accumulation phase.

2. Scope and process

Scope and definitions

2.1. The stress test includes all types of IORPs, i.e. IORPs that provide defined benefit (DB) schemes, hybrid schemes and defined contribution (DC) schemes.[14] Insurers subject to Article 4 of the IORP Directive are not within the scope of the IORP stress test, since this type of undertaking was already covered by last year's insurance stress test.

2.2. The IORP stress test framework consists of a part for:

- IORPs providing DB/hybrid schemes which are requested to perform the calculations as specified in section 4, and
- IORPs providing DC schemes which are requested to report the information as specified in section 5.

Both IORPs providing DB/hybrid schemes and IORPs providing DC schemes are requested to provide the qualitative and quantitative information for the horizontal assessment as specified in section 3.

2.3. National supervisory authorities (NSAs) will decide whether a participating IORP should complete the DB/hybrid part or the DC part of the stress test. NSAs may also allow IORPs to conduct either the DB/hybrid- or the DC-part of the stress test on ring-fenced compartments/schemes/sub-funds of the IORP. IORPs may exist that are not pure DC schemes for which it may still be appropriate to do the DC-part of the stress test. The guarantees provided by these IORPs may only relate to the pay-out phase or may be immaterial, such as the provision of complementary disability or survivor insurance. As such, there may be IORPs for which it is difficult to define at the European level whether the DB/hybrid-part or the DC-part of the stress test is most suitable.

2.4. The NSAs are choosing a representative sample of IORPs to participate in order to enable meaningful results at the level of the Member State.

Coverage rate and participation

2.5. EIOPA's aim is to reach a coverage rate of at least 60% of assets of the DB/hybrid IORP sector and of at least 50% of assets of the DC IORP sector per participating

[14] For other applicable definitions, please do refer to EIOPA (2018): Decision of the Board of Supervisors on EIOPA's regular information requests towards NCAs regarding provision of occupational pensions information, April 2018, https://eiopa.europa.eu/Publications/Protocols/Decision%20on%20Consultation%20Paper_EIOPA-CP-17-005.pdf, paragraph 1.17.

country in the EEA. A lower coverage than 60%, yet not lower than 50%, is acceptable if, after including the largest IORPs, IORPs with less than EUR25 million balance sheet total or less than 100 members and beneficiaries would need to be included in the exercise. For the required coverage of the DC sector, extreme national specificities, for example the very high number of very small DC IORPs in IE, have been addressed in a proportionate manner.

2.6. The IORP stress test covers all EEA member states with material IORP sectors, which was determined as exceeding EUR500 million in assets by year-end 2018[15].

2.7. As a consequence, the 2019 stress test exercise will be carried out in 20 countries (AT, BE, CY, DE, DK, EL, ES, FI, FR, IE, IT, LI, LU, NL, NO, PT, SE, SI, SK and UK).

2.8. The corresponding NSAs choose a representative sample of IORPs in their Member State. Those participating IORPs will carry out the calculations and the exercise as well as report their results in the relevant reporting templates.

Questions and answers

2.9. The national supervisory authorities (NSAs) coordinate the stress test exercise in their Member States. Participating IORPs have to direct questions on the stress test specifications, the technical specifications for valuing the common balance sheet and the accompanying spreadsheet templates/tools to the NSAs.

2.10. The NSAs will forward questions of general relevance on the stress test specifications and technical specifications to EIOPA as well as any errors in spreadsheets. Questions with regard to the use of the spreadsheets may be answered by the NSAs themselves, if they are able to do so.

2.11. EIOPA will put in place a questions-and-answer procedure (Q&A) for the stress test specifications, including the technical specifications for the valuation of the common balance sheet. The aim of the Q&A procedure is to ensure consistency in the interpretation of the technical specifications and templates by providing common answers to questions raised by the participants during the exercise. Q&A documents will be published on EIOPA's website, which will be updated once every week. [16]

Validation

2.12. Participating IORPs have to submit the reporting spreadsheets to their NSA after completing the exercise, no later than 19 June 2019. The NSAs will validate the data submissions at the national level and will follow up with IORPs if inconsistencies are discovered.

2.13. The NSAs will submit the reporting spreadsheets and accompanying documents in a non-anonymised way to EIOPA by 28 August 2019. The data provided by individual IORPs will be validated at EIOPA level to ensure consistency of outcomes between and within countries. Moreover, the central validation team will analyse the data and prepare figures and tables for the stress test report.

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[15] In absence of end-2018 data, the participating Member States have been determined by using end-2017 data. Equally, NCAs are allowed to use end-2017 data to determine the representative sample of participating IORPs.

[16] The Q&A for the 2015 IORP stress test are available here: https://eiopa.europa.eu/Publications/Surveys/2015_IORPS%20Stress%20Test%20QA%20consolidated%20version_20150805.pdf; the Q&A for the 2017 IORP stress test here: https://eiopa.europa.eu/Publications/Surveys/EIOPA%20ST_QandA%2005_07_2017.pdf

2.14. The central validation team is expected to meet in September. The validation team will refer any issues or questions with regard to the data to the relevant NSAs which may require some re-submissions from the participating IORPs during that period. The validation team will not directly contact the participating IORPs.

2.15. EIOPA has a process in place for ensuring confidentiality of all data[17] collected and stored by EIOPA. A limited number of experts will participate in the central validation meetings and be granted access to the database, subject to strict confidentiality and security protocols

Report

2.16. EIOPA expects to publish a report on the stress test outcomes by mid-December 2019. The report will disclose the names of the IORPs participating in the stress test exercise. The report will not contain data that can be linked to individual IORPs. This also implies that no country-specific data will be published, if such data reveals information about individual IORPs. This would, for example, be the case when only a few IORPs of a Member State participate in the stress test exercise.

3. Horizontal assessment

3.1. The 2019 IORP stress test assesses the resilience to the adverse market scenario and the second round effects on the real economy for IORPs providing DB/hybrid schemes as well as DC schemes. However, the methodological approaches used differ between both types of IORPs, which is the reason why they are specified in different sections, i.e. section 4 for DB/hybrid and section 3 for DC. The horizontal assessment of the second round effects on financial markets and ESG exposures is similar - but not always identical - for all types of IORPs.

Second-round effects on financial markets

3.2. One of the key areas of the stress test is to assess the potential impact of the adverse scenario on IORPs' investment behaviour and, consequently, financial markets. Primarily, the questionnaire addresses both the short-term and the longer-term effects of the adverse scenario. To analyse the effects appropriately, the evaluation needs to take into account the investment allocation on 31 December 2018 prior to the shock. Further, in a qualitative manner, the questionnaire asks for trends pertaining in the five years before the shock - the purpose is to identify common behaviours - like search for yield - given the persistent low interest rate environment throughout the recent years. Finally, any legal, contractual or voluntary constraints of the actual (and future) investment allocation of IORPs - and the impact thereof - is addressed in the last part of the questionnaire.

3.3. IORPs are requested to provide estimates of expected changes in the asset allocation within a year following the stress event. The requested asset allocation data includes the type of asset as well as the geographical breakdown of the investments for both the fixed-income and the equity portfolio. This will provide an indication to what extent, if at all, IORPs will rebalance their investment portfolios after the shock. This should provide deeper insights into a potential stabilising effect on financial markets or to what extent IORPs are incentivised to

[17] This includes data referring to the IORP's sponsor(s).

reduce asset risk with a potentially destabilising effect. IORPs are also asked to indicate the longer-term effects on their strategic asset allocation. This will provide an indication of potential trends, such as 'flight to quality', or phenomena like 'herding behaviour' following a sudden rise in interest rates.

Reporting templates

3.4. IORPs are requested to complete and submit to their NSA the following reporting templates:

- The spreadsheet with the results of the calculations of the impact of the adverse scenario on the IORP's overall assets. This spreadsheet also serves as the response template for the qualitative/quantitative questionnaire;
- The output spreadsheet generated by the spreadsheet tool containing the input data provided by the IORPs, including the response template for the questions which are relevant for this part of the exercise, and the sheets with the effects on future retirement income of the three representative plan members.

Assessing ESG exposures

3.5. The aim of the exercise is to carry out a relevant evaluation of IORPs' ESG exposures. In absence of a defined ESG taxonomy, the analysis should be considered a first step towards more comprehensive future stress testing of ESG risks. IORPs are requested to provide qualitative information through the questionnaire that covers all aspects of ESG:

- The extent to which IORPs take into account ESG factors, the objectives of ESG integration and the way this is done: exclusion policies, implementing international principles for sustainable investing (like UNPRI), voting, engagement, best-in-class investing and impact investing;[18]
- The extent to which IORPs assess their exposure to ESG risks and, if yes, how;[19]
- The extent to which the integration of ESG factors enhances/impairs the risk-return characteristics of the investment portfolio;
- Whether the introduction of IORP II (transposition 13 January 2019) and the new Shareholder Rights Directive[20] (transposition 10 June 2019) have impacted the ESG policies of IORPs.

3.6. The qualitative information is complemented by a quantitative survey focussing on carbon emissions linked to climate change. For that, asset information from IORPs is matched with Eurostat data on carbon emission intensities by economic activities. IORPs are requested to provide a breakdown of their investments in three major asset classes by ten economic activities based on the NACE section classification.[21] For investments in investment funds, the identification of the economic activity should follow the underlying assets (i.e. a 'look through

[18] See for a description of the various approaches DNB, Sustainable investment in the Dutch pension sector, 2016: https://www.dnb.nl/en/binaries/Sustainable%20investement%20in%20the%20Dutch%20pension%20sector_tcm47-346418.pdf

[19] An EIOPA Project Group for IORP II Implementation on governance and risk evaluation is in the process of developing a classification for the assessment of ESG risks, which could be helpful for this part of the questionnaire. ESG risks mainly relate to 'asset risk' and 'reputational risk'.

[20] The Shareholder Rights Directive requires institutional investors (incl. IORPs) to disclose their engagement policy, i.e. a description and the annual implementation of the engagement policy.

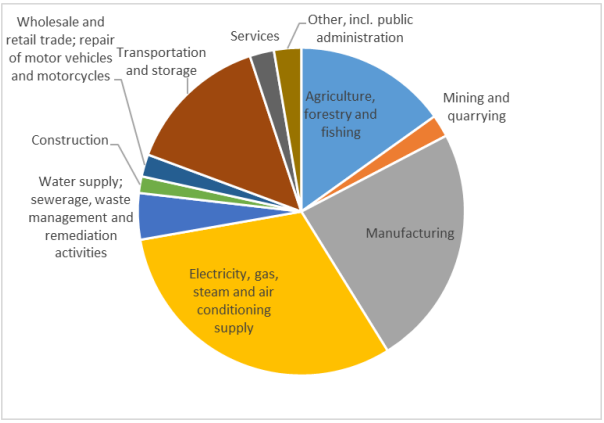
[21] See Eurostat, NACE Rev. 2 - Statistical classification of economic activities in the European Community, Methodologies and Working papers, 2008: https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF/dd5443f5-b886-40e4-920d-9df03590ff91?version=1.0

approach' should be applied) and not the economic activity of the asset/fund manager.

Economic activity	NACE section code	Equity investment	Debt investment	Other investment
Agriculture, forestry, fishing	A			
Mining and quarrying	B			
Manufacturing	C			
Electricity, gas, steam, air conditioning	D			
Water supply & waste management	E			
Construction	F			
Wholesale and retail trade	G			
Transportation and storage	H			
Services	I-N			
Other, incl. public administration	O-U			

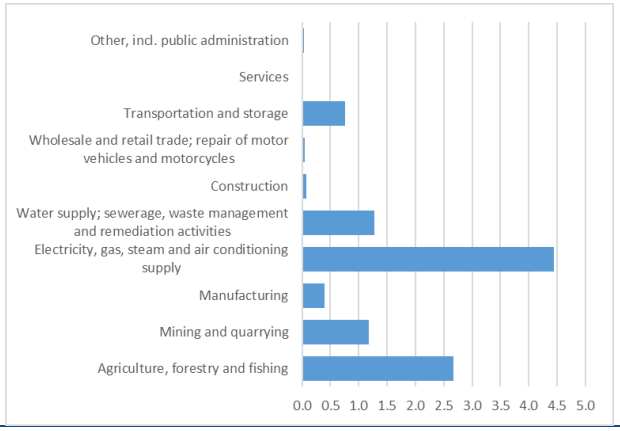
3.7. Acknowledging the limitations of such a high-level analysis of IORPs' investments by NACE section codes, the breakdown allows for an identification of business activities that are prone to being exposed to risks related to a transition to a low-carbon environment (see Figure 1 and 2). Moreover, it will provide an indication of the overall carbon footprint of IORPs investment assets.

Figure 1: Greenhouse gas emissions in EU in 2016, tonnes



Source: Eurostat

Figure 2: Greenhouse gas intensity in EU in 2016, kg per EUR value added



Source: Eurostat

3.8. By the end of 2019, IORPs should be able to identify the economic activity of the issuer of their assets using NACE section codes for as part of EIOPA's regular

information requests towards NSAs regarding occupational pensions data.[22] As a possible simplification for this stress test, IORPs may allocate their assets using the Global Industry Classification Standard (GICS) developed by MSCI and S&P Dow Jones Indices.[23] For that purpose, Annex 5 provides a mapping of the GICS sub-industries to the ten economic activities based on the NACE classification. The GICS classification only considers private companies. In consequence, IORPs would still have to allocate securities issued by government to the economic activity O-U.

4. IORPs providing DB/hybrid schemes

4.1. This section provides the stress test specifications for IORPs that provide non-pure DC schemes, i.e. DB or hybrid pension schemes, possibly in addition to pure DC schemes (see paragraph 2.2).

4.2. In short, these IORPs have to establish 1) the balance sheet using national valuation standards (incl. the funding requirement(s)), and 2) the balance sheet valued on a market-consistent basis and including all security and benefit adjustment mechanisms, using the common methodology as described in the (separate) "Annex to IORP Stress Test 2019 Specifications - Technical Specifications Common Balance Sheet". Subsequently, IORPs have to evaluate an instantaneous adverse market stress scenario with respect to the two balance sheets. This means that IORPs have to calculate two unstressed balance sheets and two stressed balance sheets. In addition, IORPs have to conduct a cash flow analysis and complete the qualitative/quantitative questionnaire.

Impact adverse scenario on national and common balance sheet

National balance sheet (incl. funding requirement(s))

4.3. IORPs should report their balance sheet at the reference date using national valuation standards.

4.4. IORPs should also report the funding requirement (liabilities plus possible buffer requirements) and the surplus/deficit relative to the funding requirement at the reference date. If more than one funding requirement exists, IORPs should provide both the highest funding requirement and minimum funding requirement and the accompanying surpluses (or deficits) at the reference date.

National balance sheet and funding requirement(s)	
Assets	**Liabilities**
Investments	Excess of assets over liabilities
	Gross technical provisions
(Re-)Insurance recoverables, if applicable	(-/-) (Re-)Insurance recoverables, if applicable

[22] See EIOPA, Decision of the Board of Supervisors on EIOPA's regular information requests towards NCAs regarding provision of occupational pensions information, EIOPA-BoS/18-114, 10 April 2018: https://eiopa.europa.eu/Publications/Protocols/Decision%20on%20Consultation%20Paper_EIOPA-CP-17-005.pdf

[23] See https://www.msci.com/gics

	Net technical provisions
Pure DC assets	Pure DC liabilities
Other assets	Other liabilities (excl. subordinated loans)
1a Funding requirement (higher or unique)	
2a Assets eligible to cover funding requirements	
3a Surplus (higher or unique) (=2a - 1a)	
1b Funding requirement (minimum if more than one exists)	
2b Assets eligible to cover funding requirements	
3b Surplus (minimum) (= 2b - 1b)	

4.5. IORPs have to re-evaluate the national balance sheet and the funding requirements at the reference date after applying the stress scenario.

4.6. The stress scenario discussed does not provide information on the development of (unobserved) risk premiums on fixed and non-fixed income securities. In some countries the discount rate for the valuation of the technical provisions in the national balance sheet will be based on expected returns on assets or risk premia. If relevant, IORPs should assume for the valuation of technical provisions that risk premiums on fixed and non-fixed income assets do not change in the stress scenario as compared to the baseline scenario.

4.7. IORPs should contact their NSA for further guidance on assessing the impact of the stress scenario on the national balance sheets.

Common balance sheet

4.8. IORPs have to value the common balance sheet at the reference date including all available security and benefit adjustment mechanisms.

4.9. The items on the common balance sheet should be valued on a market-consistent basis, i.e. using the basic risk-free interest rate curve and including a risk margin in technical provisions. Technical specifications for valuing the common balance sheet are provided in the separate Annex to these stress test specifications.[24] EIOPA provides a helper tool to assist in the valuation of sponsor support and pension protection schemes.

Common balance sheet incl. all security and benefit adjustment mechanisms	
Assets	**Liabilities**
Investments (excl. pure DC)	Excess of assets over liabilities

[24] EIOPA, Annex to IORP Stress Test 2019 Specifications - Technical Specifications Common Balance Sheet.

(Re-)Insurance recoverables	Risk margin
	Best estimate of technical provisions
Sponsor support	- unconditional benefits
- legally enforceable	- conditional benefits
- non-legally enforceable	- of which: ex ante benefit reductions *
	- discretionary benefits
Pension protection scheme	- ex post benefit reductions *
	- benefit reductions in case of sponsor default *
Pure DC assets	Pure DC liabilities
Deferred tax assets	Deferred tax liabilities
Other assets	Other liabilities (excl. subordinated loans)
* benefit reduction items enter into the common balance sheet with a negative sign.	

4.10. IORPs have to revalue the common balance sheet at the reference date after applying the stress scenario.

4.11. Since the stress scenario is to be considered instantaneous, no management actions may be assumed before/at the time of the stress in the valuation of the stressed balance sheet in addition to those management actions already assumed in the baseline common balance sheet. However, in assessing the impact of loss-absorbency of the best estimate of technical provisions and security mechanisms on the value of those items on the common balance sheet, IORPs should take into account possible future management actions of the IORP.[25]

National and common balance sheet

4.12. The reference date for the valuation of the balance sheets is end 2018. IORPs that do not dispose of (audited) data for the reference date should use a best estimate approach to valuation at that date.

4.13. The value of subordinated loans should not be included on the balance sheets, but reported separately.

4.14. IORPs should apply a look-through approach to investment funds and other indirect exposures in assessing the impact of the shocks contained in the stress scenario on the value of investments (see Annex 3).

4.15. The stressed basic risk-free interest rate curves and - if applicable - the stressed inflation curves should in principle be applied to both the asset side and the liability side of the balance sheets. The effect of this on the national balance sheet will depend on national valuation rules. There will be a direct effect on the common balance sheet since it is valued on a market-consistent basis. For

[25] For more guidance on the allowance for IORP management actions, see paragraphs 2.4.26-31 of EIOPA, Annex to IORP Stress Test 2019 Specifications - Technical Specifications Common Balance Sheet.

example, in the common balance sheet, changes in the risk-free interest rates will affect the value of liabilities, sponsor support and pension protection schemes, changes in the inflation curve will affect inflation-linked pension obligations, sponsor support and pension protection schemes covering such inflation-linked obligations and inflation-linked bonds. The value of fixed-income securities will be impacted by the changes in yields on government and corporate bonds in the stress scenario, which combine the changes in risk-free interest rates or swap rates and credit spreads. The values on the asset side of the common balance sheet will also be affected by the listed equity, real estate and alternative investment stresses.

4.16. When valuing derivatives, IORPs need to take into account the nature of the derivative (option, forward, future, swap, etc.) and the way its value would change following the stresses applied to the underlying assets and risk-free interest rates.[26]

4.17. No currency stresses are included in the stress scenario which means that all exchange rates are assumed to be constant in the scenario.

4.18. When calculating the stressed balance sheets, IORPs should take into account the risk-mitigating effects of financial and insurance risk mitigation techniques on the value of these financial instruments and the amounts recoverable from (re-)insurance contracts.

4.19. IORPs should take into account the direct as well as indirect effects of the stress scenario on technical provisions and the value of security mechanisms. This includes a possible increase in technical provisions as a consequence of any relevant adverse changes in behaviour of members and beneficiaries or sponsors in reaction to the stress scenario.

4.20. The approach taken to value the stressed balance sheets, including assumptions regarding behaviour of members and beneficiaries and sponsors as well as future management actions of the IORP, should be consistent with the valuation of the unstressed common balance sheet. IORPs should leave market volatilities unchanged in the stress scenario.

Adverse market scenario

4.21. The variables included in the adverse market scenario are:

- Euro interest rate swap stresses for maturities 1, 2, 3, 5, 7, 10, 20 and 30 years;
- Inflation swap curve stresses for maturities 1, 2, 3, 5, 7, 10, 20 and 30 years;
- Sovereign bond yield shocks for the EEA countries, US, other developed countries and emerging markets for maturities 1, 2, 3, 5, 7, 10 and 20 years;
- Corporate bond yield stresses (non-financial) for rating classes AAA, AA, A, BBB, BB, B and CCC and lower;
- Corporate bond yield stresses (financial) for rating classes AAA, AA, A, BBB, BB, B and CCC and lower;
- Corporate bond yield stresses (financial, covered bonds) for rating classes AAA, AA and A rated;
- Residential mortgage backed securities (RMBS) stresses for the EU, North America and Asia (other) and rating classes AAA, AA, A and BBB;

[26] If the market-consistent value of derivatives is established using a risk-free market interest rate curve deviating from the risk-free interest rate curve provided for the common balance sheet then the difference between that curve and the risk-free interest rate curve provided for the common balance sheet should remain unchanged after application of the stresses. The stressed risk-free market interest rate curve to be applied then equals the stressed risk-free interest rate curve provided for the common balance sheet plus this unchanged difference.

- Real estate fund stresses for EU, US and other REITs;
- Real estate stresses for commercial and residential property for the EEA countries;
- Equity stresses for developed (EU, US, other) and emerging markets;
- Private equity, hedge fund and commodity stresses.

4.22. The stresses defined under the scenario have been derived in a coherent fashion using the ECB's financial shock simulator.[27] The market risks in the stress scenario are calibrated to be occurring instantaneously and simultaneously taking into account correlations/diversification between shocks, i.e. aggregation of individual shocks by means of a correlation matrix to allow for diversification effects is not necessary.

4.23. Annex 1 provides an overview of the size of the stresses to the variables in the stress scenario.

4.24. The interest rate swap and inflation swap curve stresses - i.e. the absolute change to the end-2018 levels - are assumed to be the same for all countries participating in the stress test. This ensures that the impact of the stresses is comparable between Member States. The stress test package includes a spreadsheet with the stressed interest rate term structures and inflation curves for the currencies of all Member States participating in the DB/hybrid part of the stress test, i.e. CHF, DKK, EUR, GBP, NOK and SEK.[28] The interest rate and inflation stresses are applied to the basic risk-free interest rate curves and inflation curves for the relevant currencies which have been derived using the Smith-Wilson method including the Ultimate Forward Rate (UFR).

4.25. The government bond stresses are expressed as changes in the 1, 2, 3, 5, 7, 10 and 20-year yields. As a consequence, the stresses capture the combined effect of lower risk free long-term interest rates and higher credit spreads over the risk-free interest rate. The spreadsheet included in the stress test package contains the changes in yields for maturities other than 1, 2, 3, 5, 7, 10 and 20 year. Bonds issued by municipalities and regional government, and such that are guaranteed by governments, shall be treated as government bonds of the corresponding jurisdiction. The yield change for bonds issued by supranational institutions should be assumed to be zero for all maturities.

4.26. The corporate bond stresses are expressed as changes in the yield. The corporate bond yield stresses should be assumed equal for all maturities. Participating IORPs should apply the corporate bond stresses to corporate bonds issued by companies in all countries in all currencies.[29] The stresses corresponding to the rating CCC and lower should be used for unrated corporate bonds. The stress for corresponding residential mortgage backed securities (RMBS) should be applied to collateralised securities, loans and mortgages relating to those regions and rating classes. It should be assumed that the value of "deposits other than cash equivalents" is not affected by changes in the risk-free interest rate and credit spreads.

4.27. The 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.

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[27] See "Annex 1: Simulation methodology" in ESRB, Adverse scenario for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test in 2017, 23 March 2017.

[28] A linear interpolation has been applied to attain the stresses for maturities that are not generated by the financial shock simulator. Stresses after the last maturity generated by the simulation model have been extrapolated by applying the stress level of the last known maturity.

[29] The underlying assumption is that risk-free interest rates for all currencies increase by the same amount, as depicted in Annex 1.

4.28. The property stresses should be applied to direct/indirect and listed/unlisted real estate investments (including property held for own use). The property stresses contain shocks for REITs referring to different geographical locations. The REITs shocks should 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 (the relevant non-EU REIT shock should be applied in this case). In addition, shocks are provided for commercial and residential property in the EEA countries. The latter should be used for European direct property investments and unleveraged, indirect property investments by applying a look-through approach, distinguishing commercial and residential property investment by individual EEA country. Collateralised bonds issued by REITs (or other real estate companies) should be treated as RMBS.

4.29. The listed equity stresses contain shocks for the developed and emerging markets as well as the geographical components of the developed markets aggregate: EU, US and other. IORPs should apply the listed equity stresses - i.e. aggregate versus underlying components - which are most appropriate for their situation. The private equity shock should be applied to participations.

Simplifications

4.30. IORPs may use the defined simplifications, if their use does not have material consequences for the outcomes. The use of the simplifications and a description of the impact need to be disclosed in through the questionnaire and, where possible, a quantitative assessment shall be provided. Simplifications and practical expedients have to be applied consistently, so, if applicable, both for the national balance sheet and for the common balance sheet, and both for the unstressed and the stressed balance sheets.

4.31. It may be appropriate for IORPs to use the simplifications for the look-through approach (as referred to in Annex 3). This simplification may be used in conjunction with one of the simplifications provided below aggregating the shocks to a lower level of granularity.

4.32. IORPs may use the aggregated stresses provided by ESRB if (part of) government bonds and/or (part of) corporate bonds are invested in line with the broad, market capitalisation weighted bond indices. I.e. there should not be a significant over- or underweighting of particular countries in the 'euro area'/ 'Europe' government bond basket or in market benchmarks. Similarly, there should not be a significant over- or underweighting of particular types of bonds in the all corporate bonds basket nor of particular rating classes in the investment grade/high yield baskets or in market benchmarks.

4.33. Annex 2 provides aggregated stresses to observed yields on government bonds for the 1, 2, 3, 5, 7, 10 and 20-year maturities as well as on corporate bonds and residential mortgage-backed securities. The spreadsheet included in the stress test package provides the changes in government bond yields for all maturities. The yield shocks for corporate bonds and residential mortgage-backed securities should be assumed to be the same for all maturities.

4.34. IORPs may use the aggregate European shocks to commercial and residential property provided in Annex 2, if they invest in diversified, European and unleveraged portfolios of these types of property.

Cash flow analysis

4.35. IORPs are requested to carry out - and report - cash flow projections for:

- unconditional benefits (or equivalent[30]), expenses and contributions;
- conditional and discretionary benefits;
- benefit reductions;
- sponsor support;
- pension protection schemes; and
- other net cash flows, e.g. from reinsurance.

The cash flows should be projected and reported in nominal terms.

4.36. IORPs do not have to make projections of cash flows for investment assets, i.e. coupon and dividend payments. IORPs are asked to report the expected development of investment assets (common balance sheet and national valuations) as well as of the national liabilities as stock values (end of each projected year. The asset values include annual investment income, comprising coupon/dividend income and, where relevant, realised/unrealised changes in market value in a given year.

4.37. The cash flows for the different types of benefits, security mechanisms and benefit reduction mechanisms should be derived using the technical specifications for the common balance sheet. This implies among others that:

- only cash flows relating to current members and beneficiaries should be considered ('closed modelling')[31], notwithstanding that cash flows for security and benefit adjustment mechanisms may depend on a national 'open modelling' approach (see paragraph 4.46);
- cash flows should be projected over the full lifetime of the pension obligations;
- cash flows projections should be consistent with existing national IORP systems, including the national supervisory framework.

4.38. The cash flows relating to the unconditional pension obligations should distinguish between cash in-flows (i.e. future contributions), if relevant, and cash out-flows (future unconditional benefits (or equivalent) and expenses).[32] The cash flows relating to unconditional pension obligations in the baseline and adverse market scenario may differ due to the decline in break-even inflation rates, in particular if promises for future pension benefits are linked to inflation.

4.39. Cash flow projections for benefit reductions in case of sponsor default and pension protection schemes are contingent on a default of the sponsor. The cash flow analysis only considers deterministic scenarios. In consequence, IORPs should assume a probability of sponsor default of 0%. Still, IORPs have to ensure in their projections that the total amount of sponsor support does not exceed the maximum value of sponsor support. This implies that IORPs will have to compare for each year of the projection horizon whether the present value of maximum sponsor support is sufficient to cover the envisaged sponsor support cash flow in

[30] IORPs which do not report unconditional benefits on the common balance sheet but rather pure conditional benefits with an ex ante benefit reduction mechanism should report the cash-flows for pure conditional benefits excluding the ex-ante benefit reduction mechanism.

[31] The extent to which future contributions and benefits of current members and beneficiaries should be included in cash flows is determined by the rules provided in paragraphs 2.5.8-2.5.9 in the Annex to IORP Stress Test 2019 Specifications, Technical Specifications Common Balance Sheet.

[32] The extent to which future contributions and benefits should be included in cash in- and out-flows is determined by the rules provided in paragraphs 2.5.8-2.5.9 in the Annex to IORP Stress Test 2019 Specifications, Technical Specifications Common Balance Sheet.

that year.[33] Once the maximum value of sponsor support is exhausted, the subsequent cash flows for sponsor support should be zero.

4.40. The cash flows for conditional/discretionary benefits, benefit reductions, sponsor support and pension protection schemes are likely to depend on national funding requirements, valuation standards and recovery mechanisms. This implies that IORPs have to establish for each year of the projection period whether the funding situation using national valuation standards for assets and liabilities complies with the funding requirements. As such, IORPs have not only to project the value of national assets[34] but also of national liabilities in each year of the projection period by calculating the present value of the remaining cash flows[35] using the national discount rate.[36] If at any point in time the funding situation does not comply with national funding requirements, IORPs should take into account recovery measures consistent with national prudential mechanisms, including maximum recovery periods and allowances for expected returns on assets in the recovery plan, expected IORP management actions and sponsor behaviour.

4.41. IORPs should take into account any IORP policy, expected IORP management actions and/or sponsor behaviour which aim for an earlier intervention than recovery measures triggered by breach of national funding requirements.

4.42. The projected cash flows for conditional/discretionary benefits, benefit reductions, sponsor support and pension protection schemes may depend on an 'open modelling' approach, i.e. including new members and new accruals. In that case, IORPs may project the cash flows using the 'open modelling' approach and subsequently attribute the resulting cash flows to the accrued benefits of current members and beneficiaries.[37]

4.43. In making the cash flow projections, IORPs should at all times ensure that the market value of assets does not turn negative during the projection period.

4.44. IORPs are asked to produce two sets of cash flow projections:

(1) A set based on the assumption that future investment returns follow the forward rates implied by the EIOPA risk-free interest rate term structure for the relevant currency in both the baseline and adverse market scenario. This assumption of risk-free investment returns is consistent with the technical specifications for the common balance sheet;

(2) A set based on the assumption that future investment returns follow common expected returns in both the baseline and adverse market scenario. This assumption constitutes an extension of the technical specifications for the common balance sheet and is consistent with the pension projections in the DC part of the stress test. The expected returns should be equal to the risk-free

[33] This requires that the maximum sponsor support is updated each year. The maximum sponsor support increases compared to the previous year (t-1) by applying the specified investment return in year t but is reduced by any cash flow for sponsor support in year t.

[34] In some countries the national value of assets may deviate from the market value of assets, meaning that IORPs will have to make parallel projections of the value of assets using the national and common framework definition.

[35] The national definition of cash flows for pension benefits may differ from the common frameworks definition. For example, because the national cash flows do not include a trend in future mortality rates. This means that IORPs would have to make parallel projections of national cash flows for pension benefits and the common framework's cash flows for unconditional benefits (or equivalent).

[36] Depending on the national approach, the national discount rate may be fixed over time but also be dependent on the changing market interest rates or forward term structures, as specified for the scenario under consideration. EIOPA provides the term structures that can be used as a basis for the national adaptations.

[37] See also paragraph 2.5.10 in the Annex to IORP Stress Test 2019 Specifications, Technical Specifications Common Balance Sheet.

forward rates in the baseline and adverse scenario plus a risk premium as provided in the table after paragraph 5.57 for the corresponding asset classes.

4.45. The stress test package contains a spreadsheet containing the future investment returns for both sets of cash flow projections.

4.46. IORPs may on a voluntary basis report two additional sets of cash flow projections, relaxing the technical specifications for the common balance sheet. These cash flows should be based on an 'open modelling' approach, i.e. including new members and new accruals, provided that the inclusion of new members/accruals would be part of a realistic modelling of the pension policies of the IORP towards the future, capturing the present state of the IORP and within the national context including the national supervisory framework. Moreover, the time horizon of the projection does not have to exceed 20 years. The first voluntary additional set should be based on the assumption of the risk-free investment returns and the second on common expected investment returns.

Simplifications

4.47. IORPs may use simplifications to reduce the burden of calculating and reporting the cash-flows relating to unconditional pension obligations, provided that these simplifications are appropriate and explained through the qualitative questionnaire. Examples of appropriate simplifications are:

- IORPs may not dispose of cash flow projections at the reference date of end-2018 because they do not have to prepare national valuations of technical provisions every year, in which case they can report the most recent cash flow projection available;
- IORPs may have deviated from the technical specifications for establishing cash flows for unconditional benefits in order to value the best estimate of technical provisions on the common balance sheet, in which case they can report that cash flow projection;
- IORPs may have based the valuation of the best estimate of technical provisions on the common balance sheet on national cash flows, either directly or indirectly, in which case they can report their national cash flow projection.
- IORPs may find it burdensome to separate cash in-flows and out-flows and/or distinguish between benefits and expenses within the cash out-flows, in which case they can provide net and/or aggregated cash flows.

Qualitative/quantitative questionnaire

4.48. IORPs are asked to complete a qualitative/quantitative questionnaire, which includes a request for some additional data. The additional information will inform the analysis of the second rounds effects of the adverse market scenario on the real economy as well as the horizontal assessment of the impact of common behaviours on financial markets and the exposure of IORPs to ESG risks.

Impact on sponsors

4.49. The DB/hybrid part of the stress test will analyse the impact of the adverse market scenario on sponsors in a qualitative and quantitative way. IORPs are asked to answer the qualitative/quantitative questions on the key characteristics of the sponsor(s), current national assessments of sponsor strength and their assumptions for sponsor strength underlying the valuation of sponsor support on the common balance sheet.

4.50. IORPs are requested to provide the following information (measures of sponsor strength) through the questionnaire to facilitate the quantitative analysis of the impact of the stress scenario on the sponsor:

I. Net cash flow of the sponsor(s) for the last three years (only one measure of net cash flow required)
1. EBITDA
2. Profits before taxes (PBT)
3. Net income
4. Other if deemed more appropriate (please specify)
II. Financial information (as disclosed in the most recent annual report(s) of the sponsor(s)):
1. Shareholder funds/equity
2. Total assets
3. Total debt
III. Market value of the sponsor(s)
IV. Liabilities of the sponsor towards the IORP, as disclosed in the most recent annual report(s)
V. Total wages paid by the sponsor(s)

4.51. IORPs are asked to provide data for all five main categories of sponsor strength (i.e. item I to V). However, it is sufficient to provide only one metric for net cash flows of the sponsor(s) for the last three years under item I.

4.52. IORPs can assume that the measures of sponsor strength do not change as a result of the stress scenario. They can use the latest available information, and the information they most easily have access to. If more than one measure is available for one of the five main categories, then IORPs should provide values for the measure of sponsor strength that they consider most appropriate, f.i.

those which they have used to determine the maximum value of sponsor support[38].

4.53. Only IORPs recognising legally and/or non-legally enforceable sponsor support on the common balance sheet should provide the data, IORPs without sponsor support do not have to provide this information. Consequently, IORPs with sponsor support are requested to report the information, independently of the type(s) of sponsors, be it a private company/group, a subsidiary of a private company/group, a not-for-profit institution, multiple sponsors, sector- or industry-wide associations, or members of a profession/self-employed persons. In case of legally enforceable sponsor support, the measures of sponsor strength should be reported for the entity that ultimately bears the guarantee, whether it be the group- or parent-company or a subsidiary.[39]

4.54. IORPs can use estimates or simplifications to obtain the requested data. IORPs with a large number of sponsors could report values which are based on actual data of only some of their sponsors (f.i. the largest X sponsors or a number of sponsors which represent at least 50% of technical provisions of the IORP). This data can then be grossed up to the level of the IORP/all sponsors. Grossing up could be done based on the share of technical provisions represented by the sponsors for which actual data is provided. Alternatively, IORPs with a large number of sponsors within a specific industry or sector could make use of sector data from Eurostat or the national statistics office. Other methods might be used if IORPs consider this more appropriate.

4.55. IORPs may estimate the measures of sponsor strength using appropriate (market) price/earnings and/or (market) price/book ratios observed in financial markets. This will allow IORPs with an unlisted sponsor to calculate its market value using net cash flow data or book values from the sponsor's accounts. Moreover, if the IORP disposes of data for one of the first three main categories (I..III), it can straightforwardly derive the information for the other two main categories using such ratios.

4.56. IORPs that are unable to provide data for one of the five main categories are requested to explain the reasons through the qualitative questionnaire. Moreover, IORPs are requested to indicate the reliability of any estimates as well as their assessment of the appropriateness of the reported data as a measure to assess the capability of the sponsor(s) to provide sponsor support.

5. IORPs providing DC schemes

5.1. This section provides the stress test specifications for IORPs providing DC schemes.

5.2. In short, in the DC-part of the exercise IORPs have to calculate the impact of the adverse market scenario on their overall (investment) assets. Moreover, IORPs need to assess the second round effects on the retirement income of three representative plan members. These calculations will be performed by the spreadsheet tools provided by EIOPA using an input data template to be filled by IORPs. Finally, DC IORPs should complete a qualitative/quantitative questionnaire. The information provided through the questionnaire will inform

[38] See paragraph 2.7.27 ff. in Annex to IORP Stress Test 2019 Specifications, Technical Specifications Common Balance Sheet.

[39] See also paragraph 2.7.26 in Annex to IORP Stress Test 2019 Specifications, Technical Specifications Common Balance Sheet.

EIOPA's estimates of the overall effect on retirement income of the current members. Moreover, the information will support the horizontal assessment on the second round effects of investment behaviour on financial markets and the exposure of IORPs to ESG risks.

5.3. The reference date for the calculations and input data is end December 2018.

Impact of adverse scenario on overall assets

Market value of assets

5.4. IORPs have to apply a look-through approach to investment funds and other indirect exposures (see Annex 3) and value their (investment) assets at the reference date on a market-consistent basis (see Annex 4).

5.5. IORPs have to apply the adverse market scenario, using the look-through approach to investment funds and other indirect exposures.

5.6. The market value of fixed-income assets will be impacted by the changes in yields on government and corporate bonds in the stress scenario, which combine the changes in risk-free interest rates or swap rates and credit spreads. In addition, inflation-linked bonds will also be affected by changes in the inflation curve. The market value of assets will also be affected by the listed equity, real estate and alternative investment stresses.

5.7. IORPs should take into account the risk-mitigating effects of financial risk mitigation techniques on the value of these financial instruments.

5.8. When valuing derivatives, IORPs need to take into account the nature of the derivative (option, forward, future, swap, etc.) and the way its value would change following the stresses applied to the underlying assets and risk-free interest rates.[40]

5.9. No currency stresses are included in the stress scenario which means that all exchange rates are assumed to be constant in the scenario.

Adverse market scenario

5.10. The variables included in the adverse market scenario are:

- Euro interest rate swap stresses for maturities 1, 2, 3, 5, 7, 10, 20 and 30 years;
- Inflation swap curve stresses for maturities 1, 2, 3, 5, 7, 10, 20 and 30 years;
- Sovereign bond yield shocks for the EEA countries, US, other developed countries and emerging markets for maturities 1, 2, 3, 5, 7, 10 and 20 years;
- Corporate bond yield stresses (non-financial) for rating classes AAA, AA, A, BBB, BB, B and CCC and lower;
- Corporate bond yield stresses (financial) for rating classes AAA, AA, A, BBB, BB, B and CCC and lower;
- Corporate bond yield stresses (financial, covered bonds) for rating classes AAA, AA and A rated;
- Residential mortgage backed securities (RMBS) stresses for the EU, North America and Asia (other) and rating classes AAA, AA, A and BBB;
- Real estate fund stresses for EU, US and other REITs;
- Real estate stresses for commercial and residential property for the EEA countries;

[40] If the market-consistent value of derivatives is established using a risk-free market interest rate curve deviating from the risk-free interest rate curve provided by EIOPA, the difference between that curve and the risk-free interest rate curve provided by EIOPA should remain unchanged after application of the stresses. The stressed risk-free market interest rate curve to be applied then equals the stressed risk-free interest rate curve provided by EIOPA plus this unchanged difference.

- Equity stresses for developed (EU, US, other) and emerging markets;
- Private equity, hedge fund and commodity stresses.

5.11. The stresses defined under the scenario have been derived in a coherent fashion using the ECB's financial shock simulator.[41] The market risks in the stress scenario are calibrated to be occurring instantaneously and simultaneously taking into account correlations/diversification between shocks, i.e. aggregation of individual shocks by means of a correlation matrix to allow for diversification effects is not necessary.

5.12. Annex 1 provides an overview of the size of the stresses to the variables in the stress scenario.

5.13. The impact of the adverse market scenario on most asset categories can be determined by applying the government and corporate bond yield stresses to fixed-income assets and the listed equity, real estate and alternative investment price stresses to non-fixed income assets. However, in some cases IORPs may require risk-free interest rate stresses, for example to establish the post-stress value of derivatives. Moreover, inflation curve stresses will be needed to revalue inflation-linked bonds.

5.14. The interest rate swap and inflation swap curve stresses - i.e. the absolute change to the end-2018 levels - are assumed to be the same for all countries participating in the stress test. This ensures that the impact of the stresses is comparable between Member States. The stress test package includes a spreadsheet with the stressed interest rate term structures and inflation curves for the currencies of all Member States participating in the DC-part of the stress test, i.e. CHF, EUR and GBP.[42] The interest rate and inflation stresses are applied to the basic risk-free interest rate curves and inflation curves for the relevant currencies which have been derived using the Smith-Wilson method including the Ultimate Forward Rate (UFR).

5.15. The pre-stress risk-free interest rate term structures produced by EIOPA are based on interest rate swap rates or government bond yields for the relevant currencies that can be observed in deep, liquid and transparent markets. A credit risk adjustment is applied to these rates/yields to obtain risk-free market rates/yields. The adjusted swap rates/government bond yields are interpolated and extrapolated using the Smith-Wilson method for maturities for which no data points are available in deep, liquid and transparent markets. After the so-called last liquid point (LLP), the forward rates converge at the convergence point (LLP + convergence period) to the ultimate forward rate (UFR), which is based on estimates of expected inflation and the long-term average of short-term real interest rates. The table below summarises the approach used for deriving the basic risk-free interest rate curves for the relevant countries:[43]

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[41] See "Annex 1: Simulation methodology" in ESRB, Adverse scenario for the European Insurance and Occupational Pension Authority's EU-wide pension fund stress test in 2017, 23 March 2017.

[42] A linear interpolation has been applied to attain the stresses for maturities that are not generated by the financial shock simulator. Stresses after the last maturity generated by the simulation model have been extrapolated by applying the stress level of the last known maturity.

[43] See for a more elaborate description of the derivation of the risk-free rate term structures section 2.10 in Annex to IORP Stress Test 2019 Specifications, Technical Specifications Common Balance Sheet or for a detailed descriptions EIOPA, Technical documentation of the methodology to derive EIOPA's risk-free interest rate term structures, EIOPA-BoS-15/035: https://eiopa.europa.eu/Publications/Standards/20180813_Technical%20Documentation%20%28RP%20methodology%20update%29.pdf

Country	Currency	Instrument	Credit risk adjustment (bps)	LLP	Convergence period	UFR
Euro area	EUR	Swap	10	20	40	4.05%
Liechtenstein	CHF	Swap	10	25	40	3.05%
UK	GBP	Swap	10	50	40	4.05%

5.16. The pre-stress inflation rates curve are based on zero-coupon break-even inflation swap rates for the EUR and GBP. The observed inflation swap rates are interpolated and extrapolated using the Smith-Wilson method. The target inflation is set at 2% for the EUR and GBP. The LLP and the convergence period are assumed to be the same as for the basic risk-free interest rate curve. No credit risk adjustment is applied. The inflation curve for CHF is set equal to 1% for all maturities as no inflation swap rate data are available.

5.17. The government bond stresses are expressed as changes in the 1, 2, 3, 5, 7, 10 and 20-year yields. As a consequence, the stresses capture the combined effect of lower risk free interest rates and higher credit spreads over the risk-free interest rate. The spreadsheet included in the stress test package contains the changes in yields for maturities other than 1, 2, 3, 5, 7, 10 and 20 year. Bonds issued by municipalities and regional government, and such that are guaranteed by governments, shall be treated as government bonds of the corresponding jurisdiction. The yield change for bonds issued by supranational institutions should be assumed to be zero for all maturities.

5.18. The corporate bond stresses are expressed as changes in the yield. The corporate bond yield stresses should be assumed equal for all maturities. Participating IORPs should apply the corporate bond stresses to corporate bonds issued by companies in all countries in all currencies.[44] The stresses corresponding to the rating CCC and lower should be used for unrated corporate bonds. The stress for residential mortgage backed securities (RMBS) should be applied to collateralised securities, loans and mortgages. It should be assumed that the value of "deposits other than cash equivalents" is not affected by changes in the risk-free interest rate and credit spreads.

5.19. The 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.

5.20. The property stresses should be applied to direct/indirect and listed/unlisted real estate investments (including property held for own use). The property stresses contain shocks for REITs referring to different geographical locations. The REITs shocks should 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 (the relevant non-EU REIT shock should be applied in this case). In addition, shocks are provided for commercial and residential property in the EEA countries. The latter should be used for European direct property investments and unleveraged, indirect property investments by applying a look-through approach, distinguishing commercial and residential property investment by

[44] The underlying assumption is that risk-free interest rates for all currencies increase by the same amount, as depicted in Annex 1.

individual EEA country. Collateralised bonds issued by REITs (or other real estate companies) should be treated as RMBS.

5.21. The listed equity stresses contain shocks for the developed and emerging markets as well as the geographical components of the developed markets aggregate: EU, US and other. IORPs should apply the listed equity stresses - i.e. aggregate versus underlying components - which are most appropriate for their situation. The private equity shock should be applied to participations.

Simplifications

5.22. IORPs may use simplifications if the use of such simplifications does not have material consequences for the outcomes. The use of the simplifications and a description of the impact, which - where possible - should be quantified, need to be disclosed in the qualitative questionnaire.

5.23. It may be appropriate for IORPs to use the simplifications for the look-through approach (as referred to in Annex 3). These simplifications may be used in conjunction with one of the simplifications provided below aggregating the shocks to a lower level of granularity.

5.24. IORPs may use the aggregated stresses provided by ESRB if (part of) government bonds and/or (part of) corporate bonds are invested in line with the broad, market capitalisation weighted bond indices. I.e. there should not be a significant over- or underweighting of particular countries in the 'euro area'/ 'Europe' government bond basket or in market benchmarks. Similarly, there should not be a significant over- or underweighting of particular types of corporate bonds in the all corporate bonds basket nor of particular rating classes in the investment grade/high yield baskets or in market benchmarks.

5.25. The ESRB's adverse scenario provides aggregated stresses to observed yields on government bonds for the 1, 2, 3, 5, 7, 10 and 20-year maturities as well as on corporate bonds and residential mortgage-backed securities. The spreadsheet included in the stress test package provides the changes in government bond yields for all maturities. The yield shocks for corporate bonds and residential mortgage-backed securities should be assumed to be the same for all maturities.

5.26. IORPs may use the aggregate European shocks to commercial and residential property provided in Annex 2, if they invest in diversified, European and unleveraged portfolios of these types of property.

Second round effects on retirement income of three representative members

5.27. For this part of the DC exercise, IORPs are requested as a first step to complete the input data template. These input data relate to the features of three representative plan members, the asset allocation of the representative plan members' DC fund(s) during the accumulation phase, administrative costs and investment fees and charges and the typical pay-out method of the IORP.

5.28. Subsequently, IORPs should use the dedicated spreadsheet tool to calculate the impact of adverse scenarios on future retirement income of the representative plan members. Based on the IORPs' input, the tool will automatically evaluate the results for the representative members under the baseline and adverse market scenario. Scenario data and prescribed settings are all embedded in the spreadsheet tool. Outcomes are automatically collected and reported on three reporting sheets and appended to the input sheets in an output spreadsheet, which has to be submitted to the NSA.

5.29. The spreadsheet tool applies a stylised model of a DC plan and may not take into account all possible specificities. The spreadsheet tool allows for some specificities:

- IORPs that make material use of derivative hedging techniques can specify their own calculations of the instantaneous impact of the adverse market scenario on the values of derivative instruments for the representative members. Taking into account these user-specified effects on the value of derivative instruments, the spreadsheet tool will generate future retirement income in the adverse scenario.
- IORPs that make use of dynamic investment strategies can specify both pre-stress and post-stress asset allocations over the lifetime of the representative members.

If IORPs believe that the tool ignores other important features of the DC scheme, they are requested to communicate this through the qualitative/quantitative questionnaire.

Input template: input data to be provided by IORPs

5.30. IORPs are asked to provide input data in the input template on the following topics:

- Three representative plan members;
- Asset allocation of DC fund(s) held by these members;
- Costs and charges;
- Typical pay-out method.

Representative plan members

5.31. IORPs are asked to provide data for three representative plan members which - at the reference date - are respectively (1) 35 years before the expected retirement date, (2) 20 years before the expected retirement date, and (3) 5 years before the expected retirement date. Some characteristics of the plan members are prescribed by the exercise, whilst for other characteristics IORPs are asked to provide data in respect of members to best represent the characteristics of its member population.[45] IORPs that run more than one scheme with different characteristics (e.g. distinct schemes belonging to different sponsors) may consider only the most dominant or largest scheme in terms of assets or membership for the purpose of choosing the three representative plan members.

5.32. For each of the three representative plan members, the following characteristics are assumed in the analysis:

- Years to retirement, 35, 20 and 5 years respectively;
- Member has been a member of the IORP for its full working life;
- Member works full time;
- The member profile does not specify a gender.[46]

5.33. IORPs have to provide data for the following characteristics of the representative member:

[45] Since some characteristics are pre-specified, this implies that the "representative member" is not necessarily fully representative for the current member population. For example, in a young DC fund an old member is not representative for the population with respect to age. Still this member can be representative in other features like profession and career path, etc.

[46] The member is viewed as representative for member population and hence combines the characteristics of male and female members in the member population. For example the representative current salary of the member can be set at a representative level by the (weighted) average of salaries of the male and female members.

- The expected retirement age. The expected retirement age is the best estimate of the age of retirement and is specified by the IORP. It is advised to set the expected retirement age in accordance with the national pension age, but the IORP can deviate from this based on e.g. actual member choice or IORP experience. Note that this characteristic also determines the age of the representative plan members. I.e. if the expected retirement age is 65 and the representative plan member is 20 years before retirement then 'its' current age is 45.
- The market value of total assets in the three individual members' accounts at the reference date. This is based on an estimate provided by the IORP, taking into consideration that the assumption must be that the member has been a member of the IORP for its full working life. This can be estimated by comparing with account values of current members of similar age who have been a member of the IORP for their full working life. If such members do not exist, IORPs could approximate the account value of such members as follows: firstly, using the wage growth parameter from the stress test specifications, the IORP can make a backward projection of the member's wage. Secondly, using this backward projection of the wage, the IORP can proceed over time by allocating part of annual wages as contributions to the pension scheme and accrue it with annual return parameters from the stress test specification, taking into account the applied investment portfolio.
- A product name and optionally a profile name. This is to identify the specific DC arrangement assumed for the representative member.[47]
- Current salary expressed as gross annual earnings of the representative plan members in 2018. Salaries are assumed to grow with 1% above the level of price inflation in the economic scenario plus a career specific salary growth.
- Career specific salary growth profile. This is an estimate for the salary growth on top of general wage inflation, reflecting career development. The career salary growth profile is specified over the full life cycle of the member. A default value is provided based on the Member State specific annual (full-time) earnings by age group in 2014,[48] as published by Eurostat, where the intermediate ages have been linearly interpolated.[49]
- Pensionable income. This is the (part of) member salary over which pension contributions are made. By default it is equal to salary, but it can be capped and floored to obtain the pensionable income. Contributions are made only to the part of salary between the cap and floor. IORPs can specify whether a cap and/or floor apply and state their levels. IORPs may choose from either price or wage inflation when assuming indexation of caps and floor levels.
- The expected total contribution rate as a percentage of pensionable income. This needs to be specified per year until the retirement of the representative plan members. In many cases, the expected contribution rate can be kept the same as in 2018, but in some countries expected contribution rates may increase (or decrease) in future years and/or as members age. Supplementary insurance premia for insurances such as disability insurance should be excluded from the contributions.
- The investment mix over the life cycle of the representative members in the baseline and the adverse market scenario (see paragraph 4.34 ff. below).
- The instantaneous impact of the adverse market scenario on the value of any derivative instrument used for hedging purposes (see paragraph 4.44 ff. below).

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[47] A product name refers to the name of the product or DC fund. Some DC plans discriminate between different investment profiles, e.g. a defensive, neutral or offensive profile. The profile name can be used to indicate a specific investment profile that applies.

[48] Due to the absence of 2014 data, the default career growth for Greece is based on 2010 earnings data. The default career growth for Liechtenstein is based on (2014) earning data for Switzerland.

[49] The career wage growth is floored at zero for old age to adjust for sample selection effects due to early retirement of higher earners.

Asset allocation DC fund(s)

5.34. IORPs should specify the current and future asset allocation of the DC fund for the three representative plan members. If multiple investment options are provided to plan members, IORPs should specify for each example member the most representative asset allocation based on choice-architecture (defaults)/experience with the current member population.

5.35. In the case of a target-date fund or life-cycling fund the asset allocation will change over the years as the representative plan members get closer to retirement.

5.36. To facilitate this, the process is divided in two steps. First, the IORP specifies an Asset Menu of assets the plan invests in, describing the core features of these assets. Next, the IORP specifies in the Asset Allocation Table(s) the proportion of the account value that is allocated to these Assets. The IORP can specify the allocation per year-to-retirement to specify a complete life-cycle investment mix.

5.37. The asset types that can be specified in the Asset Menu are:

Asset types in Asset Menu
Listed Equities (developed markets (EU, US, other), emerging markets)
Real estate (EU, US, other) & unleveraged EU real estate (commercial, residential)
Alternatives (commodities, hedge funds, private equity)
Fixed-income by
- type (cash and deposits, government bonds (EU, non-EU), corporate bonds (total, non-financial, financial)
- duration
- Inflation-linked or nominal

5.38. Fixed-income investments are specified by type, duration and whether they are inflation-linked. Fixed-income investments are classified in the following broad types: cash and deposits, government bonds (EU and non-EU), corporate bonds (total, non-financial, financial). These types represent aggregated broad, market capitalisation weighted bond portfolios. Based on the type, a risk premium over the swap yield curve is applied. The duration of the bond is assumed constant over time. If the duration of the fixed-income portfolio changes over time, IORPs should define two (or more) government/corporate bond asset types with different durations. The duration of the overall fixed-income portfolio can be set to the desired length during the years until retirement by appropriately adjusting the asset allocation to these two (or more) bond types over time. For example, a decline in the duration of government bonds can be represented by decreasing the proportion of government bonds with a high duration and increasing the proportion of government bonds with a low duration.

5.39. The Asset Menu does not contain the entire universe of asset types. If the DC fund invests in an asset class which is not included in the menu, IORPs should specify an asset type which most resembles its risk-return characteristics. IORPs are requested to specify the "other" asset class in the description of the selected asset type. For example, collateralised fixed-income securities can be represented as corporate bonds with the description mentioning the name of the

asset category. In case of several different types of 'other investments', the IORPs should distinguish the different categories be specifying them as such explicitly, for example 'other investments - catastrophe bonds'.

5.40. It is possible that future asset allocations in target-date or life-cycling funds are not explicitly defined. Instead, the DC fund may be subject to a risk budget that is adjusted in line with the age of the plan member or the remaining years until retirement. Where future asset allocations are not explicitly defined, the IORPs is asked to provide the best estimate of future asset allocations.

5.41. The DC fund/investment option should be defined from the perspective of the plan members. For example, in the case of life-cycling or target-date investing, it is possible that the plan member moves through different assets/investment funds over the years with the asset allocation changing in line with his/her age to retirement. This should be specified by setting up the appropriate Assets in the Asset Menu and specifying a corresponding allocation to these assets via the Asset Allocation Table(s).

5.42. Asset allocations can be specified in Asset Allocation Tables for both the baseline and the adverse market scenario. The asset mix under the adverse market scenario is set equal to the asset mix in the baseline scenario, as the impact is assessed on the assets held at end December without any allowance for reactions to the stress. DC IORPs that employ a dynamic asset allocation strategy can specify post-stress asset allocations over the life-cycle of the representative plan members, if these are expected to be different from the pre-stress allocations.

5.43. In determining the asset allocation of the DC fund(s)/investment option(s) IORPs have to apply a look-through approach to investment assets (see Annex 3) and value assets on a market-consistent basis (see Annex 4).

Derivative hedging

5.44. IORPs can specify the immediate impact of any derivatives used for hedging purposes on the portfolio value of each of the three representative plan members following the adverse market scenario. IORPs have to make their own calculation of the impact of the stresses in the adverse market scenario, as set out below, on the value of derivative instruments used to hedge against equity, interest rate, spread and inflation risk. The combined effect will be added to the representative members' post-stress value of assets, i.e. the value of assets after accounting for the instantaneous impact of the adverse scenario.

Costs and charges

5.45. IORPs should provide best estimates of administrative costs and charges and investment costs and charges, excluding explicit and implicit transaction costs.[50] The best estimates of costs and charges will impact on 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.

5.46. Investment costs are all costs related to the custody and managing of the investments, excluding transaction costs. All other costs, excluding transaction costs, are labelled administrative costs. In cases where it is unclear whether a cost is an investment cost, then it is classified as an administrative cost.

[50] See EIOPA, EIOPA Report on Costs and charges of IORPs, EIOPA-BoS-14/266, 7 January 2015 for a description of 1) pension scheme / IORP costs (administrative costs), 2) investment costs and 3) explicit/implicit transaction costs: https://eiopa.europa.eu/Publications/Reports/EIOPA-BoS-14-266-Final_report_on_costs_and_charges_of_IORPs.pdf

5.47. The administrative costs and charges can be expressed as (a combination of) a:

- fixed annual cost which is assumed to grow with price inflation;
- annual percentage of the total asset value;
- percentage of contributions;
- percentage of final pension wealth.

5.48. The investment costs and charges can be expressed as (a combination of):

- annual percentage per asset
- annual percentage of the total asset value;
- percentage of gross annual return - a percentage of the gross annual return minus a threshold return. This cost is floored at zero.
- percentage of contributions;
- percentage of final pension wealth.

5.49. The IORP should apply a full look-trough approach in determining the amount of investment costs of the DC fund/investment option. The IORP should not only include costs charged by the IORP directly, but also costs charged by investment funds to which the DC fund has allocated assets, costs charged by a possible second layer of investment funds to which the first layer of investment funds has allocated assets, et cetera.

5.50. IORPs do not have to take into account explicit and implicit transaction costs related to the trading of financial instruments, if that is disproportionally burdensome.

Typical pay-out method

5.51. IORPs have to specify which is most representative for their DC scheme from a menu of possibilities. EIOPA will report on the different methods but the analysis will focus on showing two approaches which enable a consistent comparison to be made:

- A lump sum;
- A 'flat' real annuity (in real terms the annuity is flat, yet in nominal terms the annuity is increasing);

Spreadsheet tool: future retirement income in baseline and adverse scenario

5.52. The spreadsheet tool calculates the impact of the adverse scenario on pension outcomes for the three representative plan members based on the input data template completed by the IORP. The following outlines the main assumptions underlying the spreadsheet tool with respect to the baseline scenario, adverse market scenario and the calculations being performed.

Baseline scenario

5.53. The spreadsheet tool calculates accumulated assets at retirement and expected retirement income in a deterministic baseline scenario. The baseline delivers best estimate projections of pension outcomes and can be viewed as the 'median' or 'expectation' forecast. Subsequently, the impact of the adverse market scenario can be assessed by comparing the outcomes of this scenario with the baseline scenario.

5.54. The expected returns on the asset categories are based on the forward rates underlying the risk-free interest rate (spot) curves as at the end of December 2018 for the relevant currency. The expected returns for the different asset categories are calculated by adding the relevant (estimated) risk premium to the

appropriate risk-free forward rate at year t. The expected returns on inflation-linked bonds also depend on the forward rates implied by the inflation swap curve at the end of December 2018, since the principal of inflation-linked bonds is indexed with inflation. This approach ensures that:[51]

- Expected returns incorporate recent market information, i.e. the forward risk-free interest rates and inflation rates implied by the end-2018 spot curve;
- Expected returns following an adverse scenario can be determined in a consistent manner by adding the specified shocks to the risk-free interest rate and inflation curves in the baseline in order to obtain stressed spot and, subsequently, forward rates.

5.55. The calculation tool models bonds as zero-coupon with a time to maturity equal to the duration specified by the IORP. The expected return on a nominal bond with duration d in year t depends on the value of the bond at the beginning of that year and at the end of that year and, hence, on the yield of the bond at the beginning of the year (d-year forward rate + risk premium) and the yield at the end of the year ((d-1)-year forward rate + risk premium). However, since it is assumed that there is no term premium, the expected return on the bond is the same as the one-year risk-free forward rate in year t plus the risk premium. Similarly, the absence of an inflation risk premium or illiquidity premium means that the expected return on inflation-linked bonds is the same as on nominal bonds.

5.56. The risk premiums on government and corporate bonds are based on EIOPA estimates for long-term average spreads minus the costs of default/downgrade (or fundamental spread).[52] The fundamental spread is the part of the credit spread that does not constitute a compensation for risk. The risk premium on cash and deposits is assumed to be equal to zero.

5.57. The expected return on non-fixed income assets is determined by the one-year forward rate in year t plus the risk premium. The risk premium on non-fixed income assets is assumed to be equal to 3%.

[51] The same approach was followed in the DC part of the 2017 IORP Stress Test, the DC satellite module of the 2015 IORP Stress Test as well as in the 2015 quantitative assessment for the determination of the so-called Level B expected return on assets. See for the latter HBS.10.35-41 in EIOPA, Technical Specifications - Quantitative Assessment of Further Work on Solvency of IORPs, EIOPA-BoS-15/070v2, 11 May 2015.

[52] The spread data used for establishing the risk premium on government and corporate bonds can be found in the spreadsheet EIOPA-RFR_20181231_PD_COD in the zip-file Monthly Technical Information, December 2018 under the following link: https://eiopa.europa.eu/regulation-supervision/insurance/solvency-ii-technical-information/risk-free-interest-rate-term-structures
The long-term average spread for euro denominated government bonds (0.40%) is in cell L11 of the sheet [LTAS-Govts] assuming a 10-year maturity. The fundamental spread equals 30% of the long-term average spread, i.e. 0.12%, implying a risk premium of 0.28% (0.40% - 0.12%).
The long-term average spread for A-rated euro denominated financial corporate bonds (1.56%) is in cell G13 of the sheet [LTAS_Corps] and for A-rated euro denominated non-financial corporate bonds (0.86%) is in cell G20 assuming a 5-year maturity. The corresponding fundamental spreads for respectively financial and non-financial corporate bonds are in cells Y15 (0.55%) and Y55 (0.30%) of the [EUR] sheet, implying risk premiums for financial corporate bonds of 1.01% (1.56% - 0.55%) and non-financial corporate bonds of 0.56% (0.86% - 0.30%). Assuming that corporate bonds consists for 2/3 of financials and 1/3 of non-financials the overall risk premium amounts to 0.86% (= (2/3)x1.01% + (1/3)x0.56%).

Risk premiums in the baseline scenario	
Fixed income risk premium over risk-free interest rate	
Government bonds	28 bps
Corporate bonds (and other fixed-income excl. cash and deposits)	86 bps
- non-financial	56 bps
- financial	101 bps
Non-fixed income risk premium over risk-free interest rate	
Equities, property, alternatives and other non-fixed income	300 bps
Cash and deposits risk premium over risk-free interest rate	
Cash and deposits	0 bps

Adverse market scenario

5.58. The adverse market scenario is the same as the adverse scenario that was used by participants to assess the impact on the DC IORP's overall (investment) assets. However, the spreadsheet tool only makes use of aggregate shocks for sovereign bonds, corporate bonds and commercial/residential property.[53] I.e. the tool does not distinguish the detailed shocks for sovereign bonds, commercial and residential property for individual EEA countries. Moreover, the tool distinguishes shocks for financial and non-financial corporate bonds, but not for covered bonds or a further breakdown by individual credit steps (see overview table below).

5.59. The stresses are applied as permanent shocks to the baseline scenario, assuming that there is no change in long-term risk premiums on fixed-income and non-fixed income assets compared to the baseline scenario. This assumption is consistent with the aim of a stress test to assess events of low probability which are nonetheless considered to be plausible.

Overview of the adverse market scenario	
Interest rate stresses (absolute change in basic risk-free interest rate curve in bps)	
Maturity 1y	+80
Maturity 2y	+71
Maturity 3y	+62
Maturity 5y	+45

[53] Another simplifying assumption is that the spreadsheet tool expresses the government and corporate bond stresses as constant shocks to the credit spread over the risk-free interest rate curve. The shock to the spread on government bonds is determined as the shock to the 10-year yield minus the shock to the 10-year swap rate. The shock to the spread on corporate bonds is determined as the shock to the 5-year yield minus the shock to the 5-year swap rate.

Maturity 7y	+37
Maturity 10y	+25
Maturity 20y	+20
Maturity 30y	+15
Inflation curve stresses (absolute change in inflation curve in bps)	
Maturity 1y	+101
Maturity 2y	+58
Maturity 3y	+44
Maturity 5y	+37
Maturity 7y	+32
Maturity 10y	+23
Maturity 20y	+17
Maturity 30y	+18
Fixed-income stresses (absolute change in spread over risk-free interest rate in bps, all maturities)	
Government bonds EU	+81
Government bonds US	+140
Government bonds Other Developed Markets	+155
Government bonds Emerging Markets	+365
Corporate bonds	+128
Corporate bonds Non-Financial	+76
Corporate bonds Financial	+159
Property stresses (percentage change in the value of property measured in EUR/reporting currency)	
Real Estate EU	-38%
Real Estate US	-35%
Real Estate Other Developed Markets	-30%
Commercial unleveraged real estate (EU)	-30%
Residential unleveraged real estate (EU)	-20%
Equity (listed) stresses (percentage change in the value of listed equities in EUR/reporting currency)	
Equities EU	-38%
Equities US	-47%
Equities Other Developed Markets	-24%
Equities Emerging markets	-46%
Alternative investment stresses (percentage change in the value of alternatives in EUR/reporting currency)	

Private equity (unlisted)	-32%
Commodities	-47%
Hedge funds	-32%

5.60. The asset price shocks have most impact for members close to retirement, who have accumulated a lot of pension wealth. The instantaneous shocks applied to the current value of assets held by the representative members will have limited impact on young members or new members, who have accumulated little pension wealth to date. However, younger members are more exposed to the decline in long-term future investment returns as a result of the lower risk-free interest (forward) rates.

Impact of adverse scenario on future pension outcomes

5.61. The spreadsheet tool simulates future pension outcomes for the different representative members under the baseline and adverse market scenario. The simulations are conducted under the following assumptions

- The initial value of assets in the member account equals the pre-stress value of assets at the reference date of end December 2018. This initial value is provided by the IORP. This asset value is the final value for 2018 after accounting for contributions, returns and costs over 2018. The post-stress initial value will then equal the value of assets after taking into account the instantaneous effect of the adverse scenario and any immediate impact on derivative hedging positions, as specified by the IORP (see paragraph 5.44).
- Contributions are assumed to be paid into the DC funds until the retirement of the representative plan members. Contributions are based on the contribution rates provided by the IORP.
- Annual earnings grow with the overall nominal wage growth, consisting of price inflation, a real wage growth of 1%, and the age-specific career growth. Inflation rates are variables in the market scenarios and hence set accordingly. Default career growth profiles are provided by the tool. These can be overridden by the IORP (see above).
- The different asset classes generate gross investment returns during the simulation period. Interest rates and returns on different assets classes are specified in the baseline and adverse market scenario.
- The administration and investment costs charged to the DC fund are taken into account in calculating the annual increase in assets. The accumulated assets at retirement are reduced with any transaction costs levied on pension pay-outs.

5.62. Pension outcomes under the baseline scenario are compared with those under the adverse market scenario to measure the impact of the stress on pension outcomes.

5.63. Pension outcomes can be decomposed into different drivers by comparing with counter-factual scenarios and assumptions. For example, the impact of future contributions can be assessed by comparing the pension outcomes with and without future contributions. Similarly, the effect of costs can be assessed by comparing a simulation with costs against a simulation without costs.

Output spreadsheet: pension outcome measures

5.64. Pension outcomes are measured by replacement rates. A replacement rate is the retirement income at the start of the retirement period as a proportion of the final salary just before retirement.

5.65. Retirement income depends on the pay-out product used at retirement. Replacement rates are calculated automatically by the spreadsheet tool with respect to different pay-out options. In particular, the following pay-out options are considered:[54]

- A lump sum
- A flat real annuity

5.66. The replacement rate is calculated as

$$Replacement\ Rate = \frac{Pension\ wealth\ at\ retirement}{Final\ salary\ \times price\ of\ 1\ unit\ of\ payout}$$

where pension wealth is the total account value at retirement date, final salary is the salary in the year before retirement and the price of one unit of pay-out depends on the choice of pay-out option.

5.67. In case of a lump-sum pay out, the 'replacement rate' then simply measures the lump sum as a proportion of final salary.

5.68. To ensure consistent comparisons, pension outcomes are evaluated under 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.

5.69. The advantage of using this common indicator is that it provides comparable outcomes. Member States take different approaches to organising the decumulation phase for DC IORPs.[55] National social and labour law may be very prescriptive or may allow for plan member choice. Pay-out methods may range from life annuities, temporary annuities, variable annuities, programmed withdrawals to lump sum payments.

5.70. The pricing of the flat real annuity is based on the currency-specific risk-free interest rate curves and the country-specific life expectancy and mortality tables derived from the Eurostat population projections 2015.[56]

Qualitative/quantitative questionnaire

Extrapolating retirement income to IORP level

5.71. The questionnaire asks for data on the current members of the IORP, by broad age groups. This includes the number of members and the assets held in respect of the members of each age-group.

5.72. The results for the baseline and stressed scenarios are then used together with this aggregate member information to make estimates for the total future impact of the stressed scenario on the current scheme membership, assuming all members contribute until retirement. Current members will retire over the next 40 years or so, and will receive income from their accumulated savings over many years after retirement. So, although the stress test can produce some illustrative impacts, it is important to recognise that the impacts will be spread over many years.

[54] The output spreadsheet also shows the outcomes for a flat nominal annuity and variable nominal drawdown for illustration. The variable nominal drawdown pays a constant nominal amount during the decumulation phase depending on the expected return of a portfolio invested 25% in equities and 75% in risk-free bonds.

[55] See EIOPA, EIOPA's Fact Finding Report on Decumulation Phase Practices, EIOPA-BoS-14/193, 27 October 2014.

[56] Since the Eurostat projection does not contain Iceland and Liechtenstein, for both countries the life-expectancy and mortality tables are assumed to be equal to the tables of respectively Norway and Austria.

Features of the pay-out phase

5.73. The questionnaire also requests IORPs to provide information on the main features of the decumulation phase, in particular in relation to the typical pay-methods. The stress test only considers lump sums and flat real annuities and the additional information on the decumulation phase will allow for a comparison with actual pay-out practices.

Derivative hedging instruments and dynamic asset allocation strategies

5.74. IORPs are requested to specify through the questionnaire the aim and characteristics of derivative hedging instruments, if they included their own calculation for the instantaneous impact of the adverse market scenario on the value of derivatives in the representative members' portfolio. Moreover, IORPs should explain the nature of dynamic asset allocation strategies, if they included a separate asset allocation over the life-cycle of the representative plan member(s) in the adverse market scenario.

Annex 1: Overview of shocks in adverse market scenario[57]

Overview of stress test parameters in adverse market scenario			
Interest rate swap stresses (absolute change in basic risk-free interest rate curve in bps)			
Maturity 1y	+80		
Maturity 2y	+71		
Maturity 3y	+62		
Maturity 5y	+45		
Maturity 7y	+37		
Maturity 10y	+25		
Maturity 20y	+20		
Maturity 30y	+15		
Inflation swap curve stresses (absolute change in inflation curve in bps)			
Maturity 1y	+101		
Maturity 2y	+58		
Maturity 3y	+44		
Maturity 5y	+37		
Maturity 7y	+32		
Maturity 10y	+23		
Maturity 20y	+17		
Maturity 30y	+18		
Sovereign bond stresses (absolute change in yields in bps)[58]			
	Maturity[59]		
	2Y	5Y	10Y
Austria (AT)	+91	+77	+67
Belgium (BE)	+93	+92	+81
Bulgaria (BG)	+89	+86	+96
Cyprus (CY)	+130	+66	+91
Czech Republic (CZ)	+160	+136	+103
Germany (DE)	+76	+50	+30
Denmark (DK)	+88	+63	+36

[57] Please refer to the ESRB's adverse scenario for the full information: https://eiopa.europa.eu/Pages/Financial-stability-and-crisis-prevention/Occupational-Pensions-StressTest-2019.aspx.

[58] The yield change for bonds issued by supranational institutions should be assumed to be zero for all maturities.

[59] The spreadsheet included in the stress test package contains the changes in yields for maturities other than the ones mentioned here. Please refer to the ESRB's adverse scenario to see the shocks relating to other maturities. The yield changes for maturities exceeding 20 years have been set equal to the 20-year yield change.

Spain (ES)	+184	+210	+193
Finland (FI)	+84	+69	+54
France (FR)	+94	+86	+75
Greece (GR)	+185	+207	+195
Croatia (HR)	+75	+55	+35
Hungary (HU)	+240	+323	+347
Ireland (IE)	+155	+139	+123
Iceland (IS)	+49	+71	+51
Italy (IT)	+173	+200	+173
Liechtenstein (LI)	+49	+71	+51
Lithuania (LT)	+95	+107	+80
Luxembourg (LU)	+60	+58	+49
Latvia (LV)	+90	+112	+55
Malta (MT)	+112	+110	+101
Netherlands (NL)	+86	+70	+54
Norway (NO)	+34	+60	+37
Poland (PL)	+174	+211	+233
Portugal (PT)	+137	+216	+205
Romania (RO)	+119	+140	+79
Sweden (SE)	+92	+68	+54
Slovenia (SI)	+129	+127	+102
Slovakia (SK)	+105	+90	+89
United Kingdom (UK)	+210	+220	+165
United States (US)	+200	+196	+165
Other developed countries	+137	+182	+180
Emerging markets	+424	+433	+390
Corporate bond stresses - Non-financial (absolute change in yields in bps)			
AAA	+119		
AA	+120		
A	+121		
BBB	+146		
BB	+158		
B	+170		
CCC and lower	+183		
Corporate bond stresses - Financial (absolute change in yields in bps)			
AAA	+137		

AA	+143			
A	+204			
BBB	+260			
BB	+283			
B	+314			
CCC and lower	+349			
Corporate bond stresses - Financials, covered (absolute change in yields in bps)				
AAA	+124			
AA	+131			
A	+193			
BBB	+243			
BB	+268			
B	+292			
CCC and lower	+317			
Residential mortgage backed securities (RMBS) stress (absolute change in yield in bps)				
	AAA	AA	A	BBB
EU	+156	+176	+196	+240
US	+168	+192	+216	+269
Asia (other)	+143	+160	+176	+212
Real estate investment trust stresses (percentage change in the value of property)				
EU	-38%			
US	-35%			
Other	-35%			
Property stresses in EEA	**Commercial**	**Residential**		
Austria (AT)	-35%	-25%		
Belgium (BE)	-27%	-14%		
Bulgaria (BG)	-35%	-26%		
Cyprus (CY)	-28%	-15%		
Czech Republic (CZ)	-42%	-35%		
Germany (DE)	-31%	-20%		
Denmark (DK)	-29%	-18%		
Estonia (EE)	-35%	-25%		
Spain (ES)	-34%	-24%		
Finland (FI)	-27%	-12%		

France (FR)	-30%	-17%
Greece (GR)	-23%	-6%
Croatia (HR)	-29%	-15%
Hungary (HU)	-45%	-42%
Ireland (IE)	-36%	-28%
Iceland (IS)	-30%	-20%
Italy (IT)	-27%	-11%
Liechtenstein (LI)	-32%	-21%
Lithuania (LT)	-33%	-24%
Luxembourg (LU)	-35%	-25%
Latvia (LV)	-33%	-23%
Malta (MT)	-32%	-21%
Netherlands (NL)	-35%	-25%
Norway (NO)	-45%	-30%
Poland (PL)	-28%	-14%
Portugal (PT)	-32%	-22%
Romania (RO)	-31%	-21%
Sweden (SE)	-35%	-27%
Slovenia (SI)	-33%	-23%
Slovakia (SK)	-31%	-19%
United Kingdom (UK)	-24%	-20%
Equity (listed) stresses (percentage change in the value of equities)		
Equities EU	-38%	
Equities US	-47%	
Equities Other Developed Markets	-24%	
Equities Emerging markets	-46%	
Alternative investment stresses (percentage change in the value of alternatives)		
Private equity (unlisted)	-32%	
Commodities	-47%	
Hedge funds	-32%	

Annex 2: Simplified stresses for sovereign bonds, corporate bonds, RMBS and commercial/residential property in adverse market scenario

Simplified stress test parameters for government bonds, corporate bonds, RMBS and commercial/residential property			
Sovereign bond stresses			
	Absolute change in yields by maturity[60] in bps		
	2Y	5Y	10Y
Eurozone	+113	+110	+93
Europe	+128	+129	+106
US	+200	+196	+165
Other developed markets	+137	+182	+180
Emerging markets	+424	+433	+390
Corporate bond stresses - All corporate bonds			
	Absolute change in yields in bps		
AAA	+127		
AA	+131		
A	+173		
BBB	+216		
BB	+236		
B	+259		
CCC and lower	+283		
Investment grade	+162		
High yield	+271		
All	+204		
Corporate bond stresses - Non-financial corporate bonds			
	Absolute change in yields in bps		
Investment grade	+126		
High yield	+177		
All	+145		
Corporate bond stresses - Financial corporate bonds			
	Absolute change in yields in bps		
Investment grade	+186		

[60] The spreadsheet included in the stress test package contains the changes in yields for maturities other than the ones mentioned here. Please refer to the ESRB's adverse scenario to see the shocks relating to other maturities. The yield changes for maturities exceeding 20 years have been set equal to the 20-year yield change.

High yield	+332
All	+241
Corporate bond stresses - Financial, covered bonds	
	Absolute change in yields in bps
Investment grade	+173
High yield	+305
All	+224
Residential mortgage-backed securities stresses - All regions	
	Absolute change in yields in bps
AAA	156
AA	176
A	196
BBB	240
Property stresses (percentage change in the value of property)	
Real Estate EU	-38%
Real Estate US	-35%
Real Estate Other Developed Markets	-30%
Commercial unleveraged real estate (EU)	-30%
Residential unleveraged real estate (EU)	-20%

Annex 3: Look-through approach

IORPs should apply a look-through approach to collective investment funds and other indirect exposures in order to achieve a comparable and transparent view of allocations to the different asset classes. A number of iterations of the look-through approach may be required where an investment fund is invested in other investment funds.

Where a collective investment scheme is not sufficiently transparent to allow a reasonable allocation of the investments, reference should be made to the investment mandate of the scheme. It should be assumed that the scheme invests in accordance with its mandate.

As a possible simplification, IORPs do not have to apply the look-through approach if over 90% of a collective investment fund or other indirect exposure is invested in one of the asset classes distinguished in the exercise. In that case IORPs may assume that the collective investment fund or other indirect exposure is fully invested in that asset class.

IORPs may use their own simplifications, if the use of such simplifications does not have a material impact on the outcome. For example, if 80% of a fund can be allocated to a specific asset class, the remaining 20% is qualified as 'residual investment fund' and subject to the most severe stress.

If it is not possible to apply a look-through approach by means of the look-through or mandate-based method, or if assets of the collective investment fund or indirect exposure allocated to one of the asset classes distinguished in exercise do not exceed 90%, and if the collective investment fund or indirect exposure does not qualify as ‘hedge funds', IORPs should categorise the collective investment fund or other indirect exposure as 'residual investment funds' and subject it to the most severe stress.

Annex 4: Market-consistent valuation

Investment assets shall be valued on a market-consistent basis in accordance with the general principles and valuation hierarchy below. A possible simplification for the calculation is to apply a formulaic simplified approach for the time value if the differences between the simplified approach and the approach in accordance with the general principles and valuation hierarchy are not considered to be material.

General principles

(1) Investment assets shall be recognised in conformity with the international accounting standards, as endorsed by the Commission in accordance with Regulation (EC) No 1606/2002.

(2) Valuation of investment assets shall be carried out in conformity with international accounting standards, as endorsed by the Commission in accordance with Regulation (EC) No 1606/2002 provided that those standards include valuation methods that are consistent with market-consistent valuation approach. If those standards allow for more than one valuation method, only valuation methods that are market-consistent can be used.

(3) Individual investment assets shall be valued separately.

Valuation hierarchy

(1) The use of quoted market prices in active markets for the same assets shall be the default valuation method, regardless of whether international accounting standards, as endorsed by the Commission in accordance with Regulation (EC) No 1606/2002 allow valuation methods that are market-consistent to follow a different valuation hierarchy.

(2) Where the use of quoted market prices for the same assets is not possible, quoted market prices in active markets for similar assets with adjustments to reflect differences shall be used.

(3) The use of quoted market prices shall be based on the criteria for active markets, as defined in international accounting standards, as endorsed by the Commission in accordance with Regulation (EC) No 1606/2002.

(4) Where the criteria referred to in paragraph 3 are not satisfied, IORPs shall, unless otherwise stated, use alternative valuation methods, other than those stated in the paragraph 2, provided that those methods are market-consistent.

(5) The use of alternative valuation methods shall make maximum use of relevant market inputs and rely as little as possible on IORP-specific inputs.

Annex 5: Mapping GICS sub-industries to NACE sections

Please note that this example reconciliation of Eurostat's NACE codes to GICS codes is only provided as a means of simplifying the application of the exercise.

It should not be construed in any way as authoritative mapping and may only be used for this specific stress test exercise. Further, this reconciliation has not been validated by MSCI or S&P Dow Jones Indices or Eurostat.[61]

	GICS sub-industry code	GICS sub-industry name
NACE SECTION A. AGRICULTURE, FORESTRY AND FISHING		
	15105010	Forest Products
	30202010	Agricultural Products
	30202030	Packaged Foods & Meats[62]
NACE SECTION B. MINING AND QUARRYING		
	10101010	Oil & Gas Drilling
	10101020	Oil & Gas Equipment & Services
	10102010	Integrated Oil & Gas[63]
	10102020	Oil & Gas Exploration & Production
	10102050	Coal & Consumable Fuels
	15104010	Aluminum[64]
	15104020	Diversified Metals & Mining
	15104025	Copper
	15104030	Gold
	15104040	Precious Metals & Minerals
	15104045	Silver
	15104050	Steel[65]

[61] The Global Industry Classification Standard ("GICS") was developed by and is the exclusive property and a service mark of MSCI Inc. ("MSCI") and Standard & Poor's, a division of The McGraw-Hill Companies, Inc. ("S&P"). Neither MSCI nor S&P, nor any of their respective affiliates nor any third party involved in making or compiling GICS or any GICS classifications (collectively, the "GICS Parties") makes any express or implied warranties or representations with respect to such standard or classification (or the results to be obtained by the use thereof), and all the GICS Parties hereby expressly disclaim all warranties of originality, accuracy, timeliness, completeness, merchantability and fitness for a particular purpose with respect to any of such standard or classification. Without limiting any of the foregoing, in no event shall any of the GICS Parties have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages with respect to any use of GICS or any GICS classifications, including but not limited to any use related to this example reconciliation. Without the prior written permission of MSCI or S&P, neither GICS nor any GICS classifications may be: (i) reproduced or disseminated in any form, (ii) used for any purpose (including but not limited to the creation any financial products or indexes) other than this specific stress test exercise and/or (iii) reverse engineered, decompiled, recompiled or disassembled from Eurostat's NACE codes or any other source or compilation of data.

[62] Sub-industry includes manufacturing of food products in NACE section C.

[63] Sub-industry includes manufacturing of refined petroleum products and chemical in NACE section C as well as storage and transportation in NACE section H.

[64] Sub-industry includes manufacturing of basic metals in NACE section C.

[65] Sub-industry includes manufacturing of basic metals in NACE section C.

NACE SECTION C. MANUFACTURING		
	10102030	Oil & Gas Refining & Marketing
	15101010	Commodity Chemicals
	15101020	Diversified Chemicals
	15101030	Fertilizers & Agricultural Chemicals
	15101040	Industrial Gases
	15101050	Specialty Chemicals
	15102010	Construction Materials
	15103010	Metal & Glass Containers
	15103020	Paper Packaging
	15105020	Paper Products
	20101010	Aerospace & Defense
	20102010	Building Products
	20104010	Electrical Components & Equipment
	20104020	Heavy Electrical Equipment
	20105010	Industrial Conglomerates
	20106010	Construction Machinery & Heavy Trucks
	20106015	Agricultural & Farm Machinery
	20106020	Industrial Machinery
	20201010	Commercial Printing
	20201050	Environmental & Facilities Services
	25101010	Auto Parts & Equipment
	25101020	Tires & Rubber
	25102010	Automobile Manufacturers
	25102020	Motorcycle Manufacturers
	25201010	Consumer Electronics
	25201020	Home Furnishings
	25201040	Household Appliances
	25201050	Housewares & Specialties
	25202010	Leisure Products
	25203010	Apparel, Accessories & Luxury Goods
	25203020	Footwear
	25203030	Textiles
	30201010	Brewers
	30201020	Distillers & Vintners
	30201030	Soft Drinks

	30203010	Tobacco
	30301010	Household Products
	30302010	Personal Products
	35101010	Health Care Equipment
	35101020	Health Care Supplies
	35201010	Biotechnology
	35202010	Pharmaceuticals
	45201020	Communications Equipment
	45202030	Technology Hardware, Storage & Peripherals
	45203010	Electronic Equipment & Instruments
	45203015	Electronic Components
	45203020	Electronic Manufacturing Services
	45301010	Semiconductor Equipment
	45301020	Semiconductors
NACE SECTION D.ELECTRICITY, GAS, STEAM, AIR CONDITIONING		
	55101010	Electric Utilities
	55102010	Gas Utilities
	55103010	Multi-Utilities
	55105010	Independent Power Producers & Energy Traders
	55105020	Renewable Electricity
NACE SECTION E. WATER SUPPLY AND WASTE MANAGEMENT		
	55104010	Water Utilities
NACE SECTION F. CONSTRUCTION		
	20103010	Construction & Engineering
	25201030	Homebuilding
NACE SECTION G. WHOLESALE AND RETAIL TRADE		
	20107010	Trading Companies & Distributors
	25501010	Distributors
	25502020	Internet & Direct Marketing Retail
	25503010	Department Stores
	25503020	General Merchandise Stores
	25504010	Apparel Retail
	25504020	Computer & Electronics Retail

	25504030	Home Improvement Retail
	25504040	Specialty Stores
	25504050	Automotive Retail
	25504060	Homefurnishing Retail
	30101010	Drug Retail
	30101020	Food Distributors
	30101030	Food Retail
	30101040	Hypermarkets & Super Centers
	35102010	Health Care Distributors
	45203030	Technology Distributors
NACE SECTION H. TRANSPORTATION AND STORAGE		
	10102040	Oil & Gas Storage & Transportation
	20301010	Air Freight & Logistics
	20302010	Airlines
	20303010	Marine
	20304010	Railroads
	20304020	Trucking
	20305010	Airport Services
	20305020	Highways & Railtracks
	20305030	Marine Ports & Services
NACE SECTION I-N. SERVICES		
	20201060	Office Services & Supplies
	20201070	Diversified Support Services
	20201080	Security & Alarm Services
	20202010	Human Resource & Employment Services
	20202020	Research & Consulting Services
	25301020	Hotels, Resorts & Cruise Lines
	25301040	Restaurants
	25302020	Specialized Consumer Services
	35103010	Health Care Technology
	35203010	Life Sciences Tools & Services
	40101010	Diversified Banks
	40101015	Regional Banks
	40102010	Thrifts & Mortgage Finance
	40201020	Other Diversified Financial Services

	40201030	Multi-Sector Holdings
	40201040	Specialized Finance
	40202010	Consumer Finance
	40203010	Asset Management & Custody Banks
	40203020	Investment Banking & Brokerage
	40203030	Diversified Capital Markets
	40203040	Financial Exchanges & Data
	40204010	Mortgage REITs
	40301010	Insurance Brokers
	40301020	Life & Health Insurance
	40301030	Multi-line Insurance
	40301040	Property & Casualty Insurance
	40301050	Reinsurance
	45102010	IT Consulting & Other Services
	45102020	Data Processing & Outsourced Services
	45102030	Internet Services & Infrastructure
	45103010	Application Software
	45103020	Systems Software
	50101010	Alternative Carriers
	50101020	Integrated Telecommunication Services
	50102010	Wireless Telecommunication Services
	50201010	Advertising
	50201020	Broadcasting
	50201030	Cable & Satellite
	50201040	Publishing
	50202010	Movies & Entertainment
	50202020	Interactive Home Entertainment
	50203010	Interactive Media & Services
	60101010	Diversified REITs
	60101020	Industrial REITs
	60101030	Hotel & Resort REITs
	60101040	Office REITs
	60101050	Health Care REITs
	60101060	Residential REITs
	60101070	Retail REITs
	60101080	Specialized REITs

	60102010	Diversified Real Estate Activities
	60102020	Real Estate Operating Companies
	60102030	Real Estate Development
	60102040	Real Estate Services
NACE SECTION O-U. OTHER, INCLUDING PUBLIC ADMINISTRATION		
	25301010	Casinos & Gaming
	25301030	Leisure Facilities
	25302010	Education Services
	35102015	Health Care Services
	35102020	Health Care Facilities
	35102030	Managed Health Care