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IORP Stress Test 2017

Specifications

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1. Introduction

Aim of the document

1.1. This document describes the specifications for the 2017 stress test for Institutions for Occupational Retirement Provision (IORPs). EIOPA developed the 2017 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 18 May 2017 and participating IORPs will have two months to complete the exercise until 13 July 2017.

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 distinguishes two possible objectives of such stress tests, assessing:

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

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

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.[3]

Macro-financial developments since the first stress test

1.4. EIOPA conducted its first stress test for IORPs in 2015. Based on end-2014 data, IORPs providing defined benefit (DB) or hybrid schemes were requested to assess the impact of two adverse market scenarios and one longevity scenario on their national balance sheet and the balance sheet using the common methodology, as prescribed by EIOPA. IORPs providing only defined contribution (DC) schemes were asked to calculate the effects of two instantaneous shock scenarios, two low return scenarios and a longevity scenario on expected retirement income of three representative plan members.[4]

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

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

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

[4] EIOPA, IORP Stress Test 2015 Specifications, EIOPA-BoS-15/072v2, 11 May 2015: https://eiopa.europa.eu/Publications/Surveys/EIOPA-BoS-15-072v2-Specifications_IORP_Stress_Test_2015.pdf

1.5. This first EIOPA stress test exposed risks and vulnerabilities of the occupational pensions sector in Europe.[5] The outcomes showed in aggregate substantial pre- and post-stress shortfalls when comparing assets and liabilities of the DB/hybrid IORP sector. Those shortfalls would have to be covered by future sponsor support and/or benefit reductions or by future investment returns in excess of the risk-free interest rates used for valuing both the national balance sheet, where applicable, and the common balance sheet. The results of the DC satellite module demonstrated that older plan members that are close to retirement are relatively more vulnerable to an instantaneous fall in asset prices, while younger DC members are more sensitive to the low return scenarios.

Figure 1: Risk-free interest rate term structure in 2015 IORP stress test and end-2016, EUR

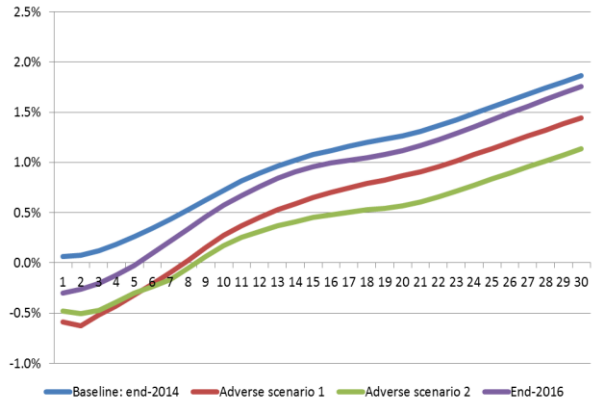


Figure 2: Risk-free interest rate term structure in 2015 IORP stress test and end-2016, GBP

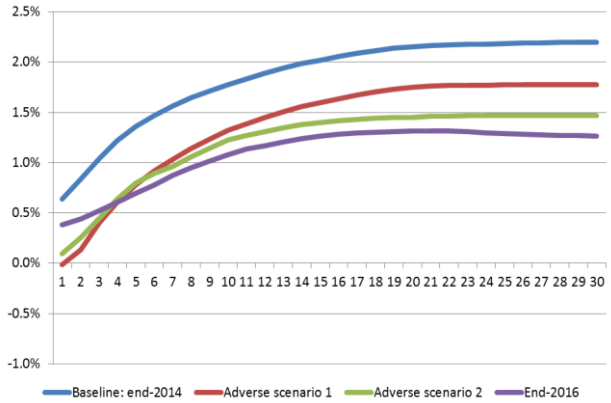
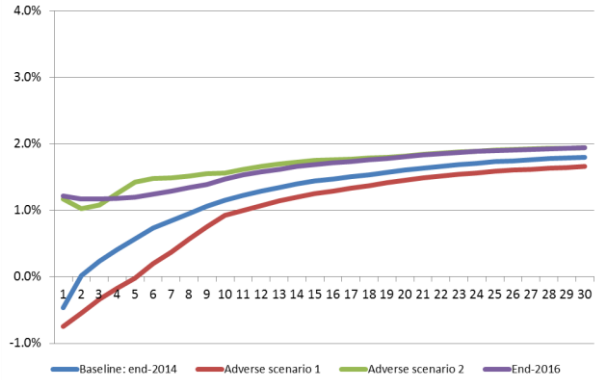
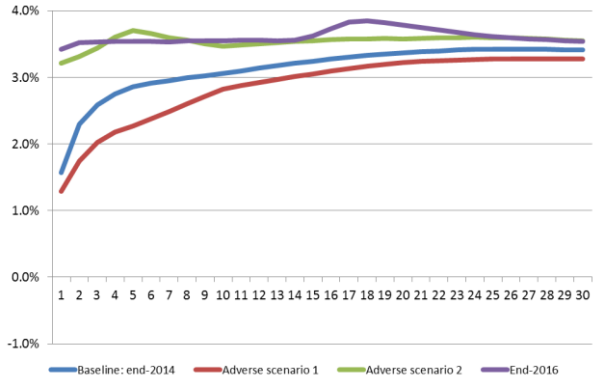


Figure 3: Break-even inflation swap curve in 2015 IORP stress test and end-2016, EUR



Source: EIOPA

Figure 4: Break-even inflation swap curve in 2015 IORP stress test and end-2016, GBP



Source: EIOPA

1.6. Since the last stress test, the external economic and financial environment for IORPs has remained challenging. Risk-free interest rates have decreased further between end-2014 and mid-2016 with a rebound towards end-2016

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

albeit interest rates have not reached end-2014 levels for the euro (Figure 1). The situation is more profound for the British pound as yield decreased further in mid-2016 in response to the results of the EU referendum in the UK (Figure 2). The decline in nominal interest rates has been accompanied by a rise in break-even inflation rates to levels comparable to the second adverse market scenario in the 2015 IORP stress test, implying an even more pronounced decline in real interest rates.

1.7. The lower risk-free interest rates in combination with narrowing credit spreads have resulted in higher bond prices. Also global equity prices have risen by almost 20% measured in euro and nearly 30% measured in GBP, reflecting the 10% depreciation of the pound vis-à-vis the euro since the last stress test.[6]

Motivation for the 2017 IORP stress test

1.8. To get an up-to-date view of the risks and vulnerabilities of the European occupational pensions sector, EIOPA has decided to conduct a second IORP stress test in 2017. The 2017 stress test will use end-2016 as the reference date, taking into account the impact of the macro-financial developments since the first stress test. The decline in interest rates and, in some member states, the rise in break-even inflation rates will have exerted upward pressure on liability values of DB/hybrid IORPs. The rise in bond and equity prices will have increased asset values of both DB/hybrid and DC IORPs.

1.9. The 2017 IORP stress test also allows analysing the impacts of an adverse market scenario provided by ESRB which reflects the ESRB's and EIOPA's up-to-date assessment of macro-financial risks and vulnerabilities of the IORP sector in Europe. Moreover, the new exercise can take into account changes in the exposure of IORPs to the various risk factors due to changes in asset allocations and hedging strategies over the past two years.

1.10. Finally, an important reason for EIOPA conducting a new stress test is to follow up on the conclusions provided in the 2015 IORPs stress test report to deepen the understanding of the second-round effects on financial stability and the real economy. The report highlighted the need to further assess how national prudential mechanisms absorb shocks over time and the consequences of the additional pressure put on sponsors to increase their future payments to secure benefits. 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.[7]

Objectives 2017 IORPs stress test

1.11. The 2017 IORP stress test has two main objectives:

- To assess the resilience of IORPs to an adverse market scenario, taking into account the available security (sponsor support and pension protection schemes) and benefit adjustment mechanisms;
- To analyse the second-round effects on the real economy and financial markets.

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[6] Between end-2014 and end-2016 the EUR appreciated vis-à-vis the GBP from 0.7789 GBP/EUR to 0.85618 GBP/EUR. Source: ECB.

[7] 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

Main features of the exercise

1.12. 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.

Adverse market scenario

1.13. The resilience of both DB/hybrid and DC schemes and the subsequent second round effects on the real economy and financial markets will be assessed using an adverse market scenario provided by the ESRB.[8]

1.14. 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 257 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.

1.15. The stress scenario combines a drop in risk-free interest rates with a fall in the price of assets held by IORPs ("double-hit" scenario). It has been designed for the harmonised valuation of DB and hybrid IORPs using a common balance sheet approach and the market valuation of assets of DC IORPs. EIOPA specified the assumptions for long-term risk premiums, which are needed for other components of the stress test.

Resilience of IORPs

1.16. 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. New in the 2017 exercise is that 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

1.17. 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 first stress test, the DB/hybrid-part of the exercise will analyse how the adverse market scenario impacts on sponsor support and pension benefits over time and affects sponsoring companies. The DC-part will assess the impact of the adverse market scenario on the assets of the IORP and on the retirement income of three representative plan members.

1.18. IORPs are large institutional investors with assets in the EEA amounting to EUR 3,573bn.[9] As such, IORPs may have a significant influence on financial markets through their investment behaviour. The data analysis of the 2008 financial crisis included in the 2015 IORPs stress test report showed differences in investment responses between IORPs, although it should be recognised that the

[8] See ESRB, Adverse scenario for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test in 2017, 23 March 2017.

[9] See EIOPA, 2016 Market development report on occupational pensions and cross-border IORPs, EIOPA-BoS-16/222, 10 March 2017.

analysis was limited and had a low statistical reliability. On an asset-weighted basis, IORPs tended to have a (slight) net stabilising effect by moderately buying equities during a falling stock market, implying counter-cyclical behaviour. Both the DB/hybrid and DC part of the exercise will address the expected investment behaviour of participating IORPs following the adverse market scenario.

Overview of the DB/hybrid part

Resilience of DB/hybrid IORPs

1.19. 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 the common balance sheet.

1.20. 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 Directive[10] 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.

1.21. 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 level 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.

1.22. IORPs will also 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.

1.23. 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 the standardised risk assessment, which was part of the recommended framework. A number of modifications were implemented in the technical specifications for valuing the common balance sheet, following the suggestions in the opinion as well as the lessons learned from the 2015 stress test exercise, including:

[10] This document still refers to the articles of the IORP Directive 2003/41/EC, although in the beginning of this year the IORP II Directive (EU) 2016/2341 of 14 December 2016 entered into force. The reason is that Member States still have some time to transpose the Directive into their national law by 13 January 2019. However, the articles referenced in this document have not changed materially in the recast IORP II Directive.

[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

- Mixed benefits are no longer distinguished as a separate category of non-unconditional benefits. Non-unconditional benefits do now comprise of conditional and discretionary benefits;
- Surplus funds do not have to be valued/reported;
- Security mechanisms and benefit reductions do not have to be valued/reported if IORPs dispose of sufficient financial assets to cover liabilities on the common balance sheet;
- The conditions for the balancing item approach to sponsor support have been enhanced. In order to qualify, IORPs that dispose of a sponsor with a sufficiently low default probability should also demonstrate the strength of the sponsor in terms of the maximum amount of sponsor support.
- A negative excess of assets over liabilities on the common balance sheet will not be possible. After valuing all items on the common balance sheet, and if no other balancing items are available, any remaining shortfall has to be covered by recognising a (higher) value for ex post benefit reductions;
- The risk margin should be set to zero for all IORPs with a negative excess of assets over liabilities. A new simplification for the risk margin has been introduced for IORPs that have a positive excess of assets over liabilities. The simplification depends on the regulatory own funds requirement in accordance with Article 17 of the IORP Directive and aims to prevent that IORPs would have to calculate an (hypothetical) SCR for a reference IORP.

Cash-flow analysis

1.24. The DB/hybrid part of the exercise will also include a cash-flow analysis that compares (the projected cash-flows for) the unconditional benefits and the current assets of the IORP in the baseline and the adverse scenario. [12] Such an analysis enables EIOPA to assess the extent to which current assets (i.e. excluding the future effects of security mechanisms) are sufficient to pay out the projected cash-flows for unconditional benefits (i.e. excluding future benefit reductions), taking into account the risk-free and/or expected returns on these assets. In contrast to the part of the DB/hybrid stress test in which the adverse scenario is applied to the national and common balance sheets, the cash-flow analysis does not require any valuation.

1.25. IORPs are only asked to report cash-flows for unconditional benefits.[13] Participants do not have to provide a projection of future asset cash-flows, like coupon payments and dividends on investments. The cash-flow analysis abstracts from issues like asset liquidity.

1.26. The limited cash-flow analysis in this year's stress test should be considered a first step towards a more comprehensive analysis, taking into account the mitigating effect of possible sponsor support and benefit reductions.

Analysis of second round effects

1.27. 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

[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

[13] 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.

sponsor support and benefit reductions over time and how it impacts on sponsors based on information provided by NCAs and IORPs.

1.28. The extent to which shocks are absorbed over time will depend on national prudential regimes, as mentioned above, as well as the features of the pension schemes. EIOPA will do a qualitative analysis of national prudential mechanisms and IORP-specific arrangements based on information provided by national supervisory authorities (NSAs) as well as IORPs through the qualitative questionnaire.

1.29. The analysis of the impact on sponsors will distinguish a quantitative and qualitative component. IORPs are asked to provide data on the strength of the sponsor(s), namely its annual earnings, book and market value. These measures of sponsor strength can be compared to the sponsor support values on the common balance sheet to get an impression of the affordability to the sponsor(s). The quantitative part will be supplemented by a qualitative analysis based on information provided by IORPs on the nature of the sponsor(s), existing national assessments of sponsor strength and the IORPs' assessment of sponsor strength in the valuation of sponsor support on the common balance sheet.

1.30. Besides the second round effects on the real economy, the DB/hybrid part of the stress test will also consider the effects of IORP's investment behaviour on financial markets. The aim is to analyse the short-term effects of buying/selling of securities in response to the adverse market scenario on financial markets as well as the longer term effects, assuming the adverse scenario and the implicit lower-for-longer interest rates are permanent. To that end, IORPs are asked to indicate expected adjustments to their asset allocation and possible other policy responses following the adverse market scenario. Moreover, IORPs are requested to provide asset allocation data for a couple of recent years, allowing EIOPA to compare forward-looking estimates with actual investment behaviour in the past.

Overview of the DC part

Resilience of DC IORPs

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

Analysis of second round effects

1.32. The analysis of DC IORPs' investment behaviour in response to the adverse scenarios will be similar as for DB/hybrid IORPs. DC IORPs will have to provide expected short-term and longer term changes to the asset allocation of the IORP or, if relevant, the largest (default) investment option following the adverse market scenario. These estimates will be supplemented with a qualitative assessment of changes in investment strategies and other policy responses and a quantitative comparison with historical changes in asset allocations.

1.33. The DC part of the stress test will also 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. The

fact that the balance sheet of DC IORPs is always in equilibrium does not mean that future pensions are not affected. [14]

1.34. 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.

Spreadsheet tool

1.35. DC IORPs will have to report their own calculations regarding the impact of the adverse scenario on overall investment assets. As in the 2015 IORP stress test, IORPs will be provided with a helper tool to assist with the calculations for assessing the impact of the stress scenario on retirement income of representative members. The tool was amended to take into account the lessons learned from the first stress test:

- In the new tool IORPs can provide their own calculations of the direct impact of the instantaneous shocks on the value of derivative instruments used for hedging purposes;
- In the new tool IORPs can specify different pre- and post-stress asset allocations over the life-cycle of the representative plan members, allowing them to take into account dynamic asset allocation strategies.

1.36. The tool also incorporates new life-expectancy/mortality tables based on 2015 Eurostat population projections (instead of 2013) and updated default career growth data based on 2014 Eurostat earnings data (instead of 2010). Moreover, four more asset categories have been added: non-financial corporate bonds, financial corporate bonds, EU commercial property and EU residential property. Finally, an additional functionally has been added, allowing IORPs to choose price/wage inflation - instead of the default of price inflation -for indexation of caps and floors on wage income to which contribution rates are applied.

Proportionality and simplifications

1.37. 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.

1.38. The number of adverse scenarios has been significantly reduced compared to the 2015 IORPs stress test. IORPs only have to assess the impact of one adverse market scenario compared to two adverse market scenarios and one

[14] 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."

longevity scenario in the DB/hybrid-part and two instantaneous shock scenarios, two low return scenarios and one longevity scenario in the DC-part of the 2015 stress test exercise.

1.39. The stress test does introduce some new elements compared to the 2015 exercise. In particular, this part of the stress test will include a rudimentary cash-flow analysis based on cash-flows for unconditional benefits to be provided by IORPs. Moreover, to analyse the absorption of shocks over time and the impact on sponsors, IORPs are requested to answer some qualitative questions and provide data on the strength of their sponsor(s).

1.40. As compared to 2015, the DC-part of the exercise will also assess the impact of the adverse market scenario on the IORPs' overall assets and the second round effects on financial markets.

1.41. The DB/hybrid stress test specifications, including the technical specifications for the valuation of the common balance sheet, still contain numerous simplifications which IORPs may use, if appropriate. Besides the simplifications included in the specifications, IORPs may use their own simplifications as long as this is proportionate to the nature, scale and complexity of the underlying risks.

1.42. The package relating to the DC-part of the stress test will again include a calculation tool that will in many cases 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.

Contents

1.43. This document contains the specifications for the 2017 IORP stress test and consists of three main sections:

- Section 2 provides a description of the scope of the stress test exercise and the coverage of the IORP sector that EIOPA is aiming for in the participating countries. Moreover, this section outlines the next steps following the stress test exercise and specifies the type of information that EIOPA will disclose and not disclose in the stress test report.
- Section 3 provides the stress test specifications for IORPs providing DB/hybrid pension schemes. The technical specifications for the valuation of the common balance sheet are included in the separate Annex to this document.[15]
- Section 4 provides the stress test specifications for IORPs providing DC plans.

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. 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.

[15] EIOPA, Annex to IORP Stress Test 2017 Specifications - Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017.

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 3, and
- IORPs providing DC schemes which are requested to report the information as specified in section 4.

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.

2.4. The reason is that the IORP sector in Europe is very diverse. IORPs may provide pension schemes ranging from DB schemes with full guarantees to pure DC with no guarantees at all. 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.

Coverage rate and participation

2.5. EIOPA's aim is to reach a coverage rate of IORPs of at least 50% of assets of the total IORP sector per country in the EEA.

2.6. NSAs will aim to achieve a representative sample of IORPs in their country, which includes both DB/hybrid IORPs and DC IORPs, where material.

2.7. NSAs may choose to distinguish between DB/hybrid IORPs and DC IORPs by aiming to reach a coverage rate of at least 50% of assets of the total DB/hybrid sector and 50% of members of the total DC sector in their country.

2.8. The IORP stress test will at least take place in EEA member states with material IORP sectors.

2.9. Material means, for the purpose of this section, that the sector exceeds EUR 500 million in assets by year-end 2015.

2.10. As a consequence, the stress test exercise will be conducted in at least 19 countries (AT, BE, CY, DE, DK, ES, FI, GR, IE, IT, LI, LU, NL, NO, PT, SE, SI, SK and UK).

2.11. The reporting templates of the stress test should be completed by the participating IORPs.

Questions and answers

2.12. 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.

2.13. 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.

2.14. 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

2.15. Participating IORPs will have to submit the reporting spreadsheets and word-templates to their NSA after completing the exercise, no later than 13 July 2017. The NSAs will validate the data submissions at the national level and will follow up with IORPs if inconsistencies are discovered.

2.16. The NSAs will submit the reporting spreadsheets and word-templates in a non-anonymised way to EIOPA by 22 August. 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.

2.17. The central validation team is expected to meet during the last week of August and again during the last week of 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.

2.18. 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

2.19. EIOPA expects to publish a report on the stress test outcomes by mid-December 2017. 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. EIOPA will not publish the names of the IORPs participating in the stress test exercise.

3. IORPs providing DB/hybrid schemes

3.1. 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).

3.2. 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 2017 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

[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

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

balance sheets and two stressed balance sheets. The stress test also includes a qualitative/quantitative questionnaire and an additional data request regarding cash flows.

Impact adverse scenario on national and common balance sheet

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

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

3.4. 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
	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)	

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

3.6. The stress scenario discussed in 3.22-3.35 does not provide information on the development of (unobserved) risk premia 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 premia on fixed and non-fixed income assets do not change in the stress scenario as compared to the baseline scenario.

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

Common balance sheet

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

3.9. 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.[18] EIOPA provides helper tabs to assist the calculations.

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

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

3.11. 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

[18] EIOPA, Annex to IORP Stress Test 2017 Specifications - Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017.

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.[19]

National and common balance sheet

3.12. The reference date for the valuation of the balance sheets is end December 2016. IORPs that do not dispose of (audited) data for the reference date should use a best estimate approach to valuation at that date.

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

3.14. 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. A number of iterations of the look-through approach may be required where an investment fund is invested in other investment funds.

3.15. 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.

3.16. 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 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.

3.17. 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.[20]

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

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[19] For more guidance on the allowance for IORP management actions, see paragraphs 2.4.26-31 of EIOPA, Annex to IORP Stress Test 2017 Specifications - Technical Specifications Common Balance Sheet, EIOPA-BoS-17/076v2, 18 May 2017.

[20] 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.

3.19. 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.

3.20. 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 option take-up behaviour of members and beneficiaries or sponsors in reaction to the stress scenario.

3.21. 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

3.22. 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 for maturities 2, 5 and 10 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;
- Real estate fund stresses for global, EU and non-EU 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;

3.23. The stresses defined under the scenario have been derived in a coherent fashion using the ECB's financial shock simulator.[21] 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.

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

3.25. The interest rate swap and inflation swap curve stresses - i.e. the absolute change to the end-2016 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.[22] The interest rate and

[21] 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.

[22] 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.

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).

3.26. The government bond stresses are expressed as changes in the 2, 5 and 10-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 2, 5 and 10 year.[23] The yield change for bonds issued by supranational institutions and government bonds issued by non-EEA countries should be assumed to be zero for all maturities. This implies that lower risk-free interest rates are exactly compensated by higher credit spreads on these bonds.

3.27. 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.[24] The stresses corresponding to the rating CCC and lower should be used for unrated corporate bonds. The stresses for financial corporate bonds (covered) 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.

3.28. 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.

3.29. 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 global REITs as well as its geographical components: EU and non-EU REITs. 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 (specifically, the non-EU REIT aggregate shock should be applied in this case). The global REITs stress will be suitable if real estate exposures follow a worldwide index. 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.

3.30. The listed equity stresses contain shocks for the developed and emerging markets aggregates 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.

[23] The yield changes between the 2-year and 5-year and between 5-year and 10-year maturities have been linearly interpolated. The yield change for 1-year maturities has been set equal to the 2-year yield change, the yield change for maturities exceeding 10 years has been set equal to the 10-year yield change.

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

Simplifications

3.31. IORPs may use simplifications if the use of such simplifications does not have material consequences for the outcomes and if the use of such simplifications is indicated in the qualitative questionnaire. If an IORP chooses to use a simplification, it shall use that simplification, if applicable, both for the national balance sheet and for the common balance sheet, and both for the unstressed and the stressed balance sheets.

3.32. IORPs may choose not to apply the look-through approach (as referred to in paragraph 3.14) if over 90% of a collective investment fund or other indirect exposure is invested in one asset category (from the asset categories distinguished in the stress scenario). In that case IORPs may assume that the collective investment fund or other indirect exposure is fully invested in that asset category. This simplification may be used in conjunction with one of the simplifications provided below aggregating the shocks to a lower level of granularity.

3.33. 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.

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

3.35. 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.

Qualitative/quantitative questionnaire

3.36. 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 effect of the adverse market scenario on the real economy and financial markets.

Absorption over time

3.37. EIOPA will assess in qualitative way to what extent sponsor support and benefit reductions can be smoothed over time in absorbing the adverse scenario. The analysis will be based on a questionnaire asking NSAs to specify national prudential/recovery mechanisms. This will be supplemented by some additional questions for IORPs relating to the features of their (national) discount rate and the characteristics of current or future recovery plans.

Impact on sponsors

3.38. 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.

3.39. 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. Book or net asset value of the sponsor (s) (only one measure required):
1. Shareholder funds of the sponsor(s) in its latest accounts
2. Other if deemed more appropriate (please specify)
III. Market value of the sponsor(s)
IV. Liabilities of the sponsor towards the IORP, as written in its balance sheet, if available.
V. Total balance sheet value of the sponsor(s)
VI. Total wages paid by the sponsor(s)

3.40. IORPs are asked to provide data for all six main categories of sponsor strength (i.e. item I to VI). 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 and only one metric for the book or net asset value of the sponsor under item II.

3.41. 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 six 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[25].

3.42. All IORPs recognising legally and/or non-legally enforceable sponsor support on the common balance sheet should provide the data. In consequence, IORPs with all types of sponsors are requested to report the information, be it a

[25] See paragraph 2.7.27 ff. in Annex to IORP Stress Test 2017 Specifications, Technical Specifications Common Balance Sheet.

private company/group, a subsidiary of a private company/group, a not-for-profit institution, multiple sponsors 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.[26]

3.43. 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. Other methods might be used if IORPs consider this more appropriate.

3.44. 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) then it can straightforwardly derive the information for the other two main categories using such ratios.

3.45. IORPs that are unable to provide data for one of the six 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.

Impact on investment behaviour and other potential actions

3.46. The stress test will assess the impact of the adverse scenario on investment behaviour of IORPs and other potential actions that would follow the adverse scenario. The questionnaire addresses both the short-term and the longer-term effects of the adverse scenario.

3.47. IORPs are requested to provide estimates of expected changes in the asset allocation within a year following the stress event. This will provide an indication to what extent IORPs will rebalance investment portfolios which would have a stabilising effect on financial markets and to what extent IORPs will reduce asset risk which would potentially have a destabilising effect. In addition, IORPs are asked to indicate the longer term effects on investment policy, hedging of interest rate risk and potential changes to the pension scheme/contract, assuming that the adverse scenario with lower-for-longer interest rates will persist.

3.48. The questionnaire also addresses the 2008 financial crisis and the 2008-2016 low-interest rate environment, allowing EIOPA to compare the expected short-term and longer term investment behaviour with actual behaviour in the past. To that end, IORPs are also requested to provide their historical asset allocations for the years 2007, 2008 and 2012.

[26] See also paragraph 2.7.26 in Annex to IORP Stress Test 2017 Specifications, Technical Specifications Common Balance Sheet.

Reporting template

3.49. The DB/hybrid-part of the stress test will include a cash-flow analysis that compares the projected cash-flows for the unconditional benefits (excl. future benefit reductions) and the current assets (excluding future sponsor support) of the IORP in the baseline and the adverse scenario, taking into account future investment returns. To allow EIOPA to perform such an analysis, IORPs are requested to provide only cash-flow projections for unconditional benefits.[27]

Cash-flow analysis

3.50. The DB/hybrid-part of the stress test will include a cash-flow analysis that compares the projected cash-flows for the unconditional benefits (excl. future benefit reductions) and the current assets (excluding future sponsor support) of the IORP in the baseline and the adverse scenario, taking into account future investment returns. To allow EIOPA to perform such an analysis, IORPs are requested to provide cash-flow projections for unconditional benefits.

3.51. The cash-flows for unconditional benefits (or equivalent[28]) should be derived using the technical specifications for the valuation of the common balance sheet. IORPs should distinguish between cash in-flows (i.e. future contributions), if relevant, and cash out-flows (future benefits and expenses).[29] The cash-flows for unconditional benefits 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 benefit are linked to inflation.

3.52. IORPs may use simplifications to reduce the burden of calculating and reporting the cash-flows for unconditional benefits, 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-2016 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 used national cash-flows or may not have used cash-flow at all in order to value the best estimate of technical provisions on the common balance sheet, 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.

[27] 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.

[28] 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.

[29] 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 2017 Specifications, Technical Specifications Common Balance Sheet.

4. IORPs providing DC schemes

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

4.2. 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 EIOPA's estimates of the overall effect on retirement income of the current members. Moreover, the information will support the analysis on the second round effects of investment behaviour on financial markets.

4.3. The reference date for the calculations and input data is end December 2016.

Impact of adverse scenario on overall assets

Market value of assets

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

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

4.6. 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.

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

4.8. 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.[30]

4.9. 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

4.10. 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 for maturities 2, 5 and 10 years;

[30] 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.

- 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;
- Real estate fund stresses for global, EU and non-EU 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;

4.11. The stresses defined under the scenario have been derived in a coherent fashion using the ECB's financial shock simulator.[31] 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.

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

4.13. 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.

4.14. The interest rate swap and inflation swap curve stresses - i.e. the absolute change to the end-2016 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, GBP and ISK.[32] 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).

4.15. 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-

[31] 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.

[32] 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.

term real interest rates. The table below summarises the approach used for deriving the basic risk-free interest rate curves for the relevant countries:[33]

Country	Currency	Instrument	Credit risk adjustment (bps)	LLP	Convergence period	UFR
Euro area	EUR	Swap	10	20	40	4.2%
Iceland	ISK	Government	10	8	52	4.2%
Liechtenstein	CHF	Swap	10	25	40	3.2%
UK	GBP	Swap	17	50	40	4.2%

4.16. 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 UFR 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 curves for the CHF and ISK are set equal to respectively 1% and 2.5% for all maturities as no inflation swap rate data are available.

4.17. The government bond stresses are expressed as changes in the 2, 5 and 10-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 2, 5 and 10 year.[34] The yield change for bonds issued by supranational institutions and government bonds issued by non-EEA countries should be assumed to be zero for all maturities. This implies that lower risk-free interest rates are exactly compensated by higher credit spreads on these bonds.

4.18. 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.[35] The stresses corresponding to the rating CCC and lower should be used for unrated corporate bonds. The stresses for financial corporate bonds (covered) 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.

[33] 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 2017 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, 22 December 2016: https://eiopa.europa.eu/regulation-supervision/insurance/solvency-ii-technical-information/risk-free-interest-rate-term-structures

[34] The yield changes between the 2-year and 5-year and between 5-year and 10-year maturities have been linearly interpolated. The yield change for 1-year maturities has been set equal to the 2-year yield change, the yield change for maturities exceeding 10 years has been set equal to the 10-year yield changes.

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

4.19. 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.

4.20. 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 global REITs as well as its geographical components: EU and non-EU REITs. 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 (specifically, the non-EU REIT aggregate shock should be applied in this case). The global REITs stress will be suitable if real estate exposures follow a worldwide index. 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.

4.21. The listed equity stresses contain shocks for the developed and emerging markets aggregates 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

4.22. IORPs may use simplifications if the use of such simplifications does not have material consequences for the outcomes and if the use of such simplifications is indicated in the qualitative questionnaire.

4.23. It may be appropriate for IORPs 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.

4.24. 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.

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

4.26. 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

4.27. 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.

4.28. 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.

4.29. The spreadsheet tool applies a stylised model of a DC plan and may not take into account all possible specificities. Taking into account the lessons learned from the 2015 IORP stress test exercise, some modifications were already made to the spreadsheet tool:

- 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

4.30. 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

4.31. 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.[36]

[36] 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.

4.32. 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 works full time;
- The member profile does not specify a gender.[37]

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

- 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.[38]
- A product name and optionally a profile name. This is to identify the specific DC arrangement assumed for the representative member.[39]
- Current salary expressed as gross annual earnings of the representative plan members in 2016. 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,[40] as published by Eurostat, where the intermediate ages have been linearly interpolated.[41]
- 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 2016, 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).

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[37] 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.

[38] This can be estimated by comparing with account values of current members of similar age.

[39] 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.

[40] 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.

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

- 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).

Asset allocation DC fund(s)

4.34. 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.

4.35. 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.

4.36. 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.

4.37. 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 (global, EU, non-EU) & 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

4.38. 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.

4.39. 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.

4.40. 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.

4.41. 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).

4.42. 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.

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

Derivative hedging

4.44. 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. To that end, IORPs have to make their own calculation of the impact of the stresses in the adverse market scenario, as specified in paragraph 4.58 ff. 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

4.45. IORPs should provide best estimates of administrative costs and charges and investment costs and charges, excluding explicit and implicit transaction costs.[42] 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

[42] 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

wealth into net final pension wealth, where "gross" excludes and "net" includes the effect of costs and charges.

4.46. 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.

4.47. 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.

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

- 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.

4.49. 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.

4.50. IORPs do not have to take into account explicit and implicit transaction costs related to the trading of financial instruments.

Typical pay-out method

4.51. 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;

Spreadsheet tool: future retirement income in baseline and adverse scenario

4.52. 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

4.53. 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 the this scenario with the baseline scenario.

4.54. 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 2016 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 2016, since the principal of inflation-linked bonds is indexed with inflation. This approach ensures that:[43]

- Expected returns incorporate recent market information, i.e. the forward risk-free interest rates and inflation rates implied by the end-2016 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.

4.55. 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.

4.56. 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).[44] 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.

4.57. 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%.

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[43] The same approach was followed in 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.

[44] The spread data used for establishing the risk premium on government and corporate bonds can be found in the spreadsheet EIOPA-RFR_20161231_PD_COD in the zip-file Monthly Technical Information, December 2016 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 (0.4%) 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. 0.1%, implying a risk premium of 0.3% (0.4% - 0.1%).

The long-term average spread for A-rated euro denominated financial corporate bonds (1.63%) is in cell G13 of the sheet [LTAS_Corps] and for A-rated euro denominated non-financial corporate bonds (0.89%) 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 (0.57%) and Y55 (0.31%) of the [EUR] sheet, implying risk premiums for financial corporate bonds of 1.06% (1.63% - 0.57%) and non-financial corporate bonds of 0.58% (0.89% - 0.31%). Assuming that corporate bonds consists for 2/3 of financials and 1/3 of non-financials the overall risk premium amounts to 0.9% (= (2/3)x1.06% + (1/3)x0.58%).

Risk premiums in the baseline scenario	
Fixed income risk premium over risk-free interest rate	
Government bonds	30 bps
Corporate bonds (and other fixed-income excl. cash and deposits)	90 bps
- non-financial	60 bps
- financial	110 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

4.58. 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.[45] I.e. the tool does not distinguish the detailed shocks for sovereign bonds, commercial and residential property for individual EEA countries. Moreover, the tool only includes shocks for financial and non-financial corporate bonds, but no further distinction covered bonds nor a further breakdown by individual credit steps (see overview table below).

4.59. 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	-35
Maturity 2y	-50
Maturity 3y	-55
Maturity 5y	-54
Maturity 7y	-53
Maturity 10y	-51

[45] 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 20y	-46	
Maturity 30y	-47	
Inflation curve stresses (absolute change in inflation curve in bps)		
Maturity 1y	-10	
Maturity 2y	-12	
Maturity 3y	-13	
Maturity 5y	-14	
Maturity 7y	-11	
Maturity 10y	-12	
Maturity 20y	-10	
Maturity 30y	-11	
Fixed-income stresses (absolute change in credit spread over risk-free interest rate in bps, all maturities)		
Government bonds	74	
- EEA	126	
- non-EEA	51	
Corporate bonds	142	
- non-financial	99	
- financial	163	
Property stresses (percentage change in the value of property measured in EUR/reporting currency)		
Global real estate investment trusts	-28%	
- EU	-41%	
- non-EU	-31%	
Commercial unleveraged real estate (EEA)	-9.1%	
Residential unleveraged real estate (EEA)	-6.2%	
Equity (listed) stresses (percentage change in the value of listed equities in EUR/reporting currency)		
Developed markets	-36%	
- EU	-48%	
- US	-24%	
- other developed	-37%	
Emerging markets	-27%	
Alternative investment stresses (percentage change in the value of alternatives in EUR/reporting currency)		
Private equity (unlisted)	-39%	
Commodities	-24%	

Hedge funds	-10%

4.60. 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

4.61. 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 2016. This initial value is provided by the IORP (see paragraph 4.33). This asset value is the final value for 2016 after accounting for contributions, returns and costs over 2016. 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 4.44).
- 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.

4.62. 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.

4.63. 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

4.64. 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.

4.65. 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:[46]

- A lump sum
- A flat real annuity

4.66. 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.

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

4.68. 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.

4.69. 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.[47] 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.

4.70. 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.[48]

Qualitative/quantitative questionnaire

Extrapolating retirement income to IORP level

4.71. 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.

4.72. 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.

[46] 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.

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

[48] 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 pay-out phase

4.73. 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

4.74. 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.

Second round effects on financial markets

4.75. The stress test will assess the impact of the adverse scenario on investment behaviour of IORPs. The questionnaire addresses both the short-term and the longer-term effects of the adverse scenario.

4.76. IORPs are requested to provide estimates of expected changes in the asset allocation of the IORP or, if relevant, the largest (default) investment option within a year following the stress event. IORPs that provide life-cycle or target date funds should indicate the expected changes on the aggregate allocation for members of all ages. These short-term estimates will provide an indication to what extent DC IORPs will contribute to stabilising or potentially destabilising financial markets during a stress event. IORPs are also asked to indicate the longer term effects on investment strategy as well as other policy responses under the assumption that the adverse scenario and the implicit lower-for-longer interest rates will be permanent.

4.77. The questionnaire also considers the 2008 financial crisis and the 2008-2016 low-interest rate environment, allowing EIOPA to compare the expected short-term and longer term investment behaviour with actual behaviour in the past. To that end, IORPs are also requested to provide the historical asset allocations of the IORP or the largest (default) investment option for the years 2007, 2008, 2012 and 2016.

Reporting templates

4.78. 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 part of 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;
- The word template for completing the remaining qualitative questions.

Annex 1: Overview of shocks in adverse market scenario

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	-35		
Maturity 2y	-50		
Maturity 3y	-55		
Maturity 5y	-54		
Maturity 7y	-53		
Maturity 10y	-51		
Maturity 20y	-46		
Maturity 30y	-47		
Inflation swap curve stresses (absolute change in inflation curve in bps)			
Maturity 1y	-10		
Maturity 2y	-12		
Maturity 3y	-13		
Maturity 5y	-14		
Maturity 7y	-11		
Maturity 10y	-12		
Maturity 20y	-10		
Maturity 30y	-11		
Sovereign bond stresses in EEA (absolute change in yields in bps)[49]			
	Maturity[50]		
	2Y	5Y	10Y
Austria (AT)	22	45	49
Belgium (BE)	50	53	46
Bulgaria (BG)	103	87	80
Cyprus (CY)	103	95	92
Czech Republic (CZ)	75	85	91
Germany (DE)	4	0	0

[49] The yield change for bonds issued by supranational institutions and government bonds issued by non-EEA countries should be assumed to be zero for all maturities. This implies that lower risk-free interest rates are exactly compensated by higher credit spreads on these bonds.

[50] The spreadsheet included in the stress test package contains the changes in yields for maturities other than 2, 5 and 10 year. The yield changes between the 2-year and 5-year and between 5-year and 10-year maturities have been linearly interpolated. The yield change for 1-year maturities has been set equal to the 2-year yield change, the yield change for maturities exceeding 10 years has been set equal to the 10-year yield change.

Denmark (DK)	37	54	51
Spain (ES)	116	111	109
Finland (FI)	17	46	48
France (FR)	31	44	47
Greece (GR)	548	509	489
Croatia (HR)	117	113	103
Hungary (HU)	242	283	169
Ireland (IE)	138	104	133
Iceland (IS)	36	51	49
Italy (IT)	153	135	130
Liechtenstein (LI)	30	41	41
Lithuania (LT)	69	158	163
Luxembourg (LU)	9	27	44
Latvia (LV)	95	101	109
Malta (MT)	69	81	82
Netherlands (NL)	27	40	48
Norway (NO)	24	30	33
Poland (PL)	145	138	119
Portugal (PT)	186	173	161
Romania (RO)	70	105	137
Sweden (SE)	38	53	53
Slovenia (SI)	65	58	104
Slovakia (SK)	63	69	72
United Kingdom (UK)	52	56	43
Corporate bond stresses - Non-financial (absolute change in yields in bps)			
AAA	32		
AA	35		
A	45		
BBB	50		
BB	342		
B	659		
CCC and lower	921		
Corporate bond stresses - Financial (absolute change in yields in bps)			
AAA	37		
AA	40		
A	109		

BBB	252	
BB	342	
B	659	
CCC and lower	921	
Corporate bond stresses - Financials, covered (absolute change in yields in bps)		
AAA	20	
AA	21	
A	38	
BBB	Na	
BB	Na	
B	Na	
CCC and lower	Na	
Real estate investment trust stresses (percentage change in the value of property)		
Global REITs	-28%	
- EU REITs	-41%	
- non-EU REITs	-31%	
Property stresses in EEA	**Commercial**	**Residential**
Austria (AT)	-10.2%	-9.1%
Belgium (BE)	-6.7%	-6.5%
Bulgaria (BG)	-13.3%	-10.9%
Cyprus (CY)	-10.5%	-5.7%
Czech Republic (CZ)	-3.2%	-2.1%
Germany (DE)	-6.8%	-6.5%
Denmark (DK)	-13.5%	-11.7%
Estonia (EE)	-13.5%	-6.4%
Spain (ES)	-8.7%	-6.4%
Finland (FI)	-6.5%	-4.8%
France (FR)	-7.8%	-4.8%
Greece (GR)	-8.0%	-7.8%
Croatia (HR)	-7.1%	-5.3%
Hungary (HU)	-6.9%	-4.3%
Ireland (IE)	-10.1%	-3.3%
Iceland (IS)	-9.1%	-6.2%
Italy (IT)	-7.1%	-5.8%
Liechtenstein (LI)	-9.1%	-6.2%

Lithuania (LT)	-11.1%	-9.4%
Luxembourg (LU)	-5.5%	-3.8%
Latvia (LV)	-10.0%	-6.6%
Malta (MT)	-8.8%	-4.3%
Netherlands (NL)	-7.7%	-5.2%
Norway (NO)	-9.1%	-6.2%
Poland (PL)	-12.9%	-8.7%
Portugal (PT)	-3.7%	-3.4%
Romania (RO)	-11.3%	-9.8%
Sweden (SE)	-13.1%	-11.7%
Slovenia (SI)	-10.8%	-5.4%
Slovakia (SK)	-13.2%	-5.7%
United Kingdom (UK)	-13.8%	-5.8%
Equity (listed) stresses (percentage change in the value of equities)		
Developed markets	-36%	
- EU	-48%	
- US	-24%	
- other developed	-37%	
Emerging markets	-27%	
Alternative investment stresses (percentage change in the value of alternatives)		
Private equity (unlisted)	-39%	
Commodities	-24%	
Hedge funds	-10%	

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

Simplified stress test parameters for government bonds, corporate bonds and commercial/residential property			
Sovereign bond stresses			
	Absolute change in yields by maturity[51] in bps		
	2Y	5Y	10Y
Euro area	85	82	82
Europe	79	79	75
Corporate bond stresses - All corporate bonds			
	Absolute change in yields in bps		
AAA	28		
AA	39		
A	60		
BBB	106		
BB	342		
B	659		
CCC and lower	921		
Investment grade	30		
High yield	598		
All	41		
Corporate bond stresses - Non-financial corporate bonds			
	Absolute change in yields in bps		
Investment grade	36		
High yield	574		
All	207		
Corporate bond stresses - Financial corporate bonds			
	Absolute change in yields in bps		
Investment grade	110		
High yield	645		
All	222		

[51] The spreadsheet included in the stress test package contains the changes in yields for maturities other than 2, 5 and 10 year. The yield changes between the 2-year and 5-year and between 5-year and 10-year maturities have been linearly interpolated. The yield change for 1-year maturities has been set equal to the 2-year yield change, the yield change for maturities exceeding 10 years has been set equal to the 10-year yield changes.

Corporate bond stresses - Financial, covered bonds		
	Absolute change in yields in bps	
Investment grade	20	
High yield	Na	
All	20	
Property stresses	**Commercial**	**Residential**
Europe	-9.1%	-6.2%

Annex 3: Market-consistent valuation and look-through approach

Market-consistent valuation

Participants in the DC stress test have to value investment assets 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.

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.

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'.