EIOPA-BoS-15/072v2
11 May 2015

IORP Stress Test 2015

Specifications

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1. Introduction

Background

1.1. EIOPA is required, in cooperation with the European Systemic Risk Board (ESRB), to initiate and coordinate European stress tests of financial institutions. The EIOPA regulation distinguishes two possible objectives of such stress tests, assessing:

(1) the resilience of financial institutions to adverse market developments;

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

1.2. "EIOPA shall, in cooperation with the ESRB, initiate and coordinate Union-wide assessments[1] of the resilience of financial institutions to adverse market developments. To that end, it shall develop the following, for application by the competent authorities:

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

(b) common approaches to communication on the outcomes of these assessments of the resilience of financial institutions."[2]

1.3. "EIOPA shall, in consultation with the ESRB, develop criteria for the identification and measurement of systemic risk and an adequate stress testing regime which includes an evaluation of the potential for systemic risk that may be posed by financial institutions to increase in situations of stress."[3]

IORP stress test

1.4. EIOPA has already conducted stress tests of insurance undertakings in 2011 and 2014.[4] This document describes the specifications for the 2015 stress test exercise for Institutions for Occupational Retirement Provision (IORPs), which EIOPA developed in cooperation with ESRB.

1.5. 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 core module for IORPs providing defined benefit (DB) or hybrid schemes and a satellite module for IORPs providing defined contribution (DC) schemes.

1.6. The main objective of the core module for DB/hybrid schemes is to analyse in a quantitative manner the resilience of IORPs to two adverse market scenarios. Moreover, the resilience of IORPs to an increase in life expectancy will be investigated.

1.7. Possible transmission mechanisms under the two adverse market scenarios will be evaluated through an accompanying questionnaire in which IORPs are

[1] 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. 32(2) EIOPA Regulation (EU) No 1094/2010.

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

[4] See for the results of the 2014 insurance stress test: EIOPA, EIOPA Insurance Stress Test 2014, EIOPA-BoS-14/203, 28 November 2014.

requested to provide an estimate of potential second round effects for the stress test scenarios of the national balance sheet.

1.8. The satellite module for DC schemes will assess the resilience of future retirement income of three representative plan members to adverse scenarios. The module considers two asset price shock scenarios, two low return scenarios and a longevity scenario.

1.9. The stress test exercise launches on 11 May 2015 and participating IORPs will have three months to complete the exercise until 10 August 2015. The stress test is undertaken in conjunction with the quantitative assessment of the further work on solvency of DB/hybrid IORPs. There is considerable overlap between the stress test and the quantitative assessment, in particular with regard to the valuation of the holistic balance sheet for IORPs providing DB/hybrid pension schemes. As a consequence, combining both exercises reduces the burden on participating IORPs as well as supervisory authorities. It should be emphasised though that both exercises have different objectives and will be reported on separately.

Resilience of IORPs to adverse market developments

1.10. EIOPA, in cooperation with the ESRB, is required to assess the resilience of IORPs to adverse market developments.

1.11. Stress tests for other financial institutions, like insurance undertakings and credit institutions often have a similar objective. These stress tests commonly assess whether financial institutions have sufficient (risk-weighted) capital/own funds to withstand an adverse market scenario. Insolvency of an insurer or bank implies that the institution can no longer fulfil its obligations towards depositors, policy holders and/or other creditors. Insolvency of a part of the banking or insurance sector may imply risks to financial stability.

1.12. IORPs in many member states do not operate in the same way as insurance companies and so a different approach to assessing "resilience" and presenting the stress test is needed. Often IORPs' obligations are of a long-term nature and IORPs do not bear the (full) risks of commitments to members and beneficiaries, which in many instances means that IORPs cannot become insolvent, like banks and insurance companies.[5] The risks may be borne by (1) the IORP itself, but also by (2) the sponsoring employer, (3) the members and beneficiaries, and/or (4) pension protection schemes. A stress test framework for IORPs has to take into account the nature of these long-term obligations and all security and benefit adjustment mechanisms in order to achieve a proper view of the extent to which IORPs are able to withstand stressed market conditions. In addition, including the security and benefit adjustments recognises that IORPs may take a long-term approach to absorbing short-term losses through recovery plans, where permitted.

Core module: IORPs providing DB/hybrid schemes

1.13. First of all, the resilience of IORPs providing DB/hybrid schemes will be tested by assessing the impact on funding requirements under adverse scenarios. Prudential rules for IORPs, and hence funding requirements, are to a large extent determined by national regulation. The IORP Directive[6] lays down

[5] IORPs are subject to the regulatory own funds requirement in accordance with the IORP Directive when all risks are underwritten by the IORP itself instead of the sponsoring undertaking. In some countries - such as Sweden - this type of IORPs can become insolvent.

[6] Directive 2003/41/EC on the activities and supervision of institutions for occupational retirement provision.

minimum requirements with regard to the valuation of liabilities, the funding of technical provisions and regulatory own funds, which may be supplemented on the national level. Therefore, IORPs will have to apply the stress scenarios to their balance sheet using valuation standards in accordance with the national prudential regime.

1.14. 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 interpretation of outcomes will very much depend on the design of national IORP systems and the availability of security and benefit adjustment mechanisms.

1.15. The resilience of IORPs providing DB/hybrid schemes will also be assessed using the holistic balance sheet valued on a market-consistent basis. A common valuation standard - as opposed to national valuation standards - will provide a comparable view of the impact of the stress scenarios on IORPs in different member states. IORPs will only have to assess the impact of adverse scenarios on the value of assets and liabilities on the holistic balance sheet. The stress test framework does not include the calculation of a solvency capital requirement (SCR).

1.16. The holistic balance sheet will include all security and benefit adjustment mechanisms that are available to IORPs in the different member states. This will ensure a comprehensive assessment of the resilience of IORPs which does not consider the IORP in isolation, but which takes into account e.g. the support of sponsoring employers, pension protection schemes and members and beneficiaries in absorbing adverse scenarios.

1.17. The holistic balance sheet will also provide an assessment of the long-term sustainability of IORPs following a stress scenario. As all available security and benefit adjustment mechanisms are included, the balance sheet will provide a 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 are expected in the adverse scenarios.

Satellite module: IORPs providing DC schemes

1.18. Stress testing the resilience of IORPs providing DC schemes by assessing the impact of adverse scenarios on the institutions balance sheet would not yield meaningful outcomes. In DC schemes risks are borne by the plan members, which means that the IORP's balance sheet will by definition be in equilibrium.

1.19. The outcomes might even prove misleading from the perspective of members and beneficiaries. A particular stress scenario may increase the value of assets while at the same time decreasing the expected level of future retirement income. For example, a decline in interest rates will result in a higher value of fixed-income investments. Still, expected retirement benefits may end up lower, since the lower interest rates imply lower future returns on DC assets during the accumulation and pay-out phase.

1.20. A scenario type of analysis is most relevant for IORPs providing DC schemes if it considers the impact of adverse development on expected retirement income

of plan members.[7] Therefore, the DC satellite module will assess the impact of adverse scenarios on replacement rates, i.e. expected pension income as a proportion of final earnings - of some of the IORP's representative plan members. As a result, the DC satellite module is not assessing the resilience of the IORP, but rather the potential outcomes for members under various defined scenarios.

1.21. The DC satellite module provides an overview of the design characteristics of DC plans offered by IORPs across Europe. The robustness of design features is compared by assessing the effects of adverse scenarios on future retirement income of plan members in different DC plans. Furthermore, results from the DC satellite module can give insights in how risks are distributed over the member's life cycle and how DC plans connect to the pension pay out phase. The DC satellite module provides a stylized model of the behaviour of the DC plan. To facilitate a more comprehensive understanding of the outcomes, the DC satellite module is complemented with qualitative questionnaire to provide more background information.

Transmission mechanisms

1.22. Stress tests have direct relevance for financial stability through the direct and indirect financial linkages within the financial system.

1.23. The significance of direct linkages to other financial institutions is likely to be limited for IORPs. The most important reason is that the IORP Directive prohibits IORPs from borrowing.[8] IORPs are only allowed some borrowing for liquidity purposes and only on a temporary basis.[9] In addition, IORPs are not exposed to liquidity risk like banks. IORPs have long-term pension commitments which may usually not be redeemed in cash and only be transferred to other pension institutions under specific conditions. Instead, IORPs have large amount of assets and their investment behaviour may be a possible transmission channel of stress scenarios.

1.24. The stress test addresses potential transmission mechanisms relating to IORPs through the accompanying questionnaire. Participating IORPs are requested to provide an estimate of the impact on 1) the asset allocation, 2) total contributions, and 3) total pension benefits following the instantaneous stress scenarios, possibly as part of a recovery plan.

Simplifications

1.25. IORPs providing DB/hybrid schemes have to calculate the impact of two adverse market scenarios and a longevity scenario on the prudential balance sheet using national valuation standards and the holistic balance sheet using a market-consistent valuation. IORPs are requested to complete the stress test calculations on a best effort basis.

1.26. EIOPA has prepared simplifications with regard to the granularity of the stresses. IORPs may use other simplifications where appropriate, provided the use of such simplifications is indicated through the qualitative questionnaire. In

[7] This is also one of the main recommendations in International Organisation of Pension Supervisors (IOPS), Stress Testing and Scenario Analysis of Pension Plans, IOPS Working Paper on Effective Pensions Supervision No. 19, March 2014 which concludes 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."

[8] Article 18.2 of the IORP Directive 2003/41/EC.

[9] IORPs are also allowed to cover part of the solvency margin with subordinated loans in accordance with Article 17 of the IORP Directive.

particular, the stresses to the yields on government bonds distinguish between the various European countries. The credit spread stresses distinguish between non-financial corporate bonds, covered bonds and non-covered, financial corporate bonds as well as the various rating classes. The level of detail is only relevant if IORPs are over- or underweighting government bonds issued by particular countries and/or corporate bonds of a particular type/rating class, instead of investing in broad government and corporate bond indices (see paragraph 3.35).

1.27. The valuation of the holistic balance sheet has to be conducted in accordance with the technical specifications for the quantitative assessment of the further work on solvency of IORPs. This implies that IORPs may treat sponsor support, pension protection schemes or benefit reductions as a balancing item, provided that they meet the conditions put forward in the technical specifications. Moreover, IORPs may use the simplifications provided for in the technical specifications. For example, if cash-flows are not available or a calculation based on those cash-flows is considered too burdensome, the best estimate of technical provisions can be determined based on the duration of the corresponding obligations. IORPs may also use the simplifications that are provided to establish the risk margin based on the cost-of-capital approach, including the one that determines the risk margin as 8% of the best estimate of technical provisions.

1.28. IORPs providing pure DC plans will only have to provide a number of input variables, concerning the features of a number of representative plan members, information on current investments and costs and charges, the asset allocation of the representative plan members during the accumulation phase and the pay-out method that is most representative for the scheme. Based on the inputs provided by IORPs, EIOPA will calculate the expected replacement rates of the typical plan members under different scenarios. The spreadsheet tool is included in the stress test package to provide IORPs with insight in the outcomes for their DC scheme.

Contents

1.29. This document provides the specifications for the 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, which EIOPA will disclose and not disclose in the stress test report.
- Section 3 puts forward the stress test specifications for IORPs providing DB/hybrid pension schemes.
- Section 4 puts forward the specifications for the satellite module 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.

2.2. The IORP stress test framework consists of two parts:

- Core module for IORPs providing DB/hybrid schemes which are requested to perform the calculations as specified in section 3.
- Satellite module for IORPs providing DC schemes which are requested to report the information as specified in section 4.

2.3. EIOPA will not attempt to provide a definition of both types of IORPs in these stress test specifications. 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 this example makes clear there may be IORPs providing schemes where it is difficult to define at the European level whether the DB/hybrid-part or the DC-part of the stress test is most suitable.

2.4. Therefore, the national supervisory authorities (NSAs) will decide whether a participating IORP should complete the DB/hybrid stress test or the DC satellite module. 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.

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. The latter recognises that the DC satellite module will assess the impact of adverse scenarios on member outcomes rather than assets (and liabilities) on the IORP's balance sheet.

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 2013.

2.10. As a consequence, the stress test exercise will be conducted in at least 17 countries (AT, BE, CY, DE, DK, ES, FI, IE, IT, LU, NL, NO, PT, SE, SI, SK and UK)

Questions and answers

2.11. 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 holistic balance sheet and the accompanying spreadsheet templates/tools to the NSAs.

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

2.13. EIOPA will put in place a questions-and-answer procedure (Q&A) for both the stress test specifications as well as the technical specifications for the valuation of the holistic balance sheet, in conjunction with the quantitative assessment of the further work on solvency of IORPs. The aim of the Q&A procedure is to ensure consistency of responses to questions raised during the exercise. Q&A documents will be published on EIOPA's website, which will be updated once every week.

Validation

2.14. IORPs participating in the DB/hybrid exercise will have to submit the spreadsheets and word-templates to their NSA after completing the exercise, no later than 10 August 2015. IORPs participating in the DC satellite exercise should provide the completed reporting template, also by 10 August 2015. The NSAs will validate the data submissions and will follow up with IORPs if inconsistencies are discovered.

2.15. The NSAs will submit the spreadsheets and word-templates to EIOPA by 24 August. The data provided by individual IORPs will be validated at EIOPA to ensure consistency of outcomes between and within countries. Moreover, the validation team will analyse the data and prepare figures and tables for the stress test report.

2.16. The validation team working at EIOPA will refer any issues or questions with regard to the data to the relevant NSAs. The validation team will not directly contact the participating IORPs.

2.17. EIOPA has a process in place for ensuring confidentiality of all data[10] collected and stored by EIOPA. The data will only be used for the purpose of the IORP stress test exercise. A limited number of EIOPA staff and experts from NSAs will be granted access to the data, subject to strict confidentiality and security protocols. The data will not be accessible to staff/representatives of any other organisations.

Report

2.18. EIOPA expects to publish a report on the stress test outcomes by December 2015. 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. Core module: 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 IORPs providing 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 holistic balance sheet valued on a market-consistent basis. Subsequently, IORPs have to evaluate three instantaneous stress scenarios with respect to the two balance sheets: two adverse market scenarios and one longevity scenario. All in

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

all, IORPs have to calculate two unstressed balance sheets and six stressed balance sheets.

National and common balance sheet

3.3. The reference date for the valuation of the balance sheets is 31 December 2014. IORPs that do not dispose of (audited) data for the reference date should use a best estimate approach to valuation at that date.

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

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

3.5. 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.

3.6. The balance sheet and funding requirement(s) under the national prudential regimes also have to be reported as part of the quantitative assessment of the further work on solvency issues.

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

3.7. IORPs have to re-evaluate the national balance sheet and the funding requirements at the reference date after applying the three stress scenarios. The market risks in the two adverse market scenarios are calibrated to be occurring instantaneously and simultaneously, i.e. aggregation by means of a

correlation matrix is not necessary. The longevity scenario comprises an instantaneous, single-factor shock to life expectancy.

3.8. 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 scenarios 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.

3.9. 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 categories distinguished in the stress scenarios, possibly in conjunction with one of the simplifications provided below aggregating the shocks to a lower level of granularity. In that case IORPs may assume that the collective investment fund or other indirect exposure is fully invested in that asset category.

3.10. The two adverse market scenarios discussed in 3.26-3.38 do not provide information on the development of (unobserved) risk premiums on fixed and non-fixed income securities. In some countries the discount rate for the valuation of the technical provisions will be based on expected returns on assets or risk premiums. If relevant, IORPs should assume for the valuation of technical provisions that risk premiums on fixed and non-fixed income assets do not change in the two adverse market scenarios as compared to the baseline scenario.[11]

3.11. IORPs should contact their national supervisor for further guidance on assessing the impact of the stress scenarios on the national balance sheets.

Holistic balance sheet

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

3.13. The items on the holistic balance sheet should be valued on a market-consistent basis, i.e. using the basic risk-free interest rate curve (without volatility/matching adjustments). The technical provisions should include a risk margin using the cost-of-capital approach.

3.14. The holistic balance sheet corresponds to baseline scenario 1, excluding the Solvency Capital Requirement (SCR), of the quantitative assessment of the further work on solvency of IORPs. IORPs have to value the holistic balance sheet in accordance with the technical specifications for the quantitative assessment.[12]

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

[11] The same assumption has been used in the DC satellite module for the two instantaneous shock scenarios (see paragraph 4.34).

[12] See EIOPA, Technical Specifications - Quantitative Assessment of Further Work on Solvency of IORPs, EIOPA-BoS-15-070, 11 May 2015.

	Best estimate of technical provisions
Sponsor support	- unconditional benefits
- legally enforceable	- pure conditional benefits
- non-legally enforceable	- of which: ex ante benefit reductions *
	- mixed benefits
Pension protection scheme	- pure discretionary benefits
	- ex post benefit reductions *
	- 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)
* These benefit reduction items enter the holistic balance sheet with a negative sign.	

3.15. IORPs have to revalue the holistic balance sheet at the reference date after applying the three stress scenarios. The market risks in the two adverse market scenarios are calibrated to be occurring instantaneously and simultaneously, i.e. aggregation by means of a correlation matrix is not necessary. The longevity scenario comprises an instantaneous, single-factor shock to life expectancy.

3.16. The stressed basic risk-free interest rate curves and - if applicable - the stressed inflation curves should be applied to both the asset side and the liability side of the balance sheet. For example, changes in the risk-free interest rates will affect the value of liabilities, sponsor support, pension protection schemes and fixed-income securities, changes in the inflation curve will affect inflation-linked pension obligations, sponsor support and pension protections schemes covering such inflation-linked obligations and inflation-linked bonds. In addition to the effect of the stressed risk free interest rate and inflation curves, the value of fixed-income securities will be impacted by the changes in spreads (over the risk free interest rate curve) on government and corporate bonds in the adverse market scenarios. Finally, the values on the asset side of the balance sheet will be affected by the equity, real estate, alternative investments and the USD exchange rate stresses vis-à-vis the reporting currency.

3.17. Since the stress scenarios are to be considered instantaneous scenarios, no management actions may be assumed before/at the time of the stress in the valuation of the stressed balance sheet in addition to those management actions already assumed in the baseline holistic balance sheet. However, IORPs have to take into account future management actions in the valuation of the stressed balance sheet following the stress (see paragraph 3.22).

3.18. 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 scenarios 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.

3.19. 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.

3.20. 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 categories distinguished in the stress scenarios, possibly in conjunction with one of the simplifications provided below aggregating the shocks to a lower level of granularity. In that case IORPs may assume that the collective investment fund or other indirect exposure is fully invested in that asset category.

3.21. The revaluation of the holistic balance sheet IORPs should take into account the risk-mitigating effect of financial and insurance risk mitigation techniques on the value of these financial instruments and amounts recoverable from insurance contracts.

3.22. IORPs should take into account the direct as well as indirect effects of the stress scenarios on the best estimate of technical provisions and the value of security mechanisms. This includes a possible increase in the best estimate of 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. IORPs should also take into account the loss-absorbing capacity of the best estimate of technical provisions, sponsor support and pension protection schemes on the value of these items on the stressed balance sheet. In assessing the impact of loss-absorbency of the best estimate of technical provisions and security mechanisms, IORPs should take into account possible future management actions of the IORP.

3.23. The value of the risk margin should not change as a consequence of the stress scenario.

3.24. The approach taken to value the stressed holistic balance sheet, 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 balance sheet. IORPs can leave market volatilities unchanged in the stress test.

Stress scenarios

3.25. IORPs have to evaluate three instantaneous stress scenarios with respect to the national balance sheet as well as the holistic balance sheet. The two adverse market scenarios and the longevity scenario are described below.

Adverse market scenarios

3.26. ESRB, in cooperation with ECB and EIOPA, developed two macro-financial stress scenarios containing the most relevant market risk exposures of IORPs.[13] The variables included in the two adverse market scenarios are:

- 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;

[13] See ESRB, Scenarios for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test in 2015, 19 March 2015 for background, description and narrative of the two adverse market scenarios.

- Sovereign bond yield shocks for the EU countries for 2 and 10 year maturities;
- Corporate credit spread stresses (non-financial corporate) for rating classes AAA, AA, A, BBB, BB, B and lower and unrated;
- Corporate credit spread stresses (financial, unsecured) for rating classes AAA, AA, A, BBB, BB, B and lower and unrated;
- Corporate credit spread stresses (financial, covered bonds) for rating classes AAA, AA, A, BBB, BB, B and lower and unrated;
- Real estate fund stresses for global, EU and non-EU markets;
- Equity stresses for developed (EU, US, other) and emerging markets;

- Private equity, hedge fund and commodity stresses;
- Exchange rate stresses vis-à-vis the US dollar.

3.27. The two adverse market scenarios reflect EIOPA/ESRB's current assessment of risks to the financial system and the economy and the vulnerabilities of the IORP sector in the EU. The stresses defined under the scenarios have been derived in a coherent fashion using the ECB's financial shock simulator.[14]

3.28. The table below provides an overview of the size of the stresses to the variables in the two market scenarios.

3.29. The interest rate swap and inflation swap curve stresses - i.e. the absolute change to the end-2014 levels - are assumed to be the same for all countries participating in the stress test.[15] 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 stress test, i.e. DKK, EUR, GBP, NOK and SEK.[16] 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).

Overview of stress test parameters in adverse market scenarios

Stresses	**Adverse scenario 1**	**Adverse scenario 2**
Probability of occurrence over one-quarter horizon	<0.5%	<0.5%
Interest rate swap stresses (absolute change in basic risk-free interest rate curve in bps)		
Maturity 1y	-65	-54
Maturity 2y	-70	-58
Maturity 3y	-64	-59

[14] See Box 2 in ESRB, Scenarios for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test in 2015, 19 March 2015.

[15] The approach is (approximately) the same as in the 2014 insurance stress test, where the relative change in 1 plus the risk free interest rate for currencies other than the euro and for each maturity (t) was set equal to the relative change in 1 plus the risk free interest rate for the euro for the same maturity: $(1+rf(t)^{other}_{stressed}) = \frac{(1+rf(t)^{EUR}_{stressed})}{(1+rf(t)^{EUR}_{baseline})}(1+rf(t)^{other}_{baseline})$. This is equivalent to $\log(1+rf(t)^{other}_{stressed}) = \log(1+rf(t)^{other}_{baseline}) + \log(1+rf(t)^{EUR}_{stressed}) - \log(1+rf(t)^{EUR}_{baseline})$ or approximately $rf(t)^{other}_{stressed} = rf(t)^{other}_{baseline} + (rf(t)^{EUR}_{stressed} - rf(t)^{EUR}_{baseline})$.

[16] 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.

Maturity 5y	-58		-56	
Maturity 7y	-53		-60	
Maturity 10y	-45		-55	
Maturity 20y	-40		-70	
Maturity 30y	-42		-73	
Inflation swap curve stresses (absolute change in inflation curve in bps)				
Maturity 1y	-28		164	
Maturity 2y	*-56*		101	
Maturity 3y	*-57*		85	
Maturity 5y	-59		85	
Maturity 7y	-47		64	
Maturity 10y	-23		41	
Maturity 20y	-15		21	
Maturity 30y	-14		14	
Sovereign bond stresses (absolute change in 2-year and 10-year yields in bps)				
	2-year	10-year	2-year	10-year
Austria (AT)	3	48	21	61
Belgium (BE)	3	87	8	24
Bulgaria (BG)	62	110	118	57
Cyprus (CY)	109	109	0	0
Czech Republic (CZ)	32	121	32	26
Germany (DE)	0	0	0	0
Denmark (DK)	3	44	0	0
Spain (ES)	37	118	12	25
Finland (FI)	0	18	0	0
France (FR)	3	50	9	37
Greece (GR)	466	466	0	0
Croatia (HR)	91	119	0	58
Hungary (HU)	177	231	98	22
Ireland (IE)	39	131	1	2
Italy (IT)	145	146	3	0
Lithuania (LT)	106	248	0	2
Luxembourg (LU)	6	56	0	29
Latvia (LV)	63	155	0	1
Malta (MT)	37	113	2	11

Netherlands (NL)	1	14	0	0
Poland (PL)	150	211	28	0
Portugal (PT)	29	155	0	1
Romania (RO)	114	206	1	0
Sweden (SE)	2	16	0	0
Slovenia (SI)	30	121	0	0
Slovakia (SK)	17	94	24	71
United Kingdom (UK)	1	3	0	0
Corporate bond stresses - non-financial corporate (absolute change in credit spread over risk-free interest rate in bps)				
AAA	14		91	
AA	29		124	
A	51		127	
BBB	90		135	
BB	121		141	
B and lower	156		147	
Unrated	173		150	
Corporate bond stresses - financials - unsecured (absolute change in credit spread over risk-free interest rate in bps)				
AAA	17		134	
AA	36		130	
A	82		166	
BBB	251		337	
BB	359		441	
B and lower	498		579	
Unrated	560		639	
Corporate bond stresses - financials - covered bonds (absolute change in bps to credit spread over risk-free interest rate curve)				
AAA	33		123	
AA	41		142	
A	72		249	
BBB	91		313	
BB	116		398	
B and lower	139		472	
Unrated	150		512	
Property stresses (percentage change in the value of property)				
	In reporting	(In USD)	In reporting	(In USD)

	currency		currency	
Global real estate	-46%	(-35%)	-62%	(-63%)
- EU	-55%	(-46%)	-36%	(-37%)
- non-EU	-44%	(-)	-67%	(-)
Equity (listed) stresses (percentage change in the value of equities)				
	In reporting currency	(In USD)	In reporting currency	(In USD)
Developed markets	-43%	(-)	-13%	(-)
- EU	-45%	(-)	-33%	(-)
- US	-42%	(-30%)	-2%	(-4%)
- other developed	-43%	(-)	-13%	(-)
Emerging markets	-32%	(-18%)	-32%	(-33%)
Alternative investment stresses (percentage change in the value of alternatives)				
	In reporting currency	(In USD)	In reporting currency	(In USD)
Private equity (unlisted)	-42%	(-)	-38%	(-)
Commodities	-46%	(-35%)	+56%	(+53%)
Hedge funds	-27%	(-12%)	-8%	(-10%)
Currency stresses				
Reporting currency versus USD exchange rate	20% (a)		-2% (b)	
(a) Corresponds to a depreciation of the US dollar vis-à-vis the reporting currency. (b) Corresponds to an appreciation of the US dollar vis-à-vis the reporting currency.				

3.30. The government bond stresses are expressed as changes in the 2-year 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 and 10 year.[17] The yield change for bonds issued by supranational institutions and government bonds issued by non-EU 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.

3.31. The corporate bond stresses are expressed as changes in the credit spread over the risk-free interest rate. The spreadsheet included in the stress test package provides the corporate bond stresses expressed in terms of the change in the total yield, i.e. combining the effect of lower risk-free interest rates and higher credit spreads.[18] Participating IORPs should apply the corporate bond stresses

[17] The yield changes between the 2-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.

[18] The assumption is made that the changes in the credit spread - as reported in the Table - is the same for all maturities.

to corporate bond issued by companies in all countries in all currencies.[19] 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.

3.32. 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, which means that the effects of the depreciation of the USD (scenario 1) and appreciation of the USD (scenario 2) have already been incorporated. The Table also provides in parentheses the value changes of real estate, listed equity and alternatives measured in USD, if the particular stress variable was generated by the financial shock simulator in terms of USD.

3.33. The property stresses contain shocks for global real estate as well as its geographical components: EU and non-EU real estate. The global real estate stresses will be suitable if real estate exposures follow a worldwide index. In case of material over- or under-weighing of European real estate, the application of the EU and non-EU stresses will be more appropriate. The property stresses should be applied to direct/indirect and listed/unlisted real estate investments (including property held for own use). Similarly, 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.[20] 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.

3.34. The USD exchange rate stresses are the same for all currencies of member states participating in the stress test. I.e. the USD depreciates by 20% vis-à-vis all other currencies in scenario 1 and appreciates by 2% vis-à-vis all other currencies in scenario 2. The property, listed equity and alternative investment stresses already take into account the effects of the USD exchange rate shocks. IORPs should assess separately the impact of the USD exchange rate shocks on the value of USD-denominated fixed-income assets and USD derivative/hedging positions.

Simplifications

3.35. 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.

3.36. In particular, IORPs may use the aggregated stresses provided in the table below 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 covered/non-covered bonds in the corporate bonds (financials) basket nor of particular rating classes in the investment grade/high yield baskets or in market benchmarks.

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

[20] It is assumed that the "other" developed markets stresses equal the market capitalisation weighted average of the EU and US stresses.

3.37. The table below provides aggregated stresses to observed yields on government and corporate bonds for respectively 10-year and 5-year maturities. The spreadsheet included in the stress test package provides the changes in observed yields for other maturities.

3.38. IORPs which are not able to retrieve the modified duration of the aggregate government and corporate bond investments - in line with the broad indices below - may use the simplification in the last two columns of the table below. The simplification expresses the aggregate stresses as a percentage change in value, assuming a duration of 10 years for government bonds and 5 years for corporate bonds.

Simplified stress test parameters for government and corporate bonds				
	Adverse 1	**Adverse 2**	**Adverse 1**	**Adverse 2**
Sovereign bond stresses - 10-year maturity				
	Absolute change in observed yield in bps		Percentage change in value (modified duration = 10y)	
Euro area	85	14	-9%	-1%
Europe	75	11	-8%	-1%
Corporate bond stresses - total corporate bonds - 5-year maturity				
	Absolute change observed yield in bps		Percentage change in value (modified duration = 5y)	
Investment grade	56	143	-3%	-7%
High yield	156	181	-8%	-9%
Total	62	148	-3%	-7%
Corporate bond stresses - non-financial corporate - 5-year maturity				
	Absolute change in observed yield in bps		Percentage change in value (modified duration = 5y)	
Investment grade	4	74	0%	-4%
High yield	82	88	-4%	-4%
Total	11	75	-1%	-4%
Corporate bond stresses - financial corporate - 5-year maturity				
	Absolute change in observed yield in bps		Percentage change in value (modified duration = 5y)	
Investment grade	79	173	-4%	-9%
High yield	377	460	-19%	-23%
Total	82	176	-4%	-9%
Corporate bond stresses - financial (unsecured) - 5-year maturity				
	Absolute change in observed yield in bps		Percentage change in value (modified duration = 5y)	
Investment grade	82	171	-4%	-9%
High yield	377	460	-19%	-23%

Total	86	175	-4%	-9%
Corporate bond stresses - financial (covered bonds) - 5-year maturity				
	Absolute change in observed yield in bps		Percentage change in value (modified duration = 5y)	
Investment grade	15	197	-1%	-10%
High yield	71	383	-4%	-19%
Total	15	197	-1%	-10%

Longevity scenario

3.39. IORPs have to evaluate the impact of an instantaneous permanent decrease in mortality rates as a separate scenario. Allowance should be made for any longevity hedging by adjusting the longevity-related assets. EIOPA will be able to combine the longevity scenario with the adverse market scenarios by assuming that the longevity shock is statistically independent from the financial market shocks.

3.40. If longevity risk is considered to be immaterial, the IORP does not have to calculate the longevity scenario, while indicating in the reporting template that the risk is not material.

3.41. IORPs have to apply a stress to their mortality assumptions that results in an instantaneous permanent decrease of 20% in mortality rates for each age and each member or beneficiary where the payments of benefits (either lump sum or multiple payments) is contingent on longevity risk in the longevity scenario compared to mortality assumptions on the unstressed balance sheet at the reference date, where the mortality assumptions underlying the (unstressed) holistic balance sheet should contain a future trend in mortality rates.[21]

Longevity scenario	
Mortality rates for each age and each member and beneficiary	-20%

3.42. IORPs may calculate the longevity stress scenario based on the holistic balance sheet in accordance with the calculation of the SCR for longevity risk as described in the technical specifications for the quantitative assessment, including the provided simplification.

3.43. IORPs may use other simplifications if the use of such simplifications does not have material consequences for the outcomes and if the use of such simplifications is explained through the qualitative questionnaire

Qualitative questionnaire

3.44. The stress test framework includes a qualitative questionnaire which IORPs are requested to complete. The aim of the qualitative questionnaire is (1) to gather background information on the calculations performed, and (2) to gain insight

[21] The part of the stress test on the national balance sheet should be based on national valuation standards, which do not necessarily prescribe the inclusion of a trend in mortality rates in the valuation of technical provisions.

in possible transmissions in the adverse market scenarios to other parts of the financial sector and the real economy.

Reporting template

3.45. IORPs are asked to complete the information requested in the reporting spreadsheet. The same reporting spreadsheet will be used as for the quantitative assessment for the further work on solvency issues, as there is considerable overlap between both exercises. The balance sheet based on national valuation standards and the holistic balance sheet valued on a market-consistent basis have to be established for both exercises.

4. Satellite module: IORPs providing DC schemes

4.1. This section provides the specifications for the satellite module for IORPs providing DC schemes.

4.2. The reference date for the input data and calculations is 31 December 2014.

Overview: Reporting templates and spreadsheet tool

4.3. The aim of the DC satellite module is to assess the resilience of future retirement income of three representative plan members to adverse market scenarios and a longevity scenario.

4.4. The module follows a so-called top-down approach. IORPs are requested to provide EIOPA with input data through the reporting 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 DC scheme. Moreover, IORPs are asked to answer a number of qualitative questions.

4.5. EIOPA will assess the impact of adverse scenarios on future retirement income of the representative plan members using a dedicated spreadsheet tool. Based on the IORPs' input, the tool will automatically evaluate the DC plan for all representative members and scenarios. Outcomes are automatically collected and reported on reporting sheets. Scenario data and prescribed settings and data are all embedded in the spreadsheet tool.

4.6. The spreadsheet tool is included in the stress test package to allow IORPs to run the tool and gain insight in the outcomes for their DC scheme. IORPs do not have to report the results of the tool.

4.7. The spreadsheet tool applies a stylized model of a DC plan and does not take into account all specificities. Most notably, the tool does not consider derivative hedging of interest rate, inflation, equity, spread and longevity risk, which may materially impact the outcomes of the (instantaneous) market and longevity scenarios. IORPs are requested to report such specificities through the qualitative questionnaire. If IORPs believe that the tool ignores important features of the DC scheme, like derivative hedges, they may use their own models to produce calculations consistent with the stress test assumptions. Such IORPs are requested to contact their national supervisor.

Reporting template: input data to be provided by IORPs

4.8. IORPs are asked to provide input data through the reporting template on the following topics:

- Representative plan members;
- Asset allocation DC fund(s);
- Costs and charges;
- Typical pay-out method;
- Qualitative questions.

Representative plan members

4.9. 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 actual members to best represent the characteristics of its member population.[22]

4.10. For each of the three representative plan members, the following characteristics are prescribed by the exercise:

- Years to retirement, 35, 20 and 5 years respectively;
- Member has a single-person household and works full time;
- The member profile does not specify a gender.[23]

4.11. 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 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 individual accounts at the reference date. This is based on an estimate provided by the IORP.[24]
- A product name and optionally a profile name. This is to identify the specific DC arrangement assumed for the representative member.[25]
- Current salary expressed as gross annual earnings of the representative plan members in 2014. Salaries are assumed to grow with 1% above price inflation plus a career specific salary growth.
- Career specific salary growth profile. This is a salary growth on top of 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 2010, as

[22] 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.

[23] The member is viewed as representative for member population and hence combines the characterstics 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.

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

[25] 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.

published by Eurostat, where the intermediate ages have been linearly interpolated.[26]

- 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. Cap and floor levels are assumed to grow with price inflation.
- 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 2014, but in some countries expected contribution rates may increase (or decrease). 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. See 4.12 below.

Asset allocation DC fund(s)

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

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

4.14. To facilitate this, the process is divided in two steps. First, the IORP specifies an Asset Menu of assets where the plan invests in, describing the core features of these assets. Next, the IORP specifies in the Asset Allocation Table 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.

4.15. 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)
Alternatives (commodities, hedge funds, private equity)
Fixed income by
- type (cash and deposits, government bonds (EU, non-EU), corporate bonds)
- duration
- Inflation-linked or nominal

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

4.16. 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. These types represent aggregated broad, market capitalisation weighted bond portfolios. Based on the type, a risk premium over to the 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.

4.17. 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.

4.18. 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.

4.19. 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 an Asset Allocation Table.

4.20. 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 1).

Costs and charges

4.21. IORPs should provide best estimates of administrative costs and charges and investment costs and charges, excluding explicit and implicit transaction costs, which will impact on pension outcomes.[27]

4.22. 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 case it is unclear whether a cost is an investment cost, then it is classified as an administrative cost.

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

- fixed annual cost which is assumed to grow with price inflation;

[27] 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

- annual percentage of the total asset value;
- percentage of contributions;
- percentage of final pension wealth.

4.24. 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.

4.25. The IORP should apply a full look-trough approach in determining the amount of investment costs at the expense 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.

4.26. IORPs do not have to take into account explicit and implicit transaction costs related to the trading of financial instruments. However, IORPs are asked to provide an estimate of explicit/implicit transaction costs and the annual turnover of securities in the DC fund/investment option's portfolio through the qualitative questionnaire.

Typical pay-out method

4.27. IORPs have to specify which is most representative for their DC scheme considering the following possibilities:

- A lump sum;
- A flat nominal annuity;
- A flat real annuity;
- A variable nominal drawdown paying a constant nominal amount depending on the expected return of portfolio invested 25% in equities and 75% in risk-free bonds over the period up to the expected life time.

Qualitative questions

4.28. The DC stress test framework includes a qualitative questionnaire which IORPs are requested to complete. The aim of the qualitative questionnaire is to gather information on the IORP and its membership, design of the DC scheme in relation to other sources of pension income, contribution rates, accumulation phase and pay-out phase. A number of questions is directed at obtaining insight in specificities of the DC scheme which are captured by the spreadsheet tool.

Adverse markets and longevity scenarios

4.29. Four types of scenarios are relevant for the DC satellite module:

- Baseline scenario;
- Asset price shock scenarios;
- Low return scenarios;
- Longevity scenario.

Baseline scenario

4.30. The DC satellite module requires the calculation of accumulated assets at retirement and expected retirement income in a 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 instantaneous as well as low return scenarios can be assessed by comparing the outcomes in the adverse scenarios to the baseline scenario.

4.31. The baseline scenario will based on the following assumptions:

- Basic risk-free interest rate curve and inflation curves are derived from swap curves using the Smith-Wilson methodology including the Ultimate Forward Rate (UFR).
- Future interest rates follow forwards implied by the current yield curve at the end of 2014 (i.e. no term premium)
- Realised price inflation follows forwards implied by the inflation curve at the end of 2014 (i.e. no inflation risk premium)
- Sovereign bonds earn a risk premium over the risk-free rate of 0.3%, which is based on the long-term average spread on a basket of EU government bonds and after correcting for the expected losses due to default/downgrade.
- Corporate bonds (incl. other fixed-income categories) earn a risk premium over the risk-free rate of 0.9%, which is based on the long-term average spread on A-rated euro denominated corporate bonds and after correcting for the expected losses due to default downgrade.
- Equities and other non-fixed income assets, such as property and alternatives, earn a fixed equity risk premium of 3%.
- Cash and deposits earn a risk premium of 0%.

Baseline scenario risk-free interest rates, inflation rates and risk premiums	
Risk free rate and inflation	
Risk-free interest rate	Forwards risk-free interest rate curve
Inflation rates	Forwards inflation rate curve
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-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

Two instantaneous shock scenarios

4.32. These adverse scenarios emphasise the resilience of the DC scheme to short-term shocks. Financial market shocks will have most impact for members close to retirement, who have accumulated a lot of pension wealth. Shock resilience is also useful to analyse conversion risk and problems related to rebalancing.

4.33. These scenarios are based on the two instantaneous stress scenarios for the DB/hybrid core stress test exercise, excluding the USD exchange rate shock. The stresses defined under the scenarios have been derived in a coherent fashion assuming a simultaneous and instantaneous occurrence of the assumed shocks.

4.34. These stresses are applied as (permanent) shocks to the baseline scenario, i.e. by assuming that there is no change in long-term risk premiums on fixed income and non-fixed income assets compared to the baseline scenario (see overview table below). This assumption is consistent with the aim of a stress test to assess events of low probability which are nonetheless plausible.

Overview of instantaneous shock scenarios		
	Adverse 1	***Adverse 2***
Interest rate stresses (absolute change in basic risk-free interest rate curve in bps)		
Maturity 1y	-65	-54
Maturity 2y	-70	-58
Maturity 3y	-64	-59
Maturity 5y	-58	-56
Maturity 7y	-53	-60
Maturity 10y	-45	-55
Maturity 20y	-40	-70
Maturity 30y	-42	-73
Inflation curve stresses (absolute change in inflation curve in bps)		
Maturity 1y	-28	164
Maturity 2y	-56	101
Maturity 3y	-57	85
Maturity 5y	-59	85
Maturity 7y	-47	64
Maturity 10y	-23	41
Maturity 20y	-15	21
Maturity 30y	-14	14
Fixed-income stresses (absolute change in credit spread over risk-free interest rate in bps, all maturities)		
Government bonds	68	59
- EU	120	67
- non-EU	45	55
Corporate bonds	120	204
Property stresses (percentage change in the value of property measured in EUR/reporting currency)		

Global real estate	-46%	-62%
- EU	-55%	-36%
- non-EU	-44%	-67%
Equity (listed) stresses (percentage change in the value of listed equities in EUR/reporting currency)		
Developed markets	-43%	-13%
- EU	-45%	-33%
- US	-42%	-2%
- other developed	-43%	-13%
Emerging markets	-32%	-32%
Alternative investment stresses (percentage change in the value of alternatives in EUR/reporting currency)		
Private equity (unlisted)	-42%	-38%
Commodities	-46%	+56%
Hedge funds	-27%	-8%
Impact on long-term risk premiums		
Government bonds	0	0
Corporate bonds	0	0
Equities, property, alternatives	0	0
Cash and deposits	0	0

Two low return scenarios

4.35. The instantaneous shocks applied to the current value of fixed income and real assets will have limited impact on young members, who accumulated little pension wealth yet. Young members are more exposed to changes in long-term shocks in the level of investment returns, i.e. lower risk premiums. Hence, it is appropriate to complement the instantaneous scenarios with two scenarios where the long-term levels of return are stressed, rather than the asset values.

4.36. The permanent shocks to nominal interest rates and inflation rates are the same as in the two instantaneous stress scenarios. Instead of stressing the current values of fixed income and non-fixed income assets, the low return scenarios encompass a downward shift in risk premiums on these asset classes. The size of these downward shocks to risk premiums have been calibrated is such a way that the impacts are broadly equivalent to the impacts of the instantaneous stress scenarios.

4.37. The decline in risk premiums can be interpreted as a sensitivity analysis, recognising the high degree of uncertainty surrounding long-term projections of such variables.

Overview of long-term, low return stress test scenarios		
	Adverse 1	***Adverse 2***

Interest rate stresses (absolute change in basic risk-free interest rate curve in bps)		
Maturity 1y	-65	-54
Maturity 2y	-70	-58
Maturity 3y	-64	-59
Maturity 5y	-58	-56
Maturity 7y	-53	-60
Maturity 10y	-45	-55
Maturity 20y	-40	-70
Maturity 30y	-42	-73
Inflation curve stresses (absolute change in inflation curve in bps)		
Maturity 1y	-28	164
Maturity 2y	-56	101
Maturity 3y	-57	85
Maturity 5y	-59	85
Maturity 7y	-47	64
Maturity 10y	-23	41
Maturity 20y	-15	21
Maturity 30y	-14	14
Instantaneous stress on prices		
Government bonds (through credit spreads)	0	0
Corporate bonds (through credit spreads)	0	0
Equities	0	0
Property	0	0
Alternatives	0	0
Impact on long-term risk premiums (in bps)		
Government bonds	-25	-20
Corporate bonds (and other fixed income)	-20	-35
Equities, property, alternatives	-150	-100
Cash and deposits	0	0

Longevity scenario

4.38. Besides the adverse market scenarios, the impact of an adverse longevity scenario on future retirement income of the representative plan members will be analysed. The longevity scenario comprises an instantaneous and permanent decline in in mortality rates for each age and representative plan member. The longevity shock is assumed to be independent of the adverse market scenarios. The impact of the longevity scenario is calculated automatically by the spreadsheet tool.

Longevity scenario	
Mortality rates for each age and representative plan member	-20%

4.39. The longevity scenario will impact pension outcomes via the change in annuity prices and drawdown period. The impact of the longevity stress is obtained by comparing pension outcome measures under the baseline scenario and the longevity scenario.

Spreadsheet tool: impact of scenarios on future pension outcomes

4.40. The aim of the DC satellite module is to assess the impact of the market scenarios and a longevity scenario on future pension outcomes for the three representative plan members.

4.41. The spreadsheet tool simulates the DC scheme for the different representative members under different scenarios. Pension outcome measures are automatically calculated. 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 31 December 2014. This value is provided by the IORP (see paragraph 4.11). This asset value is the final value for 2014 after accounting for contributions, returns and costs over 2014.
- Contributions are continued 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 market scenarios.
- The administration and investment costs at the expense of 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.

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

4.43. A sensitivity analysis is conducted to assess by how much 1) contribution rates would have to be increased and 2) how many years retirement should be postponed in order to absorb the negative impact of the adverse scenarios on pension outcomes.

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

Pension outcome measures

4.45. 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.

4.46. 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:

- A lump sum
- A flat nominal annuity
- A flat real annuity
- A variable nominal drawdown paying a constant nominal amount depending on the expected return of portfolio invested 25% in equities and 75% in risk-free bonds over the period up to the expected life time.

4.47. 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.

4.48. The term 'replacement rate' is commonly not used in case of a lump-sum pay out. In that case the price of one unit of pay-out is just 1. The 'replacement rate' then measures the lump sum as proportion of final salary.

4.49. Pension outcomes are evaluated under the pay-out option as specified by the IORP (see paragraph 4.27). A disadvantage is that it is difficult to compare DC-arrangements that target different pay-out options

4.50. For comparison purposes, pension outcomes are also evaluated under the other standard pay-out options, such as a lump-sum-equivalent and annuity-equivalent basis.

4.51. An 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.[28] 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.

4.52. A disadvantage is that the income streams cannot be interpreted as expected retirement benefits. In particular, expected retirement benefits will be higher if assets are to some extent invested in risk-bearing securities instead of entirely in risk-free bonds.

4.53. The prices of all pay-out options are automatically calculated in the simulations on a market-consistent fair valuation basis. The valuation hence does not account for mark-ups.[29]

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

[29] Evidence suggests that the impact of mark-ups and non-competitive pricing is small. See e.g. the research on annuity money's worth ratio's in Cannon, E. and I. Tonks (2011) "Annuity Markets: Welfare, Money's Worth and Policy Implications",Netspar Panel Paper No. 24.

4.54. The pricing of annuity and drawdown pay-out options is based on country-specific life expectancy and mortality tables derived from Eurostat population projections 2013.

Annex 1: 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%, IORPs should categorise the collective investment fund or other indirect exposure as 'other fixed income' or 'other non-fixed income', whichever is most relevant.