METHODOLOGICAL FRAMEWORK FOR STRESS-TESTING IORPS

European Insurance and
Occupational Pensions Authority

Table of Contents

List of abbreviations

BS	Background survey
CBS	Common balance sheet
CFA	Cash flow analysis
CRA	Credit risk adjustment
DB	Defined benefit
DC	Defined contribution
DTA	Deferred tax assets
DTL	Deferred tax liabilities
EA	Euro Area
EBA	European Banking Authority
EEA	European Economic Area
ESA	European Supervisory Authority
ESMA	European Securities and Markets Authority
ESRB	European Systemic Risk Board
EU	European Union
HQLA	High-quality Liquid assets
IAIS	International Association of Insurance Supervisors
IBS	Investment behaviour survey
IORP	Institution for occupational retirement provision
IRR	Internal rate of return
LCR	Liquidity coverage ratio
LLP	Last liquid point
NBS	National balance sheet
NCA	National competent authority
OECD	Organization for Economic Cooperation and Development
PEPP	Pan-European Personal Pension product
PPS	Pension protection scheme
REIT	Real estate investment trust
RFR	Risk-free interest rate
RI	Retirement income
RMBS	Residential mortgage-backed securities
SPV	Special purpose vehicle
ST	Stress test
STS	Stock take survey
SVaR	Standardized value at risk
UCITS	Undertakings for the Collective Investments in Transferable Securities

1. Introduction

1.1. Background and purpose of the methodological paper

1. Stress testing frameworks have evolved considerably over the last few years and have become an increasingly important risk management instrument for the financial sector. Stress tests (STs) form an integral part of the financial risk management of individual institutions and have become a core tool for supervisors to identify and assess risks and vulnerabilities in the financial system. STs can provide additional insights and a forward-looking perspective on the risk and vulnerabilities of Institution for Occupational Retirement Provision (IORPs) that cannot be derived from the regular supervisory reporting.
2. EIOPA is mandated to conduct regular EU-wide ST exercises for the European IORP sector, in collaboration with the European Systemic Risk Board (ESRB). The stress testing mandate will be further elaborated on in chapter 2.
3. As part of the regular ST exercises, EIOPA is tasked with developing common methodologies for assessing the effect of adverse economic and financial scenarios on the European IORP sector, in cooperation with national competent authorities (NCAs). For each exercise, EIOPA can tailor specific elements of the ST according to the objectives and specific research questions formulated for that exercise. Currently, the methodology for EIOPA IORP STs is specified separately for each exercise in technical specifications.
4. Including the 2019 IORP ST, EIOPA has initiated and coordinated three Union-wide IORP STs. The tools and methodologies used have been constantly further developed to gain deeper insights into the resilience and vulnerabilities of the IORP sectors in Europe. The complexity of the different tools has reached a critical point in the 2019 exercise, where the financial situation of IORPs has been assessed based on national valuation frameworks and a common methodology, four variants of cash flow analyses, as well as an initial assessment of IORPs' exposure to climate related risks. In their feedback stakeholders have suggested to focus on main tools that proved to provide for relevant insights, rather than developing a number of different variants.
5. Furthermore, the analyses were differentiated between Defined Benefit (DB) and Defined Contribution (DC) IORPs, where in recent years, the dividing line between DB and DC pension obligations have become more and more blurred. This calls for analyses that can appropriately capture the characteristics of both DB and DC IORPs.
6. Given the growing complexity and the blurring line between DB and DC IORPs, having a toolbox of common methodological principles and guidelines agreed upon beforehand can greatly facilitate the ST process and guide efficient deployment of instruments. To that end, EIOPA has developed this paper setting out the main methodological elements and principles of and guidelines for an EU-wide IORP ST exercise. Applying EU-wide stress tests on the different national IORP sectors requires to deploy analytical tools that can be applied in a consistent and meaningful way to all scheme types. This is important to understand the effects of an adverse market development on the IORP sector, fairly reflecting on the different characteristics, which need to be addressed in the analysis of the stress test results.

7. The methodological elements and principles take into account the tools developed so far, the observed developments in the IORP sector that call for horizontal approaches, as well as EIOPA's obligation to deliver on its mandate, particularly on the assessment of the effects stemming from environmental risks. The document will serve as a reference point and tool-box, from which –in line with the specificities of the individual exercise– (an) appropriate approach(es) and corresponding tool(s) can be tailored. This informs and facilitates both the design and execution phases of EIOPA ST exercises, while leaving sufficient room for considerations about the design and specific objectives of the exercise at hand.
8. The methodological paper had been published for consultation with stakeholders from 22 June 2021 to 22 September 2021. All comments have been duly considered and, where necessary, the paper has been modified accordingly.

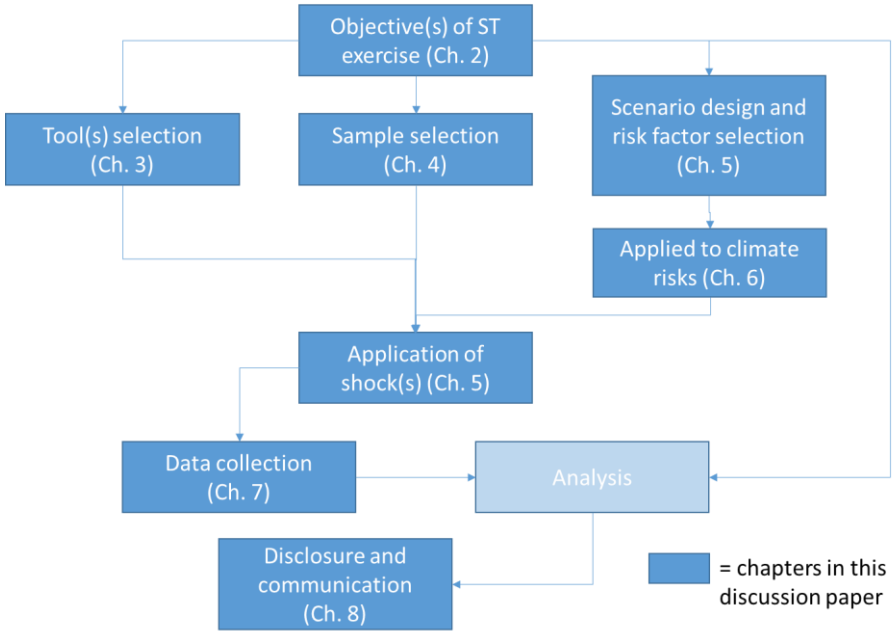
1.2. Scope of the methodological paper

9. Supervisory STs can be implemented through a top-down or bottom-up approach. This methodological paper focuses solely on bottom-up (institution-run) supervisory STs, which resemble the EU-wide IORP ST exercises conducted so far by EIOPA.
10. This methodological paper provides a comprehensive overview on the viable approaches and tools to define the main and discretionary elements of a bottom-up ST exercise from a methodological and theoretical perspective. It does not (extensively) cover procedural and operational elements, such as the governance of a ST exercise or the necessary cooperation with other European or national institutions.
11. To the extent possible, reporting templates and classifications for the IORP ST exercise follow EIOPA's taxonomy for its regular information requests towards NCAs regarding the provision of occupational pensions information.

1.3. Structure of the methodological paper

12. Whilst operational elements are not (extensively) covered, the structure of the paper roughly follows the stress testing process. This ensures that we touch upon the several elements that need to be considered when developing a ST exercise (see figure 1.1). These different elements should not be seen in isolation as their interrelations and interactions influence the design as well as the outcome of a ST exercise.

Figure 1.1. ST process and structure of this paper



13. To ensure that ST exercises provide valuable insights whilst using resources efficiently, each ST exercise should have clearly defined objective(s) and research questions laid down at its inception. STs can be used to achieve different objectives including microprudential and macroprudential objectives. The objectives will shape all other elements of the ST approach such as the tools to be deployed, their tailoring to the specific exercise, as well as the time horizon to be analysed and the extent and type of management actions that are allowed to be included in the adverse scenario(s). Chapter 2 discusses the two types of ST objectives that are relevant in relation to EIOPA's IORP stress testing mandate.
14. The toolbox approach is introduced and extensively explained in chapter 3. It aims to provide guidance in the selection and tailoring of the appropriate tools in such a way that the objective of the ST can be effectively evaluated. First and foremost, the selection of tools must be made in the context of the objectives of the specific ST exercise. Additional aspects may be taken into account, amongst which the horizontal applicability of the tools as well as practical considerations. The horizontal applicability of a tool is determined by the extent to which it gives relevant and comparable results across scheme types and across Member States. Horizontally applicable tools are particularly attractive for a ST exercise since they can be used for the complete IORP sector. Since narrative and objective are unique for each ST exercise, the toolbox approach may yield a different tool set for each exercise, or may use the same tool(s) in consecutive exercises. For illustrative purposes, the chapter describes a number of specific examples of the way that the toolbox approach may be applied. Each example shows how, starting with the narrative of an adverse scenario and the objective of a hypothetical exercise, tools can be selected using the above-mentioned considerations.
15. The next step is to tailor the criteria for selecting the participating IORPs to the objectives of the exercise and ensure that the selected sample provides a fair

representation of the national and European IORP sector (see chapter 4). The sampling criteria should also be targeted to IORPs that have an actual exposure to the risk drivers that are included in the adverse scenarios. Chapter 4 discusses sample selection in more detail.

16. Scenario design, risk factor selection and the application of shocks is another key element of ST design (see chapter 5). To be relevant, the scenarios should be built on a thorough risk assessment of the economic environment and reflect severe but plausible adverse developments in the markets and/or of the whole economy. The type of scenario can vary from a relatively simple sensitivity analysis that assesses the impact of a stress to a single or a limited set of risk factors to a more developed scenario analysis that considers the impact of a stress on multiple macroeconomic and pension-specific variables simultaneously. Furthermore, a bottom-up ST relies on the IORPs to calculate the impact of the shocks. To ensure comparability of the results, the technical specifications and additional guidance should therefore also provide clarity on how to apply the different shocks and potential simplifications that could be used in the calculations. Assumptions, limitations and potential simplifications are defined upfront and are further elaborated on during the consultation of specifications as part of a ST exercise in order to ensure a level playing field and comparability of the results.
17. Chapter 6 provides methodological guidance for introducing stress testing of environmental risks within an IORP ST framework. The idea behind environmental stress testing of financial institutions is that environmental developments, and societies' response to them, may have a significant impact on economic and financial systems: environmental risks may affect economies in many different ways - it may trigger demographic changes, changes in labour markets and may influence (expectations on) mortality and longevity. First and foremost, for financial institutions, adverse environmental developments lead to financial risks. Therefore, the key objective of environmental stress testing for IORPs is to assess the potential impact of such financial risks and the implications for financial stability. Consequently, in essence an environmental ST is just a specific type of "traditional" ST, the difference being that a very specific adverse environmental scenario is considered. Chapter 6 can in that sense also be seen as guidance for the design of a ST exercise revolving around an adverse climate scenario application of the respective shocks.
18. Clear data reporting requirements and validation should safeguard the credibility as well as the information value of the exercise. Chapter 7 lays down the main aspects and principles of the data collection and validation process. Any type of action following a ST exercise should be the result of a thorough analysis of the data collected, which can only be accomplished if the quality of the results is sufficiently high.
19. Last but not least, the output of the ST and the follow-up will generally consist of a report that concludes with recommended preventative or remedial actions, calibrated to the outcome of the exercise (see chapter 8). The published report will provide an overview of the exercise and discuss the results at country and/or EU aggregated level.

2. Stress test mandate and perspectives

2.1. Main characteristics of IORPs in relation to stress testing

20. IORPs exhibit specific characteristics linked to their specific role within the financial system that set them apart from other financial institutions, mainly because their obligations and set-up are integrated in the national social security systems to provide retirement income. In relation to stress testing there are two relevant IORP characteristics that need specific mentioning.

21. One: due to their long-term obligations, IORPs tend to take a long-term perspective on their operations, i.e. investments, sponsor relations, members and beneficiaries.

- This long-term perspective is related to the long-term character of the pension product or arrangements, which includes the accumulation of pension savings for a long-term period and at retirement the provision of income via withdrawals of those savings at retirement or over the retirement period or the provision of an annuity;
- IORPs' obligations are generally illiquid, i.e. mostly members and beneficiaries are limited in transferring their savings or to withdraw their savings before retiring;
- Similarly, in a number of cases, sponsoring undertakings are limited in their choice to use a different provider or to use different ways of providing occupational pensions for their employees.

22. Two: IORPs typically pass on risk to ultimate risk bearers; they manage investments to provide for future retirement income. Hereby, IORPs' obligations may only relate to the savings phase or also cover payments in the retirement phase. The IORP pension obligation may refer to a defined benefit or guarantees, thereby covering biometric risks and/or investment risk, collectively or individually, on the contributions of the members and the sponsoring undertaking. Depending on the characteristics of the scheme and the national framework, through the IORP some or all risks linked to the pension obligation are ultimately born by ultimate risk bearers as integrated part of the execution of the pension scheme or arrangement (this may be pre-agreed or foreseen in national law):

- For pension plans offering any form of guarantee and depending on the particular arrangement of security mechanisms, risk may be shifted –in no fixed order– to a. a (re-)insurer in case of a (re-)insured risk, b. a plan sponsor in case a sponsor guarantee is in place, c. plan members and beneficiaries in case pension benefit payments can be adjusted,[1] d. a pension protection scheme (PPS) if such a scheme is in place and the conditions for scheme support are met, or any combination of these.

[1] This may take different forms, depending on the particular scheme arrangements and range from a lower level of lump sum payment / implied nominal annuity upon retirement (in a protected DC setting) to lower conditional, discretionary and/or unconditional benefits (mainly in DB settings).

- As a consequence, IORPs tend to be bankruptcy-remote institutions.

23. It should be noted that, though these characteristics of IORPs are quite general, various aspects of IORPs differ (sometimes markedly) across EU countries, partly as a result of the different prudential and social and labour law frameworks present in each Member State.

2.2. Dual ST perspective in relation to EIOPA's ST mandate

24. EIOPA's mandate to carry out EU-wide ST exercises for the European IORP sector derives from the following articles in the EIOPA Regulation:

- Article 32(2) EIOPA Regulation (EU) No 1094/2010 specifies that EIOPA "shall, in cooperation with the ESRB, initiate and coordinate Union-wide assessments of the resilience of financial institutions to adverse market developments." Recital 40 of Regulation (EU) 2019/2175 amending the EIOPA Regulation explains that those 'Union-wide assessments' are indeed 'Union-wide stress tests'.
- Article 23(1) EIOPA Regulation (EU) No 1094/2010 specifies that EIOPA "shall, in consultation with the ESRB, develop criteria for the […] evaluation of the potential for systemic risk posed by, or to, financial market participants to increase in situations of stress, including potential environmental-related systemic risk."

25. In fulfilling EIOPA's ST mandate for IORPs, the starting point for the design of ST methodologies for IORPs should be the specific characteristics of IORPs and the specific function of IORPs within the financial system. As described in section 2.1, IORPs are different financial institutions than for example banks or insurers and this fact has its consequences for the design of an IORP stress test.

26. From the general characteristics of IORPs mentioned in section 2.1, the following observations are relevant in the context of stress testing:

- For IORPs the concept of solvency (sufficient assets to cover and in excess of IORPs' liabilities) and its interpretation needs to be seen within the national framework and specificities of the scheme that allow IORPs to shift biometric and investment risks to ultimate risk bearers. Security and benefit adjustment mechanisms and risk mitigation techniques are relevant when considering and interpreting IORPs' assets and liabilities and its solvency.
- The different ways in which biometric and investment risks can be shared between and within IORPs and ultimate risk bearers produce a spectrum of risks, ranging from the situation where investment and biometric risks are borne individually by members on the one end, to the situation where risks are fully borne by the sponsor and / or the IORP on the other end. See table 3.5 for an elaboration of this spectrum.
- Depending on the pension scheme or arrangement, biometric and/or investment risks are shared between the IORPs, sponsors and members/beneficiaries and PPSs in different ways in the EEA. In the context of stress testing, it is relevant to consider the effects of the different scheme characteristics for the impact of the adverse scenario on the IORPs and the risk bearers as well as for the

transmission mechanisms onto the real economy and financial stability (see 2.3.1 and 2.3.2).

- In addition, IORPs provide different types of pension obligations to their plan members and beneficiaries. In the context of stress testing, it is relevant to consider and interpret the different types of obligations, including guarantees, in relation to this spectrum. Moving from one end of this spectrum to the other, DB plans may have some DC characteristics and DC plans may likewise involve DB-like guarantees.
- In some Member States, pension plans have gradually moved along this spectrum, e.g. from having mainly DB characteristics towards having material DC elements. As a consequence, the traditional difference between DB and DC has increasingly become blurred.
- Given the relevance of security mechanisms and benefit adjustment mechanisms, an analysis of the financial position of an IORP should consider the financial effects on the IORP's ultimate risk bearers. This characteristic of IORPs is especially relevant as a result of the typically long-term relationship between the IORP and its sponsors and members. In particular, this characteristic limits possibilities of sponsors and plan members to withdraw from the IORP in case of negative financial results, thus indeed exposing sponsors and members as the ultimate risk bearers in case of adverse scenarios.
- The effects on IORPs' ultimate risk bearers (e.g. through security mechanisms and benefit adjustment mechanisms) entails that potentially an adverse scenario impacting on the financial position of the IORP sector can be transmitted via the IORP sector onto the real economy, thus impacting financial stability.
- The long-term focus of IORPs and the ability to shift biometric and/or investment risks to other, ultimate risk bearers has significant implications for investment choices made by IORPs. This is relevant when considering the investment behaviour of IORPs from a financial stability perspective, both when analysing potential common behaviours and when considering IORPs' investment behaviour in relation to other financial market participants.
- The long-term perspective of IORPs is also relevant when considering the potential for liquidity risks, e.g. because the long-term nature of liabilities and sponsor relations may lead to relatively predictable incoming and outgoing cash flows. The ability to shift biometric and/or investment risks to other, ultimate risk bearers, is less relevant in the context of liquidity risk since security mechanisms and benefit adjustment mechanisms typically operate on a longer term than the timing typically involved when considering liquidity stress.

27. Given these observations, for the purpose of this paper, EIOPA's above-mentioned mandate to carry out Union-wide STs is translated into the following overarching dual perspective of EU-wide IORP ST exercises:

- Perspective 1: Assessing the impact of an adverse scenario on the financial position of an IORP
- Perspective 2: Assessing the transmission effects of adverse economic scenarios via the IORP sector onto financial stability

28. The distinction between these two perspectives is broadly speaking that the first perspective focusses on the effects of an adverse scenario on individual IORPs, while the second perspective looks into the combined effects of an adverse scenario on the entire IORP sector, including possible effects on financial markets, the wider economy, and the financial system. Hence, the second perspective follows from first perspective. The following paragraphs discuss both perspectives in more detail.
29. From this overarching dual perspective, EIOPA can formulate specific objectives for specific ST exercises to meet its mandate. These ST objectives may vary from exercises to exercise, and in turn drive the design, methodology and application of specific tooling of each of them. For that reason, the dual perspective plays an essential role in the remainder of this paper.

2.2.1. Perspective 1: Assessing the impact of an adverse scenario on the financial position of an IORP

30. The main aim of this perspective is to assess whether IORPs are able to meet their institutional goals also in an adverse scenario. The resilience of an IORP has a broad meaning and covers, amongst other factors, the financial position of the IORP, its exposure to and mitigation of legal risks, strategic risk as well as its operational integrity. In the EIOPA EU-wide IORP ST exercises, the emphasis is expected to be (mostly) on the financial aspects of resilience and hence on the assessment of the financial position of the IORP.
31. The financial position of an IORP reflects a number of aspects in the context of a ST exercise –each of which will be explained in more detail below– including:

- its capital adequacy (solvency position)
- its liquidity position
- its potential to maintain its businesses in the future (going concern premise)
- the transmission of risks to the IORP's ultimate risk bearers

32. Capital adequacy or solvency of the IORP refers to the ability of the IORP to absorb the effects of a financially adverse scenario through reserves as expressed by an excess of assets over liabilities or other capital buffers. The solvency regime and the regulatory capital adequacy is determined by national supervisory requirements. The holistic approach embedded in the EIOPA common balance sheet (CBS) methodology acknowledges security mechanisms in place, such as contingent assets (like sponsor support and PPS payments) and contingent liabilities (like conditional or discretionary benefits) as well as potential reductions to liabilities (benefits reductions) in the analysis.
33. The liquidity position of an IORP refers to the ability of the IORP to meet its payment obligations in a specific period of time as they fall due without excessive cost and / or significant delay. Relative to solvency or capital adequacy, the liquidity position is thus geared to the ability of the IORP to absorb the effects of an adverse scenario in a much shorter term in its cash position and cash flows. For the avoidance of doubt: other financial scenarios may be considered 'adverse' in the context of liquidity than in the context of solvency or capital adequacy.

34. The going concern premise refers to the IORP's capability to generate sufficient income over time to cover its expenses and therewith to continue carrying out its operations.
35. An element of the analysis of the effect of an adverse scenario on the financial position of an IORP is how the financial effects of the scenario affect the ultimate risk bearers of the IORP (the sponsors, and / or PPSs, and / or plan members and beneficiaries). Such transmission effects may be direct and straightforward, such as the impact of an adverse scenario on the plan assets of plan members and beneficiaries in unprotected DC plans. But as highlighted above, it may also take an indirect form through the security mechanisms and benefit adjustment mechanisms of other plan types. In all situations, the risks born by the ultimate risk bearer may result in a change in the long-term viability of the IORP, for instance because sponsors cease to let the IORP operate their scheme or because pressure from plan members and beneficiaries forces the termination/transfer of the scheme.

2.2.2. Perspective 2: Assessing the transmission effects of adverse economic scenarios via the IORP sector onto financial stability

36. The main aim of this perspective is to assess the transmission effects onto financial stability of the impact of an adverse scenario on the IORP sector. Such effects may run via various transmission channels, which will be subsequently elaborated upon.
37. For all of these transmission effects onto financial stability, the size or materiality of the effects ultimately depends on the size and significance of the IORP sector for the financial and economic system. The materiality of the transmission effects may consequently vary widely across countries.
38. This approach can be the starting point for developing an evaluation of IORPs with regard to the potential for systemic risk posed by, or to, financial market participants to increase in adverse scenarios.
39. An immediate transmission effect may run via the liquidity needs and financial position of the IORP in an adverse scenario. Negative net cash flows as a result from falling asset returns and / or selling pressure (also potentially resulting from margin calls on derivative positions) may directly and automatically impact financial markets.
40. A direct, although potentially discretionary, transmission effect may run via the investment behaviour of the IORP in response to the adverse scenario. The IORP may for instance decide to tactically or strategically sell or buy assets in response to an adverse financial markets scenario. These effects will be stronger the more such tactical and strategic behaviours are common or conjoint for a larger fraction of the IORPs.
41. An indirect transmission effect onto financial stability, running via the transmission on the real economy, may result from the impact of the adverse scenario on the ultimate risk bearers of the IORP. Plan sponsors may be obliged to support the IORP in the adverse scenario, and the sponsor support payments they make impact their operating income and investment capacity. Rates of indexation

may be lower in the adverse scenario and / or benefits may be cut, impacting disposable income of households.

3. Toolbox approach and horizontal applicability of tools

3.1. Introduction

42. EIOPA's ST exercises have two main perspectives: (i) assessing the impact of an adverse scenario on the financial position of an IORP and (ii) assessing the transmission effects of adverse economic scenarios via the IORP sector onto financial stability. Each ST exercise starts from a narrative of an adverse scenario with clearly defined objectives related to these perspectives that have to be assessed. These objectives may vary from ST exercise to exercise.
43. In order to design analyses in line with a given objective, appropriate tools have to be selected and tailored in such a way that the objective can be effectively evaluated. The aim of the toolbox approach is to give guidance in this process.
44. The candidate tools from which to choose are described in section 3.2. They consist of the tools that were already developed in the previous ST exercises (e.g. NBS, CBS, IRR, CFA, replacement rates of representative members, behavioural questionnaires), but also of some new tools that will be introduced in this paper (e.g. projection of retirement income from the IORP, stochastic tools). These tools have been classified into three categories relating to the nature of the information they can provide: balance sheet tools, projection tools and survey tools.
45. In the selection process of the tools, of course, attention must be paid firstly to their relation with the objectives/perspectives of the ST exercise. This is explored in section 3.3. Three specific examples of the way the toolbox approach may be implemented in practice are illustrated by means of boxes. Each example starts with a narrative of an adverse scenario. Based on the characteristics and objectives of each adverse scenario, example tool selections are described taking into account all the above-mentioned considerations.
46. Nonetheless, other aspects also have to be taken into account, in order to refine the selection process of the appropriate tools, such as the horizontal applicability of the tools and some practical considerations.
47. The horizontal applicability of a tool is determined by the extent to which it gives relevant and comparable results across scheme types and across Member States. Horizontally applicable tools are particularly attractive for a ST exercise since they can be used for the complete IORP sector. The horizontal applicability of the tools is discussed in section 3.4.
48. From a practical point of view, the selection process should finally also take into account the cost-benefit ratio of a tool. For this purpose, the selection process should make a balance between the insightfulness of the results provided by a tool (benefit), and the tool's practicability for the involved stakeholders (cost). This balance may also vary from exercise to exercise, depending on the specific insights (benefits) needed from the analysis. The different elements to take into consideration are discussed in section 3.5.

3.2. Introduction candidate instruments

49. In a ST, different tools can be used to support the analysis, tailored to a certain objective of the specific exercise. The tools can essentially be divided into three categories.
50. Firstly, the balance sheet tools to value assets, liabilities at a certain point in time. With balance sheet tools it is also possible to consider security and benefit adjustment mechanisms. Secondly, the projection tools to project future, expected incoming and outgoing cash flows. Depending on the scheme type, these may include e.g. investment returns, (un)conditional benefits or protection mechanisms over time. Thirdly, surveys can be used to gather all kinds of additional information.
51. Balance sheet tools and projection tools are primarily quantitative tools, whereas surveys are likely to be more qualitative in nature.

3.2.1. Balance sheets

National Balance Sheet (NBS)

52. The NBS is valued according to national valuation standards (incl. the funding requirements).
53. The NBS displays assets and liabilities at a certain reference date. The asset-side consists of investments, (re-)insurance recoverables (if applicable) and other assets. The main part of the liability-side are the technical provisions. In addition, there are other assets and excess of assets over liabilities.
54. The discount rate for the valuation of the technical provisions in the NBS is based on national provisions.

Common Balance Sheet (CBS)

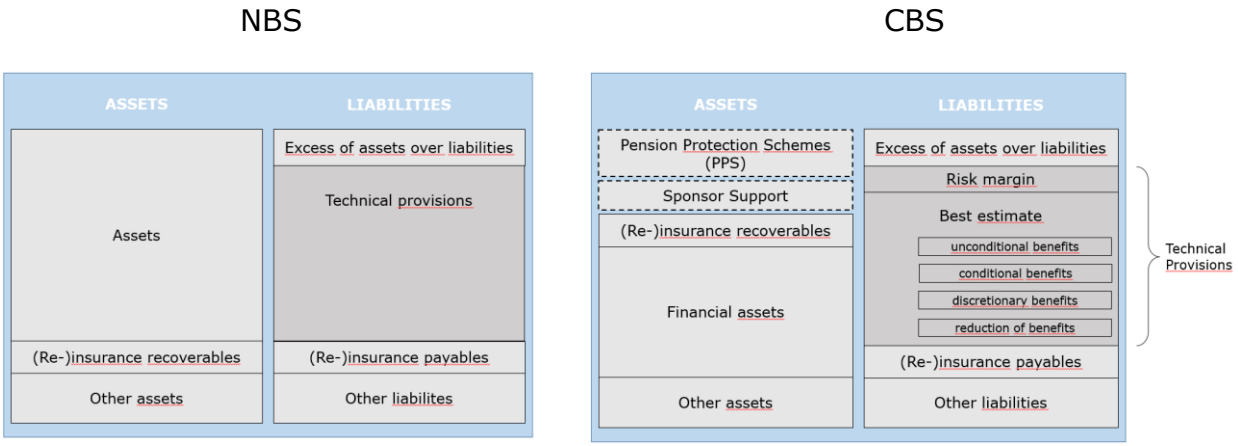
55. The CBS is valued on a market-consistent basis and includes security and benefit adjustment mechanisms. It corresponds to the common framework's balance sheet which EIOPA advised in its Opinion on the practical implementation of the common framework for risk assessment and transparency of IORPs, published in 2019. It should be noted that the ST methodology does not include the calculation of a standardized value at risk (SVaR) in the context of a standardized risk assessment, as described in the Opinion.
56. The CBS provides a comparable and transparent view of the extent to which IORPs' pension obligations can be supported by financial assets, sponsor support and PPSs and the extent to which benefit adjustments may be needed at some point in future, in the baseline as well as in the adverse market scenario.
57. As a principle, the general method to value the best estimate of technical provisions, and other items on the CBS, is to calculate the probability weighted average of the discounted values of future cash flows.
58. Technical provisions shown on the CBS should be calculated using the risk-free interest rate (RFR) term structure.

59. The value of technical provisions shall be equal to the sum of a best estimate and a risk margin. However, where future cash flows associated with pension obligations can be replicated reliably using financial instruments for which a reliable market value is observable, the value of technical provisions associated with those future cash flows should be determined on the basis of the market value of those financial instruments ("calculation of technical provisions as a whole"). In this case, separate calculations of the best estimate and the risk margin are not required.
60. The IORP has to value the mechanisms that will offer protection to the IORP (solvency), or ultimately to the benefits of members and beneficiaries, even in the context of or after an IORP winding-up process. It should be outlined that the CBS is not designed solely for the valuation of an IORP's solvency as it also intends to value the protection available to the members and beneficiaries with regard to the pension obligation run/intended to be offered to them by the sponsor through the IORP even after the IORP is wound-up.
61. The security and benefit adjustment mechanisms considered in the CBS are related to the risk bearers of a pension plan described in section 2.2. However, it should be noted that there can be other sources of protection to either the IORP solvency or ultimately to the pension obligations to the members and beneficiaries acting ahead of or after the winding up of an IORP. However, the CBS does not consider these other mechanisms and does not require their valuation.

NBS versus CBS

62. Both NBS and CBS have to be calculated at a certain reference date and reflect all assets and liabilities of an IORP.
63. The main difference, besides the valuation of individual positions, is the explicit consideration (i.e. the valuation on the balance sheet) in the CBS of PPS, sponsor support, benefit adjustment mechanisms, and of mechanisms that can act before or even after the IORP is wound-up.
64. Another difference is that for the NBS, the IORP is required to provide the value of its funding requirement(s) (in some Member States, there can be two levels) which can include in some Member States a regulatory own funds requirement above the cover of the technical provisions (see articles 13 to 19 of the IORP 2 Directive), and the value of the eligible items to cover it (these), so that funding ratio(s) can be calculated. In the CBS (of the ST methodology), it is not required to calculate any sort of additional (hypothetical) capital requirement above the liabilities .
65. Another difference is that while the NBS values the solvency position of an IORP, the CBS assesses the solvency position of an IORP, but also assesses –to some extent– the viability of an IORP's business continuity by valuing the security mechanisms intervening even after the IORP is wound-up (e.g. benefit adjustments, sponsor payments directly to members and beneficiaries, claims on the sponsor on discontinuance of the IORP).

Figure 3.1. NBS versus CBS



3.2.2. Projection tools

66. This section describes the tools and approaches that may be used in IORP ST exercises and which entail the necessity to project future cash flows, so that potential future effects of an adverse scenario can be assessed.
67. Projections are inherently a challenging task, as most future developments cannot be predicted with certainty. Therefore, projections should be accompanied by sufficiently clear and detailed descriptions to extrapolate trends and to set unified inputs to minimize the use of judgment in the calculations and to foster comparable results.
68. However, there is certainly a trade-off between specifying future developments centrally in technical specifications and the expert view and the managerial projections provided for internal purposes of the IORP's management. Further, the IORP's governance and management board may allow for certain management actions relating, for example, to a change in certain investment allocations, adapting pension obligations, closing certain pension schemes for new accruals or accept additional financing by parent undertakings. Depending on the objective of the ST exercise, the availability of such management actions may be important to assess.
69. On the other hand, depending on the characteristics of the pension promise and the operations of a specific IORP, certain cash flow types, such as fixed expenses, contractually specified contributions or unconditional benefit payments, can be relatively clearly determined even for a long term horizon.
70. In the following subsections three different types of projection tools are presented:

- The calculation of the internal rate of return, by which –based on the projected unconditional benefit payments– the required yield on investments can be determined;
- Cash flow tools, which can be used to project all cash flows of an IORP, deterministically or stochastically, and which can provide insights into the timing and significance of cash in- and out-flows, as well as triggering points for supervisory measures or supporting actions by sponsors and members or pension protection mechanisms;

- Tools to project the income of members and beneficiaries from the IORP: based on deterministic or stochastic modelling, here the projected retirement income of total IORP's members. Simplifications, based on representative members or of groups of members and beneficiaries from their accrued pension savings in the IORP, can be determined. The results provide insights into the projected out-payments of IORPs as well as the effects on members and beneficiaries of an IORP.

Internal rate of return (IRR)

71. This approach builds on the determined, projected cash flows, linked to guaranteed benefit payments. It allows for an assessment of the financial situation of IORPs in terms of the required profitability and sustainability of the investment income, here specified as the IRR, i.e. the return that is needed so that all future benefits can be paid with the current funding levels and the investments held. The required IRR can be compared to the effective risk-free rate to understand the risk premium or yield the IORP's investments have to generate to afford to pay out the expected benefits.
72. This is necessarily a partial analysis, assuming that all investments are available to cover the expected benefit payments and does not take into account future sponsor support, benefit reductions, contributions or accruals.
73. The IRR provides insights into the financial situation of an IORP in terms of the required long-term investment returns as well as the 'profitability', here the creation of value and revenues from its investments, which may be compared to the past experience and current returns on the investment portfolios.

Cash flow tools

74. To understand the long-term effects of an adverse scenario, future cash flows can be projected, comparing the expectations based on the baseline to the effects following from the adverse scenario. Such an assessment can take a holistic view, presenting fixed cash flows, such as expenses and unconditional benefit payments, as well as conditional or discretionary cash flows, here in particular the effects of national prudential mechanisms to absorb shocks over time through sponsor support and benefit reductions. Herewith both the size and the timing of such expected cash flows can be determined as well as potential consequences in terms of transmitting stress on sponsors, members and beneficiaries as well as the real economy and financial stability.
75. To ensure a realistic representation of supervisory measures or triggered security mechanisms, the projected cash flows have to take full account of national prudential mechanisms, including when supervisory measures would be triggered, as well as the size and probability of sponsor support, the effects of PPSs or benefit reductions. Further, IORPs may be in a position to take management actions in line with their statutes, which may be reflected in the cash flow projections.

76. Cash flow projections can be carried out in a deterministic way, allocating certain probability-weighting to various trajectories, or in a stochastic manner to enable a more sophisticated analysis of potential future outcomes, also in terms of probability of the results, mean and median results as well as quantiles. Both methods have their pros and cons. Deterministic approaches are simpler in the application, but challenging in terms of setting appropriate probabilities to unknown, future developments. Stochastic approaches require models to carry out the projections and to set the parameters and key inputs, whereas the results provide a more comprehensive view on the distribution of the results. Stochastic projections allow one to assess the distribution of the future cash flows (for example in terms of mean, quantiles etc.).

77. In line with the objective of the analysis, alternative specifications concerning scope, inputs and assumptions of the expected cash flows are possible, for those cash flows that are not fixed:

- Cash in-flows stemming from contributions: the concept of the CBS assumes that the IORP does not accept any further contributions outside its legal obligations towards the current members and beneficiaries and therewith projects only those cash flows related to those obligations. Alternatively, or as an extension, further contributions, in addition to those included in the CBS, in relation to the current members can be included, which population and contribution levels may be assumed to stay stable, increase or decrease. In order to promote comparable results and to prevent overly optimistic assumptions, realistic assumptions on net increase in membership and accruals are necessary to enable a realistic presentation of the IORP's financial situation.
- Cash in-flows stemming from investment income: due to the low predictability of investment returns and the high dependence on the asset allocation, the expected investment income in a cash flow analysis (CFA) needs to be standardised to foster comparable results and to avoid overly optimistic results. The concept of the CBS specifies that IORPs should be in a position to yield risk-free returns. Alternatively, or as an extension, it may be specified that the IORP applies standardised expected returns per asset class whilst maintaining its current asset allocation.
- Considerations on management actions: the projected cash flows may take into consideration potential management actions, for example changes in the investment allocation or potential additional sources of financing. It may be allowed to reflect such management actions to portray realistically the further development of the IORP's business, but should probably be limited to contractually or legally enforceable management actions.
- The time horizon of the projections: due to their long-term pension obligations, IORPs have to be in a position to project all cash flows linked to the current obligations. Depending on the specificities of the IORP, that time horizon easily reaches 100 years. In case such projections are done for a shorter timeframe, the cash flow projection is limited in its relevance to project long-term effects, such as benefit reductions, and the potential consequential effects on financial stability.

- Nominal versus real values: the cash flow projections carried out in past ST exercises did not take into account the effects of inflation. However, in particular to understand the effects of benefit reductions, it may be relevant to extend the analysis to provide inflation-adjusted figures, as the effects of benefit reductions are more severe over time when expressing those in real terms.

Retirement income (RI) from IORP

78. In past ST exercises a projection tool was applied to assess the second round effects on the real economy by estimating the impact of the adverse market scenario on expected RI based on three representative plan members. This was used to assess the impact of the adverse scenario on members of unprotected DC schemes (without guarantees) where the impairment of DC IORP's assets directly affect the accumulated savings of the members.
79. For that, the ST analysed how the adverse market scenario impacts on RI and replacement rates –i.e. expected pension income as a proportion of the final salary– of three representative plan members with respectively 35, 20 and 5 years until reaching retirement. EIOPA then extrapolated the outcomes for the three representative members to the overall membership of the DC IORPs, whereas it is necessary to point out that these impacts on income have a long-term effect on the RI.
80. To enable a fair estimate of the future RI from the IORP, whilst ensuring - to some extent - comparability of the results, the projection tool required high standardisation. This has been done in terms of: expected investment returns per asset class, yet was open for adaptation in terms of contributions, salary increases and consequent increases in contributions, investment allocations and strategies, including life cycling, expected retirement age and for each representative member a certain level of pension savings or respective assets in one's account, taking into consideration any costs and charges. Further, it was assumed that the member has been and will be a member of the IORP for his or her entire working life.
81. This deterministic approach and analysis worked with standardized assumptions on investment returns, extrapolating the current asset allocation of representative members and investment option, acknowledging investment strategies and the length of the accumulation period. However, the tool did not take into account risk-mitigation techniques, such as building reserves or buffers or minimum return guarantees, which may be applied to certain cohorts, or collectively building buffers and reserves that can mitigate market valuations.
82. In the development of the regulatory framework of the Pan-European Personal Pension Product (PEPP), EIOPA, in cooperation with the OECD, developed a stochastic model[2] to assess the risks and rewards of a PEPP in a reliable and relevant manner. The approach taken can be applied to IORPs, covering all types of pension obligations, as it is capable of addressing specificities in collective and individual risk-

[2] See EIOPA (2020): Pan-European Personal Pension Product (PEPP): EIOPA'S stochastic model for a holistic assessment of the risk profile and potential performance, August 2020, Description of EIOPA's stochastic model used for PEPP | EIOPA (europa.eu).

mitigation techniques, as well as the building of reserves, life cycling techniques and (minimum-return) guarantees.

83. A stochastic model allows simulation of different realizations of the world and generates, for each of them, the accumulated assets at the end of the accumulation phase (lump sum). The resulting distribution of lump sums allows the calculation of indicators to assess the investment strategy's risk profile and potential performance taking into account the whole accumulation phase.

84. RI derived from IORPs depends on several factors, some of which are uncertain. The factors affecting RI include the amount saved during the career, the length of the contribution period, the investment strategy, the returns on different asset classes, inflation, wages, periods of employment and life expectancy.

85. To understand the effects of an adverse market scenario on members and beneficiaries through an IORP, it is important to understand the different transmission channels and the consequences of scheme designs as well as of the IORP's different pension obligations. For that, the RI from an IORP can be further analysed along the following aspects:

- Representative members versus cohorts of members: IORPs may find it difficult to identify a representative member per age group of its members, so that the approach to extrapolate from three representative members to the entire membership may not be a fair representation. However, depending on the objective of the ST exercise, it is important to see how groups of members, or cohorts, will be affected in different ways by a certain economic scenario, depending on the remaining accumulation period before retirement, the specific investment option, the solvency of the IORP, collective risk buffers etc. Therefore, a distinction of the cash flows by groups of members or cohorts of members is required.
- Benchmarking: depending on the set-up of an IORP and the type of pension obligation, a replacement rate is often difficult or impossible to project in a reliable manner. Therefore, other benchmarks, for example, the probability of reaching a pay-out that equals the paid-in contributions may provide a more relevant and comparable benchmark.
- Investment performance: similar to the cash flow projections in the previous section, the assumption could be that IORPs should be in a position to yield risk-free returns. Alternatively, or as an extension, cash in-flows on standardized investment returns by asset classes can be considered to reflect the IORP's current asset allocation.
- Taking into account guarantees and collective risk-mitigation techniques as well as life cycling strategies: to cover all available means of mitigating investment risks for groups of members or beneficiaries, the applied tools and methodologies need to be capable of fairly reflecting the effects of applied risk-mitigation techniques.

3.2.3. Survey tools

86. The survey tools include elements with different scope: the Investment Behaviour Survey (IBS) and the Stock Take Surveys (STS) are crucial elements of a toolbox, as they are versatile and can be tailored to the specific objective of assessing the context and the channels of the impact of the adverse scenario. In addition, this tool category includes an informative element, namely the Background Survey (BS), aimed at collecting some context information from NCAs and IORPs so as to shed light on the ST results in terms of comparability, robustness and completeness of results. This information tool should be used to complement the application of one of the other candidate tools considered in this paper.

Background Survey

87. The BS is a necessary tool to collect mostly qualitative information on the characteristics of IORPs, on the evaluation criteria and on the security mechanisms when applicable. The survey is aimed at providing some context for a better assessment of the ST results. This BS can also be designed to take into account the comparability of results across IORPs and countries.
88. Questions can collect information related to the rules and parameters used to value the technical provisions in the NBS and the characteristics of the national recovery plans (and whether IORPs are submitted to one), to benefit adjustments mechanisms and in general to the security mechanisms in place (not only of the sponsor support and PPS, but also of other mechanisms available not valued in the CBS) to give a thorough picture of the protection available to the IORP or the members/beneficiaries even after the IORP is wound up.
89. Qualitative and quantitative information are also collected on the sponsor (sector of activity, nature, strength, and the form of the support), including the evaluation of the probability of sponsor default used in the valuation of sponsor support in the CBS. This additional information provides specific elements to be considered in the analysis of the impact of the adverse scenario on the IORP, on the sponsor and how security mechanisms work in an adverse scenario.
90. Other questions relate to the type of the investment options offered to members; whether they are allowed to choose between different options and who is responsible for the decisions on the asset allocation of the investment options. The gathering of this information is aimed at identifying the factors that could affect the IORP decisions with reference to the asset allocation or investment choices, also as consequence of the adverse scenario, potentially affecting financial markets.
91. Further questions are related to the possibility of withdrawals (under specific circumstances) and if so, whether in the adverse scenario withdrawals are expected and whether, in adverse circumstances a contributions break (sponsor and members) might be allowed. Questions could also relate to the possibility of transfer of the scheme arrangements by the sponsor to another institution (e.g. an IORP, an insurer, or another financial institution).

The Investment Behaviour Survey (IBS)

92. The IBS is an instrument that combines qualitative and quantitative information, to evaluate the impact of the adverse scenario on the IORP's asset values and asset allocation by taking into consideration the investment behaviour of the IORP after the shock. This information can be combined with the analysis performed by the other ST tools to better understand the impact and the reactions of the IORP to the adverse scenario (taking into consideration the specificities of IORP scheme and the characteristics of the national IORP system).
93. The IBS includes two main components: a) questions regarding the main characteristics of the asset allocation and the investment policy of the IORP under the baseline scenario, and b) questions regarding the expected investment behaviour of the IORP in the aftermath of the adverse shock in the short and in the medium term.
94. As for component a), the survey may suggest analysing the IORP's asset allocation in the baseline and adverse scenario with an adequate level of granularity, by also specifying the proportion of the entire investment portfolio that is allocated to specific assets so to highlight potential risk exposures. The requested asset allocation data includes the type of asset as well as the geographical breakdown of the investments for both the fixed-income and the equity portfolio. The IORP's investment allocation provides a picture of possible financial risk exposure.
95. The survey may also suggest collecting a set of further quantitative-qualitative information:

- on the portfolio's management style (passive or active), providing, approximately, the percentage of the IORP's portfolio managed passively and/or actively;
- on the main characteristics of the investment policy to better understand how strategic investment decisions are designed;
- on the regulation of an IORP's investment decisions (e.g., IORPs' investment limits for relevant concentration risks, the presence of contractual or other constraints on the investment allocation, and the degree of flexibility) and description on the possible impact that constraints may have to the investment allocation under the adverse scenario;
- on the characteristics of derivative (hedging) instruments. For instance, gross and net risk positions can also be detected to assess the efficient investment management of derivatives made by IORPs;
- on the IORP's investment trends pertaining to the five years before the shock with the aim to identify common investment behaviours in relation to different asset classes or specific circumstances (e.g. search for yield in a low interest rate environment) to assess (changing patterns in) common behaviours and in general changes in investment behaviour before and after the shock;
- on the reliance of IORPs on passive investment strategies. Common investment behaviours may also generate risks when there emerges a trend towards (more widespread) reliance on passive investment strategies. Such common behaviour might for instance limit the diversity in investment strategies as well as the number of potential arbitrageurs in the market, with risks to *inter alia* the degree of market efficiency.

96. As for component b), the focus –in the short term– is on portfolio rebalancing in the adverse scenario. The survey should analyse the (absolute and relative) asset allocation in the baseline scenario with an adequate level of granularity and report the expected adjustment of asset class allocations, by net selling (-) or net buying (+) and the new asset allocation (also in % of total assets) following the shock, as well as any rebalancing, which is evaluated both at the reference year and within the first year. This evaluation, which is performed on a best effort basis, is in monetary terms.
97. In a further forward-looking perspective, assuming persistent effects of the adverse scenario, IORPs should be asked to indicate the expected adjustment of asset class allocations, by net selling (-) or net buying (+) and the new asset allocation (also in % of total assets) up to 5 years after the shock (medium-term perspective). This evaluation, which is performed on a best effort basis, is in monetary terms.
98. To complement the above information the IORPs may be asked whether the (automatic) rebalancing mechanisms and frequency of rebalancing are defined in the investment policy. Whether different investment options are offered to plan members may optionally be added to the analysis.
99. The short and medium-term analysis on the prospective investment behaviour is meant to analyses the possible financial reactions of IORPs as a consequence of the shock and any potential aggregate effects on financial markets of the adverse scenario transmitted by their investment decisions of the IORPs collectively. This assesses potential trends, e.g. flight to quality or herding behaviour phenomena, and potential stabilizing or destabilizing effects on financial markets triggered by IORPs when trying to change their asset mix.

Stock Take Survey (STS)

100. The STS is a general category of tool that can be considered to gather qualitative and quantitative information in relation to specific asset types or in relation to specific narratives/scenarios (e.g. ESG, operational risk, liquidity risk) in order to gain more insights on specific risk exposures. This tool can be used to complement the above-mentioned IBS or as standalone. The ESG Questionnaire conducted within the 2019 IORP ST is an example of application of this tool.

3.3. Relation with ST perspectives

3.3.1. Introduction

101. EIOPA's STs have two main perspectives: (i) assessing the impact of an adverse scenario on the financial position of an IORP and (ii) assessing the transmission effects of adverse economic scenarios via the IORP sector onto financial stability. For each of both perspectives, specific objectives can be assessed. These objectives may vary from ST exercises to exercise.

102. In order to assess the impact of an adverse scenario, with a given ST objective, appropriate tools have to be selected and designed in such a way that the objective can be effectively valuated. The design of a tool can address elements of a specific ST objective, such as the projection horizon, members taken into consideration, etc.
103. The aim of this section is to illustrate how to select appropriate tools, given the objectives of a perspective: the toolbox approach. The following paragraphs discuss the tools that can be used for each perspective more in detail.

3.3.2. Assessment of the financial position of IORPs

104. The main aim of this perspective is to assess whether IORPs are able to meet their institutional goals also in an adverse scenario. The assessment of the financial position of the IORP covers (see chapter 2) (i) its capital adequacy (if applicable) and solvency position, (ii) its liquidity position, (iii) its potential to maintain its business in the future (going concern premise) and (iv) the transmission of risks to the IORP's ultimate risk bearers.
105. The assessment of the financial position can be done both from the point of view of national prudential frameworks and from a common framework that allows a comparison (same valuation rules for assets and liabilities for all participating IORPs) of the financial positions of the IORPs of the Member States.
106. The table below gives an overview of categories of the tools that can be used for the assessment of the different aspects of the financial position. Depending on the specific objectives of an exercise, one or several specific tools can be taken into consideration.

Table 3.1. Overview of tools for the assessment of the financial position of an IORP

Methodology	**Balance sheet tools (valuation)**		**Projection tools**			**Survey tools**		
Tools	**NBS**	**CBS**	**IRR based on cash flows**	**CFA**	**Projected RI from IORP**	**BS**	**IBS**	**STS**
Solvency risk	Yes	Yes. Note that the assessment of solvency deviates from national framework.	Limited. Rough indication that the solvency might be affected.	Yes, if solvency position is calculated during/at end of scenario.	No	Partial. Useful to get an idea of risk exposure	Partial. Useful to get an idea of risk exposure	Partial. Useful to get an idea of risk exposure
Liquidity risk	No	No	No	Yes	No	Yes	Yes	Yes. Can provide additional insights
Potential to maintain its business	Yes for the assessment of the potential to generate income.	Yes for the assessment of the potential to generate income.	Limited. Can be used to assess minimum required returns	Yes for the assessment of the income.	No	Yes	No	Yes. Can provide additional insights
Transmission of risks to the IORP's ultimate risk bearers	Partial. The NBS gives a rough indication that either the employer, the PPS or member / beneficiaries might be hit.	Yes. Market value of the security mechanisms	Limited. The IRR gives a very rough indication that either the employer, the PPS or member/beneficiaries might be hit.	Yes. Size and timing of security mechanisms (distribution if stochastic)	Partial, impact on plan member/beneficiary (distribution if stochastic)	Yes. Information about security mechanisms	Useful to get an idea of risk exposure	No

3.3.2.1. Solvency risk

107. The assessment of the capital adequacy or solvency position is relevant for DB schemes and protected DC schemes. For unprotected DC schemes, the liabilities will often be equal to (the total or a fixed proportion of) the assets.
108. Suitable tools have to assess the ability of the IORP to withstand the effects of an adverse scenario. Balance sheets are the most obvious tools for assessing the solvency position of IORPs. Cash flow analyses can be used to assess the solvency position at certain points in the future . The IRR gives only a rough indication that the solvency position may be affected in the future.

Balance sheet tools

109. The **NBS** assesses the funding requirements according to the national frameworks and provides therefore a realistic view of the solvency position of the IORP in the baseline and in the adverse scenario. However, it has a major disadvantage in that it does do not allow for comparison of results between Member States. Indeed, the valuation parameters and methodologies of the assets, liabilities and if applicable of the capital requirements mostly differ from one Member State to another.
110. In order to compare the solvency position of IORPs across EU on an objective basis, the valuation of the assets and liabilities should be performed based on the same methodologies and parameters. EIOPA developed for this purpose the **CBS**. The funding status (excess of assets over liabilities) is however in general not related to the national frameworks, which means that the observed funding status of the CBS will in general be different from the funding status of the NBS. Therefore, the CBS does not allow to draw any conclusions on the breach of national funding requirements or the eventual applicability of security mechanisms or benefit indexations.
111. The balance sheet is prepared at a certain point in time (usually the present), but may be projected over multiple periods in the context of a multi-period ST exercise. Taking into account the complexity of projecting complete annual accounts over several years, this kind of exercises should be limited in time to a reasonable period (e.g. for a period of 3 - 5 years). The projection of balance sheets may be limited to the current membership if the projection period is limited in time since it can be expected that assuming new members does not lead to too much deviation from expected population developments over short periods of time.

Projection tools

112. **Cash flow analyses** (CFA) can be used to assess the solvency status of the IORP at several points in time. The assessment of the solvency risk on the basis of a CFA can be approximated by the value of the assets at a particular point in time as well as the remaining expected future benefit payments from this point in time (these allow the calculation of the liabilities). This solvency calculation can be based on the NBS or the CBS framework in function of the pursued goal of the exercise (same

advantages and disadvantages of both balance sheet tools also apply here). In general, the assessment of the financial position of an IORP may be limited to the short/medium term. For this purpose, the projection horizon can be expected to be typically somewhere between 5 and 15 years in line with the objective and the design of the adverse scenario.

113. The calculation of the needed **IRR** provides insights into the financial situation of the IORP in terms of the required profitability and sustainability of the investment income. The aim of this method is to calculate the needed IRR to pay all the unconditional benefit payments starting from the actual available investment assets. This approach can be easily implemented as it does not depend on a specific framework. Only the projected guaranteed benefits are necessary over the complete run-off period of the actual population in order to complete the exercise. However, this approach does not provide insights into the timing of a potential underfunding, nor into the size of potential financing shortfalls. This method gives only a rough indication that the solvency position may be affected in some point in the future if the IRR is greater than the expected return.

Survey tools

114. General information about the specificities of the national prudential frameworks of the Member States can be collected with the **BS**. The collected information will help to gain additional insights in the national valuation of the assets, liabilities (e.g. discount-rate, valuation methodology), applicable recovery measures in case of underfunding, restrictions with regard to the asset allocation, benefit options, etc.

115. **IBSs and STSs** could be used to get additional insights in specific asset allocations or security mechanisms.

3.3.2.2. Liquidity risk

116. Even if liquidity may not be the most important risk factor for IORPs, it does require a proper risk management and therefore the assessment of liquidity risk may be covered by a ST exercise. Sources of liquidity risk can for example be high allocations in illiquid assets such as property, extensive use of derivatives, and benefit options (we refer to section 5.6.5 for a more extensive description of liquidity risk). Appropriate tools should assess the IORP's ability to meet its payment obligations as they fall due without excessive cost and / or the total inability to recover funds or only with significant delay. So, potential liquidity issues should be assessed by comparing the expected benefit payments (outflow) with the expected available liquid assets and contributions) over a predefined projection horizon. In general, these projection horizons will be limited to the short or medium term.

117. As a first step, the quantification of liquidity sources of the IORP can be assessed with a **STS.** The idea is to classify the assets according to their liquidity characteristics.

118. Liquidity needs can further be assessed with the liquidity indicator which is based on a cash flow approach. The liquidity is calculated by the equation below (see section 5.6.5 for more details). Liquidity needs can be assessed on the short term

(< 1 year) or over longer projection horizons (>1 year) in order to gain insights in the development of liquidity needs over the years. This later goal can be achieved with cash flow analyses. Such analyses suppose, besides the projection of the cash flows, a very precise projection of the assets taking into account the underlying asset allocation in illiquid investments.

$$Liquidity\ indicator = \frac{Stock\ of\ High - Quality\ Liquid\ Assets}{Total\ net\ cash\ outflows}$$

119. Finally, **IBSs** and **BSs** can provide insights in the way that IORPs deal with liquidity issues.

3.3.2.3. Potential of the IORP to maintain its business in the future (going concern premise)

120. Suitable tools should assess the capability of the IORP to generate, if applicable, sufficient income to cover its operational expenses and therewith to continue carrying out its operations on a going concern premise. Due to the specific protection mechanisms, there may not be a significant risk for some types of pension schemes or Member States.
121. This risk may for instance arise if the IORP's income is expressed as a percentage of the assets under management. A sharp fall in the value of assets may then result in the IORP having insufficient income to continue its activities. The income of the IORP can also be expressed as a percentage of the contributions of the active members. In the latter case, the continuity of the business of the IORP can be affected if the adverse scenario also has an (material) impact on the level of employment of the sponsoring undertaking(s) of the IORP. A combination of both types of revenue shocks is also conceivable.
122. The assessment of the income of an IORP in the baseline and in the adverse scenario can be assessed with **NBS/CBS** and with a **CFA** if the income is related to the development of investments or contributions. It is possible to assess minimum required returns for DB and protected DC schemes with the IRR tool. Finally, **background** and **STS**s can provide additional insights.

3.3.2.4. Effects of risks on the IORP's ultimate risk bearers

123. The aim of this section is to assess how the IORP transmits the financial effects of the scenarios onto the ultimate risk bearers of the IORP (sponsors, PPS, and/or plan members and beneficiaries) and to assess their eventual response (behaviour). The risks borne by the ultimate risk bearer may result in a change in the long-term viability of the IORP (meaning its scheme running continuance). The impact can be measured with balance sheet tools and cash flow analyses. Behaviour of the involved stakeholders can be assessed with surveys.

Balance sheet tools

124. **Balance sheet tools** can give an indication of the **size** of the impact on the risk bearers of the IORP in the adverse scenario.
125. The **NBS** has the advantage that the eventual observed shortfalls, which will have to be recovered, are directly linked to the national frameworks and to the actual recovery measures. However, it is in general not possible to derive directly from the NBS which risk bearer (sponsor, PPS and/or members and beneficiaries) will be hit and when it will be hit. Additional information requests (surveys) will be necessary to gain further insights in the transmission channels.
126. The **CBS** has the advantage that it shows clearly the market value of the security mechanisms that apply (sponsor support, PPS and/or benefit reductions) in case of shortfalls, and that results are comparable across participating IORPs from all Member States. However, the value of the reported security mechanisms may not be directly reconcilable to the NBS, following the national frameworks.
127. If one is interested in the impact over a longer period of time, the balance sheets can be projected over multiple periods. This is a more extensive exercise than a CFA since IORPs will have to produce several consecutive complete balance sheets (NBS and/or CBS).

Projection tools

128. **Cash flow analyses** allow to assess the **size** and the **timing** of the impact according to the national frameworks with a clear view on the impacted risk bearers. Depending on the objective, the projection horizon can span from any period to the full life-time of the obligations.
129. The **RI from IORPs** projection tool allows to assess the impact of an adverse scenario on members. This tool type is especially useful for members affiliated to DC schemes and for DB schemes with conditional benefits (if there are no conditional benefits, the impact in the adverse scenario will be affected in the absence of protection mechanism, in case the IORP does not have sufficient assets to cover its unconditional obligations).

Surveys

130. The response of the involved risk bearers to the impact of the adverse scenario can be assessed with **surveys**. They can involve the IORP but also other stakeholders like the sponsoring undertakings and/or the plan members and beneficiaries. As an example of the **BS**, it could be asked whether withdrawals are allowed (under specific circumstances) and if so, whether withdrawals are expected in the adverse scenario. They can also provide additional insights in eventual other security mechanisms and/or involved parties in the security mechanisms that are not captured in the CBS and can provide additional context of the national or the individual IORPs specificities.

Box 1. A longevity scenario focusing on the financial position of IORPs

131. A scenario with increased longevity could be considered. In terms of the impact on the financial position of an IORP, this constitutes an adverse scenario, although we recognize that a longer life in general is good news for plan members and beneficiaries. Increased longevity affects IORPs and the pension schemes they operate and will be felt one way or another by the ultimate risk bearers.

132. The objective of this part of the ST exercise would be to assess quantitatively what impact increased longevity has on the financial position of the IORPs. The assessment should take into account direct effects like those running via increased market-valuation for guaranteed accrual and benefits (mostly for DB schemes), as well as indirect effects that run via the annual benefit payments that can be purchased upon retirement from the accumulated pension savings (for DC schemes when capital is converted into an annuity and longevity risk is not externalized by purchasing a life insurance).

133. The challenge lies in the fact that the size of the impact varies across countries (depending on the way future mortality is modelled in the baseline) as well as over time (as shocks may be felt fully only over time).

- Depending on the national framework, the life tables used to value liabilities and annuity factors may or may not include expected future improvements in mortality rates.
- Depending on the specificities of risk distribution in the pension scheme the impact may be felt relatively quickly (mostly in DB schemes with sponsor support), with a delay (mostly in DB schemes with benefit reductions) or only upon retirement (in DC schemes where capital is converted into an annuity and longevity risk is not externalized by purchasing a life insurance).

134. The toolbox approach suggests to deploy those tools that best meet the objective of the ST exercise. In the context of the above considerations the following tools might be considered:

- **Balance sheet tools.** The CBS approach is well-placed to assess the common impact of longevity on the IORPs financial position. The CBS allows for comparison of the financial position of IORPs across the EEA and a transparent view on the pension liabilities of the IORPs since the longevity risk modelling in the baseline represents a best estimate, taking into account appropriate and recent biometric risk factors as well as future trends. The NBS shows the impact of an adverse scenario in the usual reporting templates and has therefore explanatory and interpretability power. The results are presented in a transparent way allowing supervisors to refer to usual balance sheet items.
- **Projection tools.** Projection tools (CFA and RI projections) have a couple of important qualities for such an exercise. They capture the timing dimension of the impact since they show the impact on payment flows, including their size and timing.
- **Survey tools.** Can be deployed to add qualitative insights in the assessment of the impact on the ultimate risk bearers. It may also specifically shed more light on the way that mortality is embedded in balance sheet valuation under

the national framework and thus explain how national longevity shocks may generate different outcomes.

Box 2 – A specific narrative with impact on the financial position of IORPs

135. A difficult economic situation in the financial market could result in an instantaneous capital market shock that reduces the value of assets at a certain point in time and will subsequently affect own funds and payments of IORPs, if applicable.
136. According to the shock scenario the financial position changes and will usually lead to a devaluation of assets. The IORP itself is in any way concerned and will be affected in meeting the requirement of regulatory own funds (or capital buffers), when present. This is regardless of the kind of schemes under management and affects risks at the level of the IORP.
137. Furthermore, at the level of the scheme, especially for DC-schemes relying on income from asset management's costs, a sudden loss of the value of the assets reduces also the capital of members, leading to lower income for IORPs because of the reduced asset management costs if the latter depend on the amount of assets under management.
138. This shock scenario could also lead to payments from IORPs to members due to a guarantee, which burdens the regulatory own funds.
139. **The following questions arise:** To what extent does the financial position of IORPs change? How will the assets of the IORP itself (e.g. capital buffers) be affected? Whether and to what extent are payments from the IORP to members due to a guarantee triggered? How will the assets of the plan members be affected, especially in structures where costs of the IORP cannot automatically be charged to its ring-fenced structures?
140. To answer these questions the following tools can be used:
    - **Balance sheet tools.** It reveals the effect for both assets and liabilities and includes all kinds of pension schemes (e.g. DC or DB schemes). By using the NBS the impact of a given shock scenario is shown in the usual reporting templates and has therefore explanatory and interpretability power. In case of ring-fenced structures a NBS illustrates the effect on financial position which is adequately reflected in a national framework. The results are presented in a transparent way allowing supervisors to refer to usual balance sheet items. The CBS reflects the fair value of the assets and a market-consistent valuation of the pension obligations. In addition, with the CBS, effects onto the ultimate risk-bearers are visible in a way that can be compared across countries.
    - **The CFA.** Its advantage is that all cash flows will be considered and it shows the impact on the income of IORPs and also on benefit payments for members. A CFA does not necessarily define the financial position of an IORP but is useful to illustrate future payments. At the same time, it may be needed to compute the funding position of the IORP in order to execute a CFA, if funding ratios trigger mechanisms (e.g. security payments and / or management actions). The CFA is relevant for both assets and liabilities and allows multiple period shocks. It is suitable to reveal effects for an appropriate time-horizon, because

it considers cash flows over a longer period. The inclusion of management actions (embedded or reactive in the adverse scenario) is possible with this tool.

- **Survey tool.** A survey may give insight in certain effects which cannot be derived directly from balance sheet tools and may add important qualitative insights. For example the investment behaviour that may change after shock.

3.3.3. Assessment of the transmission effects of adverse economic scenarios via the IORP sector onto financial stability

141. This perspective aims to assess the transmission effects of the impact of an adverse scenario on the IORP sector onto financial stability. The following areas can be explored in order to assess these effects (see chapter 2):

- the direct impact on the financial markets and financial stability;
- the direct impact on the real economy and indirect transmission effect onto financial stability.

142. When assessing the impact on the real economy and financial stability, it is important to take into account the provisions of the national frameworks in order to gain a realistic view in the timing and impact of the recovery mechanisms that would actually apply.

3.3.3.1. Assessment of the direct impact on the financial markets

143. The appropriate tools should measure the direct impact of the adverse scenario on the financial markets due to liquidity needs and/or the behaviour of IORPs with regard to the asset allocation.

Table 3.2. Overview of tools to assess the direct impact on the financial markets

Methodology	**Balance sheet tools (valuation)**	**Projection tools**			**Survey tools**		
Tools	**NBS and CBS**	**IRR based on cash flows**	**CFA**	**Projected RI from IORP**	**BS**	**IBS**	**STS**
Investment behaviour of the IORP	No	No	No	No	Useful to get insights in the restrictions of the asset allocation	Yes. Impact on financial market via investment response.	Useful to get an idea of specific risk exposure
Liquidity risk	No	No	Yes	No	Partial	Partial	Yes, depending on ST

144. We refer to subsection 3.3.2.2. with regard to the assessment of liquidity risks.

145. The response of IORPs to the adverse scenario by tactically or strategically selling or buying assets can be assessed with **IBS**. The survey can examine the impact of the adverse scenarios on the asset portfolio (allocation and size) at different points

in time and the actions that take place between these points in time (buying/selling of specific asset categories). The **BS** can provide insights in possible investment restrictions. A **STS** could collect specific information on specific asset types or in relation to specific narratives/scenarios to gain more insights on specific risk exposures.

3.3.3.2. Assessment of the indirect transmission effect onto financial stability

146. The indirect transmission effects onto financial stability, running via the transmission on the real economy, may result from the impact of the adverse scenario on the ultimate risk bearers of the IORP.

147. Appropriate tools should assess to which extent employers, PPS, and/or scheme members and beneficiaries are hit in case of the adverse scenario. The **size of the impact** and the **timing of the impact** are two important dimensions in this assessment.

Table 3.3. Overview of tools to assess the indirect impact onto financial stability

Methodology	**Balance sheet tools (valuation)**		**Projection tools**			**Survey tools**	
Tools	**NBS**	**CBS**	**IRR based on cash flows**	**Cash Flow Analysis**	**Projected RI from IORP**	**BS**	**IBS** **STS**
Impact adverse scenario transmission to - ***employers*** *(sponsor support)* - *PPS* - ***Scheme members*** *and* ***Beneficiaries***	Partial. Rough indication of size, but not of timing that either the employer, the PPS or member / beneficiaries might be hit.	Partial. Rough indication of size, not of timing. The CBS shows clearly the market value of sponsor support, PPS and/or benefit reductions. Note that the reported security mechanisms can differ in height from the ones that would apply under the national frameworks.	No	Yes. Size and timing of impact on sponsor support, PPS and/or benefit reductions (distribution if stochastic)	Only the impact on the size and timing of the RI (distribution if stochastic)	Useful to get insights in the recovery measures and the risk bearers	Can provide additional insights. Useful to get an idea of risk exposure

Balance sheet tools

148. **Balance sheet tools** provide insights in the **size** of the impact in the adverse scenario but do not provide insights in the timing of the transmission of these effects.

149. The **NBS** gives a rough indication that risk bearers might be hit in case of a financing deficit. Additional surveys will be necessary to identify the risk bearer(s).

The **CBS** shows clearly which risk bearers will be hit but the size of the shown impact is not related to the national frameworks.

Cash flow analysis (CFA)

150. **CFA** tools are appropriate for the assessment of the **size** as well of the **timing** of the transmission of adverse scenario impact / concrete impact to employers, PPS, and/or scheme members and beneficiaries.
151. The cash flows related to sponsor support, benefit reductions and/or PPSs are calculated according to the national funding requirements, valuation standards and recovery mechanisms. This implies that IORPs have to establish for each year of the projection period whether the funding situation using national valuation standards for assets and liabilities complies with the funding requirements. Hence, IORPs will have to project the value of national assets and national liabilities in each year of the projection period by calculating the present value of the remaining cash flows using the national discount rate. If at any point in time the funding situation does not comply with national funding requirements, IORPs should take into account recovery measures consistent with national prudential mechanisms as well as their own statutes and policies, including maximum recovery periods and allowances for expected returns on assets in the recovery plan, expected IORP management actions and sponsor behaviour.
152. In order to assess the impact on the real economy and the financial stability, an approach that assumes new members and new accruals has merits since it provides a more comprehensive view of the impact of the shock by considering both existing and new accruals. Furthermore, IORPs do not have to make assumptions about how their (investment) policy would change over time resulting from the fact that it does not receive any new accruals. However, this requires setting out clear rules for the IORPs' assumptions about new members joining, potentially based on the IORPs' own business plans, which goes at the expense of the objectivity and comparability that is achieved when limiting the analysis to the actual obligations and contributions, as recognised in the respective balance sheets (NBS or CB) - which in many cases may be equal to existing accruals. Also for reasons of proportionality (complexity of modelling new membership, new accruals) and transparency (high number of assumptions) the usage of the actual obligations and contributions, as recognised in the respective balance sheets, can be envisaged.
153. The projection horizon should be sufficiently long to fully capture the impact of the transmission of the adverse scenario. For example, the CFA of the ST exercise of 2019 showed that the roll-out of the impact of the adverse scenario was spread over several decades. The minimal needed projection horizon depends of the design of the adverse scenario and the time horizon of the recovery mechanisms.
154. **Stochastic projections** can provide additional insights in the distribution of the size and timing of the security mechanisms (e.g. expected values, medians, quantiles).

Projected RI from IORP

155. The **projection RI from IORP** tools can be used to assess the **size** and the **timing** of the impact of an adverse scenario due to transmission of adverse scenario effects to **scheme members and beneficiaries**.
156. This approach is based on the comparison of projected pension income between scenarios. In this approach, the (relative) difference in benefit payments between the baseline scenario and the adverse scenario is set out against a timeline.
157. This approach is most informative if benefit payments to members can differ between the baseline and the adverse scenario. This will typically be the case for DC pension schemes, as the projected retirement income depends on the realised net returns on the assets (after deduction of applicable management fees) until the payment date of the benefits. This approach is also relevant for DB pension schemes depending on when the benefits are affected by the adverse scenario (e.g. conditional indexations and/or reductions, and/or, if the projection parameters (e.g. inflation and/or salary increases) are stressed. Depending on the objective of the exercise, the projection of the retirement income can be carried out at different levels, for example, to a sample of representative members, specific cohorts or to the whole population.
158. An approach that assumes new pension accruals based on future contributions of the existing population (where this is not part of the CBS anyway), but no new members may be considered for this exercise. Assuming new members seems more relevant for very long projection horizons. Restricting simulations to the accruals from contributions included in the CBS can be allowed for proportionality, and / or transparency reasons.
159. If a **stochastic approach** is used, the difference in income between the baseline and the adverse scenario has to be measured for each stochastic scenario separately. The result will be the distribution (e.g. expected values, medians, quantiles) of the decrease in income from the IORP.

Surveys

160. Finally, surveys can give some insights in the risk exposures and to which extent the IORP can be exposed to a specific adverse scenario. Basic information on security mechanisms (e.g. recovery measures, risk bearers) should be included in the **BS**. Surveys are not appropriate to assess the exact size and impact of adverse scenarios.

Box 3. An exercise focusing on the transmission onto financial stability

161. An adverse financial markets scenario akin to the one employed in the 2019 EIOPA IORP ST, with widening risk spreads and falling equity prices, could be considered. This would affect IORPs and the pension schemes they operate and will be felt one way or another by the ultimate risk bearers.

162. The objective of this part of the ST exercise would be to assess quantitatively what role the IORP sector plays in transmitting such an adverse scenario onto financial stability. The assessment should take into account direct transmission effects like those running via investment behaviour, as well as more indirect transmission effects that run via the impact on the real economy.

163. The challenge lies in the fact that the size of the transmission effects varies across countries (depending on the particularities of the schemes in place) as well as over time (as shocks may be felt fully only over time). Depending on the specificities of risk distribution the transmission may run via any or all of the following ultimate risk bearers of the IORP:

- An (re-)insurer, if a risk is (re-)insured. Note that such an effect is important to assess the effects of interlinkages with the (re-)insurance sector.
- A sponsor, if a sponsor guarantee is in place. Note that the sponsor impact may itself differ across sponsors, f. i. related to some sponsors being financial institutions and thus being subject to specific solvency rules.[3]
- A PPS, if such a scheme is in place and in case the IORP or the sponsor defaults in the adverse scenario.
- Plan members and beneficiaries, where the transmission effect may come in the form of a lower lump sum payment / implied nominal annuity upon retirement (in DC settings) or in lower conditional, discretionary and / or unconditional benefits (mainly in DB settings).

164. The toolbox approach suggests to deploy those tools that best meet the objective of the ST exercise. In the context of the above considerations to focus on the following tools:

- **The IBS**. It is well placed to assess the direct (stated) effects on financial markets via the buy / sell responses of IORPs in the adverse scenario. In addition it may add qualitative insights to the analysis.
- **Projection tools.** These have a couple of important qualities for the quantitative part of such an exercise. Firstly, they capture the timing dimension of the transmission effects since they show impacts on payment flows, including their size and timing. Secondly, they are applicable to the entire range of scheme types running from fully protected DB to entirely unprotected DC, thus allowing the transmission effects to be added over scheme types into aggregate IORP transmission effects. Thirdly, the relevant horizon can be tailored to (national) legal requirements and / or security mechanisms (e.g. long enough to capture the gradual economic impact of benefit reductions and / or short enough to adequately model new accrual if that is envisaged). Specifically the RI projection tool allows for assessment of the impact on the projected future RI (after versus before the shock) and reveals the transmission effects onto real economy via plan members and beneficiaries.

[3] If this were to be a main objective of the exercise, the strength of the conclusions might be bolstered by matching sampling criteria, e.g. to ensure representativeness of the sponsoring sectors.

3.4. The horizontal applicability of tools

165. The European IORP landscape is very diverse, which is a challenge for developing a European IORP ST. First, national prudential frameworks differ considerably across countries. Second, most countries have both DB as well as DC IORPs with very diverse characteristics. Third, the dividing line between DB and DC pension obligations has become more and more blurred in recent years.

166. This makes horizontal tools, which are tools that give meaningful and comparable results across scheme types (DB-DC) and across prudential frameworks (i.e. countries), particularly attractive for being used in a European IORP ST. Consistently with the toolbox approach, the tools' suitability should also be evaluated in relation to the ST objectives/perspectives and other more practical aspects of the tooling (see sections 3.3 and 3.5).

167. Table 3.4 summarizes the main results from this section, whereas the subsections discuss these results in more detail. Column 2 discusses whether the output from a tool gives comparable results across different scheme types within a country. Column 3 shows whether the output from the tool delivers comparable results across countries.

168. Finally, in order to obtain comparable results across IORPs, it is also important that the ST specifications contain sufficient information about the assumptions (and techniques) IORPs should use for calculating results.

Table 3.4. Summary table for the horizontal applicability of tools (detailed discussion in subsections below)

Tool	**Comparable results across scheme types within a country**	**Comparable results across countries**
NBS	Partially. Comparison of funding surplus/deficit across different scheme types needs to take into consideration the characteristics of the schemes (unprotected DC schemes are always fully funded for instance).	No, since different countries use different valuation methods for assets and liabilities and have different regulatory own funds requirements.
CBS	Partially. Comparison of excess of assets over liabilities and/or security mechanisms across different scheme types needs to take into consideration the characteristics of the schemes (unprotected DC schemes are always fully funded for instance).	Yes, since the CBS uses the same valuation standard across countries.
IRR	Limited to a comparison of scheme types with guarantees.	Yes, since the required IRR can be compared across countries as the rate of return does not depend on national valuation standards.
CFA	Yes, both for incoming cashflows and outgoing cash flows.	Yes, since cash flows can be compared across countries as cash flows have the same unit of measurement (cash flow in EURO from IORP) across countries.
RI tool	Yes, since all IORP schemes pay out RI to their members.	Yes, since the RI from the IORP has the same unit of measurement (income in EURO from the IORP) across countries.

Investment survey	Yes	Yes, if one uses the same valuation standards across countries.
Stock take	Depends on stock take. In general yes.	Yes, if one uses the same valuation standards in the stock take.

3.4.1. Balance sheet tools

169. Both the NBS as well as the CBS can be technically applied to DC and DB schemes by calculating the value of assets and (if relevant) the value of liabilities across scheme types.
170. One can compare asset or liability values across scheme types within a country as long as one uses the same valuation standards within a country. However, one cannot simply compare the funding surplus/deficit (excess of assets over liabilities) across scheme types in a horizontal analysis as for example unprotected DC will never be underfunded. Consideration has to be given to the specificities of the different schemes, for example liabilities are equal to (a fixed proportion of) assets for DC schemes without guarantees (unprotected DC schemes), whereas liabilities can significantly differ from assets for DB or protected DC schemes.
171. The NBS does not deliver comparable results across countries, since different countries can use very different national valuation standards, and have different funding requirements. The CBS does give comparable results across countries, since this balance sheet uses a common valuation methodology to value assets, liabilities and security adjustment mechanisms across countries. Note that the use of different simplifications and/or other assumptions across countries can make a comparison of results more difficult.
172. Both the NBS as well as the CBS contain balance sheet items, but the particular item one analyses in a particular IORP ST depends on the chosen ST perspective as discussed in the previous section. One can for example look at the impact of the adverse scenario on the asset values (e.g. to gauge the impact of the adverse scenario on all IORP members) or the funding deficit (e.g. to analyse the impact of the adverse scenario on the solvency position of the IORP for the NBS).

3.4.2. Projection tools

173. For DB schemes, the IRR is equal to the required return for meeting guaranteed benefits. For DC schemes with guarantees, the IRR is equal to the required return for meeting the guarantee. The IRR delivers comparable results across countries. It is after all possible to compare the required rate of returns, since IRR does not depend on the national valuation standards.
174. The CFA can be technically applied to both DB as well as DC schemes by projecting the future development of the IORP along the scenario(s) and by subsequently calculating the incoming and outgoing cash flows. The partition of outgoing cash flows in cash flows from conditional and unconditional liabilities may not be relevant for some scheme types (e.g. DC schemes without guarantees). Furthermore, sponsor support may not be relevant for some scheme types. For a

specific ST exercise, it might still be relevant to include sponsor support in a horizontal analyses if one wants to analyse the risk shifting to both sponsors (mainly in DB schemes) (and the PPS) as well as to members and beneficiaries (mainly in DC schemes and DB schemes where benefits can be adjusted). This depends on the chosen ST perspective. The CFA does give comparable results across countries, since the output uses the same unit of measurement (EURO to or from the IORP) across countries.

175. The RI tool can be technically applied to both DB and DC schemes by projecting the future development of the IORP along the scenario(s) and by subsequently calculating the (total) RI to IORPs' members and groups of members. Furthermore, one can compare the outgoing cashflows to groups of members across different scheme types, since all scheme types by nature (eventually) pay out cash flows to members. The RI tool does give comparable results across countries, since its output (outgoing cash flows to (selected) groups of members in EURO) uses the same denominator unit of measurement across countries. Both the CFA as well as the RI tools give cash flows as output. Note that the analysis of these cash flows depends on the chosen ST perspective as discussed in the next section. One can for example look at the impact of the adverse scenario on the cash flows (either as a percentage change relative to the baseline or express the cash flow relative to other economic variables such as the GDP).

3.4.3. Survey tools

176. The investment survey tool can be technically applied across scheme types, since IORPs, irrespective of scheme type, invest on financial markets. The resulting current and (hypothetical) future asset allocations can be compared across scheme types and across countries as long as one uses the same valuation standard to value the assets.

177. The horizontal applicability of the stock take depends on the specific exercise. In general, if the stock take focuses on the asset side of IORPs (such as for the ESG breakdown in the 2019 ST), it can be technically applied and it gives comparable and relevant results across scheme types and countries as long as it uses common valuation standards.

Table 3.5. DB-DC IORPs: two buckets containing schemes with various degrees of risk-sharing

<table>
<tr><th>TYPE OF SCHEME</th><th colspan="2">MAIN CHARACTERISTICS</th><th>SPECTRUM OF RISKS</th></tr>
<tr><td rowspan="3">DC OCCUPATIONAL PENSION SCHEMES</td><td rowspan="3">Occupational pension schemes under which the scheme sponsor and employees pay fixed contributions and have no legal or constructive obligation to pay further contributions to an ongoing scheme in the event of unfavourable plan experience.

DC benefits are defined primarily in terms of the level of the capital built up from the contributions made over the employees' working lives, the increases in value that result from the investment of such contributions by the pension scheme and decreased by expenses.

DC schemes manage savings offering to members different investment options, ranging from guaranteed options (protected DC IORPs) to investment options (unprotected DC schemes) with different risk-return and time horizon to meet retirement needs of members.</td><td>Unprotected DC pension scheme

An occupational DC pension scheme where the pension scheme/fund itself or the pension provider does not offer any investment return or benefit guarantees or promises covering the whole pension scheme/fund.

By definition an unprotected DC pension scheme is always fully funded.</td><td>Investment and biometric risks borne individually by members

Investment risks shared collectively</td></tr>
<tr><td>Protected DC pension scheme

An occupational DC pension scheme other than an unprotected DC pension scheme. The guarantees or promises may be offered by the pension plan/fund itself or the plan provider (e.g. deferred annuity, guaranteed rate of return).</td><td rowspan="3">Risks shared collectively

Investment risks shared between the plan, providers, sponsors, members (accumulation) and possibly partly re-insured.

Investment and biometric risks shared between the plan, providers, sponsors and members, beneficiaries (pay-out), and possibly partly re-insured</td></tr>
<tr><td rowspan="2">DB OCCUPATIONAL PENSION SCHEMES</td><td rowspan="2">Occupational schemes other than DC schemes. The benefits payable to the employee on retirement are determined by the use of a formula, either alone or in combination with a guaranteed minimum amount payable.

Pension obligations of DB schemes are valued using actuarial methods, addressing both investment as well as biometric risks. Generally, the factors considered to value the defined benefits are the years of service, the salary over a defined period of time, the age at retirement and the indexation rule.

DB schemes estimate the surplus/deficit relative to the funding requirements at the reference date.</td><td>Hybrid DB scheme

A DB scheme where benefits depend on a rate of return credited to contributions, where this rate of return is either specified in the scheme rules, independently of the actual return on any supporting assets (e.g. fixed, indexed to a market benchmark, tied to salary or profit growth, etc.), or is calculated with reference to the actual return of any supporting assets and a minimum return guarantee specified in the scheme rules.</td></tr>
<tr><td>Traditional DB scheme

A DB scheme where benefits are calculated through a formula to the members' wages or salaries, length of employment, or other factors.</td><td>Risks fully borne by the sponsor provider</td></tr>
</table>

Source: Based on EIOPA, OECD, and ESA classifications.

3.5. Practical considerations in the selection process

178. To support the choice of the most appropriate tools during future exercises, the relation of the candidate tools regarding the ST perspectives/objective(s) is the primary aspect to look at (section 3.3). Nonetheless, other aspects, such as for example the horizontal applicability (discussed in detail in section 3.4), should be included in the tool selection process and would help refine the choice.

179. This section aims at listing and describing a set of complementing aspects to be looked at (subsection 3.5.1), and at providing a qualitative assessment of the candidate tools regarding these other aspects (subsection 3.5.2). The qualitative assessment is for guidance to the selection process only and does not suggest to jump to conclusions that can only be arrived at in the encompassing context of ST design.

3.5.1. List of considerations

180. Conscious of the effort needed to run a bottom-up ST exercise at industry and supervisor level, a basic principle that underlies tool selection is a cost-benefit assessment. In that sense, the selection process should consider both the insightfulness of the results provided by a tool (benefit) and the tool's practicability for the parties involved (EIOPA, NCAs and IORPs) (cost).

181. In terms of insightfulness of the tool, besides the relation with the ST perspective/objective(s) (section 3.4) and the horizontal applicability (section 3.3), the quality of the information should also be considered:

- **Interpretability (and transparency) of the results**: the supervisors (EIOPA and NCAs) should be able to interpret the results easily. A high **number of assumptions** and level of leeway left to the participating IORPs (due for example to the **complexity** of the methodology) in the results production, and the lack of transparency could impair the interpretability of the results.
- **Explanatory power of the results:** the realistic aspect of the results of a tool, meaning the extent to which these explain and reflect a fair situation of a participating undertaking. This aspect is closely linked, but not limited, to considerations such as the treatment of management actions, valuation of embedded options valuation, etc. and could lead to a more or a less realistic situation.
- **Usefulness of a tool *for the IORPs***: a ST aims at providing insights in the IORP sector vulnerabilities, not least for the IORPs themselves. Usefulness of the exercise for IORPs helps the supervisory objective, namely it facilitates the IORP to be the owner of the results.

182. The practicability of a tool can be assessed from the point of view of (i) the supervisors (EIOPA and NCAs) who specify, validate, analyse and interpret the results of an exercise, and (ii) the IORPs performing the calculations. A ST exercise has a limited timeframe, with different steps from the establishment of the ST

package to the ST report publication. Therefore, complexity and time consumption should be assessed. The assessment could be done relative to the *level of difficulty* in conducting the different steps of an exercise:

- **Establishment of the technical specifications and templates for the ST package:** when for a tool, the technical specifications and the template(s) are already established (for example, from previous STs), this step would be easy. However, it is for the cases where a tool allows for some parametrizations (e.g. population to project amongst the members/beneficiaries, projection horizon for cash flows projection tools etc.) to be set for each exercise, that an update or creation is needed, and that the complexity of the task (methodology, consideration of national specificities, etc.) and the time required delivering the technical specifications, the reporting templates, and thereafter the relevant analysis tool(s) should be considered in the tool(s) selection process. The essential part here is that there may be a learning effect across exercises that may be limited if the specifications differ substantially between exercises. This should also to some extent be taken into account when formulating the objectives (the objective should primarily determine tooling choices).
- **Validation of the results**: Can it be automated or does it call for significant expert judgement (e.g. long term estimates of new members and accrual in an approach that takes these on board)?
- **Delivery of results *from the IORP's point of view*:** Difficulties faced by the IORPs during an exercise could affect the quality of the results (time allowed for the calculation, resources available at the participants' level, clarity in the instructions provided by the supervisor) or impair the participation level. For example, the tool selection process should reflect on:
  - Whether the tool methodology and templates are clear and provide enough information to the IORPs. For new (and small) participating IORPs, a ST exercise may be a lot more challenging than for experienced and larger IORPs.
  - Whether the ST tool methodology would require the development of new analytical / reporting tools by the IORPs, increased level of required resources. Then it would add a challenge in terms of time and burden for the IORPs.
  - Whether the tool methodology provides enough proportionality.
  - Whether the recalculation(s) required by supervisors can be performed easily by the IORPs during the validation phases and within the timeframe allowed, with an acceptable level of quality.
  - Whether the results are easily analysed and validated.

Table 3.6. Summary of aspects to consider in the tool selection process (other than the relation to the ST objectives and the horizontal applicability)

	Perspective of EIOPA/NCAs	Perspective of IORPs
Insightfulness aspects		
	Interpretability of the results / explanatory power.	Usefulness for the IORPs.
	Number of assumptions.	
	Complexity.	
Practicability aspects		
	Establishment of technical specifications and templates for the ST package.	Delivering of results.
	Proportionality	
	Validation of the results.	

3.5.2. Qualitative assessment of candidate tools regarding the other considerations

183. This subsection provides a qualitative assessment of the candidate tools regarding these other aspects. A summary overview of this assessment is available in table 3.7 below.

184. Being by construction a summary view of an IORP NBS which is reported on a regular basis to its NCA, the **NBS** tool has the following natural advantages:

- The results are easy to compute for the IORPs (tool already in place) and are directly useful for them as the results reflect their actual prudential regime.
- At the national level, the results are easy to validate and interpret.

However, due to the balance sheet valuation methodologies and the prudential regimes that differ across member states:

- The validation is more difficult at the European level and may therefore rely on NCA validation.

185. Compared to the NBS, the **CBS** is generally more difficult to implement, validate and interpret. The CBS has the advantage that:

- It is useful for IORPs in terms of their own risk management process as it provides a market consistent view of their balance sheet.

However,

- It is generally (moderately) difficult for IORPs to produce the results, due to complexity of the methodology. For IORPs normally not using stochastic techniques for the valuation of sponsor support, PPSs or the benefits adjustments mechanisms, that do not use the CBS outside of the stress testing exercises, or that do not have a similar tool in place, it can be very difficult to produce. However, when applying the simplified deterministic approach to option

valuation, or in the absence of security mechanisms to value, the results are more easy to produce.
- The validation and the interpretability of the results are (moderately) difficult. Simplified assumptions and model choice –in case of a stochastic valuation– should be closely looked at as they can reduce the comparability between IORPs.

186. The **IRR** has the following advantages:

- It is easy to calculate by the IORPs.
- It can be useful to the IORPs in terms of their own risk management, but might not capture some risks (material options in the contracts).
- It is easy to validate and interpret (more for the solvency effect than the other effects) by the NCAs/EIOPA.

187. The **deterministic CFA** tool is:

- Moderately difficult to use and interpret by the IORPs (depends on familiarity of IORPs with cash flows projections).
- Moderately difficult for NCAs/EIOPA to validate and interpret the results (depending on the parameterization of the tool).
- Useful for IORPs (it can be used for its own risk management process and gives insights in the expected cash flows). However, for IORPs with material financial guarantees and embedded options, the explanatory power and usefulness of the results for these IORPs are reduced.
- Compared to the above tools, the establishment of the technical specifications and templates for this tool would be moderately difficult initially, as it needs to be updated from the version used in 2019 ST to incorporate the valuation of unprotected DC schemes. In order to facilitate both the comparability of the results as well as for efficiency reasons to re-use the IORP's calculations for valuation purposes, the cash flow projections specifications may follow the technical specifications of the common methodology, including assuming risk-free returns and the extent to which future contributions from the current membership may be assumed.

188. Compared to the deterministic version, the **stochastic CFA** tool provides a more comprehensive view in principle but is more difficult to calculate and validate. This tool has the advantages that:

- It provides a more comprehensive view in the sense that it assesses more aspects of the distribution of the cash-flows (e.g. expected value, median, quantiles). It will also allow to better reflect the financial guarantees and options embedded in the contracts (give a full view of the value/working of these).
- It remains useful to the IORPs in terms of their own risk management.

However,

- It remains generally (moderately) difficult for IORPs to produce the results, depending on how they are familiar with cash flows and stochastic methodologies.
- The validation of the results is also more difficult, and requires more vigilance from NCAs/EIOPA than the deterministic approach. The increased comparability in theory of the stochastic approach remains dependent on the consistent

application of the methodology, and to which extent the choice of assumptions (e.g. probabilities) and methods used by IORPs (including those for the valuation of financial guarantees and options) do not impair comparability. However, the technical specifications of a stress test exercise should constrain the choice of assumptions and methods, to ensure comparability. Simplifications in the proposed methodology and/or allowance to use own (internal) models can for instance lead to less comparability than a deterministic approach.
- Furthermore, it is a new tool and therefore the technical specifications, the templates and validation rules need to be newly set up.

189. The **deterministic projected RI tool**:

- It is (moderately) difficult to use by the IORPs, depending on whether an IORP is familiar with this type of analysis.
- The results can be useful for IORPs in terms of analysis from the point of view of members and beneficiaries.
- Depending on the number of assumptions allowed for a specific exercise, the results may be difficult to validate and to interpret by NCAs/EIOPA.
- The same considerations as for the deterministic approach to the CFA are to be considered.
- It is a new tool for some IORPs. Therefore, the establishment of the technical specifications and the templates of the tool and of the validation rules for the future ST exercise that would use this tool would be moderately difficult initially.

190. Compared to the deterministic version, the **stochastic projected RI tool** provides a more comprehensive view in principle but is more difficult to calculate and validate.

- Previous considerations discussed for the cash-flow analysis tool regarding a stochastic approach compared to a deterministic approach also apply here.
- It is a new tool therefore the establishment of the technical specifications and the templates of the tool and of the validation rules for the future ST exercise that would use this tool would be difficult initially.

191. The **survey tools** are not limited to those used in the past. They constitute a general category covering any type of survey (quantitative or qualitative). Their assessment relative to these other aspects would depend on their specificities.

Table 3.7a. Assessment of candidate tools regarding other aspects to consider in tool selection: insightfulness

Methodology	**Balance sheet tools (valuation)**		**Projection tools**				
Tools	**NBS**	**CBS**	**IRR based on cash flows**	**CFA (Deterministic)**	**CFA (Stochastic)**	**Projected RI from IORP (Deterministic)**	**Projected RI from IORP (Stochastic)**
Insightfulness for EIOPA and NCA							
Number of assumptions	Low	Medium/High (depending on the simplifications)	Low	Medium	High (full distribution of equity, interest rates, inflation, etc.)	Medium	High (full distribution of equity, interest rates, inflation, etc.)
Complexity	Low	Medium/High (depending on the simplifications)	Low	Medium	High (required full stochastic calculation)	Medium	High (required full stochastic calculation)
Interpretability of the results / Explanatory power	Medium (yes on solvency position, limited for other effects)	Difficult for IORPs without CBS in use	Medium (yes on solvency position, limited for other effects)	Medium	Medium	Medium	Medium
Insightfulness for IORPs							
Usefulness for the IORPs	Gives results that are in line with national framework.	Gives a "market-consistent" view of the balance sheet.	Can be used for risk management purposes. Easy to apply and results are easy to understand.	Can be used for risk management purposes. Gives insight in the expected cash flows.	Can be used for risk management. Gives insights in the expected cash flows	Can be used for long term risk assessment from the point of view of the members and beneficiaries.	Can be used for long term risk assessment from the point of view of the members and beneficiaries.

Table 3.7b. Assessment of candidate tools regarding other aspects to consider in tool selection: practicability

Methodology	**Balance sheet tools (valuation)**		**Projection tools**				
Tools	**NBS**	**CBS**	**IRR based on cash flows**	**CFA (Deterministic)**	**CFA (Stochastic)**	**Projected RI from IORP (Deterministic)**	**Projected RI from IORP (Stochastic)**
Practicability for EIOPA and NCA							
(Difficulty in) Establishment of technical specifications and templates for the ST package	Low (STs 2015 – 2019)	Low (STs 2015 to 2019)	Low (ST 2017)	Medium (ST 2019; new for unprotected DC)	High (new)	Medium (for unprotected DC based on representative members in STs 2017 to 2019; new for protected DC and DB)	High (new)
(Difficulty in) Validation of the results	Low	Medium/High (High if CBS is not used in countries)	Low	Medium	High	High	Very high
Practicability for IORPs							
(Difficulty in) Delivering of results	Low	Medium/High (High if CBS is not used in countries)	Low	Medium (depending on whether the countries work with cash flows projections)	Medium/High (depending on whether the countries work with	Medium (depending on whether countries work with cash flows to plan members and beneficiaries)	Medium/High (depending on whether countries work with stochastic cash flows to plan

					stochastic cash flows projections)		members and beneficiaries)

4. Sample selection

4.1. Identifying IORPs to be included in the ST

192. According to Article 32(2)(aa) of Regulation (EU) 1094/2010 (EIOPA Regulation) EIOPA shall develop „common methodologies for identifying financial institutions to be included in Union-wide assessments".
193. The IORPs identified to be included in an EIOPA IORP ST (hereinafter: the sample) should be in line with the objective(s) of a European-wide ST. Therefore, the IORPs within the national samples chosen by the NCAs should provide a fair reflection of the national IORP sectors, and thus a fair reflection of the European IORP sector as a whole. Further, in case the ST objective is to focus on a particular risk type, the sample selection should consider whether IORPs or schemes may be affected by or be sensitive to that risk.
194. In past STs, only EEA member states "with material IORP sectors" were included[4]. This approach can also be taken in future STs, subject to a decision of the EIOPA BoS setting out the measure for "materiality" in the respective ST. This aspect does not need further discussion in this paper.
195. If a ST uses different approaches or tools for different groups of IORPs, for example, IORPs providing DB schemes on the one hand or DC schemes on the other hand, NCAs should consider this when choosing the sample, so each of those groups is represented appropriately in the sample, i.e. fairly reflecting the national IORP sector.

4.2. Considerations concerning the relevant level of performing the ST

196. The objective(s) of the ST as well as different objectives related to different groups of IORPs/schemes (e.g. DB or DC) may also impact on the "level" at which the ST is performed. In some cases, it may be appropriate or even indicated to perform a ST at the pension scheme level or at the level of an aggregate of certain schemes, rather than the IORP.
197. It may be the case that only certain scheme types of an IORP are sensitive to a particular risk or scenario, in line with the ST's objective, so that it may make sense to apply the ST only to the affected schemes.
198. This should be addressed in the ST specifications and NCAs should consider it based on those specifications when identifying the sample.

[4] This was determined as exceeding €500m in assets; see par. 2.6 of 2019 IORP Stress Test Specifications, EIOPA-BoS-19/157 29 March 2019.

4.3. Identifying the participating IORPs

199. NCAs should identify the sample of participating IORPs in their Member State based on the idea to fairly reflect on the national IORP sector and, where specified, on the respective ST specifications. Those specifications should take into account the principles included in this chapter and provide further guidance on how those principles are applied in the concrete ST.
200. Where EIOPA's ST specifications require a minimum market coverage rate to be reached, NCAs will have to fulfil this condition when choosing the sample. It is not always necessary for achieving meaningful results, though, to have a very high market coverage. EIOPA will therefore duly consider where to set a minimum market coverage and, if it is necessary, its level, applying a proportionate approach.
201. For a sample to provide a fair reflection of the respective national market, it should be chosen considering the most relevant characteristics of IORPs in the respective market. National specificities may determine which characteristics are relevant in different national markets, because of the diversity of IORPs throughout the EEA. Therefore, not all NCAs will necessarily consider the same characteristics, or weigh them equally. The IORPs included in the sample may represent a wide range of values of the respective characteristics.
202. Relevant characteristics may include:
    - funding level
    - total assets and mix
    - total members and beneficiaries
    - types of guarantees and/or biometric risk covered by the IORP
    - legal form or form of organization
    - applicable security and benefit adjustment mechanism
    - use of (re-)insurance
203. In the sample selection, NCA can use expert judgement and should consider proportionality (see below).

4.4. Considerations concerning proportionality

204. When identifying the sample, NCAs should apply a proportionate approach, which means they should consider the size, nature, scale and complexity of the activities of the IORP. This means that NCAs have some discretion when choosing the sample.
205. Assuming that the costs for an IORP of participating in a ST exercise are the same, independent of the size of an IORP (or even larger for small IORPs with no internal resources), the burden of such an exercise on a national IORP sector as a whole will be larger, the more (smaller) IORPs participate. The costs can be very material for a small IORP. Therefore, where the objective(s) of a ST can be fulfilled and the sample satisfies the abovementioned principles of sampling, NCAs should consider that the relative burden of participating in a ST exercise can be much higher for smaller IORPs and may choose the sample primarily among larger IORPs.
206. When considering proportionality, specificities of IORP sectors in Member States can be taken into account. The national specificities, which can - or should - be taken into account, should be specified in the ST specifications. For example, if there is, compared to other Member States, a very large number of similar IORPs in a Member

State, in particular of small IORPs, this could be taken into account by reducing the required minimum market coverage for this Member State. This would only be possible if a fair reflection of the respective national IORP sector is ensured, even with this reduced required minimum market coverage. This approach should only be used in case of extreme circumstances. This is because, if it was used based on a large number of specificities in many Member States, this would put at risk comparability of results between member states.

5. Scenario design, risk factor selection, shock application

5.1. Building the adverse scenario

207. The core assessment of IORP STs refers to the impact of an adverse scenario on the financial position of an IORP and the transmission effects via the IORP sector onto financial stability.
208. The design of the adverse scenario's narrative has to stay close to the current macrofinancial environment (baseline situation) and take into consideration new potential emerging risks on financial markets resulting in a plausible, yet severe, scenario against the baseline situation.
209. The adverse scenarios of past exercises were calibrated with an appropriate number of individual risk factors designed to cover the investment exposures of IORP´s assets and also included the Euro swap rate curve as a measure of the risk free interest rate to re-value IORPs' liabilities. Simplifications and proportionality principles were considered in the application of the shock, when their use did not have material consequences for the outcomes, to minimize the burden on IORPs.
210. The specific adverse economic and financial market scenarios for the stress testing exercises were provided by ESRB, in cooperation with EIOPA, and in line with the narrative and objective of the individual ST exercise.

5.2. Heterogeneity of IORPs in the context of shocks

211. The defined shocks for previous IORP STs considered the global economic and financial environment and the features of the commitments of the employers and employees (DB or DC).
212. The ST goal is the identification of risks for the resilience of the IORPs and the potential financial stability consequences, under a set of severe adverse scenarios. The exercise aims at covering the full picture of the Occupational Pensions.
213. Differences in national regulatory frameworks occur especially with respect to the valuation of liabilities, different IORPs' funding requirements and the available security mechanisms.
214. Other characteristics of IORPs (e.g. the legal form and the ultimate responsible of the commitments) determine the specificities of national frameworks between Member States, which makes the understanding of the European aggregate results more difficult.

5.3. Specificities of IORP ST compared to insurance ST

Shocks

215. Asset side (market shocks) are generally the same for IORPs, the significance of each asset class varying according to the type of IORP and by Member State, similar in principle to the variation in asset type used by insurance entities (composite, life, non-life or reinsurance).
216. IORPs are not exposed to a risk analogous to the lapse risk found in the insurance sector, as individual pensions savers are not customers of IORPs, but have a relationship with the IORP via their employment. However, members and beneficiaries or sponsoring undertaking may exercise their, often limited, right to transfer their accumulated pension savings or to otherwise withdraw their savings.
217. Liability side risks affecting IORPs are generally quite distinct from those affecting insurers, apart from longevity/mortality risks, which are significant for both sectors.
218. Asset and liability side risks affecting IORPs are discussed further below.

Baseline

219. The IORP sector differs from the insurance sector, not only as regards IORP specificities across and within Member States, but in the absence of an overarching solvency regime comparable to Solvency II, rather specific member state solvency regimes are in effect.
220. For participating IORPs then, a decision must be made as regards what baseline state will be used for each IORP.
221. For use in the context of the individual Member State regime, the NBS has the advantage of being easily prepared by the participating IORPs, but at the major disadvantage of a lack of true comparability across IORPs, either in the baseline or in the adverse scenario.
222. EIOPA's CBS approach allows for valid comparisons at the cost of requiring the separate calculation of a baseline under the CBS framework and being more difficult to prepare.[5]

Time horizon

223. Instantaneous shocks will affect IORPs in a similar way as they do on insurance entities, mainly on the asset side.
224. For the longer term, IORPs tend to operate at a much longer term than insurance business, so the question arises as to how to measure the effect of shocks over several decades.
225. Very long term effects can be explored in various ways, e.g., in IORP STs to date, at the IORP level, CFA in the baseline and adverse scenario, and, at the individual

[5] See Opinion on the practical implementation of the common framework for risk assessment and transparency of IORPs, published in 2019.

pension saver level, the effect of the adverse scenario on ultimate retirement income.

Management actions

226. The range of management actions available to IORP managers is generally more limited than those available in the insurance sector. Many IORPs are not themselves profit-seeking entities, so a management action such as reducing dividend payments would not be available for them. IORPs may be able to change their investment allocation, yet are often limited by a set of strategic or prudential limits per asset class.
227. However, other management actions can be available to IORP managers, depending on the financial relationship between the IORP and the pension saver.
228. For DB schemes in particular, the nature of the IORP may allow for a cut in promised benefits to be possible, depending on local rules.
229. Also in the case of DB schemes, a change in the level of some benefits may assist the IORP in response to an asset side shock, depending on local rules, e.g., changes to the level of indexation of benefits, conditional and discretionary benefits.
230. As IORPs are entities providing for occupational retirement income, the possibility of support from sponsoring employers to DB schemes may be available, and depending on local rules, may be obligatory on the sponsor.
231. Management actions for DC schemes are very limited, e.g. changes in the investment allocation or cost reduction.

5.4. ESRB role and expertise

232. The European Banking Authority (EBA), the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA), in cooperation with the ESRB, are requested by legislation to use STs in order to assess the resilience of financial institutions or market participants to adverse market developments. As part of this cooperation, the ESRB has designed scenarios of adverse economic and financial market developments.
233. In its corresponding sector of activity, each of the ESAs, in consultation with the ESRB, has to elaborate criteria for the determination and quantification of the systemic risk and the design of an adequate regime of solvency tests for the institutions of your competition.
234. The ESAs also initiate and coordinate the ST to assess the resilience of financial market participants. Financial market participants who may present a systemic risk should be subject to enhanced supervision.
235. It should be noted that EIOPA retains responsibility for all aspects of IORP STs, e.g., there is no delegation of responsibility from EIOPA to other bodies as regards to scenario design.

5.5. Scenario design

236. The central part of a ST exercise is the design of the applicable scenario, i.e. the tested adverse scenario that negatively affects the resilience of an IORP, its members and beneficiaries, and may impact the real economy and financial stability. A scenario can set out one single shock or a combination of different shocks, encompassing not only financial market shocks, but also demographic, inflation or longevity shocks.

5.5.1. From the narrative to the plausible, yet severe scenario

237. The narrative of a ST exercise is the basis of the scenario design. Hereby, the narrative specifies the triggering events of the adverse economic developments and the potential aggravating interlinkages between markets and sectors, the shocked variables and the hypothetical trajectory of the shocked variables. The narrative should capture risks faced by IORPs and the most relevant risk factors, so that there is a clear objective and basis for potential recommended actions following the ST results.

238. The starting point of a narrative and the ST exercise is the current economic situation, i.e. the baseline, at reference date. The ST exercise applies at least one plausible, yet severe, scenario against the baseline situation. The scenario stems from the narrative and the objective of the ST exercise, i.e. to understand the impact of most relevant risk factors to the IORPs. A scenario is expected to be severe, yet plausible, which means that the scenario does not necessarily have to reflect an expected or probable future development, but should be as severe as to challenge the IORP's resilience to withstand an adverse development. However, the adverse development should be plausible which means that the adverse development could actually happen, based on economic theories or science-based projections of a future state, for example for environmental STs.

239. A scenario can replicate a past event, for example a past financial crisis, to understand whether the IORP sector may be more or less resilient than in the past if the same adverse development would happen. On the other hand, scenarios can be fully hypothetical without any bearing to past events. However, it may be difficult to create an adverse scenario that is fully independent from past events or developments. That is why usually hybrid approaches are applied, which combine one or several past adverse market developments and extending those - by using expert judgment and applying economic theories – to potential further adverse trajectories. Both historical and forward-looking approaches have advantages and disadvantages, which can be considered for designing the adverse scenario in line with the ST's narrative and objective. A hybrid approach to scenario development is preferred over a purely historical or a pure forward-looking approach, as it allows assessment of the envisaged risks maintaining consistency with the co-movements of the markets. Expert judgement applied in the definition of the forward-looking component of the scenario should generate plausible outcomes that are in line with economic theory or supported by other scientific expertise on specific aspects (e.g. climate science).

Table 5.1. Advantages and disadvantages of historical and forward-looking approaches to scenario design

	Advantages	Disadvantages
Historical approach	• Past events provide a benchmark of what could potentially happen in the future • Plausibility of the scenarios may be more easily justified.	• Financial crises or pension-related shocks that exceed or are different from what happened in the past is not assessed • A purely historical approach would not allow for a partly forward-looking perspective • Limited flexibility • Specific future scenarios might not emerge or be derived from historical data
Forward-looking approach	• More tailored future scenarios can be achieved when independent from historical data • More flexibility in the design	• Requires an appropriate justification for the scenarios provided • Requires a higher degree of expert judgement, which should also be carefully justified

240. A scenario can entail one single shock of one single risk factor (i.e. a single shock) or it can provide for shocks on a number of risk factors, which follow a specific risk theme, for example market shocks (i.e. a single scenario) or the scenario presents shocks on a number of risk factors from different (correlated or uncorrelated) risk themes, for example a drop in the RFR combined with a sharp increase in inflation rates (i.e. a combined scenario). Whether to choose a single-shock (sensitivity analysis), single scenario or combined scenario follows from the objective of the ST exercise. Combined scenarios are expected to allow for a more holistic assessment of key risk factors on IORPs´ resilience and potential impact on financial stability. However, a combined scenario is difficult to interpret with reference to the effects of the single risk factors and how sensitive the results are to a change in those individual risk factors.

Table 5.2. Advantages and disadvantages of single-shocks versus single scenarios versus combined scenarios

	Advantages	Disadvantages
Single shocks	• In particular for standard market stress sensitivities, it can be expected that IORPs can leverage on existing processes for implementing the required calculations and for reporting the results • The isolated view of single risk factor movements facilitates the validation and the interpretation of results • The focus on single risk factor movements facilitates a consistent and uniform application of the scenario and therefore supports the comparison of the results	• The explanatory power of the results can be seen as limited. In particular, it can be very difficult to derive the impact of a combination of sensitivities based only on single sensitivity results. Tail dependencies and their potential implications are completely outside the scope • As most of the historical crises were not limited to single risk factor movements, the approach may be seen as rather narrow for a ST exercise. Against this background, it may be difficult for supervisors to define specific follow-up measures based only on sensitivity results

	• The approach allows the estimation of the likelihood of the prescribed shock	
Single scenarios	• They are simpler in design than a combined scenario, which includes both market and pension-specific shocks • They allow the design of several scenarios consisting of single risk factors with different likelihoods • There is no need to take the interactions and dependencies between market and pension-specific risk factors into account	• Because of the existence of multiple risk factors with mutual impacts, it may not seem realistic to look at the effects of important risk factors — i.e. market and pension risks — in isolation. As the business of the IORPs is exposed to a combination of risk factors, financial and pension-specific risks should be considered together • The explanatory power of scenarios can be superior to single-factor sensitivities, as they cover interdependencies between different risk drivers and their (often complex) combined impact. For the same reason, combined scenarios can be superior to single scenarios. IORPs may adopt a strategy to diversify the effects different risks at the same time. Such a diversification strategy cannot be assessed when a single risk factor is shocked or in a single scenario design
Combined scenarios	• Compared with single factor sensitivities, combined scenarios offer greater flexibility for tailoring to the specific objective of the ST exercise • The explanatory power of combined scenarios can be superior to single-factor sensitivities or single scenarios, as they cover inter-dependencies between different risk drivers	• The interaction between different risk drivers can be very complex and often depends on entity-specific risk profiles. Moreover, the final stress depends on the order in which the various stresses occur The results usually show the effect of combined shocks, and, consequently, there will be no information about the effects of the separate shocks

5.5.2. Extension to multi-period scenarios

241. EIOPA's IORP ST exercises so far used the developed scenarios to translate them into instantaneous and permanent shocks, which could be applied to the financial situation of an IORP at reference date. A possible extension of the exercise would be to set out a scenario of shocks that emerge or occur over multiple periods. For example, in the STs carried out by the EBA assessing the European banking sector, it is assumed that an adverse development may entail a sequence of shocks, spread over several periods, in which the entity may be subject to supervisory measures as well as may have control over mitigating measures or to introduce changes in the business model.
242. Building a scenario that extends over several periods is complex and requires setting out a number of assumptions on potential future developments and interlinkages between those developments. It may also entail allowing for no, a certain degree of, or full, discretion of the IORP in terms of management actions to react to the set of shocks in the different periods – depending on the objective of the ST exercise.
243. Multi-period scenarios may be particularly useful to test the effects of such risk factors, which evolve over time – and with time may deteriorate the financial position

of an IORP or may adversely affect sponsoring undertakings or members and beneficiaries, as well as consequently affecting the real economy and the financial stability.

244. Scenarios can be derived projecting key economic parameters which illustrate the financial and economic situation over the given time horizon according to i) the expected trajectory of the baseline (to arrive at future 'baseline' reference points) and ii) one or more adverse developments of the parameter therein (adverse scenario). The difference between the baseline and the adverse scenarios over time is assessed. Alternatively, for each reference period a set of shocks is defined, so that some risk factors and shocks affect other variables and lead to shocks in following reference period. For that, the results at the end of the last period are assessed against the baseline situation.

245. In a multi-period ST, the development of the scenario over time and the role of the risk drivers are determined by the ST's narrative. Here, the narrative needs to be translated into a technical specification of the development over time of each single risk driver to determine:

- the 'baseline' situation in each reference period;
- the adverse scenario(s) in each reference period.

246. In case of an instantaneous, permanent shock in a ST exercise, the baseline is the situation at the reference date, including interest rate curves and market prices at the reference date. However, in a multi-period ST, that baseline may need to be projected into the future and would require setting out a specific real-world development path over the intended time horizon. Depending on the ST's objective, this multi-period baseline may follow an "expected" economic and IORP-specific development over a mid-term planning horizon. It should be noted that the technical specifications must then provide the full details on the development of all relevant risk drivers in order to enable IORPs to re-evaluate their financial position at future dates. This means that the information required for the multi-period projection of a baseline over several periods is not limited to market data, but also, for example, IORP-specific assumptions on contribution levels to enable projections of the future financial position.

247. A particular challenge in a multi-period setting relates to the derivation and the specification of the change of the volatility surface over the adverse scenario horizon to reflect on the interaction between the developments of the investments and the effects on the pension obligations. Further, the balance sheet will have to be revalued under the national frameworks to see whether supervisory actions or sponsor support would be triggered.

248. To project future states of financial position and to analyse the potential transmission of the effects of the adverse scenario to the real economy and the financial stability, a number of assumptions need to be defined. In line with the objective of the ST exercise, different approaches to derive such assumptions can be taken:

- Only consider cash flows relating to current members and beneficiaries. The extent to which future contributions and benefits of current members and beneficiaries should be included in cash flows in the CBS is determined by the rules provided in paragraphs 2.5.8-2.5.9 in the Annex to IORP ST 2019 Specifications, Technical Specifications CBS. Cash flows for security and benefit

adjustment mechanisms may depend on a national-specific modelling approach. Such approach ensures comparability, as it does not provide for any judgement of the IORP, yet it is limited in the sense that it does not consider the potential of new members joining the scheme.

- An approach that assumes new members and new accruals in addition to the cash flows relating to the current members and beneficiaries. Such an approach allows the IORP to set out its own - realistic - assumptions on new members and new accruals, based on its own business plans (for the baseline) and adjusting those assumptions to address the adverse development in the adverse scenario. To foster some comparability, the ST specifications would need to set out some guiding principles on determining appropriate assumptions and potential simplifications, as otherwise, the exercise may be too subjective to allow any conclusions on the sector as a whole;
- Prescribing key assumptions, for example a fixed strategic asset allocation and timeframes for rebalancing to that asset allocation, as well as standardized assumptions on new members and new accruals. Which elements that should be fixed and which ones should be free to choose by the IORP would follow the objective of the specific ST exercise.

5.6. Risk factors

249. This section discusses the (financial market, pension-specific, IORP-specific) risk factors from which a scenario may be designed. The structure of each of the subsections is as follows. A description of the risk is given, followed by its effects and the way it may manifests itself. Then the relevance of the risk in the context of an IORP ST exercise is discussed, followed where appropriate with a discussion of potential approaches for the assessment of the risk in a ST.

5.6.1. Asset return risk

Financial market risk factors

250. The market shocks affecting market assets considered in this section are shocks to the following: **yields,** as reflected in government and corporate bond yields/prices and implied yield curves; **credit spreads,** i.e., changes in the differences between yields on different classes of assets, e.g., euro denominated bonds vs. comparable US dollar bonds, and **equity specific shocks**, i.e., adverse price movements on particular equities.

Risk description

251. For IORPs, financial market shocks arise from an adverse movement in the values of assets because of market movements. The size and timing of the impact of the shocks depends on the way the scenario is designed.

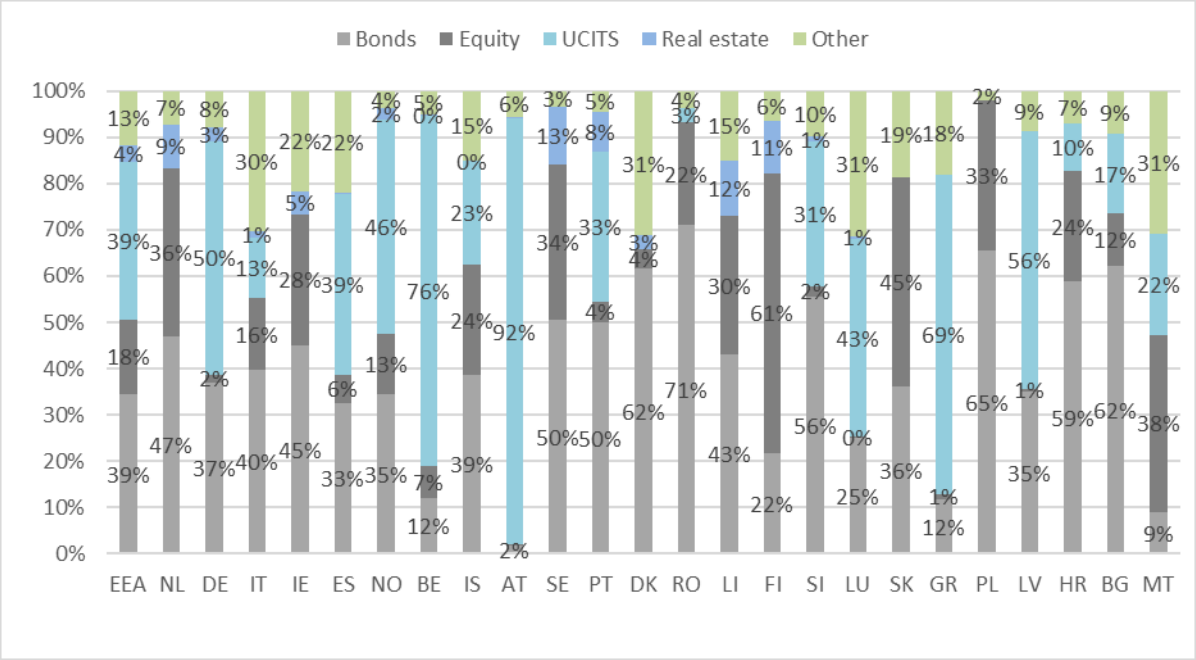
Effect of the risk

252. Firstly, adverse financial market shocks reduce the (market) value of the assets on an IORP's balance sheet, thus reducing the resources of the IORP. The precise manner in which these shocks play out is discussed individually for various asset classes below. The effect will vary by the degree to which different classes are held by the IORP sector as a whole and by individual IORPs and/or plan members and beneficiaries.
253. Secondly, adverse shock to interest rates increase the (market) value of the guaranteed liabilities on an IORP's balance sheet, thus *ceteris paribus* increasing the required resources of the IORP. The precise manner in which interest rate shock play out depends on the (presence of the) guarantees an IORP gives and is discussed in more detail below.

Relevance of the risk

254. Adverse financial market shocks affecting prices of financial assets are clearly extremely relevant and material given that IORPs across the European jurisdictions invest the lion's share of their assets in risky assets. For DC IORPs the impact of financial market shocks on their (market valued) assets is the main balance sheet effect of adverse financial market scenarios.
255. Adverse interest rate shocks affecting the value of the liabilities of IORPs are also clearly extremely relevant and material. For IORPs providing guarantees on benefit levels (mostly DB schemes) this effect is directly visible in the balance sheet. The materiality regarding the financial position varies across IORPs depending on their asset mix and interest rate hedging strategy. For IORPs providing no or limited guarantees to plan members (mostly DC schemes) the interest rate shock is not (fully) visible in the value of liabilities but nevertheless affects the financial position of the IORP via the impact on expected plan members' benefits, as explained in chapter 2.
256. To illustrate the relevance financial markets risk factors on the asset value of IORPs, information on the asset allocations employed by IORPs is presented in figure 5.1.

Figure 5.1. IORP sector investment allocation by country (2019)



Source: EIOPA [Financial Stability Report December 2020]

257. The figure indicates the major asset classes in use by IORPs across the EEA as bonds, UCITS, equity, other and real estate, in descending order. Also clearly seen is the high degree of heterogeneity between member states as regards the significance of the asset classes. The (additional) heterogeneity that exists between IORPs within member states is not visible here.
258. In the following, there are some notes on each of the principal asset classes affected by the financial risk market shocks mentioned above.

Government and corporate bonds

259. As can be seen from the data, this is a hugely significant asset class for IORPs.
260. Government bonds in particular provide capital security, liquidity and secure yield if held to maturity. As an asset class, they are be useful for matching liabilities, particularly long liabilities as found in the IORP sector.

Equities

261. Again a significant asset class for IORPs, as can be seen from the data.
262. The main use of equities as an asset class is as a source of yield (investment return) and a hedge against inflation to the extent that their price follows the real economy.

Real estate: residential real estate, commercial real estate and real estate investment trust (REITs)

263. As can be seen for the data, real estate is a major asset class for IORPs.

264. As an asset class, real estate offers benefits to IORPs that are generally similar as for equities, but with some advantages and disadvantages, e.g., relatively illiquid, less volatile than equities, higher transaction costs. Arguably, real estate provides a very good match for long pension liabilities.
265. REITs allow investors, including IORPs, to diversify their real estate holdings more easily and can improve liquidity. REIT prices act as a proxy for all real estate prices, although general market price movements will also affect REIT prices. REITs also offer a relatively passive mode of real estate investment, which is useful for smaller IORPs.

Other asset classes (private equity, hedge funds, commodities)

266. The significance of these asset classes varies by member state.
267. They provide some yield and diversification benefits. To some extent, holdings in commodities can provide a hedge against price inflation.

Derivatives

268. The use of derivatives by IORPs is specifically limited in the IORP II Directive to risk reduction and efficient portfolio management uses, i.e., they are not to be used for a yield seeking purpose.

5.6.2. Inflation risk

Risk description

269. Inflation risk manifests itself in an adverse scenario in terms of a divergent path for consumer price inflation[6] relative to the baseline. Depending on the specificity of the adverse macroeconomic scenario, consumer price inflation may be lower (in a demand-pull adverse scenario) or higher (in a cost-push macroeconomic scenario).
270. For ease of exposition, we discuss the impact of a higher path for price inflation only. Also, we look into inflation risk in isolation in this section (see section 5.6.7 on labour market risk for how it may connect to other risk factors).

Effect of this risk

271. Higher inflation rates typically push higher the operational expenses for IORPs. In addition, and mainly related to IORPs operating DB schemes, higher inflation rates imply higher required indexation rates when price indexation is part of the scheme setup.
272. For plan members and beneficiaries, higher rates of inflation may affect (expected) benefit levels, inter alia depending on the degree of inflation indexation applied by an IORP.

[6] Inflation refers to the harmonized index for consumer prices published by Eurostat.

Relevance in the context of IORP ST

273. The impact of higher inflation on the IORP via operational expenses is relevant for all IORPs (and included in section 5.8 on shock application), although its materiality depends on the way that IORP can share / shift these expenses with / to plan members and beneficiaries, and is typically limited.
274. The extent to which inflation risks feed into an IORP's financial position via indexation strongly depends on the obligation of IORPs to adjust (mainly)[7] DB-accrual and benefit payments to inflation. All else equal, higher rates of applied indexation erode the financial position of the IORP.
275. Naturally, applied indexation has an impact on plan members and beneficiaries as well via raised accrual and benefit payments. Such effects on the risk bearers of the IORP are relevant aspects of an IORP ST exercise (see also the discussion in chapter 2).
276. Other than via indexation, inflation risk may affect the (expected) financial position of plan members and beneficiaries directly as well, via erosion of the purchasing power of (expected) pension benefit payments. While highly relevant for the plan members and beneficiaries involved, in the context of an IORP ST the financial position of plan members and beneficiaries is not a relevant element in the assessment of an IORP's financial position (also see the discussion in chapter 2).

5.6.3. Longevity and mortality risk

Risk description

277. Longevity risk represents the risk of an adverse change in the value of IORP liabilities resulting from changes in the level, trend and / or volatility of longevity. The longevity risk is driven by mortality rates. Improvements in mortality, i.e. lower mortality rates for birth years or cohorts push up life expectancy and represent longevity risk.

Effect of this risk

278. Changes to mortality rates of scheme members can have both positive and negative aspects on the liability side for a particular IORP, depending on the nature of the benefits offered by the IORP. This is explained in more detail below.
279. Increasing longevity will increase the value of the liabilities of an IORP which is operating an annuity book or which guarantees pension payments in the future to current non-pensioners, and vice versa. This effect is significant and generally relevant for DB schemes, but may also be relevant in DC schemes depending in specific guarantees in the scheme. For pension schemes that do not guarantee pension payments (broadly DC schemes), increases in longevity will translate into higher annuity prices, resulting in lower pension amounts for members. This would

[7] Some DC schemes also have indexation obligations.

not be a negative financial impact on the IORP itself, but would represent an (implicit) burden for the plan members.

280. Conversely, to the extent that a pension scheme also underwrites death benefits (orphans' pension, spouse's pension), decreasing mortality rates of plan members will tend to reduce the value of these death benefit related liabilities, and vice versa.

281. Through reinsurance, IORPs are well placed to mitigate the mortality risk with regard to the provision of death benefits. Risk mitigation is more difficult to achieve as regards an annuity book or guaranteed pensions.

282. No impact is expected on the asset side of the balance sheet from longevity or mortality shocks.

Relevance in the context of IORP ST

283. Longevity risk is highly relevant for IORPs and lies at the core of the pension provision business model. The way in which this risk is shifted by the IORP to ultimate risk bearers depends on the specificities of each individual IORP.

284. Running a longevity risk scenario in an IORP ST is extremely challenging due to the fact that a common longevity baseline for IORPs from different member states participating in a ST will not normally be possible. For one reason, the methodology by which IORPs embed mortality tables in their liability valuation differs across countries and ranges from period life tables, to deterministic dynamic and stochastic dynamic life tables. For another reason, IORPs also model their own best estimate life tables (from national tables) geared specifically to their plan's participant mortality characteristics.

5.6.4. Guarantee failure risk

Risk description

285. Guarantee failure risk manifests itself in an adverse scenario in terms of guarantors failing in their obligation to bear part of the risk that the IORP is exposed to as a result of the adverse scenario.

286. The number and nature of risk bearers and guarantee providers for an IORP vary across IORPs. The effects of certain shocks may be borne by a (re)insurer as part of the normal operations of an IORP. In events that are not (re)insured, the sponsor may be obliged to bear part of the risks or member or beneficiary benefits are cut. In some cases, an IORP may resort to a PPS to bear (part of) its risks when the plan sponsor fails.

287. In a guarantee failure scenario it is assumed that a (re)insurer and / or sponsor and / or PPS fails. Benefit reductions for plan members and beneficiaries are not regarded as failure or default in the sense of failure of sponsors or PPSs.

Effect of this risk

288. For each of the risk bearers, the effect of failure is generally that any risks that would have been borne by the defaulted risk bearer (guarantee provider) shift to the

next risk bearer in line.[8] For instance for a DB plan with sponsor guarantee and no pension protection scheme, the default of the sponsor would mean that the risks shift to the plan members.

289. A sponsor default is a type of guarantee failure that may also imply that contribution payments of plan members necessarily stop.

Relevance in the context of IORP ST

290. Generally speaking, the disappearance (failure) of a risk bearer (guarantor) does not necessarily increase an IORP's exposure to risks, but it is a relevant risk factor in terms of analysing the transmission of any given other shock as well the distribution of its effects to the remaining risk bearers.

291. The default of an IORP's sponsor is somewhat different in the sense that in such a situation also contribution payments to the IORP may halt. The impact on the IORP reveals itself as a liquidity and income risk and is therefore discussed as an aspect of that risk in section 5.6.5. The impact of a sponsor default on plan members is discussed in more detail in section 5.6.7.

5.6.5. Liquidity risk

Risk description

292. Liquidity risk can be defined as the risk that an institution will not be able to meet its payment obligations as they fall due without excessive cost or the total inability to recover funds or only with significant delay.

Sources of liquidity risk / how it manifests

293. Sources of liquidity risk and relevant developments for IORPs include:

294. Negative net cash flows. While IORPs have typically been cash flow positive, the nature of liquidity risk is changing as IORPs mature with many IORPs now experiencing negative net cash flows, particularly those that are closed to new entrants and/or benefit accrual. Another factor contributing to negative net cash flows is labour market risk whereby an adverse scenario would give rise to a higher probability of unemployment and/or lower wage growth, resulting in lower contribution inflows. Similarly, the risk of a DB IORP's sponsor guarantee failing poses additional liquidity risks, although sponsor guarantee failure risk can be viewed as a funding risk/adequacy risk for members and beneficiaries.

295. Trend towards increasing allocations in illiquid assets. While IORPs have typically invested largely in liquid investments such as high-quality government and corporate bonds, the current low yield environment has prompted a transition to illiquid investments such as private equity, infrastructure projects and property investments as IORPs search for higher yields. A trend towards investment in low carbon and

[8] At the end of the line, plan members and beneficiaries are assumed to pick up any residual risks. In the event of a sponsor default this may only happen insofar as the liquidation value of the sponsor's assets is insufficient to cover its sponsor obligations to the IORP.

climate resilient infrastructure projects, which are typically less liquid investments as they rely on long term credit for financing, may also be likely in the future.

296. The use of derivatives. In some Member States the use of derivatives by IORPs, while obligatorily limited to the extent that it contributes to a reduction in investment risks or facilitates efficient portfolio management, can be significant, for example in case of Liability Driven Investment-strategies. Such extensive use of derivatives typically presents IORPs with liquidity risk and requires proper management of this risk (e.g. by significant holdings in liquid investments and cash or cash collaterals).

297. The use of derivatives to hedge interest rate, inflation and currency risks can leave an IORP exposed to higher liquidity risks due to margin calls/collateral needs. Central counterparties currently only permit variation margin to be posted in cash[9] while non-centrally cleared derivative transactions with banks traditionally allow IORPs to post high-quality government bonds with appropriate haircuts as variation margin.

298. Benefit options and beneficiary behaviour. Another potential source of liquidity risk or cash flow unpredictability is benefit optionality, for example, early retirement options, deferred member transfer options and early access facilities for members in times of hardship in financial crises.

Relevance in the context of IORP ST

299. Liquidity risk is not typically a major source of concern for IORPs or supervisors, especially when compared to other risk exposures of IORPs. Contributions precede cash outflows to members and beneficiaries, typically creating a stable source of cash in-flows for IORPs for a large proportion of the IORP's lifetime, and the potential for unforeseen liquidity requirements is limited given the predictability and stability of IORP liabilities – IORPs can better plan their liquidity needs than insurers for example, due to cash requirements being mainly linked to the retirement of members, which is predicable to a large degree. In summary, IORPs are long-term investors with generally low liquidity risks. IORPs that make extensive use of derivatives on the other hand can face material liquidity risk. In that case liquidity risk requires proper risk management.

300. Consequently, a simple and pragmatic approach to assessing liquidity risk may be considered to be in proportion to the relatively low liquidity risk posed to IORPs in general. Some basic approaches to assessing liquidity risk are outlined below. Should liquidity risk at some point in the future be considered more significant for an IORP stress test, a more elaborate analysis may be required.

Potential approaches for the assessment of liquidity risks

301. The IORP stress test exercises conducted by EIOPA focus mainly on the impact of adverse scenarios on the financial and solvency position. National funding rules generally do not include quantitative requirements for liquidity risks or relative

[9] IORPs have an exemption from central clearing obligations under EMIR/EMIR Refit until 18 June 2021 with a likely temporary extension. However it is possibly only a matter of time before IORPs will need to clear their OTC derivative contracts centrally in large scale.

metrics with respect to the liquidity position of an IORP and there is no prescribed approach to the liquidity sources and needs or standardized liquidity metrics following the IORP II Directive.

302. In a recent discussion paper[10] EIOPA set out methodological principles for use in designing stress test exercises to assess the vulnerability of insurers to liquidity shocks. The paper described potential metrics/indicators to assess the liquidity position of an insurer and the impact of a liquidity adverse scenario on that liquidity position. The paper set out a proposed approach to the design of scenarios to be used in an insurance liquidity stress test exercise, including the narrative, shocks and the appropriate calibration of the 'haircuts'.

303. The EIOPA paper proposes an approach to a liquidity stress test for insurers under which sources of liquidity and liquidity needs are defined based on the bucketing (classification) of assets according to their implied liquidity and these are 'shocked' according to the time horizon covered by the scenario.

304. Approaches to quantification of liquidity sources. There are many possibilities for classifying assets (liquidity sources) according to their liquidity characteristics. Both the IAIS and the ESRB give examples of a possible classification/bucketing. Each 'bucket' will contain assets with similar liquidity characteristics and can be assigned a factor or 'haircut' that reflects its liquidity over a given time horizon. As an example, cash is the most liquid exposure on the balance sheet, always available as a liquidity source and so a factor of 100%, or a haircut of 0%, would apply. On the other hand, property exposures are not liquid over a short time horizon so a factor of 0%, or a haircut of 100%, would apply to property investments, reflecting that this exposure cannot be used as a source of liquidity in the short term. The time horizon is key; the haircut to be applied to a given bucket will change depending on the time horizon that is considered. An exposure that is considered illiquid in the short term can become liquid over a longer term.

305. Cash flow approach to the quantification of liquidity needs. In its report, the ESRB develops a cash flow liquidity indicator, which is based on the Basel III Liquidity Coverage Ratio (LCR) for the banking sector. It relies on the concept of Total net cash outflows to define the liquidity needs in the adverse scenario over a certain time horizon. The liquidity sources are determined by the asset bucketing approach (e.g. HQLA).

$$Liquidity\ indicator = \frac{Stock\ of\ High-Quality\ Liquid\ Assets}{Total\ net\ cash\ outflows}$$

306. The definition of the time horizon for such a liquidity indicator is key and would determine which cash inflow our outflow should be considered. Also, the cash flow can be projected under normal circumstances and in the adverse scenario. This approach could be useful in a stress test context where one would be able to compare the liquidity ratio in the baseline and in the adverse scenario.

[10] EIOPA (2020) Discussion paper on the Methodological Principles on Insurance Stress Testing available at: https://www.eiopa.europa.eu/content/second-discussion-paper-methodological-principles-of-insurance-stress-testing_en.

307. Further, such cash flow analyses may provide insight into liquidity needs that can raise over the years subsequent to the shock and that can be compared to the asset allocation according to specified liquidity buckets.

5.6.6. Operational risk

Risk description

308. Operational risk is defined as the risk of loss arising from inadequate or failed internal processes, personnel or systems, or from external events.
309. Operational risks include compliance/legal risks, but exclude reputational, strategic and political/regulatory risks. However, all three excluded risks are in many respects closely related to operational risk. For example, a political/regulatory risk could affect IORPs' existing activities, triggering legal risk, which would impact the operational risk. For the purpose of this paper on ST methodologies, reputational, strategic and political/regulatory risks are not considered separately.

Sources of operational risk / how it manifests

310. IORPs may carry out the two core operational activities, pension administration and investment management, internally or delegate them to an external service provider. As operational risk may arise from internal activities, including within the IORP's management and key functions or from external events, operational risks can be further broken down in the following subcategories relating to:
    - internal fraud;
    - external fraud;
    - employment practices and workplace safety;
    - relations with sponsors, members and beneficiaries;
    - damage to physical assets;
    - operational disruption and system failures, capturing cyber risk;
    - trading/transaction processing and process management.
311. Cyber risk: In the area of IT system failures four separate IT risks are typically distinguished:
    - availability: Keeping processes running, recovering from failures within acceptable timeframes;
    - accessibility: Providing information to the right people while keeping it away from the wrong people;
    - accuracy: Ensuring information is correct, timely, and complete;
    - agility: Changing IT processes with acceptable cost and speed.
312. Specifically, in recent years EIOPA conducted a mapping exercise among Competent Authorities that identified cyber risk as a challenging operational risk that requires further supervisory attention. Cyber risk is defined by the Financial Stability Board as "the combination of the probability of cyber incidents occurring and their impact". A cyber incident is defined as a cyber-event that
    - jeopardizes the cyber security of an information system or the information the system processes, stores or transmits: or

- violates the security policies, security procedures or acceptable use policies, whether resulting from malicious activities or not.

313. Cyber risk is considered to be one of the main sources of operational risk faced by organizations generally. IORPs are a target for cyber-attacks as they hold substantial amounts of confidential data, e.g. member dates of birth, addresses and salaries. Once obtained, this information could be used for different criminal purposes such as identity theft. Cyber incidents include phishing mail, malware infections, data breaches, data exfiltration, denial of service, typically aimed at financial gain, disruption or espionage.

314. Management of operational risks: The IORP II Directive introduced new requirements for IORPs to put in place an effective risk management system, which covers operational risk management among other areas for risk management. Furthermore, IORPs are required to conduct a qualitative assessment of operational risks as part of their own-risk assessment as set out in Article 28. Within the Supervisory Review Process, as set out in Article 49, Competent Authorities are required to assess the risks IORPs face and IORPs' ability to assess and manage those risks.

Relevance in the context of IORP ST

315. In order to consider how operational risks could be taken into account in a ST exercise, it is relevant to analyse whether a quantitative approach to measuring operational risk would be feasible. In that context, it can be noted that operational risk incidents may be difficult to predict and quantify and furthermore, the liability or responsibility for losses arising from operational risks can vary, depending on the characteristics of an IORP. Such losses may be borne by the IORP itself (through capital requirements), the sponsor, members and beneficiaries, external service providers or a combination of these.

316. The extent of losses in the event of a cyber incident are particularly difficult to measure for many reasons, for example, due to:
- the dynamic nature of cyber threats and the increasing frequency and sophistication of cyber-attacks;
- difficulties in measuring the financial costs of business disruption caused by cyber events - these include not being able to pay benefits on time or invest DC contributions on time;
- differences between IORPs, for example, depending on whether an IORP provides access to personal accounts of members and facilitates online transactions, depending on the technologies and connection types, delivery channels and organizational characteristics which vary among Member States and among IORPs within Member States; and
- the need to also consider the cyber security of other entities that may affect an IORP, e.g. the sponsor.

317. Difficulties in measuring the effects and quantifying cyber risk are compounded by a lack of reporting of cyber risk incidents and insufficient evidence to potentially model the impact of a cyber-attack. Given these factors and the diversity of operational risks generally, it is challenging to set an objective and undisputed single algebraic formula or model to quantify and capture overall operational risk that can

address the characteristics of each individual IORP. The approaches developed to quantify operational risk exposures in terms of asset value losses may serve as a starting point.

Potential approaches for the assessment of operational risks

318. Given the above considerations on the challenges in quantifying operational risks, a qualitative approach towards measuring operational risks could be considered, as good qualitative risk management is of primary importance in the context of operational risks. An appropriate approach to assessing operational risk and cyber risk in particular, may be for supervisors to review IORPs' contingency plans and assessment of plausible disruptive scenarios in their risk management systems.
319. In that context, incorporating a qualitative survey covering cyber risk in a ST exercise might serve to raise awareness of the need to integrate cyber risks, in particular, in risk management systems and build IORP's cyber resilience.
320. In conclusion, in a ST a qualitative approach towards operational risks seems most appropriate in the short term, for example by use of a survey focusing on cyber risks, and to further develop the approaches to quantifying operational risk. Given that the "stress element" in such an approach is not explicit and that it may be difficult (and not very meaningful) to extract general conclusions on the "level of operational risk" from such a survey, a ST exercise may not be the most relevant tool for such an approach.

5.6.7. Labour market risk

Risk description

321. Labour market risks manifest themselves in an adverse scenario in terms of unemployment probability as well as (real) wage uncertainty. In an adverse scenario plan members are typically confronted with higher rates of unemployment. This is a general feature of macroeconomic models, but may be augmented for groups of plan members by the failure of a sponsor (discussed as part of guarantee failure risk in section 5.6.4).
322. Labour market slack translates into lower nominal wage levels over time. Depending on the specificity of the adverse scenario, the real wage level may be lower as well (when inflation in a cost-push adverse scenario is pushed upwards) or higher (when inflation in a demand-pull adverse scenario is dragged down).

Effect of this risk

323. Labour market risk (potentially) affects the IORP via three channels. First, higher rates of unemployment imply lower levels of inflow of contributions. This effect is discussed as part of liquidity risk in section 5.6.5. Second, lower rates of nominal wage growth imply lower rates of indexation for those IORPs that index benefits and accrual based on wage inflation. This effect is discussed as part of inflation risk in

section 5.6.2. Third, a different path for inflation implies a different path for indexation rates for those IORPs that index benefits and accrual on price inflation. This effect is discussed as part of inflation risk in section 5.6.2.

324. Labour market risks (potentially) affect plan members and beneficiaries along the same three channels. First, higher rates of unemployment imply lower rates of contributions, hence lower accrual of entitlements and via that route lower future expected benefit payments. Second, lower rates of nominal wage growth imply a different (nominal) lifetime earnings profile for plan members, with commensurate implications for nominal income in retirement. Third, different rates of indexation have impact on the real value of retirement benefits, potentially affecting real income in retirement.

325. Labour market risk may have an additional effect on the IORP, which is the withdrawal of (part of) the accrued pension savings by the plan member. This effect heavily depends on national specificities. In some Member States, there are some member life events (among which long spells of unemployment) that allow for withdrawal of accrued pension savings.

Relevance in the context of IORP ST

326. The labour markets risk effects on IORPs reveal themselves as liquidity and inflation risks and are therefore discussed as aspects of those two risk types in the respective sections on those risk types.

327. For plan members and beneficiaries, the effects of labour market risks are highly relevant in terms of their (potential) impact on (expected) retirement benefit levels. In the context of an IORP ST though, the financial position of plan members and beneficiaries is not a relevant element in the assessment of an IORP's financial position (also see the discussion in chapter 2).[11]

328. Withdrawal risk is a potentially relevant by-product of labour market risks and is dependent on national specificities, the conditions under which this is allowed are expected to be clearly specified. Modelling labour market-risk induced withdrawals may be difficult so to take this channel of effect into account may be challenging in an IORP ST.

5.7. Granularity

329. An important consideration in scenario design is the level of granularity of the shocks. Although IORP ST exercises have contained less granular shocks than their banking and insurance counterparts, IORP ST exercises are still characterized by a high level of granularity in the market shocks. For instance, both commercial and residential real estate were shocked at country level in the last IORP ST. An alternative to a granular scenario design is an approach in which individual shocks

[11] The material exception is in the analysis of expected retirement benefit payments in the context of assessing the transmissions channels onto financial stability; if real expected retirement benefit payments are constructed, different inflation trajectories automatically result in different levels of benefit payment streams.

are bucketed instead of having a highly granular calculated shock for each individual risk factor.

330. The goal of a ST exercise is to gauge the effects of a plausible, yet severe, negative scenario. A granular approach can contribute to this goal by adding realism to the scenario. For example, in the Great Financial Crisis the downturn to real estate in countries that appeared relatively similar, was (vastly) different in some cases (i.e. a higher granularity can enable the incorporation of country-specific elements). On the other hand, and depending on the scenario narrative, granularity can result in differences between similar countries for certain risk factors that are not proportional relative to the added insight they generate. In such situations a bucketing approach may be considered. The various advantages and disadvantages of a granular and bucketing approach are summarized below in the table.

Table 5.3. Granularity and bucketing: advantages and disadvantages

	Advantages	Disadvantages
Granular approach	• Allows the specific characteristics of the risk factors considered to be taken into account • Allows country-based analysis	• Differences in shocks between risk factors may be small, statistically significant and not proportional relative to the added insight they generate • Country-based calibrations based on past observations may be challenged and require subsequently adjustments using expert judgement • Not suitable for some undertakings that already base their risk management strategies on a bucketing approach
Bucketing approach	7. Prevents ST results focusing on small differences between IORPs / sector deriving from statistically insignificant differences in applied shock 8. Allows for a more efficient process in the design phase of the ST 9. Decreases the reporting burden	10. Complexity in the design and application of the bucketing criteria 11. Might not capture relevant differences between countries

331. A hybrid approach that aims to combine the advantages of both the granular and bucketing approach may be considered in the design of IORP ST exercises. In contrast to the granularity and bucketing approach, the hybrid approach does not universally pick a higher or lower level of granularity for all risk factors. Instead, the hybrid approach makes the level of granularity for each risk factor dependent on the scenario. For example, when a scenario is developed where real estate markets are the key component of the scenario, a higher level of granularity should be applied to real estate market shocks. In such a scenario it may even make sense to apply a higher level of granularity than in past IORP ST exercises (for instance by applying shocks at the regional, rather than country level). At the same time risk factors that are not considered to be a key component in the scenario can attain a lower level of granularity. An example of the hybrid approach has in fact already been applied in the 2019 IORP ST exercise regarding the ESG risk assessment. The ESG part of the

ST contained a (much) higher level of granularity than for the financial risk factor shocks in the rest of the exercise.

332. The level of granularity should logically follow from the scenario narrative and can often be made along the following dimensions:
- Grouping countries based on geographical area (e.g. EU, US and other areas)
- Level of development of countries (e.g. developing and developed countries)
- Credit rating of the financial instrument (AAA, AA, A, BBB, etc.).

333. Below, for each type of financial asset the level of granularity in previous IORP ST exercises is stated and considerations, depending on the specific scenario narrative, for a higher or lower level of granularity are provided.

334. **Government bonds**. In the past ST exercises, government bond shocks were determined for each country in the EU. European sovereign bonds are an important asset class for IORPs and indeed exhibit different sensitivities to macroeconomic developments, so that the granularity at country level is expected to be appropriate for future exercises. In case a country-specific shock is not relevant for the scenario, a bucketing based on credit rating may be considered.

335. **Corporate bonds**. In the past ST exercises, corporate bonds were shocked by rating and type of corporate (i.e. financial, non-financial) and whether the bonds were covered or not. Considering future changes to the degree of applied granularity, if a distinction between financial and non-financial corporations does not logically follow from the scenario narrative a lower level of granularity may be considered.

336. **Equities.** In the 2019 ST exercise equities where shocked at a relative low level of granularity (i.e. by continents and level of development). Considering future changes to the degree of applied granularity, depending on the scenario narrative a higher level of granularity may be considered along the lines, for example, type of business.

337. **Real estate**. In the past ST exercises, real estate was shocked at the country level for both commercial and residential real estate. Considering future changes to the degree of applied granularity, depending on the scenario narrative, it may be considered to achieve a lower level of granularity by grouping relatively similar countries. Because of the inherent different characteristics of commercial and residential real estate it is not opportune to bucket along this dimension.

338. **Residential mortgage backed securities (RMBS**). In the past ST exercises, RMBS was shocked by continent and credit rating. Considering future changes to the degree of applied granularity, contingent on the scenario narrative, it may be considered to shock only by continent or credit rating.

339. **Other assets**: private equity, hedge funds, real estate investment trusts and commodities. In the past ST exercises, these assets were shock at a relatively low level of granularity. Considering future changes to the degree of applied granularity, if deemed informative and meaningful a higher level of granularity may be achieved by adding more geographical areas.

5.8. Shocks and their application

5.8.1. Introduction

340. This chapter deals with shocks and their application. In some cases, there are specific references to the balance sheet tools presented in chapter 3 (NBS and CBS). Nevertheless, the shocks can also be applied in the context of the other tools presented there, considering the specificities of those respective tools.
341. While the valuation standards for the NBS differ between member states, the CBS provides a harmonized framework which can be applied in the same way in all member states. This is why Section 5.8.4, where it refers to a balance sheet, applies directly only to the CBS. How to "transfer" this to the NBS is described in Section 5.8.2.
342. IORPs are requested to apply the shocks to their full balance sheets following the prescribed guidance and to calculate their positions in the adverse scenario.
343. The approach taken to value the balance sheets in the adverse scenario, 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 balance sheets in the baseline.
344. When calculating the balance sheets in the adverse scenario, 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.
345. IORPs should take into account the direct as well as indirect effects of the adverse scenario on technical provisions and the value of security mechanisms. This includes a possible increase in technical provisions as a consequence of any relevant adverse changes in behaviour of members and beneficiaries or sponsors in reaction to the adverse scenario.
346. In case the ST includes a currency shock, the following applies: Where an IORP holds assets denominated in a currency other than that of the balance sheet of the IORP, the asset should be first subject to the respective asset shock and then the resulting amount should be transformed into the currency of the IORP`s balance sheet by applying the shocked exchange rate.

5.8.2. NBS

347. The NBS follows national valuation standards which vary across member states. IORPs have to re-evaluate the NBS and the funding requirements at the reference date after applying the adverse scenario.
348. Section 5.8.4, where it refers to a balance sheet, explains how shocks are applied to the values in the CBS. IORPs need to consider how changes in those values impact on values on the NBS. For instance, where a shock to the market value of an asset (in the CBS) is provided, IORPs should determine the effect of this change in market value on the value which is included in the NBS according to the respective national valuation rules. This applies similarly to longevity, expense inflation or any other

potential shocks. NCAs may provide further guidance on assessing the impact of the provided shock on the NBSs.

349. IORPs should apply a look-through approach to investment funds and other indirect exposures in assessing the impact of the provided shocks on the value of investments included in the NBS.

350. The basic RFR curves and - if applicable - the inflation curves in the adverse scenario should in principle be applied to both the asset side and the liability side of the balance sheets. The effect of this on the NBS will depend on national valuation rules.

351. When valuing derivatives, IORPs need to take into account the nature of the derivative (option, forward, future, swap, etc.) and the way its value in the NBS would change following the adverse scenario applied to the underlying assets and RFRs.

352. The adverse scenario may not provide information on the development of (unobserved) risk premiums on fixed and non-fixed income securities. In some member states, the discount rate for the valuation of the technical provisions in the NBS will be based on expected returns on assets or risk premia. If relevant, IORPs should assume for the valuation of technical provisions that risk premiums on fixed and non-fixed income assets do not change in the adverse scenario as compared to the baseline scenario.

5.8.3. CBS

353. This chapter presents in the following sections, without any aim of completeness, a list of the main shocks that can be applied as part of a ST exercise to the CBS of IORPs. A complete list cannot be given, as the shocks prescribed in an exercise also depend on the development of the financial markets and the risk profiles of IORPs. This chapter covers financial market shocks, longevity shocks and expense inflation shocks. The chapter also includes a specific section on possible simplifications and approximations.

5.8.4. Financial market shocks

354. In principle, shocks should be applied with the greatest possible accuracy to the assets. Namely a look-through approach should be pursued wherever possible to collective/indirect investments.

355. Variables to which financial market shocks can potentially be applied are the following:

- government bond yields;
- corporate bond yields;
- equity prices;
- swap rates;
- residential real estate prices;
- commercial real estate prices;
- loans and mortgage prices;

- other asset prices (private equity, hedge funds, real estate investment trusts (REITs), commodities).

5.8.4.1. Shocks to bonds

356. Shocks to fixed income asset prices (bond prices) can be prescribed in terms of change in yields (basis points, bps) with respect to the baseline. Geographical or time to maturity specifications can be provided for the different types of bonds. The shock should be applied to the market value of the fixed income assets. The change in yields is the combined effect of the change in spreads and of the change in the RFR derived from the shocks to swap rates for the different currencies.
357. The specifications of the respective ST exercise can prescribe the shock levels for bonds as a change in the respective yields.
358. Alternatively, the shocks to fixed income asset prices can be prescribed in terms of the increase in the credit spread. In that case the price of the assets in the adverse scenario is derived taking into account the change in the RFR and the increased spread component.

Government bonds

359. Shocks to government bonds can be provided by country, geographical area or rating (depending on the granularity) and also by selected maturity. In the event that shocks to a specific country/area are not provided, the closest geographical approximation should be taken (e.g. EU average, euro area (EA) average, other advanced economies, emerging markets).[12]
360. Shocks to sovereign bonds are provided for selected maturities. Shocks to missing maturities should be derived:
    - by interpolation (e.g. spline) for maturities that are not explicitly provided;
    - by keeping the shock constant for all maturities exceeding the last maturity provided with an explicit shock.

Corporate bonds, structured notes and collateralized securities

361. To account for different yield volatilities based on the sector, the creditworthiness of the issuer and the country's exposure, shocks to corporate bonds are distinguished as financial/non-financial[13] and grouped by rating (from AAA to CCC) and geographical area (e.g. EU, United States, Asia). The corporate bond portfolio

[12] For an explanation of the distinction between advanced economies and emerging markets, please refer to the International Monetary Fund (IMF) World Economic Outlook database: https://www.imf.org/external/pubs/ft/weo/2019/01/weodata/weoselgr.aspx.

[13] For an explanation of financial vs non-financial, please refer to the European Supervisory Authorities' 2010 definition of 'financials', which includes the sectors 'central bank', 'deposit-taking corporations except the central bank', 'money market funds' (MMF), 'non-MMF investment funds', 'other financial intermediaries, except insurance corporations and pension funds (excluding financial vehicle corporations engaged in securitization transactions)', 'financial auxiliaries', 'captive financial institutions and money lenders', 'financial vehicle corporations engaged in securitization transactions', 'insurance corporations' and 'pension funds'. All other positions are assigned to 'non-financials'.

of the IORP is allocated to the groups and subjected to the adverse scenario according to the prescribed shocks. In the absence of a precise allocation, the following proxies can be applied:

- Bonds issued by corporations based in non-covered geographical areas are to be shocked according to the average shocks provided for larger geographical areas (e.g. EU, United States, Asia).
- The shocks to the CCC rating class should also be applied to corporate bonds with lower ratings. Unrated bonds should be shocked according to the shocks prescribed to the BBB-rated bonds.

362. Shocks should be applied homogeneously to all the maturities.

5.8.4.2. Shocks to equity (holdings in related undertakings, including participations; equity listed; equity unlisted; own shares)

363. Shocks are provided in terms of percentage changes in the stock prices per country or geographical area and should be applied to the market value of the equity at the reference date according to the country or geographical area where the equity is listed.

364. When shocks are provided per country, in the case that the equity shock for a specific country is not provided, it should be approximated from the average of the shocks provided to the closest geographical area (e.g. EU average for all the European countries, United States for North America). In the case that none of the proposed areas fit the purpose, participants should apply the shock provided to the 'other advanced economies' or 'emerging markets'.[14]

365. In the case of equities listed in more than one stock exchange, (i) the average of the shocks prescribed to the countries where the stock exchange is located should be applied, or (ii) the shock prescribed to the country of the stock exchange where the majority of the equity is listed should be applied.

366. Stock indices should be treated according to geographical criteria, e.g. DAX index should be shocked with shocks prescribed to equity issued in Germany, EURO STOXX 50 index with EU average equity shock.

367. The market value of an unlisted equity at the reference date should be recalculated by applying the percentage change in the listed equity prices per country according to the country where the parent company of the issuing entity is located. The same treatment prescribed for the listed equities applies.

368. Own shares should be treated as the other equities in line with their listed or unlisted status.

369. Shocks to listed equities should be used to stress the holdings in related undertakings, including participations.

[14] For an explanation of the distinction between advanced economies and emerging markets, please refer to the International Monetary Fund (IMF) World Economic Outlook database: https://www.imf.org/external/pubs/ft/weo/2019/01/weodata/weoselgr.aspx.

5.8.4.3. Shocks to swap rates

370. Shocks to swap rates serve as an input to derive the RFR curve used to discount the cash flows to determine the best estimate of technical provisions. They are used to derive the EIOPA RFR curves in line with the standard approach based on the Smith-Wilson model.[15] In principle, the RFR curve under an adverse scenario is derived by feeding the baseline model (e.g. unchanged UFR, LLP, convergence period) with the shocked swap rates; however, parameters might be adapted to reflect the narrative and the market conditions depicted in the scenarios.
371. Risk-free term structures are provided in the specifications for the most used currencies. For the currencies whose adverse scenario RFR curves are not provided, the baseline term structure should be used.
372. In the event that no shock to credit risk is provided in the scenario, the credit risk adjustment (CRA) is kept unchanged with respect to the baseline, otherwise the value of the CRA in the adverse scenario is provided.
373. Adverse scenario swap curves also serve as an input to re-valuate the full balance sheet positions, e.g. to derive the shocks to spreads for the fixed income assets in the event that the shocks are provided to yields (see Section 5.8.4.1).

5.8.4.4. Shocks to real estate

374. Separate shocks to prices are usually provided for commercial and residential real estate at country level. Real estate located in countries for which no shocks are provided shall be shocked according to those average shocks provided for large geographical areas, e.g. EU, EA, other advanced economies and emerging markets which are most suitable for the respective country.
375. Property other than for own use should be fully shocked according to the shocks provided to the area where they are located.
376. Shocks to real estate could be also applied to the item 'property, plant & equipment held for own use'. Specifically, real estate property should be treated in line with the commercial real estate held for investment purposes, whereas equipment should be kept constant with respect to the baseline.

5.8.4.5. Shocks to loans and mortgages

377. Shocks to residential mortgage-backed security (RMBS) should be used as a proxy to determine market value of loans and mortgages in the adverse scenario.
378. The following approximations can be considered:
    - in the case that the rating quality of the (various) portfolio(s) cannot be determined, a BBB rating quality has to be assumed;
    - in the case that the shock to RMBS for a specific country is not provided, it should be treated according to the closest proxy.

[15] EIOPA, 2018, *Technical documentation of the methodology to derive EIOPA's risk-free interest rate term structures*. Available at: https://www.eiopa.europa.eu/tools-and-data/risk-free-interest-rate-term-structures-0_en.

5.8.4.6. Shocks to collective investment undertakings and to other assets

379. In line with the general principles on the application of the market shocks stated in section 5.8.4, collective investment undertakings should be subject to a full look-through approach that applies the specific shock prescribed to each asset class to the underlying assets.

380. Shocks to private equity, hedge funds, REITs and commodities should be used to treat the items 'any other assets, not elsewhere shown'. Any residual 'collective investments undertakings' (i.e. for those for which look-through was not feasible) should be shocked according to the asset shocks most closely resembling the collective investment undertakings. The application of the shocks depends on specific assets included in the balance sheet items.

5.8.5. Longevity shocks

381. Longevity stress parameters provided will most likely encompass changes in all of the relevant risk drivers, i.e. changes in the level, trend or volatility of longevity rates. Shocks should be applied directly to the mortality assumptions that are used to calculate the best estimate of technical provisions and potentially affected assets, like reinsurance recoverables.

5.8.6. Expense inflation shocks

382. An expense inflation shock assumes an increase in technical provisions caused by a higher than expected inflation which leads to a higher than expected increase in operational expenses, which modifies the best estimate assumptions.

383. Shocks are prescribed as a percentage uplift in the annual expense inflation assumed for the calculation of the BE under the baseline scenario. Using a time vector $I^B = [i_1; i_2; \dots; i_t; \dots; i_n]$ (where i_t is the value of the inflation at time t) to express the value of the claim inflation used to compute the BE, the shock can be applied in three ways, which lead to materially different impacts:

- **Additive approach**. The inflation vector to be used in the calculation of the BE in the adverse scenario I^S is derived by summing the prescribed shock *s* (scalar) to the baseline inflation vector I^B. Therefore $I^S = s + I^B$, and hence the claim inflation at time *t* is $i_t^S = i_t^B + s$. The approach implies a parallel shift in the cost of claims vector.
- **Linear approach**. The inflation vector to be used in the calculation of the BE in the adverse scenario I^S is derived by multiplying the baseline vector I^B by the prescribed shock *s* (scalar). Therefore, $I^S = s * I^B$,and hence the claim inflation at time *t* is $i_t^S = (1 + s) i_t^B$.
- **Compounded approach**. The approach implies that the projected inflation at time *t* is computed as follows: $i_t^S = i_t^B * (1 + s)^t$.

5.8.7. Derivatives

384. No specific shocks to the market prices of derivatives are prescribed in ST specifications. IORPs will be expected to reassess the market value of their exposures to derivatives taking into account the change in prices of the underlying assets against the shocks prescribed in the scenario.

5.8.8. Deferred tax assets / deferred tax liabilities

385. Assets and liabilities of the post-shock balance sheet might create tax 'advantages' or 'disadvantages'. Typically, the deferred tax per single item is recognized as the tax rate times the difference in the valuation on the balance sheet and the fiscal balance sheet. Tax disadvantages per balance sheet item, deferred tax liabilities (DTLs), are fully recognized, whereas tax advantages, deferred tax assets (DTAs), can only be recognized up to the amount that future taxable profits are available for use. A DTA may also occur if the IORP has fiscal losses from previous years that it can carry forward.

386. In the adverse scenario IORPs should recalculate the deferred taxes in relation to all assets and liabilities that are recognized on the balance sheet and the fiscal balance sheet to ensure that all amounts that could give rise to future tax cash flows are captured. This adverse scenario evaluation should be consistent with the regulatory framework. In the event that the baseline or adverse scenario balance sheet includes a positive DTA value, IORPs should be able to provide reasonable and plausible arguments that future or past taxable profits will be available against which DTAs can be utilized, taking into account any legal or regulatory requirements.

387. The development of those quantities would need to be explained in both a qualitative and a quantitative way. A dedicated table related to deferred taxes could be used in the validation (those would be of considerable help, for example in the event of the positive development of the DTAs).

5.8.9. Simplifications

388. Given the operational and methodological challenges linked to a ST exercise, the use of approximations and simplifications can be considered by the participants. However, a trade-off between the feasibility of the exercise and the reliability of the results is needed and should take into account the objectives of the exercise. Therefore, the use of approximations and simplifications should respect this trade-off and should allow for a fair reflection of the direction and magnitude of the impacts of shocks, i.e. not inappropriately distorting the interpretability and the comparability of the results.

389. All approximations and simplifications used should be clearly identified. The participants should be able to provide details of the approximations and simplifications used. Why is this simplification needed? What is the exact simplification and how is it applied? The participants should also be able to give a quantitative or qualitative indication of the materiality of the deviations created by

the use of the simplification. This information should allow the supervisor to judge the suitability of each of the simplifications.

6. Environmental stress testing for IORPs

6.1. Environmental risks and climate change

390. This chapter is intended to provide methodological guidance for introducing stress testing of environmental risks within an IORP ST framework.

391. The idea behind environmental stress testing of financial institutions is that environmental developments, and our response to them, may have a significant impact on economic and financial systems: environmental risks may affect economies in many different ways - it may trigger demographic changes, changes in labour markets and may influence expectations on morbidity and longevity. First and foremost, for financial institutions, adverse environmental developments lead to financial risks. Therefore, the key objective of environmental stress testing for IORPs is to assess the potential impact of such financial risks and the implications for financial stability.

392. Consequently, in essence an environmental ST is just a specific type of "traditional" ST, the difference being that a very specific environmental adverse scenario is considered. As for the IORP stress test in general, based on this specific adverse scenario, both stress test perspectives defined in chapter 2, i.e. the effect on the financial position of the IORP and the effect on financial stability, can be considered and the various stress test tools described in chapter 3 may be used, depending on the objective. The focus of this chapter is to highlight the main elements in designing an environmental adverse scenario.

393. The 2019 IORP stress test incorporated a high-level evaluation of IORPs' ESG exposures and sought qualitative information from IORPs to gain insight into how IORPs incorporate and manage ESG factors and risks in their governance processes. The survey was intended to be a first step towards assessing ESG factors in the IORP sector at European level. Since the 2019 ST exercise was completed, the EIOPA Regulation was amended and now includes specific references to potential environmental developments and risks in the context of a stress testing regime. The focus on environmental risks also reflects an ambition to deepen the analysis of environmental risk in future IORP stress test exercises.

394. Climate change risk is widely regarded as the key source of environmental risk faced by financial institutions generally, with a potential to wipe off a significant portion of asset values globally over future decades. For this reason, and in line with work previously carried out by EIOPA for the insurance sector, this chapter focuses solely on climate change risks and does not consider other environmental risks, social risks or governance risks. Carbon dioxide is especially important in the context of climate change risk as it accounts for a significant amount of the global warming effect resulting in climate change.

395. It should be recognized that climate change risk is a relatively new and long-term risk. Standardized methodologies for developing and evaluating climate risk

scenarios are not yet widely available and require close cooperation among different disciplines and a combination of various different data sources. Consequently, a climate change ST exercise is expected to be more explorative compared to traditional financial stress testing; the aspired depth of the analysis has to be balanced with feasibility aspects for IORPs.

396. The approach in this chapter is largely based on the approaches developed for the insurance sector to address climate change scenarios, adapted to the particularities of occupational pensions. While a climate change ST can be designed to cover microprudential or macroprudential objectives, it is likely that the first IORP climate change ST will have more of a microprudential focus with more comprehensive macroprudential exercises being considered at a later stage.

6.2. Climate stress test scenario design

397. The following aspects are relevant in designing an adverse climate scenario:
- Scenario narrative:
  The stress test will have to be based on some assumed climate change scenario in the future and on some assumed policy response to this future development. In line with the general scenario, the financial impact of the scenario should be "severe but plausible".
- Granularity:
  In order to assess the impact of a climate change related scenario on an IORP or the IORP sector, the scenario needs to be specified so that the effect on the IORP financial position can be determined. In specifying the scenario different levels of asset-level granularity can be considered.
- Timing of the shocks:
  One of the relevant aspects of designing a climate change adverse scenario is to specify the timing of the shocks in such way to get relevant insights from the exercise given the objective.

398. These aspects will be treated subsequently in the remainder of this section.

6.2.1. Scenario narrative

399. The main components of an adverse climate scenario narrative are the assumed climate change trajectories and the assumed policy response to these developments. The financial risks stemming from climate change are typically divided into three different channels: physical risk, transition risk and legal liability/litigation risk.

400. **Physical risk** refers to the risks faced by financial institutions due to the economic costs and losses arising from the direct physical impact of extreme climate change-related weather events like heat waves, landslides, floods, rising sea levels and average temperatures.

401. **Transition risk** refers to the risk related to the process of adjusting towards a climate-neutral economy which is influenced by developments in policy and regulation, the emergence of disruptive technology or business models, shifting

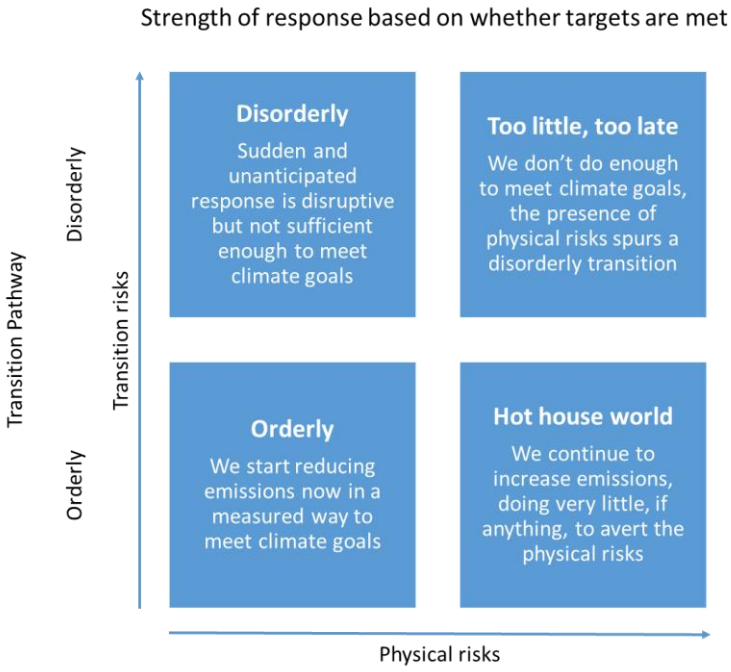
sentiment and societal preferences. Transition risks are particularly pronounced for abrupt and disorderly transitions to a climate-neutral economy.

402. **Legal liability/litigation risk** refers to the risk of climate-related claims under legal liability policies, as well as direct claims against financial institutions for failing to manage climate risks. Legal liability or litigation risk is not addressed further in this paper as there is currently very little information available in the literature on methods to incorporate this in ST frameworks more generally and on the potential relevance for IORPs in particular.

403. When designing a scenario narrative, it can be particularly useful to focus on adverse outcomes along two dimensions, as proposed by the Network for Greening the Financial System[16] (NGFS) (see figure 6.1):

- The total level of mitigation of climate change risks or, in other words, how much action is taken to achieve Paris agreement goals and reduce greenhouse gas emissions (leading to a particular climate outcome);
- Whether the transition occurs in an orderly or disorderly way, i.e., are the actions sudden and unanticipated.

Figure 6.1 Stylized climate scenarios with transition and physical risks



404. In any climate change scenario, there are dependencies between physical risks and transition risks; given their distinct but interlinked nature, both transition risk and physical risk should, in principle, ideally be assessed in conjunction in a climate change ST. However, for practical reasons and in the context of the expected exploratory nature of an initial climate change ST exercise, only transition risk is considered in detail in this chapter and only in so far as it concerns the devaluation or reassessment of assets due to changes in regulation as climate policy tightens towards climate neutrality. The impact of physical risks on assets is not explored in

[16] NGFS Comprehensive report "A call for action: Climate change as a source of financial risk"

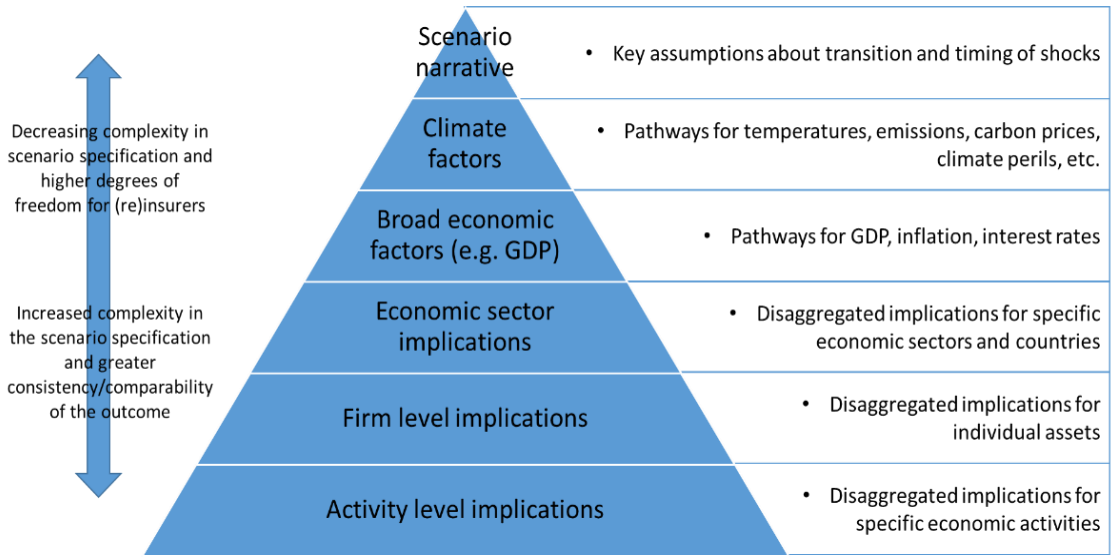
detail due to the lack of reliable methodology or data sources available currently to calibrate that impact.

6.2.2. Scenario granularity

405. Following the selection of a scenario narrative, the scenario needs to be specified in such way that the effect on the IORP's financial position can be determined as a result of asset shocks. Climate change risk may in principle also have implications for the liabilities of IORPs in terms of higher-than-expected mortality or morbidity risks; however, these are not expected to be significant at this point in time.

406. An important consideration in this regard relates to scenario granularity, as climate scenarios can be specified at different aggregation levels. A more granular scenario requires more detailed technical specifications and thus may require a more complex exercise but it may lead to more meaningful results: Relevant information about the climate-sensitivity of an IORP's assets may only be revealed when a sufficiently granular scenario is considered.

Figure 6.2. Granularity of scenario specification



Source: EIOPA, adapted from Bank of England.

407. Figure 6.2 summarizes potential different aggregation levels of scenario specification. The design of a climate change scenario starts with a scenario narrative, specifying key assumptions about the transition pathway and the timing of shocks. Subsequently these assumptions are translated into implications for IORP assets up to the desired level of granularity. At the most granular level each asset that an IORP holds is dissected in terms of its underlying economic activities with varying climate sensitivity. We refer to the EIOPA paper on insurance stress testing

methodologies[17] for a more detailed description on the granularity of the scenario in relation to transition risk. This paper also provides information on currently available models that can be used to estimate the potential financial impact on IORP investments of transition risks given a specified level granularity.

408. In order to obtain relevant insights on the climate-sensitivity of the assets held by IORPs, in a first IORP climate change ST in specifying the scenario it may be reasonable to aim for such a granularity level that the climate-sensitivity of individual assets held by the IORP is assessed.

6.2.3. Considerations on scenario granularity and data availability

409. For EU-wide STs addressing climate change risk, it makes obvious sense to align the required data as much as possible with the IORP data submitted to EIOPA as specified in the EIOPA Decision (EIOPA-BoS-18-114), which includes detailed information about the investments held[18]. That information includes references to the NACE codes linked to the sector of the asset issuer.

410. Currently, information is scarce on the environmental risks associated with certain investments. However, important developments are underway to promote comparable disclosure on the sustainability of entities and financial products using science-driven screening criteria, which link to the NACE code of economic activities. These developments should enhance understanding and reporting of investments generally, through an environmental lens and contribute to the assessment of environmental risk.

411. The Taxonomy Regulation[19] sets out relevant criteria for determining whether an economic activity qualifies as environmentally sustainable. With a clear definition of such economic activities, entities shall find it easier to raise funding across borders for their environmentally sustainable activities, as their economic activities could be compared against uniform criteria in order to be selected as underlying assets for environmentally sustainable investments. The harmonization of relevant criteria are expected to facilitate cross-border sustainable investment in the European Union (EU).

412. With the definition of what an environmentally sustainable economic activity is, financial market participants can provide a reasonably founded explanation to investors about how the activities in which they invest contribute to environmental objectives. Equally, investors will find it easier to check and compare different financial products, which may encourage investors to invest in environmentally sustainable financial products.

---

[17] See paragraph 1.3.2 and 1.4.1 of https://www.eiopa.europa.eu/sites/default/files/publications/consultations/eiopa-bos-20-341_second-discussion_paper-methodological-principles-for-stress-testing.pdf

[18] Relevant information can be retrieved from the detailed list of assets and from information on investments held in collective investment undertakings. Granular information on investments held in collective investment undertakings is required to be submitted by IORPs reporting on an individual basis.

[19] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, OJ L 198, 22.06.2020, p. 13.

413. Using non-financial reporting information[20] and product information[21] that are based on the Taxonomy Regulation, will enable IORPs to assess much more thoroughly the sustainability of their investments. However, there are limitations; for example, the Taxonomy Regulation does not define 'brown' economic activities, so a ST exercise would need to specify the methodology to assess investments sensitive to environmental risks, taking into consideration the information and screening criteria of 'green' economic activities. Therefore, whilst it is expected that sustainability information will be available more wide-spread and with appropriate granularity, the information needed for a climate ST exercise may not be readily available and the required specifications may be complex and challenging to develop.

6.2.4. Timing of the shocks

414. Even though it is quite generally accepted that climate change poses a large risk, the timing, pathways and the precise impact of the risk is highly uncertain and open to debate.

415. Given this uncertainty and given that the primary focus of the exercise will likely be to assess the climate sensitivity of the current IORP investments, it may make sense not to specify the timing of the shocks in much detail. Indeed, depending on the specified objective of the exercise, for simplicity it could be considered to model an instantaneous transition risk shock, rather than the more realistic scenario of the risk manifesting itself through multiple shocks over time.

6.3. Conclusions for the consideration of environmental risk in an IORP ST

416. Given the ambition to deepen the analysis of environmental risk in future IORP stress test exercises, in summary the following considerations would appear to be relevant when introducing stress testing of environmental risks within an IORP ST framework:

- In essence an environmental ST is just a specific type of "traditional" ST, the difference being that a specific adverse environmental scenario is considered. After specifying this scenario the impact on the financial position of the IORP and the effect on financial stability can be assessed using the same tools as in a "traditional" ST, depending on the objective of the exercise.
- It seems appropriate to focus stress testing of environmental risks on climate change risk, specifically on the potential financial impact on the investments held by IORPs of the transition risks related to the process of adjusting towards a climate-neutral economy. For the first IORP climate change ST it seems logical

[20] In accordance with the Non-Financial Reporting Directive: Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups, OJ L 330, 15.11.2014, p. 1–9.

[21] In particular disclosures in line with the Sustainable Finance Disclosure Regulation: Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector, OJ L 317, 9.12.2019, p. 1–16.

to have a microprudential focus. More comprehensive macroprudential exercises could be considered at a later stage.

- In specifying the climate risk scenario it may be reasonable to aim for such a granularity level that the climate-sensitivity of individual assets held by the IORP is assessed. It makes sense to align the data requirements for the stress test as much as possible with the asset data that IORPs are already required to submit to EIOPA.
- Depending on the objective of the exercise it could be considered not to specify the timing of the transition risk shocks in much detail, given that the timing, pathways and the precise impact of transition risks are highly uncertain.

7. Data collection and validation

417. The aim of this chapter is to discuss approaches for data collection and validation of the ST results.

7.1. General principles for data collection

418. The data and information to be collected from participating IORPs should be in line with the scope and the general objectives of the ST exercise.
419. The information requested in the ST exercise may be quantitative and/or qualitative.
420. The design of the templates for the data collection, the type and granularity of the information to be provided by participating IORPs should serve the purposes of each of the analyses that are being performed, taking into account, in particular, the level of granularity of the shocks, and should be introduced to stakeholders before, allowing for sufficient time for discussion and consideration of proportionality.
421. The set of reporting templates used to collect results under the baseline and adverse scenario(s) should, to the extent possible and relevant, take into account the existing reporting and/or disclosure requirements at the European level, namely the EIOPA's regular information requests towards NCAs regarding provision of occupational pensions information.[22]
422. To better illustrate the data requests that could be expected for some of the tools that are being proposed in this paper, a set of basic reporting templates, as referred to below in table 7.1, is being developed.
423. This proposal is without prejudice to the possibility of introducing adjustments to the templates to better fit the data collection to the goals of the ST exercise.
424. Where needed, ad hoc templates and/or additional data points request can also be published along with the technical specifications of the ST exercise.

[22] https://www.eiopa.europa.eu/content/decision-eiopas-regular-information-requests-towards-ncas-regarding-provision-occupational_en

Table 7.1. Basic IORP ST reporting templates

	Baseline	Adverse scenario(s)	
NBS	0.NBS	1. NBS	…
CBS	0. CBS	1. CBS	…
CFA	0. CFA	1. CFA	…
RI projection	0. RI_Projection	1. RI_Projection	

Reporting templates

425. IORPs participating in the ST exercise should fill in the reporting templates using the spreadsheets provided, published together with the technical specifications.
426. If the scope of the ST exercise includes the following tools, participating IORPs are expected to fill in the spreadsheets identified in the table below.
427. The 'NBS' spreadsheet is constructed based on the PF.02.01.24 of EIOPA's regular reporting requirements, with additional data points to collect information on funding requirements.
428. The 'CBS' spreadsheet follows the same structure, adding the specific elements of the common methodology, similar to the one used in the former EIOPA IORPs ST exercises.
429. In the Balance Sheets, participating IORPs are requested to provide a breakdown of their asset allocation under the baseline and the adverse scenario(s). Depending on the scope and objectives of the ST exercise and the design of the adverse scenario(s), further information on the decomposition and details of the asset portfolios could be requested.
430. The 'CFA' spreadsheet aims to collect information on the IORPs' projected cash-in and out-flows, including cash flows related to security mechanisms and benefit reductions, and considering the nature of the benefits (i.e. unconditional, conditional or discretionary). With regard to the projected-out payments, in case it is deemed relevant for the analysis to collect information according to the type of payment, a split between lump sum payments and non-lump sum payments can be introduced.
431. IORPs should use this spreadsheet in the reporting of cash flows for all types of schemes. Whether, according to the technical specifications of the ST exercise, the IORPs should consider new members and new accruals, a risk-free or an expected returns approach and real or nominal values, this does not, in principle, require any changes to the structure of the proposed spreadsheet. On the other hand, in cases where a stochastic approach is applied and the intention is to collect the results not only for expected outcomes but also for other percentiles, IORPs might be requested to complete separate worksheets for each of the envisaged percentiles.
432. Following a similar construction of the CFA table, the 'RI projection' spreadsheet focus on the projected-out payments of IORPs, with the aim of analysing the effects of the adverse scenario(s) on members and beneficiaries. In addition to the reporting of the total cash flows, the same table can be replicated to collect more disaggregated data on different groups or cohorts of members.

7.2. General principles for data validation

433. The validation of the information reported by the participating IORPs should ensure an appropriate level of confidence in the ST analysis and results.
434. One of the main goals of the validation process is to ensure the consistent application of the prescribed shocks among the participating IORPs. For this, the change of the figures between the baseline and adverse scenario(s) should be subject to validation by NCAs and EIOPA.
435. While some validations are more straightforward and can be performed in a more automated way, other may require some flexibility and / or judgement or even additional data.
436. Where applicable, data requests should distinguish between, on the one hand, data needed for the analysis of the results and disclosure and, on the other hand, data needed for validation. In particular, the data collection described in 7.1. could be complemented with additional templates and/or data points to make dedicated validation checks possible.
437. Validation rules can be grouped into different levels:
    - Level 0: consistency and completeness check.
    - Level 1: consistent application of shocks (validation of closed-form formulae).
    - Level 2: assessment of the plausibility of results.
438. Level 0 validations are simple verifications for consistency and completeness purposes, e.g. ensure that all the required cells in the reporting templates are filled and the submissions are complete. Part of these validation rules can be incorporated directly into the reporting templates, so that participating IORPs can check the data themselves before submitting the results to the NCAs.
439. Level 1 validation checks aim to ensure consistent application of the prescribed shocks. This type of validation is less automatic and typically needs formulae or proxies to check the correctness of specific figures in the templates. Relative to level 0 validations these level 1 validation will contain a margin for error since the results obtained from the level 1 validations could be slightly different from the precise calculations made by the participating IORPs.
440. One example is the validation of the application of the prescribed shocks to fixed income assets based on the exposures and modified durations reported by participating IORPs that allows for an approximation of the change in the value of these assets on the balance sheet but not the calculation of the exact result.
441. Without prejudice to the above, where relevant, some of these level 1 validation rules can also be implemented in the reporting templates, provided that their nature is properly identified.
442. Level 2 validation aims to assess the plausibility of the ST results, for instance, by comparing the results among participating IORPs and identifying potential outliers. Benchmark analysis may require grouping and/or classifying the participating IORPs by common characteristics and/or underlying risks. These validation checks can be performed both at NCAs and EIOPA level, using different databases (cross IORPs vs cross countries comparisons).

8. Communication and disclosure of the results

8.1. Introduction

443. Article 32(2) EIOPA Regulation (EU) 1094/2010 specifies that EIOPA 'shall initiate and coordinate Union-wide assessments of the resilience of financial institutions to adverse market developments. To that end, it shall develop [inter alia, (b)] common approaches to communication on the outcomes of these assessments of the resilience of financial institutions.'

444. This chapter discusses the communication about the ST exercises and its results (section 8.2 on communication) as well the principles guiding the degree of disclosure of results (section 8.3 on disclosure).

8.2. Communication

445. Communication on the ST exercise is discussed in terms of providing information on the context of the exercise (sample, scenario(s), specifications, etc.) and the presentation of the main messages and recommendations based on the exercise. These topics will be treated subsequently. The degree of disclosure of results is treated separately in section 8.3.

8.2.1. Transparency about the ST exercise

446. STs form an integral part of the financial risk management of individual institutions and have become a core tool for supervisors to identify and assess risks and vulnerabilities in the financial system. A standardized European ST exercise can provide additional insights and a forward-looking perspective on the risk and vulnerabilities of IORPs in addition to national exercises, providing for a European perspective on the IORP sectors. The degree of transparency about ST exercises is catered to maximize insights from the exercises.

447. Regular EU-wide ST exercises for the European IORP sector, give best insight when relevant information on the individual exercise (inter alia the scenarios and specifications) are publicly available on EIOPAs website, where the use and relevance of scenarios and specifications for specific exercises are explained in the ST report (see section 8.2.2).

448. The relevant information on an individual ST exercise includes the details on the sample of participating IORPs. This includes but may not be limited to:

- the sample selection criteria applied (possibly in relation to the objective(s) of the particular exercise);
- how the sample of participating IORPs is consistent with the sampling criteria (on the level of participating countries as well as the European aggregate level);
- identifying the participating IORPs by their names

449. The transparency about the sample of IORPs participating in the exercise, the description of the sample selection and the identification of the participating IORPs,

inter alia disclosing the names of the participating IORPs, follows from careful weighing of several considerations. One consideration relates to the relevance of disclosure of the names of the participating IORPs. The view embedded above is that disclosure of the participating IORPs gives transparency about the sample and is thus conducive to the effective communication on the exercise. This can be weighted against the view that more IORPs might participate in an exercise –over and above the coverage criterion based on which selected IORPs are asked to participate– if their names would not be disclosed. In the latter view, disclosure might also generate unintended stigma effects in the sense that it raises questions why some IORPs are, and others were not included in a specific ST exercise.

450. Another consideration relates to whether disclosing the names of the participating IORPs may risk the perception that results may be reconcilable to individual IORPs or generalize results as if they were the same for all IORPs in the sample. Disclosing names of participating IORPs may result in potential adverse effects on voluntary participation mentioned before. Simultaneously, however, it might generate adverse selection of IORPs volunteering to participate in the exercise, namely where the national sector predominantly or on average 'does well' in the exercise.

8.2.2. ST report

451. In line with EIOPA's mandate to provide assessments of risks and vulnerabilities in the European IORP sector, EIOPA communicates on the context and the results of a ST exercise in a ST report. The ST report addresses NCAs, IORPs, members and beneficiaries of IORPs, national and European institutions as well as potentially policymakers, and the general public.

452. The ST report complements the assessment of the key risks and vulnerabilities, where necessary, with recommended preventative or remedial actions in particular addressed to NCAs and IORPs. Such recommended actions are aligned with the ST perspectives stemming from EIOPA's mandate. For instance in its 2019 ST report EIOPA laid down its expectation that the participating IORPs in the ST exercise will use the acquired experience and foster their stress testing and risk management capacity. To NCAs, EIOPA laid down its expectation that they will oversee and promote these improvements. More generally, EIOPA might also recommend to participating IORPs that they address identified vulnerabilities in their financial positions and to NCAs that they monitor and manage transmission effects onto systemic risks.

453. EIOPA and NCAs coordinate their communications and press statements on the ST report to ensure its consistency and effectiveness.

8.3. Disclosure of the results

454. The overarching principle for presentation of results is that the results of individual IORPs are not disclosed. Disclosure of the results of individual IORPs should be possible only with the prior consent of the IORP. Also in this latter situation the overarching principle continues to prevail, meaning that for instance in the

situation of disclosing the results of many IORPs that performed (relatively) well in the ST exercise, this may not provide clear indications of the (relative) performance of remaining, non-disclosed IORPs.

455. The specific goal(s) of the ST exercise will guide the specific presentation of the ST results. To that end, results can be disaggregated in different ways to show impacts of the adverse scenario on for instance specific scheme types, differently sized IORPs and / or countries.

- If the goal of the ST exercise is for instance to show the second round effects of benefit cuts on the wider economy in the adverse scenario, the presentation of the results might zoom in on national results of countries where the IORP sector has a sizeable impact on the wider economy.
- If the goal of the ST exercise is for instance to show the impact on sponsors in the adverse scenario, the presentation of the results might zoom in on that part of the sample where sponsor support is relevant, and disaggregate to countries leaning more heavily on sponsor support or specific sponsoring sectors for adjustment.

EIOPA

Westhafen Tower, Westhafenplatz 1
60327 Frankfurt – Germany
Tel. + 49 69-951119-20
info@eiopa.europa.eu
https://www.eiopa.europa.eu