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Final Report

Framework for the 5th ESMA Stress Test Exercise for Central Counterparties

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1 Introduction

1. This report sets out the framework for the new ESMA stress test exercise for Central Counterparties (CCPs) including the scope, the detailed methodology, the expected deliverables and the implementation plan.

2. Section 2 discusses the different components of the stress test, which are the credit risk, the concentration risk, the liquidity risk, and the climate risk component, and the reverse stress test. For the components that were already part of the previous exercises (i.e. credit stress test, concentration stress test, liquidity stress test, reverse stress) the note focuses on the suggested methodological changes and implications. The design of the new climate risk component is discussed in full.

3. The required steps and implementation plan for the 5th ESMA CCP stress test exercise are presented in section 3, where the framework also stipulates the resource commitments from NCAs that are needed for a successful exercise.

4. The framework is complemented by four documents, which are 1) Instructions (Annex 1); 2) Validation (Annex 2); 3) Data Request Templates (Annex 3); and 4) the ESRB Adverse Scenario for the ESMA CCP stress test. The first document includes instructions for the CCPs regarding the calculation and reporting of the required data. This includes instructions for translating the market stress scenarios prepared by the ESRB into profit- and loss (P&L) calculations for portfolios of the CCP. The instructions (Annex 1) will be shared with the CCPs when launching the data request together with the data request templates (Annex 3) and the ESRB market stress scenario (Annex 4). The second document (Validations - Annex 2) details the checkpoints for the validation process and specifies the allocation of work across the participating authorities (i.e. NCAs and ESMA).

2 Design of the 5th ESMA CCP Stress Test exercise

2.1 Background

5. CCPs are systemically important and their resilience is critical to the stability of the financial system in the EU. By their nature, CCPs are counterparties to all their clearing members. Failure of CCPs to mitigate risks could potentially lead to spill-over effects and may exacerbate systemic risk. Moreover, as evidenced in previous ESMA stress test exercises, CCPs are highly interconnected through common participants, which may propagate failures in one CCP throughout the system. Stress testing CCPs' default waterfalls, both individually and system-wide, is an important supervisory tool to ensure the sector is safe and resilient to member defaults and market shocks.

6. The ESMA stress test is different than the stress test of individual CCPs. CCPs run daily stress tests on the basis of stringent prudential requirements that focus on their own business activity, including participants and cleared products. CCP stress tests mostly focus on their own CCP within the specific markets it clears. By its nature, the individual CCP's stress test cannot take into account how a default of one of its clearing members impacts other CCPs. Therefore, the ESMA stress test is a critical tool in assessing the systemic implications of system-wide events and thus the resilience of the system of EU and Tier 2 CCPs.

7. One of the objectives of Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories (EMIR) is to promote central clearing and ensure safe and resilient CCPs. Therefore, ESMA shall regularly, in cooperation with the ESRB, initiate and coordinate assessments of the resilience of CCPs to adverse market developments. Following the amendments to Regulation (EU) No 648/2012, these assessments should include both EU and third-country Tier 2 CCPs. Finally, ESMA shall take into account environmental risk following the review of ESMA Regulation (EU) No 1095/2010. ESMA shall develop the following, for application by the competent authorities:

    - common methodologies for assessing the effect of economic scenarios on the financial position of a financial market participant taking into account inter alia risks stemming from adverse environmental developments;

    - common methodologies for identifying financial market participants to be included in Union-wide assessments;

    - common approaches to communication on the outcomes of these assessments of the resilience of financial market participants;

    - common methodologies for assessing the effect of particular products or distribution processes on the financial position of a financial market participant and on investors and customer information;

    - common methodologies for assessing the effect of environmental risks on the financial stability of financial market participants.

8. Where the assessment exposes shortcomings in the resilience of one or more CCPs, ESMA shall issue the necessary recommendations.

2.2 Objectives & principles

9. The objectives of the ESMA Stress test exercise follow directly from the legal mandate given to ESMA under EMIR. The objectives are to:

    - assess the resilience of CCPs to adverse market developments,
    - identify any potential shortcomings in the CCPs' resilience, and
    - issue recommendations as appropriate.

10. The overall design of the Stress Test framework was also guided by a number of overarching principles. ESMA will assess the resilience of all CCPs in scope, individually and as a system. This will be done on the basis of, as much as possible, common methodologies and criteria. Moreover, the stress market shocks shall be combined with the simultaneous default of market participants. The ESMA CCP stress testing exercise is not aimed at assessing the compliance of individual CCPs with regulatory requirements nor at identifying any potential deficiency of the stress testing methodology of the CCPs. It may however expose individual shortcomings in which case ESMA will issue the necessary recommendations.

2.3 Scope & history

11. The exercise will cover all authorised EU CCPs as well as Tier 2 CCPs. A total of 16 CCPs will be included in the scope of the exercise.

12. The scope of the stress test exercise has evolved over the years. The first exercise conducted by ESMA was focused on the counterparty credit risk that EU CCPs would face as a result of clearing member defaults and simultaneous market price shocks. The second stress test introduced several methodological improvements as well as incorporating an assessment of liquidity risk. The third exercise included a concentration risk component, that was used to adjust the losses arising from the credit stress test to account for the costs of liquidating concentrated positions. In the fourth exercise, the assessment of liquidity risk was paused, whereas the scope included operational risk as a new component. Also, the integration of concentration with credit was an important development in the fourth exercise that further improved the ability to detect vulnerabilities in the system of CCPs. In this fifth exercise, the liquidity component is resumed, and climate risk is introduced as a new component, whereas the assessment of operational risk is postponed to future stress test exercises.

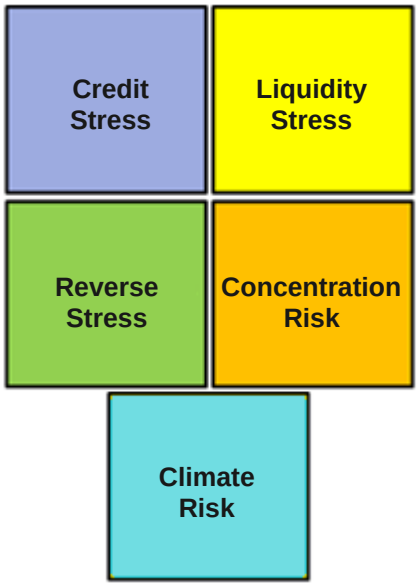
13. Counterparty credit risk and concentration risk are the core types of risks faced by CCPs and the fifth stress test exercise incorporates significant methodological improvements.

14. In addition, liquidity risk will be reintroduced to assess the resilience of CCPs to market wide and idiosyncratic liquidity stress events on a date that will be shared with credit risk.

15. A major innovation in this stress test is the introduction on climate risk. The analysis will integrate both long-term risks to the CCP and to its ecosystem resulting from the transition to a carbon-neutral economy and an exploratory analysis of physical risk, defined as the consequences of extreme weather events that are made more likely or more severe by climate change.

16. While residual risks from the in-scope risk sources are analysed and highlighted in the framework, CCPs are also subject to other types of risks that are either not covered or are partially covered and could in isolation or in combination with the above-mentioned risks challenge their resilience. In particular, legal and any type of business risks will be outside the scope of the exercise, because of their largely idiosyncratic nature. Also, potential shortcomings in policies and practices of individual CCPs, such as for example in the operationalisation of default handling procedures, can challenge their resilience but are beyond what will be considered in the course of this exercise.

17. To summarize, the 5th ESMA stress test exercise has the following components:



- **Credit Stress**: Assess the sufficiency of CCPs' resources to absorb losses under a combination of market price shocks and member default scenarios.

- **Concentration risk**: Assess the impact of liquidation costs derived from concentrated positions.

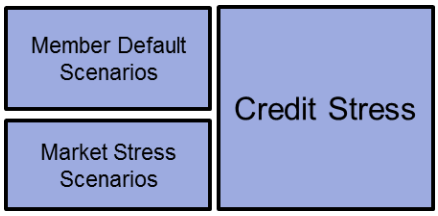
- **Liquidity Stress**: Assess the sufficiency of CCPs' liquid resources under a combination of market price shocks, member/liquidity provider default scenarios and additional liquidity stress assumptions.

- **Climate risk**: Assess the degree to which the CCP's business model is affected by the transition to a carbon-neutral economy, the consequences of the transition on the collateral posted by clearing members, and explore the impact of physical risk on CCPs.

- **Reverse Stress**: For credit and concentration, increase the number of defaulting entities, level of shocks and severity of concentration model assumptions to identify at which point resources are exhausted. For liquidity and climate, the reader can refer to each section.

2.4 Credit Stress Test

2.4.1 Objectives of the Credit risk analysis



18. The goal of the credit stress test is to assess the sufficiency of CCPs' resources to absorb losses under a combination of market price shocks and member default scenarios.

2.4.2 Scope and methodological principles

19. The CCPs will be asked to report the losses they would face in case of clearing member defaults under the provided common market stress scenarios for two reference dates. ESMA will then identify the entities with the top exposures by aggregating separately for each date the losses across accounts, clearing members and CCPs in order to compare the losses to the stressed value of the financial resources that would in each case be available to cope with the default.

20. The stress losses will comprise not only the losses imposed by the market stress shocks but will also include the additional impact from the liquidation of concentrated positions and from wrong way risk exposures. The aggregation of losses will be based on the methodology that was developed and deployed during the previous (4th) exercise. For this purpose, the CCPs will again need to report the requested data not only at clearing member but also at account level. This will allow ESMA to seamlessly calculate and incorporate the impact from these additional stress assumptions, while respecting the loss segregation rules imposed by EMIR and CCPs' rulebooks.

21. In the fifth exercise, ESMA plans to identify additional theoretical market stress scenarios and assess their impact. The objective of this improvement is to complement the results from the common market stress scenario with an exploratory analysis of the impact of additional theoretical scenarios. The additional theoretical scenarios will need to be defined after receiving and analysing CCPs' cleared exposures in order to be able to focus on scenarios that could potentially be impactful considering actual exposures. The principles and limitations of the methodology that is to be used to identify and implement these scenarios are presented in par 2.4.3.

22. The wrong way risk adjustment is further enhanced in the 5th exercise and beyond considering wrong way cleared exposures will also include the estimated impact from posting collateral that is issued or guaranteed by another defaulting clearing member.

23. The reverse stress test analysis used to assess the absorption capacity of CCPs by increasing the number of defaulting entities and the severity of the market shocks is extended into one additional dimension. In particular, the analysis will also consider the impact of assuming different levels of severity in the assumptions underlying the estimation of the concentration cost.

24. In order to manage the overall effort for all stakeholders, the fifth exercise will not include an assessment of the aggregate effect of CCP recovery and resolution arrangements. This will be further explored in future exercises.

25. Finally, ESMA will explore the possibility of identifying large positions of individual clients, potentially held through multiple clearing members or multiple CCPs. Since the information on individual clients' exposures is not always available to the CCP, ESMA would need to rely on additional data sources and attempt to combine this information with the data received from CCPs. Hence, ESMA will further assess the feasibility of performing this analysis after receiving the data from CCPs.

2.4.2.1 Member Default Scenarios

26. The member default scenarios define the conditions that are used to select the clearing members that are considered to be in default. In all cases, the defaulting members will be selected for each stress date individually and using only the required margin (i.e. excluding excess collateral posted). Central banks, governments and interoperable CCPs are not included in the list of entities that may be assumed to be in default for the purpose of this exercise. The following scenarios will be employed:

    - **All CCPs Cover-2 groups**: Across all CCPs (full scope), identify the two clearing member groups with the highest aggregate exposure under a particular market stress scenario. All clearing members that belong to an identified corporate group are assumed to default across all CCPs. This scenario will give an aggregate view of the impact of the default of two groups of clearing members in the EU. With regards to the exact condition to be used to select the clearing member groups, the first choice is to select the top-2 groups that would lead to the highest aggregate breach of prefunded resources across all CCPs. However, depending on the results and as we have seen in the previous stress test exercises, it may be that this selection condition just focuses on the breach of one CCP (that is already presented under the cover-2 groups per CCP scenario) and propagates to all other CCPs the default of the same two clearing member groups with no material implications. In such a case, this selection condition would fail to adopt a more systemic point of view, as for example by exploring the default of pairs of groups that would put simultaneous pressure on multiple CCPs. If there is no breach of prefunded resources or if the breach is already presented under the individual CCPs' scenarios with no material implications to other CCPs, one can

choose to select the two clearing member groups that would cause at an aggregate level the highest losses above the defaulters' margin and default fund contributions. The final calibration of the selection criteria will be done after the analysis of the results. In all cases, it will be ensured that if there are breaches of prefunded resources at one or more than one CCPs, these will be presented and discussed under at least one of the selected scenarios. Furthermore, it can be considered to run and present in the final report more than one variant in order to make sure that all relevant results are highlighted. In general, the "All CCPs Cover-2 groups" scenarios may fail to stress all CCPs individually, as it can be that defaulting entities, that are being selected as the most relevant at an ESMA level, may not be relevant or may not even be participants at some of the CCPs. Therefore, we will also run the cover-2 groups per CCP scenario.

- **Cover-2 groups per CCP:** For this scenario, we will select the defaulting clearing members as the members belonging to the top-2 corporate groups of clearing members for each individual CCP. The defaulting clearing member groups are selected per CCP; hence they may be (and in most cases will be) different for each CCP and they are not considered to be in default in other CCPs. When a group is considered to be in default in one CCP, all clearing members that belong to the identified corporate group are assumed to default for the same CCP. The "All CCPs Cover-2 groups" scenarios, where we select the top-2 groups across all CCPs, cannot be used to assess the resilience of individual CCPs, as the selection algorithm will always focus on the two most systemically important groups and may fail to highlight shortfalls for individual CCPs. Therefore, the inclusion of this member default scenario is important in order to allow the assessment of the resilience of individual CCPs. The groups that will be selected for each CCP are the ones that lead to the highest resource consumption beyond required margin collateral and beyond the Default-Fund-level prefunded mutualised resources, including the default fund, the dedicated resources ("skin-in-the-game") and other prefunded Default-Fund-level resources. Thus, the selection process will select the two groups that could together lead to a depletion of the prefunded resources. If such pairs of groups are not to be found, ESMA will select the two groups that would lead to the highest consumption. This can be done either on a relative (i.e. % of resources consumed) or on an absolute basis (amount of resources consumed). This may lead to different results for CCPs that have more than one default fund. The selection of defaulting entities on the basis of the relative consumption may focus on a smaller default fund that was closer to creating a breach, instead of selecting pairs of groups that would cause larger losses (in absolute EUR terms) at a larger default fund. Moreover, one can choose to focus on the losses above own resources of the defaulting members (including margin and default fund contribution) or the losses above only margin. The final calibration of the selection criteria will be done after the analysis of the results. As in the case of the "All CCPs Cover-2 groups" scenarios, it can be considered to run and present in the final report more than one variant if needed

to make sure that all relevant results are highlighted. In all cases, the same conditions will apply to all CCPs in order to ensure a fair and consistent presentation of the results.

2.4.2.2 Market Stress Scenarios

27. The common market stress scenario[1] of the fifth ESMA CCP stress test exercise was designed by the ESRB's Task Force on Stress Testing in close collaboration with the European Central Bank (ECB) and ESMA. The shocks were produced using the tool that is employed for the calibration of financial shocks for adverse scenarios at the ECB and has been in use for the calibration of financial shocks for the EBA, EIOPA and ESMA scenarios.

28. It is important to note that the market stress scenarios should not be bound to only replicate past historical scenarios, but also use past observations in combination with a narrative that reflects the assessment of prevailing sources of systemic risk for the EU financial system to produce shocks that model potential future market conditions.

29. The stress test is a scenario-based analysis measuring how CCPs would fare under hypothetical adverse economic developments. The scenario has been designed to be severe to meet CCP-specific regulatory requirements. When modelling the stress scenario, it is not possible to cover all possible movements of different risk factors and their co-movements within and across asset classes. In the 5th exercise ESMA will complement the stress test results derived from the common market stress scenario by identifying additional theoretical market stress scenarios and assessing their impact on CCPs.

2.4.3 Proposed modelling

30. The set of price/yield shocks included in the common market stress scenario will need to be run by individual CCPs. The scenario is defined for a set of high-level risk factors across different asset classes. The asset classes and list of risk factors were updated to reflect the main risks of products cleared by the in-scope CCPs. Given that it is not feasible to define scenarios for each and every risk factor of all CCP-cleared contracts, the CCPs will need to translate the risk factor shocks into a P&L for their cleared products and the members' portfolios. Therefore, the ESMA Stress Test Expert Group has developed a set of instructions that explain how these are expected to be implemented and ESMA will provide these instructions together with the data request and the common market stress scenario.

[1] Link to ESRB scenarios: https://www.esrb.europa.eu/mppa/stress/html/index.en.html

31. The instructions were drafted to provide clarity and address all material implementation challenges. The instructions were shared with EACH for consultation before the finalisation of the design.

32. Some of the key provisions in the instructions are listed below for illustration purposes and to better represent the assumptions, possible limitations, and resources implications of the exercise. The detailed instructions are included as Annex 1 to this note.

33. In the previous exercise we used two stress dates and one common market stress scenario. The experience has shown that running the same shocks on different dates can lead to significantly different results. This may be due to differences in positions, the prevailing level of resources (e.g. margin requirement, size of default fund), the level of prices, etc. Hence, the credit stress test will again be based on two distinct dates (17/03/2023 and 16/12/2022).

34. In the previous (4th) stress test exercise, ESMA modelled one of the two dates as an intraday default and the CCPs were asked to report exposures and collateral as of a specific time window on this date. While recognising any uncertainties stemming from the complexities of sourcing and validating intraday data for the implementation of this assumption, the results indicated that the intraday default assumption did not put significant additional stress on the resilience of the system of CCPs. This default assumption posed significant implementation challenges and increased effort was required by all participants/stakeholders, including CCPs, NCAs and ESMA. In order to manage the overall effort, also considering the extension of scope and methodological improvements, it was decided to focus for the 5th exercise on end-of-day default scenarios. For both dates the default will be modelled as a weekend default. This means that all payments/obligations due on Friday prior to the default are assumed to be met in full. After the default (which occurs during the weekend), no payments would be exchanged between the CCP and the defaulting member. Trading access is assumed to have been revoked in the weekend, so that no position changes were accepted after the last novation cycle of Friday. The open positions would therefore reflect the positions as of Friday end-of-day, including all transactions that were accepted for novation during Friday. All price movements are supposed to be happening instantaneously at the time the defaults are announced.

35. The CCPs are asked to report for one of the dates (17/03/2023) the data for all scenario severity steps at both account and clearing member level. This allows ESMA to incorporate the additional stress assumptions, i.e. the losses from concentrated positions and the impact from wrong-way risk, including in the reverse stress test results. It is understood that reporting the data needed to perform this assessment implies a significant amount of data to be reported for the credit stress test. For this reason, it was decided to request this more granular account-level data only for one of the dates (17/03/2023). This means that for the second date (16/12/2022), the results will be reported only at clearing member level

and ESMA will not be able to reflect these additional stress assumptions (concentration and wrong-way risk impact) in the credit stress test results and reverse stress test analysis. This will allow to reduce the amount of data requested to CCPs while allowing to explore and incorporate other significant methodological improvements.

36. The CCPs are again asked to report separately the minimum required collateral, not including any excess amounts, and the total available collateral. The usage of the minimum required collateral is meant to reflect a scenario where members would withdraw under stressed conditions any collateral exceeding the minimum required. The CCPs are asked to revalue the collateral alongside the cleared products using the market stress scenarios shocks. CCPs will again report and use for the credit stress component the stressed values of margin and default fund collateral actually provided by clearing members (as opposed to the stressed values of relevant resources following re-investment). This implies that any market risk P&L for such collateral beyond haircuts will affect the default waterfall. However, any additional credit risk stemming from the re-investment of collateral will not be reflected.

37. The CCPs are asked to report separately any Powers of Assessment that can be called from non-defaulting members and additional own resources subject to further conditions detailed in the instructions.

38. The CCPs are instructed on how to identify or adjust when needed the shocks to be applied to their own products using the high-level risk factor shocks and how to calculate the P&L stemming from those shocks.

39. The amounts will again be reported in currency (EUR) also accounting for the provided FX shocks.

40. The new elements that were introduced in the credit component of this 5th stress test exercise are discussed in detail below:

Simulating additional theoretical market stress scenarios

41. ESMA plans to identify additional theoretical market stress scenarios and assess their impact on CCPs. The objective of this improvement is to complement the common market stress scenario with an exploratory analysis of the impact of additional theoretical scenarios.

42. The common market stress scenario forms the basis of the assessment of resilience of CCPs to shocks reflecting the triggering of one or more of the sources of systemic risk to the EU financial system as identified by the ESRB. However, CCPs may also be exposed to more asset-specific or even CCP-specific risks, sometimes also linked to particular

positions or strategies. ESMA aims to strengthen its assessment of these risks with the simulation of additional theoretical scenarios.

43. As explained in the limitations of previous exercises, when modelling stress scenarios it is not possible to cover all possible co-movements between risk factor for all CCPs. Hence, there is a need to focus on scenarios that would be relevant or impactful for in-scope CCPs. Therefore, ESMA plans to define such scenarios after receiving and analysing CCPs' exposures.

44. From a methodological perspective, ESMA will identify the key risk factors for the different CCPs and use the available historical data of risk factor behaviour and correlations between risk factors to replay the historic moves and/or to come up with hypothetical moves inspired from past stress events. ESMA would then use the shocks implied by the theoretical scenarios defined on the basis of this process to simulate the P&L for already reported clearing members positions as of the reference date and assess the sufficiency of CCPs financial resources to withstand such shocks. In all cases, all theoretical scenarios would be run for all CCPs.

45. During the design of the theoretical scenarios, different elements will need to be assessed: plausibility, relevance of historical events to the current environment, and an exploratory analysis of scenarios not contained in the historical data set. For example, it is acknowledged that with regard to the definition of such scenarios one needs to be careful, on the one hand when anchoring the plausibility assessment on only what has happened in the past, and on the other hand assuming that what has happened in the past is still plausible and applicable to current market conditions. Hence, a significant degree of expert judgement will be used, and any assumptions or limitations will need to be detailed to allow the interpretation of the results.

46. For this 5th stress test exercise, the accuracy of the results using the theoretical scenarios will be restricted by the calculation of results using first-order sensitivities to risk factors and also using position data with a more limited level of granularity compared to the data used internally by CCPs. In this sense, the results will not have the same level of accuracy as those computed through full revaluation and full product specifications by CCPs for the main market stress scenario. Nonetheless, ESMA will aim to reconcile the produced estimates with CCPs.

47. The results of this assessment will be used as an exploratory analysis to identify potential weaknesses not highlighted by the main stress scenario and any residual limitations will be duly noted in the final report.

Enhancement of wrong-way risk assessment

48. Ideally, when assuming that an entity is in default, one should also reflect this in the price of the cleared instruments and collateral for all clearing members and CCPs.

49. The wrong-way risk assessment performed in past stress test exercises was focused on the specific wrong-way risk assumed through cleared exposures, i.e. the impact of the default of a clearing member on the price of cleared instruments issued or guaranteed by the clearing member. For the most recent iteration (4th exercise), the methodology was improved to incorporate the impact that the default of a clearing member will have on relevant instruments cleared by other clearing members.

50. The methodology is now further enhanced to also account for wrong-way risk assumed via posted collateral. Clearing members are not allowed by regulation to post collateral that is issued by the clearing member providing the collateral, or an entity that is part of the same group as the clearing member, except in the case of a covered bond subject to further conditions. However, clearing members can still post collateral that is issued by other clearing members. Hence, in case of default of two clearing members, a CCP may still have to rely to collateral that is issued by a defaulting entity.

51. Similar to what is done for cleared positions and in order to accommodate this assessment, the CCPs are instructed to report at account level the collateral provided to cover margin requirements, also indicating which instruments are issued or guaranteed by one of their clearing members or affiliates. Hence, where reported positions or collateral include instruments issued by the defaulting entity or its affiliates, ESMA can estimate and incorporate in the stress test results the impact that the default of the entity will have on the positions/collateral of all clearing members.

52. Index products (e.g. for equities and CDS) are again left out of scope of this assessment in order to avoid complexity. Moreover, the methodology will not cover any wrong-way risk stemming from CCP's investments (including re-investment of posted margin collateral) or from instruments provided to cover other obligations such as default fund contributions. The methodology used to estimate the impact is further detailed in the instructions (Annex 1).

2.4.4 Limitations of the Credit Stress

53. As in all exercises of this scale and type, there are residual limitations.

- The credit stress test exercise has evolved to include the impact from concentrated positions for one of the stress dates. However, the estimation of this impact is subject to limitations, which are described in the relevant methodology, including due to the restricted modelling of the default management procedure, the model granularity and the uncertainties around the estimation of the market impact parameters.

- Investment risks, including market and credit risk assumed as a result of CCPs' investments are not assessed in the credit stress test component. The exercise does incorporate an assessment of the market risk for provided collateral using the market stress scenarios and an adjustment for the wrong-way risk resulting from margin collateral issued by clearing members. Any additional market or credit risks, also resulting from the re-investment of provided collateral are not covered. These limitations are due to the fact that these risks are linked to the individual actions and rules of the CCP and are thus difficult to model consistently across CCPs.

- The wrong-way-risk adjustment is applied for one of the stress dates and has been enhanced to also reflect the risk from margin collateral issued by another defaulting clearing member. However, the estimation of this impact is subject to limitations, including due to uncertainties in the estimation of the recovery values. Moreover, in the interest of avoiding complexity, the wrong-way risk effects on cleared index products are not modelled.

- Operational risks, including those that may lead to increased credit risks, such as the operationalisation of default procedures, are also not reflected in the credit stress test results.

- Any additional second round effects to prices following the default of entities will not be modelled (i.e. the price shocks are the ones including in the scenarios and the number of defaults are the ones described above, but the two are taken exogenously). Also, the default of additional entities due to losses accumulated from non-cleared portfolios will not be modelled.

- In this exercise ESMA plans to identify additional theoretical market stress scenarios and assess their impact on CCPs. The objective is to complement the common market stress scenario with an exploratory analysis of the impact of additional theoretical scenarios. However, when modelling the scenarios and credit exposure, it is not possible to cover all possible risk factors and then all possible combinations of risk factor shocks for all CCPs, as this would require modelling several thousands of risk factors and then all their co-movements.

2.5 Concentration Risk Analysis

2.5.1 Objectives of the Concentration risk analysis

54. The Credit component of the Stress Test applies market shocks to positions regardless of their size. All positions are valued at the mid-price, regardless of their size and direction, implicitly assuming that the CCP will be able to close out positions at this price. However, in practice, in closing out positions a CCP might incur costs beyond those factored in the shocked mid-price. The inability to perform market transactions at the mid-price is a manifestation of market illiquidity. The level of market illiquidity risk is linked to the size of the position and the depth of the market.

55. Market illiquidity can be broken down into two parts:

- an exogenous component generated by the bid-ask spread. Bid-ask spreads create a cost for closing out even small positions.

- an endogenous component, when positions are large relative to market capacity and their liquidation in a short time frame (such as in the context of a CCP's default management process) causes market prices to move further in an adverse direction than would have been observed otherwise. The impact of this component depends on the size of the position in relation to market depth, which is the ability of the market to absorb a substantial amount without materially impacting the market price.

56. For the world's largest and most liquid markets, such as interest rates on major currencies, the exogenous component generated by the bid-ask spread is of minor importance. It can be larger in other markets such as credit or energy markets.

57. However, in all markets, the market impact from liquidation costs of large positions is significantly more material than that of bid-ask spreads.

58. The analysis will consist of the identification of the concentrated positions present in the portfolios of CCPs, the estimation of the potential liquidation costs that could be derived from having to close these out in case of clearing member defaults, and the assessment of potential implications to CCP resources introduced by these positions. This analysis has the following objectives:

- Identify concentrated positions of clearing members both at an individual CCP level and across CCPs.

- Assess the potential liquidation costs of concentrated positions for CCPs at system wide level during a market stress situation and the potential implications of the simultaneous liquidations at different CCPs of the same asset or contract.

- Combine the liquidation costs with those stemming from market shocks to produce an estimate of the overall costs that would need to be absorbed by CCPs in the event of a default of a clearing member.

- Assess concentration and liquidity add-ons and the impact of concentrated positions on the required margins calculated by CCPs in their internal margin models for the different asset classes and products they clear.

59. In this exercise the methodology will be extended to examine concentration risks originating from further asset classes (such as FX and inflation derivatives) and liquidation of non-cash collateral. Additionally, the analysis of model risk will aim to examine the impact of assumptions regarding offsetting of liquidation costs across positions.

2.5.2 Regulatory background of the ESMA CCP Concentration Risk Analysis

60. Under the Article 53(3) of the RTS (Commission Delegated Regulation EU No 153/2013), a CCP shall conduct a thorough analysis of the potential losses it could suffer and shall evaluate the potential losses in clearing member positions, including the risk that liquidating such positions could have an impact on the market and the CCP's level of margin coverage.

61. Under the 2017 CPMI-IOSCO further guidance on the PFMI, a CCP's margin model assumptions should incorporate estimates of market liquidation costs, including bid-ask spreads not otherwise modelled in the price returns or explicit fees paid to trading platforms or liquidation agents. These market liquidation costs should also reflect the market impact of liquidation activity, when applicable. When a portfolio liquidation requires the disposal of concentrated positions or portfolios that are otherwise significant in terms of anticipated impacts on market liquidity in the relevant product, a CCP should contemplate the possibility that assumed market liquidation costs, such as bid-ask spreads or mid-market pricing, will not in fact be actionable or otherwise predictable in the face of an actual liquidation.

62. ESMA intends to reflect the above regulatory requirements in the design of Concentration Risk Analysis of CCPs.

2.5.3 Scope and methodological principles

2.5.3.1 General structure of the Concentration Risk analysis

63. The concentration risk analysis consists of the following elements:

- CCPs aggregate positions per instrument/asset class following specific guidelines detailed in the instructions annex.
- CCPs compare the aggregated positions to thresholds detailed in the instructions annex to determine which aggregated positions are categorized as concentrated positions and need to be reported for the concentration risk analysis.
- CCPs provide liquidation costs estimates for the asset classes they clear following specific guidelines detailed in the instructions annex.
- ESMA will develop liquidation cost models for all asset classes from the CCPs' liquidation estimates. Specific details on the process are specified in the *Proposed modelling* section of this document.
- Using these models and the reported concentrated positions by CCPs, ESMA will calculate potential concentration costs for the different CCPs, Clearing Members and asset classes.
- ESMA will perform different analyses with the calculated concentration costs as detailed in the *Analysis of results* section.
- ESMA will perform a model risk assessment as detailed in the *Assessment of model risk* section.

2.5.3.2 Methodology and assumptions of the concentration risk analysis

64. CCPs will be requested to provide:

- The details at account level of the positions defined as concentrated positions. For some asset classes this requires the positions to be larger in size than a certain threshold. Positions below the thresholds should be reported in aggregate rather than at individual level.
- The level of concentration add-ons in the CCP's margin framework (i.e. the additional margin called and received from each clearing member specifically to cover concentrated positions).

- Sensitivity tables providing the expected market impact of liquidating in stressed conditions large positions relative to the average volumes.

65. From all the contributions received, ESMA staff will then propose a common ESMA sensitivity table for each asset class.

66. The concentration risk analysis will be carried out by ESMA staff using consistent modelling and parameters for all CCPs in scope. In other words, a position of the same relative size in the same instrument will receive the same market impact estimate at each CCP.

67. ESMA staff will then compute the concentration risk levels in each service and asset class and perform an analysis of the results in terms of absolute risk and against the concentration provisions of the CCP. The exercise will include the market impact of the liquidation on most cleared positions. The scope of considered cleared positions will include most securities and derivatives markets.

68. To best reflect the characteristics of the covered asset classes, the specific modelling choices will present some differences. For securities, the exercise will consider the concentration of instruments at the ISIN level. For most listed derivatives, we will consider the risk concentration within one aggregated sub-class. For fixed income and credit derivatives, we will consider the market impact cost of setting-up a relevant hedging portfolio.

69. The design of the framework ensures that concentrated spread positions, even market neutral ones, will in general be captured by the analysis. The base calculation will not model spread positions between two correlated but different underlying values as offsetting in respect of the concentration component of the ST, because it is not assumed that the transaction costs associated with concentrated positions in two different underlying can be offset. For example, a large short position in one equity and a large long position in another equity will not offset each other's costs. Likewise, electricity or commodity derivatives with different delivery points will be captured.

70. Curve / calendar spreads in the same underlying will be captured to the extent that the spread position doesn’t get aggregated following the aggregation rules of its asset class.

71. Also, ESMA staff will be able to assess the materiality of porting assumptions, as positions will be reported at account level.

2.5.3.1 Features out of scope

72. Modelling any auction mechanism presents many theoretical and practical challenges. This would be even more challenging in an ESMA exercise with a large variety of market and

service structures. Therefore, modelling the auction mechanism is out of reach for this exercise.

73. The methodology makes no attempt at modelling gradual liquidation of concentrated positions and a corresponding extension of the MPOR. Instead, liquidation is modelled as happening in a single tranche for all position, leading to the modelled liquidation costs.

2.5.4 Proposed modelling

2.5.4.1 Asset class scope

74. The equity and bond securities markets are in scope.

75. The scope will aim to cover Equity, Fixed Income, Commodities, Credit, Freight, Emission allowance, Foreign exchange and Inflation derivatives.

76. To limit the overall complexity, some asset classes and sub-classes have been excluded from the scope. Structured finance products, ETCs and ETNs bond types, securitised derivatives, CFDs, volatility index derivatives and dividend derivatives are not covered.

77. The choices of asset classes to be excluded have been done following different criteria:

- Small volumes in CCPs (structured finance products,, securitised derivatives, CFDs)
- Complex sub-asset classes decided on a case-by-case basis to limit overall complexity of calculations (volatility index derivatives, dividend derivatives).

78. The implication of leaving out some asset classes is the lack of information of concentration risks present in these segments as well as the difficulty of assessing the impact to CCPs which share default funds between included and excluded asset classes.

79. The detailed coverage is available in the instructions.

2.5.4.2 Aggregation and reporting of positions

80. To limit the volume of data, CCPs will report positions at individual instrument level when these are greater than class-specific thresholds. Other positions will be reported at aggregate level.

81. The instruction document details the aggregation rules for each asset class. The target sub-classes are built from tables of the annex III of the Commission Delegated Regulation 2017/583 on MiFID II, dealing with transparency requirements. The segmentation criteria

are complemented where necessary to improve the granularity, with for instance, the introduction of a delivery / cash settlement location for some commodity derivatives.

82. To allow for a simpler implementation, the positions should be valued without the impact of any market risk scenario.

83. The principles governing that aggregation are the following:

- For securities, the positions will be aggregated at the ISIN level.
- For derivatives, non-linear positions (e.g. options) will be aggregated with linear positions (e.g. futures/forwards) using their delta.
- The aggregated vega will also be used for asset classes where this is material and practicable.
- The aggregation of single stock equity derivatives will be done at an underlying ISIN level. For the rest of derivatives, the aggregation will be done according to different categories and maturity buckets. The details for each asset class can be found in the instructions.

2.5.4.3 Determination of the common market-impact sensitivity tables

84. For each asset class it clears, each CCP will be requested to provide a sensitivity table. This sensitivity table will contain the estimates of liquidation costs gathered by CCPs for the different asset classes they work with. The explanation of the procedure to generate the sensitivity tables is defined in the instructions annex. The CCP should be able to justify the numbers provided to its NCA as realistic measures of potential liquidation costs during a stress situation.

85. Typically, for any given asset sub-class within that asset class, the table should give the cost (bps or % of market value) for executing trades that are x0.5, x1, x2, x5 of the average daily volume (or average daily notional amount when relevant) in stressed market conditions after at least one large clearing member just defaulted. The exact content of each table is specified in the instructions.

86. From all the contributions received, ESMA staff will then propose a common ESMA sensitivity table for that asset class. This step will likely involve the scrutiny for accuracy and plausibility as well as the removal of outliers.

87. For each table, ESMA staff will also propose a methodology to get the market impact given a position size. This could involve simple interpolation / extrapolation techniques or the fitting of a functional form.

88. After consultation with the ESMA group of experts on CCP stress testing, the common set of tables and interpretation techniques will be finalised and used as baselines.

89. The final report will provide an order of magnitude of the market impact for a representative large position in each asset class. This will make sure that the market can duly understand ESMA's results, and the inputs provided by CCPs. This transparency should also act as an incentive for CCPs to provide adequate estimates.

2.5.4.4 Computation of concentration risk

90. Following the framework aggregation rules and required granularity, the CCPs will have reported the concentrated positions of each of its clearing members at account level.

91. For each aggregation level, the size of the position to be liquidated will be computed under the chosen modelling assumptions.

92. ESMA staff will evaluate the size of this position (or its hedge) relative to the average daily volume (or such relevant parameter). Then, using the common ESMA sensitivity tables, the liquidation market impact of the position will be determined.

93. This market impact will then be allocated at account level to include concentration costs into the waterfall.

94. When estimating concentrated positions, ESMA staff will allow for hedges with economic rationale such as delta hedging single stock derivatives with the underlying stock. For fixed income and credit derivatives, the permitted hedges are fully specified in the instructions.

95. In case of multiple clearing member defaults, the total position will be used to get the total market impact. This market impact will then be apportioned to the different clearing members.

2.5.4.5 Analysis of results

Descriptive analysis

96. For each CCP, a descriptive analysis of the concentration risk across asset classes and clearing members will be performed.

97. The computed concentration risks will be compared to the reported concentration add-ons and required margins of the CCPs.

98. Through these analyses, we will assess the effectiveness of the CCP models to account for the concentration risk. For instance, the asset classes for which the CCP and the model

of the component identify concentrated positions may differ. In addition, instances where the computed concentration risk is high in relation to the total margin required could point to insufficient concentration add-ons.

Combined concentration and market shock scenario

99. The losses stemming for the liquidation of concentrated positions will be added to the scenario P&L caused by the market shocks. ESMA staff will then run the waterfall to get the stressed loss over the members' required resources. The impact of concentration risk on mutualised resources will be analysed.

100. ESMA staff will check whether the inclusion of concentration risk would have changed the choice of Cover 2 defaulting clearing members.

2.5.4.6 Assessment of model risk

101. It is notoriously difficult to estimate the price impact as a function of the sold volume for hypothetical sales, in particular under stressed market conditions. Moreover, the market impact parameters are derived from the CCPs' own estimates, with only few contributions for some asset classes.

102. As in the previous exercises, the order of magnitude of the chosen estimates will be reported for transparency.

103. Model risk will be assessed in different ways. When possible, this will include reverse stress testing to test the level of market impact at which the Cover 2 resources would be breached (instead of relying solely on CCPs' market impact sensitivity estimates).

104. The alternative approach to modelling of concentration costs developed by Fukker et al (2022)[2] and already employed in the last ESMA stress test exercise will be used as a model risk sensitivity test.

105. Model risk will be further tested by flexing the base model's assumptions on the offsetting of liquidation costs for correlated assets at different levels of granularity.

2.5.5 Limitations of the Concentration Risk Analysis

106. In this exercise, we are not modelling the whole default management procedure. More specifically, there is no distinction between the process for OTC and exchange-traded instruments, and no attempt to factor-in the detailed mechanics of an auction which could

[2] Fukker and al (2022). Contagion from market price impact: a price-at-risk perspective, ECB Working Paper.

lead to smaller or bigger concentration costs. This impact could be significant for credit and fixed income derivatives that are modelled through their hedging portfolios.

107. Some calendar / curve risks within asset classes are not being considered when they are categorized within the same proposed buckets. These are not being considered to limit the complexity of the exercise. Likewise, for some asset classes, market practices could allow for more aggregation than considered in the framework.

108. The modelled liquidation costs will not take into account the effect of any positions held by the defaulters outside the CCPs in scope for the exercise, for example on a non-cleared basis or at other CCPs. It is reasonable to expect that in an actual default there might be a further strain on the market capacity from these positions being liquidated at the same time.

2.6 Liquidity Stress Test

2.6.1 Objectives of the ESMA CCP Liquidity Stress Test

109. The liquidity stress test aims to:

* Assess the resilience of CCPs to market wide and idiosyncratic liquidity stress events.

* Examine system-wide effects, in particular the knock-on impacts of stress-scenarios on Clearing Members and Clients.

* Capture the systemic dimension of liquidity risk in addition to the analysis of resilience of individual CCPs.

* Assess the impact of investments of CCPs on their liquidity positions and the wider market.

* Enable ESMA to identify potential shortcomings and issue recommendations to address those.

110. As such, the exercise tests the resilience of the system of CCPs against liquidity shocks. This exercise is not designed to check compliance of CCPs with regulatory requirements or identify deficiencies in individual CCPs' stress testing frameworks.

2.6.2 Regulatory background of the CCP Liquidity Stress Test

111. Under Articles 51(2) of the RTS (Commission Delegated Regulation EU No 153/2013) CCPs are required to conduct stress tests considering inter alia their liquidity risk management frameworks. Under the Article 54(3) of the RTS, scenarios used in the stress testing of liquid financial resources must consider the design and operation of the CCP and include all entities that might pose material liquidity risk to it.

112. RTS Article 32(4) and (5) prescribes the framework to be designed and implemented by individual CCPs in order to accurately address the liquidity risk dimension of the CCP stress tests, taking into account any interdependencies across the entities and multiple relationships it might have to those entities in its liquidity risk management framework.

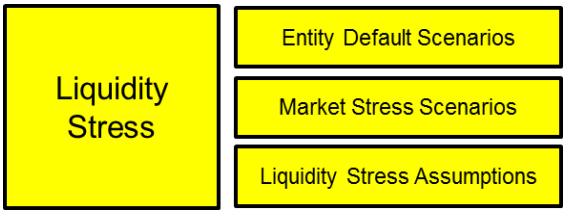
113. ESRB issued recommendations on liquidity risks arising from margin calls (ESRB/2020/6) and especially recommendation B4: 'ESMA […] to conduct coordinated liquidity stress test exercises which also take into account the default of any two entities'.

114. ESMA takes the above regulatory requirements into account in the design of system-wide liquidity stress test of CCPs.

2.6.3 Scope and methodological principles for the Liquidity Stress test

115. Liquidity risk can be defined as the risk that the CCP has insufficient liquid funds to meet its payment obligations in a timely manner when they become due over the relevant time horizon. It can arise due to an unexpected generation of liquidity needs and/or the absence of sufficient liquidity resources.

116. The liquidity stress test scenario combines market shocks with the simultaneous default of market participants. The same severe but plausible shocks that are used for the credit component are applied here. The default of market participants is the actual or technical insolvency of Clearing Members and/or providers of liquidity and settlement services with an impact on the liquidity profile of an individual CCP.



117. A liquidity mismatch analysis of individual CCPs under the different scenarios is then performed; all projected cash in- and outflows, linked to clearing, facilitating settlements and payments, and investment activities but also other relevant cash flows such as those following from operational activities of the CCPs, for the predefined time horizon, are aggregated per time bucket and the counterbalancing available liquid resources in each currency assessed.

118. System-wide effects, including liquidity requirements on Clearing Members and clients are also investigated. Such analysis could include the quantification of flows of Clearing members and their clients under market-wide stress scenarios without assuming any default.

119. A final assessment is made on the relative contribution of the different tools at CCPs' disposal to fill the liquidity mismatch.

2.6.3.1 Definition of the scenarios for the liquidity stress test

120. Liquidity stress testing will be run on a single date, 17 March 2023, applying the scenario market shocks to both collateral and positions.

121. ESMA proposes to design and implement scenario types based on the following default assumptions:

- **Cover-2 groups per CCP:** For each CCP, identify the set of 2 groups defaulting in all capacities creating the highest liquidity exposure under the market scenario. This selection will be run for each relevant currency (any EU currency, GBP, USD) and also netting exposures across all currencies.

  The institutions assumed to default may be clearing members or/and providers of liquidity with implications for liquidity needs or sources of a CCP. Failures of CSDs or central banks will not be considered in the selection process.

- **All CCPs Cover-2 groups:** Across all CCPs, identify 2 corporate groups with the highest aggregate system-wide liquidity exposure under the market scenario.

122. Liquidity risk is generated by the following channels:

- **Variation Margin due by the defaulted Clearing Members (CMs)**: CCPs need to post cash VM to non-defaulting CMs for positions held by defaulted CMs.

- **Change in non-defaulting CMs' initial margin**: changes in IM may stem from:

  - the expiry of trades and the change in positions. The CCP shall assume the trades occurring are the ones the CCP observed during the days following the selected default date (ignoring the new trades would imply all securities trades do settle and all margins are returned to non-defaulting CM, this would be both very penalizing and not realistic)

  - and on the impact of the market shock on the historical dataset on which the margin model is calibrated. However, this effect is not to be modelled.

- **Settlement of obligations of defaulted CMs:** cash flows are linked to fulfilment of the settlement of physical delivery obligations of the defaulted CM. Cash outflows are generated when a CCP has to step in on behalf of the defaulted CMs to post cash to non-defaulting CMs or when a CCP needs to execute buy-in transactions for failed deliveries on behalf of the defaulting member.

- **Non-performance of liquidity provider:** which would imply a reduction of the counterbalancing capacity (e.g. investment counterparties, credit line provider, investment agent for funds received temporarily into its accounts, repo counterparties).

- **Non-performance of payment/settlement service provider** (e.g. the CCP cannot get access to the funds accumulated on its accounts with the payment / settlement / concentration bank due to its failure).

- **Failure of custodian** which would incur in delayed/impaired access to assets held with that custodian (including non-cash collateral and investments). We will assume no access at all for the liquidity horizon.

123. In order to assess the resilience of CCPs and their reliance on different types of sources of liquidity, additional assumptions to default scenarios will be tested:

- **Repayment of excess cash collateral**: This represents the removal of the excess collateral already provided. This models the fact that in times of crisis, members may not leave excess collateral at the CCP.

- **Usage of central bank repo lines:** Assessing the impact of the amount of usage of central bank repo lines for CCPs that have reported some. This will test the CCPs' reliance on access to credit at the central bank of issue to the extent it has collateral that can be pledged at the relevant central bank. It should not be seen as an assessment of an event affecting the reliability of central bank resources.

- **Compare potential spot FX requirements** with underlying FX spot market liquidity.

124. Moreover, the following exploratory scenarios will be conducted in addition to the above-mentioned main scenario and assumptions:

- **Unavailability of interoperable CCPs:** Assessing the liquidity consequences of the temporary unavailability of interoperable CCPs, due to operational issues for instance. This could be done by delaying expected flows coming from the largest interoperable CCP, in addition to a Cover 1 scenario.

- **Reverse stress testing** including an increase in settlement needs due to higher market volumes.

125. Each entity will be assumed to default in all its capacities impacting the liquidity profile of a CCP (clearing member, liquidity provider, issuer of bonds, etc.).

2.6.3.2 Capacity of the defaulting / unavailable entities

126. The capacities below are considered:

- clearing member and interoperable CCPs:

    a) VM payments;

    b) premium payments;

c) settlement of assets.

- investment counterparties:

a) credit institutions (secured / unsecured);

b) custodian of collateral or investments;

c) issuer of collateral or investments.

- liquidity provider:

a) committed credit lines;

b) committed Repo counterparties for assets from collateral / investments;

c) committed Repo counterparties for assets from settlement.

- payment / settlement / concentration bank or agent.

127. Security settlement system operators, CSDs, Central Banks or issuers of government fixed income securities are never defaulted in the exercise.

128. The impact on market access of the default of a firm providing brokerage services to the CCP or FX conversion facilities is also out of scope.

2.6.3.3 Time frame

129. The Liquidity stress test will be run on a single date, selected from the default dates of the credit component (17 March 2023). It is assumed that all defaults occur simultaneously. Margins are collected as required prior to day 0. Payment of margins by the defaulting members fails on day 0 morning. The shocks are applied to the prices used for the last 'good' VM payment.

130. The market shocks will be assumed to be instantaneous, and the market factors to then stay unchanged for the considered liquidity horizon. The shock will be the same if a position is closed on T+0 or T+n, ensuring the consistency / comparability of results across CCPs. All (excluding decay effects) of the VM flows of the defaulted participant will occur on the first modelled day.

131. The liquidity stress test will require in and out cash flows to be provided for the whole liquidity horizon, which will be set at 7 days ahead, as some CCPs use a 7 days MPOR on OTC or SFT. A final bucket will aggregate any cash flows that come strictly after the maximum horizon.

2.6.4 Proposed modelling

132. Within one default fund and assuming the default of n entities, we will compute the liquidity exposure with the following steps:

- identify remaining liquid resources and their availability through time under the default assumptions;
- identify liquidity requirements, distinguishing inflows and outflows.

2.6.4.1 Identifying liquid resources

133. Only resources that the CCP would use in a default situation according to its rules will be considered. ESMA staff will build them at account level from resources as provided to the CCP, factoring in the impact of investments. Any excess collateral removal will consider any minimum cash amount rule.

134. Reported resources may include CCP own funds, committed lines, default fund contributions, excess collateral, required collateral / IM and skin in the game (SIG). Powers of assessment and any recovery tools that a CCP may apply to fund liquidity shortfalls in the recovery phase will not be considered as they would not have an impact within the liquidity horizon.

135. Valuation of non-cash assets will reflect the scenario market shocks.

136. Within the chosen default fund and the chosen currency, we will select all the liquid resources[3], factoring in the impact of investments, that:

- are not in the custody of or issued by the defaulting entities;
- are not of a specifically excluded asset type;
- are not excess collateral;
- are not an uncommitted credit line (not allowed under EMIR).

137. Having looked at the resources available in each default fund, we then look at the resources available from the defaulting members that were not already considered. The

[3] defined in Article 47(1) of Regulation EU No 642/2012 and Annex II of the RTS (Commission Delegated Regulation EU No 153/2013)

CCP will be able to define the largest usage possible for each resource (i.e. clearing member, default fund or CCP level) and for each relevant currency

138. Liquid resources must be cash (central bank, commercial bank secured or unsecured), government or other fixed income securities, equities or committed line. Banks guarantees are not considered.

139. Any collateral issued by a defaulting entity will be considered as unavailable for liquidity purposes. Irrespective of its final recovery value, it is assumed not to be usable for liquidity management. This affects all collateral issued by the LEI in question, regardless of which Clearing Member provided it. However, non-defaulting Clearing Members are expected to replace the defaulted collateral at the following margin call; and if they do not, this is an event of default. The new asset (on which no assumption is made) would be liquidated in 2 days. Therefore, the defaulted assets in the collateral held by the CCP will be modelled as unavailable for 3 days rather than zeroed out for the entire length of the default management period. In practice, such collateral is not expected to be material.

2.6.4.2 Identifying liquidity requirements

140. For settlement flows, CCPs need to report securities inflows and outflows separately, at their stressed market value.

141. For each day of the liquidity horizon, CCPs will identify per account and clearing member:

- net cash flows resulting from variation margin[4] and premium;
- cash inflows and outflows from settlement payments.

These flows should be the ones that would have been met by the defaulting member if it had not defaulted. Once the defaulters are identified by the model, the flows that the CCP needs to meet are those of the defaulting members' portfolios. Increased liquidation costs of concentrated defaulted positions will be considered.

142. The CCPs should assume they must meet all settlement obligations of the defaulting clearing members unless they have specific provisions to defer, postpone or cancel settlement. No hedging, anticipated buy-ins or sell-offs should be assumed.

143. The close of business schedule will add cumulative relevant cash flows per account.

[4] In the case of segregated client margin accounts, the netting of flows may represent a further simplification, however the mechanism of the margin call will not be modelled in detail.

2.6.4.3 Identifying other potentially available liquidity tools

144. The CCPs will report the list of their repo counterparties, and all expected additional outflows such as business as usual outflows and provision of liquidity to facilitate settlement needs.

145. Cumulative cash flows over the contemplated period and resulting from entering new repos will be built, assuming that repos are entered up to the maximum capacity for the maximum duration given the available collateral.

2.6.4.4 Liquidity exposure profile

146. The availability of liquid resources is modified to reflect the assumptions made on market access delay, on settlement lag and on the nature of the repo lines (committed/uncommitted).

147. Under the chosen working assumptions, the schedule of liquidity exposures is generated by aggregating the different resources and requirements.

148. Some resources are restricted to a certain level such as clearing member or default fund level.

149. For each non-defaulting clearing member that has the usage of its collateral restricted to itself, we will take out from the liquidity position both its restricted liquid resources and the liquidity requirements for “Premium Settlements”. The “Variation Margin” and “Settlement” flows are unaffected as they are passed through.

150. It is assumed that all resources of defaulting Clearing Members can be used at CCP level.

151. We then perform the aggregation and get the final position per currency. The worst position of the aggregated cumulative cash flows over the schedule is taken as the liquidity position.

152. Finally, in addition to computing the liquidity position per currency, to get the overall liquidity position, assuming access to the short-term FX markets, we aggregate all the currencies, converting them to EUR using stressed FX Rates.

2.6.4.5 Identifying the largest liquidity exposures

153. Given the market stress scenario, the selection of entities will be performed using the largest peak liquidity exposures under the most conservative end of day liquidity assumptions.

154. No selection will be performed using any other set of assumptions as the amount of data and its interpretation would be difficult if we were to perform the selection of the defaulting entities in all possible cases (alternatively including or excluding each of the liquid resources)

155. When testing various liquidity assumptions, we will therefore assume that the entities defaulting remain unchanged. This helps the analysis and reduces the computational requirements. This means however that the entities selected are not necessarily the worst ones in terms of liquidity outside of the most conservative assumptions.

156. When netting across all currencies, we will aggregate all the exposure schedule into the reference currency (EUR) using the stressed FX rates.

2.6.4.6 Testing the different liquidity tools

157. The exercise tests different assumptions on how it can access the tools used to fulfil liquidity needs, i.e.is based on a set of conservative, but realistic end of day assumptions to compute the liquidity needs of the different CCPs.

158. These assumptions are:

- no access to short-term FX markets (this assumption is relaxed when computing an overall liquidity position in addition to the analysis of the position per currency);
- market access delay of one day for any asset sale performed by the CCP when monetising collateral (including the use of non-defaulting members' collateral for liquidity purposes to the extent allowed);
- a settlement lag of 2 days for asset sell-offs;
- no use of excess collateral (which reflects the conservative view that in times of stress the members might reduce as much as possible their liquidity exposure to the CCP in order to maximise their own liquidity balance);
- no use of uncommitted repo lines;
- securities issued by defaulted entities will be replaced by the equivalent amount of cash by the non-defaulting clearing member at T+3 as a conservative measure and in line with the proposed modelling approach (cf. "Identifying liquid resources).

159. On this basis, the above assumptions will be relaxed to identify the tools on which CCPs rely on to fulfil their liquidity needs.

160. In addition, when CCPs have access to central bank liquidity and although this liquidity resource is highly reliable, the stress test will quantify to what extent this tool is used by the CCPs in comparison to other liquid resources, which is one of the objectives of the exercise.

2.6.4.7 Further analyses

161. The investments of the CCPs will be analysed to:

- understand the impact of the CCPs' choices with respect to their investments (type of instrument, maturity, etc.) on the liquidity profile and stress testing performance;
- assess the incremental market and liquidity risks they create, including potential liquidation costs (cf. concentration component);
- assess the impact on repo markets due to the CCP(s) potentially shifting from cash lender to cash borrower under stressed market conditions.

162. Interoperability links will be further assessed, with a focus on liquidity requirements, assuming the temporary unavailability of payments and/or settlements between CCPs and their postponement.

163. A reverse stress test including an increase in settlement needs (market volumes) will be introduced.

164. The system-wide liquidity requirements on market participants will be quantified according to their types:

- clearing members according to their category;
- clients.

  Such a system-wide liquidity analysis could be also conducted under stress market conditions but without necessarily assuming any actual default (e.g. stressed flows of the clearing ecosystem). This could include a breakdown of provided resources and flows.

165. The reliance on the FX spot market will be compared to the depth of the FX spot market.

2.6.5 Limitations of the liquidity stress test

166. As for any risk model, limitations remain in this exercise.

167. The tightening of liquidity in financial markets reflected by a reduction of committed lines and flight to quality in securities markets with eligibility implication on private repo markets will not be modelled.

168. Potential second round effects to prices following the default of entities will not be modelled: the price shocks are the ones provided by the ESRB and there is no explicit link between the market prices and the number of defaults.

169. Actual liquidity needs may differ from the modelled liquidity needs based on the individual CCPs default management rule and procedures, including the strategy of hedging transactions or optimisation of intraday cash use.

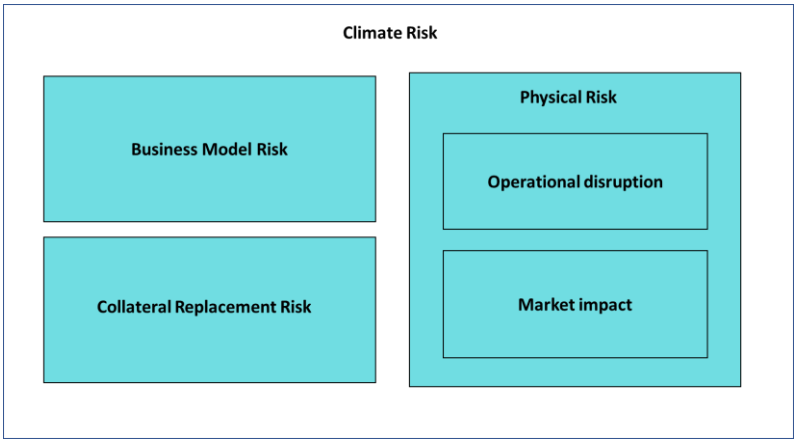
170. In a margin model that uses all past observations, it is possible that the margin levels would be affected by the shock that is assumed to occur on the first day of the scenario; and would increase for the second day of the scenario. However, this is quite difficult to model. From past discussions with the CCPs and the NCAs, this would be quite complex to model for the CCPs and even more complex to validate, while the output would be a probably minor increase in non-defaulting members' margin requirements. This effect is therefore ignored.

171. Initial margin of non-defaulting Clearing Members is not affected by trade expiries and trading pattern changes.

2.7 Climate risk

2.7.1 Objectives of the ESMA CCP Climate risk stress test

172. Given the novelty of climate stress tests in general, and of their application to CCPs in particular, ESMA engaged in a fact-finding mission since 2021, with a key milestone being the publication of a Call for Evidence [5] in February 2022.



173. This preliminary work lays down the theoretical foundation of the climate stress test by categorising climate risk in four pillars. This approach is based on the traditional split of climate risk into physical risk and transition risk and looks into the specificities of CCPs.

174. Business model risk is the long-term risk to the profitability and ultimately stability of a CCP that a portion of its business is linked to assets which will be gradually phased out in the real economy. The reduction in the usage of a product or the reduction in a specific activity in the real economy is likely to translate into the volumes of the financial instruments linked to this product or activity. This will then translate in reduced revenues for the CCP, while its costs may be in part fixed. This would affect the business model of the CCP and constitutes a channel by which long-term transition to a carbon-neutral economy can affect the CCP.

175. In contrast to this long-term impact of the transition, Rapid transition risk is defined as the risk that market participants could change their appetite towards certain financial instruments cleared by the CCP, as a result of their perception of the transition or as a result of an unanticipated change in regulation. To be relevant to the CCP, this adverse market development needs to unfold within a number of days commensurate with the holding period, as per the other components of ESMA CCP Stress Test.

176. While some answers to the Call for Evidence explored the idea that such materialisation of risk could be linked to authorities unexpectedly relaxing or abandoning measures in favour a transition to a carbon-neutral economy, perhaps more than a sudden run from

[5] ESMA launches Call for Evidence on climate risk stress testing for CCPs (europa.eu)

investors away from so-called “brown” assets, most responses demonstrated a very limited support for the plausibility of a market reaction fast enough to be relevant within the margin period of risk.

177. Physical risk is the risk that an extreme weather event, the likelihood and/or the severity of which increases as a result of climate change, could impact the CCP and its ecosystem, in particular its clearing members. The event would result simultaneously in an operational disruption and in increased market volatility, most likely within energy or commodity markets, materialising over a number of days commensurate with the margin period of risk.

178. Finally, collateral replacement risk explores how, over the long term, a change in the valuation or in the eligibility of assets used as collateral would force market participants to replace or top-up the amount of assets.

179. In addition to this background research, data availability is of critical importance to defining the scope of the modelling that can be achieved in this first iteration of climate stress tests. Overall, data availability is more limited than for other types of stress tests. This translates in a number of limitations to what can be modelled in a stress test exercise. As a consequence, the modelling choices and the scope of this first exercise derive to a certain extent from the availability of data as well as the responses received after the Call for Evidence of February 2022.

2.7.2 Regulatory background of the ESMA CCP Climate risk analysis

180. In addition to the regulatory mandate behind stress tests mentioned in Chapter 2, it is worth recalling that environmental risks are specifically mentioned in ESMA Regulation (EU) No 1095/2010.

181. Article 32 states that “The Authority shall initiate and coordinate Union-wide assessments of the resilience of financial market participants to adverse market developments. To that end, it shall develop: (a) common methodologies for assessing the effect of economic scenarios on the financial position of a financial market participant, taking into account inter alia risks stemming from adverse environmental developments […] (d) common methodologies for assessing the effect of environmental risks on the financial stability of financial market participants.”

182. This effort should also be seen in the broader context of ESMA’s work on sustainable finance[6].

[6] See Sustainable Finance (europa.eu)

2.7.3 Scope and methodological principles

183. The development of the climate risk analysis follows the general approach of previous ESMA CCP stress tests. For the first publication of the findings of this component, results will be anonymised, and the modelling of climate risks will be gradually developed over subsequent iterations of the stress test.

184. Moreover, given the challenges exposed above, the modelling choices and the scope of this first exercise derive to a certain extent from the availability of data.

185. Finally, the responses received after the Call for Evidence of February 2022 are taken into account when designing the framework.

186. As a result, the scope will be focused on the longer-term pillars of climate risk, i.e. business model risk and collateral replacement risk, and on physical risk. Fast transition risk is excluded from this analysis.

2.7.4 Approach to business model risk

2.7.4.1 Rationale and definition

187. Climate change modelling introduces scenarios for a transition out of carbon-intensive activities over the long term, typically 30 or 50 years. This time horizon is unfamiliar for CCPs, as stress testing typically focuses on market moves which occur at a speed commensurate with the number of days needed for the liquidation of a defaulting member's portfolio.

188. With the exception of when it is managing the portfolio of a defaulting member, a CCP is not exposed to the price variations of the assets and contracts for which they offer clearing services in a business-as-usual.

189. However, CCPs are dependent on the volumes cleared to run a viable business. As a result, should a CCP's clearing activities be linked to carbon-intensive activities, in a long-term scenario where the overall economy transitions away from these activities, the source of income of the CCP will be at risk. This is the definition of business model risk.

2.7.4.2 Data and confidentiality

190. Following the above definition of business model risk, one could conceive a theoretical approach such as:

191. Breakdown the CCP's activities into a sufficiently granular classification.

192. Make an assumption of how the changes in the real economy translate into clearing volumes (in other words, try to answer questions such as: “if the usage of coal is reduced by a given amount, what is the reduction in the volumes of cleared derivatives referencing coal as a commodity?”).

193. Apply a scenario with a decline (or increase in the case of “green” activities) for each of the types of contracts cleared by the CCP.

194. For each of these types of contracts, model the revenues and costs of the CCP: what are the fixed and flexible costs associated with this clearing segment, what is the income from clearing fees, from membership fees, and from collateral management? From this, deduct a projection of profitability.

195. However, using the precise breakdown of the costs and revenues of the CCPs in this exercise would require the use of highly confidential commercial information from the CCPs in scope, and even the aggregated results would be sufficient to provide a reader with insight into sensitive information.

196. As a result, a different assessment is used in the context of this ESMA CCP Stress Test.

2.7.4.3 Modelling approach

197. For the reasons explained above, the outcome of the analysis of business model risk is not a projection of future profitability under a climate transition scenario. Instead, the question to be addressed is: “*what portion of the CCP’s mix of activities is exposed to the transition into a low-carbon economy?*”

198. This relies on the implicit assumption that the cleared volumes in a given product evolve proportionally with the usage of the product in the real economy. This assumption was supported in discussions held by ESMA staff with external stakeholders.

199. Two building blocks appear as necessary to build this analysis: defining a “portion of activity” and identifying a measurement of exposure to the transition.

Step 1: defining the breakdown of clearing activities between asset classes

200. The approach of looking at clearing volumes to define the breakdown of clearing activities between asses classes requires an answer to the question: where a CCP clears such different asset classes as commodity derivatives and interest rate derivatives, how does one compare these volumes?

201. The different orders of magnitude of traded notionals involved and the absence of direct comparability between (e.g.) one euro of value of an equity and one euro of notional for an interest rate swap derive from the different levels of financial risk. To compare the risk level of two portfolios, one typically uses a metric such as a VaR. By extension of this logic, for the purpose of breaking down the CCP's activities between asset classes, we will therefore use Initial Margin.

202. To ensure comparability of answers across CCPs and avoid seasonality effects which could affect certain asset classes, it is necessary to further define initial margins in this context. The numbers to be reported will be, per asset class, the total IM including margin add-ons. This total will include all members and all house and client accounts. The IM amount will be the average over one year. The list of asset classes will be provided in the instructions document. It is not expected that any cross-margining will be taking place between these different asset classes, which will make this reporting easier.

Step 2: defining the breakdown of clearing activities within each asset class

203. Once the breakdown between asset classes is calculated, it is possible, within each asset class, to compare volumes cleared by the CCP for different products.

204. Some asset classes are not expected to be as exposed to transition risk as others. For these asset classes, no further breakdown is required. This includes: interest rate derivatives (both IR swaps and futures), foreign-exchange products, crypto-currencies. The Instruction document will further specify this list. Including an asset class or a category of products in this list of exclusions does not mean we are excluding the possibility that transition risk can be relevant to them. What is meant by this exclusion is that it is not anticipated that transition risk will be a key driver of changes in cleared volumes, at least when comparing these products to more relevant asset classes.

205. For each other asset class, a metric of volumes needs to be defined. In order to avoid seasonality effects and have robust business-relevant figures, this will be the cleared volumes, using a yearly total (not double-counted).

206. Once the breakdown is known, the next key building block is to map a cleared product (asset or derivative) into a sector. This will be done using NACE codes, which are the key to an existing mapping of exposures.

Step 3: assessing the exposure of each group of products to the transition

207. Once for a CCP the activity linked to each asset class is quantified, and within each asset class the portion of volumes to each NACE code, the next step is to assess the transition risk associated with each of these.

208. Not all companies in a sector are equally "green", and the search for data to quantify transition risk for each security issuer, let alone each potential producer/distributor of a commodity would be fraught with difficulties. Hence, the effort is best performed at the aggregated level, i.e. by looking at the alignment of each sector with the EU taxonomy of sustainable activities[7].

209. This mapping is done following the approach proposed by the contribution of the EC's Joint Research Center[8] (JRC), which has established a mapping from NACE codes to a degree of alignment with the EU taxonomy.

210. The mapping follows the introduction by the JRC's paper of Transition Alignment Coefficients (TAC) and transition Exposure Coefficients (TECs) and for each NACE code.

211. TACs are a measure of the alignment of an activity to the objectives of the Taxonomy. While many of the existing NACE codes are mapped to a TAC equal to zero, this does not mean that this industry does not work toward the climate transition.

212. TECs are the relevant metric for the Stress Test as they are the assessment of transition risk to the activity of the CCP. Activities which are most exposed to the transition such as fossil fuels have a TEC of 100%, and activities which do not need to transform themselves in the transition to a carbon-neutral economy have a TEC of 0%. At the combined level, the TEC represented the percentage of activity that is exposed to transition risk.

Step 4: reporting the results

213. Rather than a projection of profitability of the CCP, a breakdown between asset classes, singling out the asset classes not exposed to the transition, and using the distribution of TECs in the clearing activity of the CCP, the analysis will display which part of the CCP's activity is exposed to which degree to transition risk.

[7] EU taxonomy for sustainable activities (europa.eu)
[8] jrc128099.pdf (europa.eu)

2.7.4.4 Metrics used per asset class

214. As explained, within each asset class, a breakdown needs to be decided in order to run the modelling approach. This breakdown has 2 dimensions: the definition of how the products are grouped, and the definition of the metric of the volumes.

215. Regarding the grouping of products, we will use the risk factors used for the scenario applied to the credit stress test, with a few exceptions, which will be specified in the Instruction document. These exceptions are related to the energy segment, where contracts for certain types of energy need to be taken into account. Further details of this mapping are provided in the Instructions document.

216. Broad indexes which are not sector specific (e.g. DAX for equities, iTraxx Main for CDS) will be assumed not to be exposed to the transition as they relate to the overall economy, and the selection rules are typically engineered so that the index always covers the largest companies in the economy. Hence, should one sector experience a large transition, the growth in one activity would be expected to compensate the contraction in another. The positions reported for this type of instruments will be mapped to the risk factor as defined for the credit component of the stress test, and positions with such a risk factor will be assigned a TEC of 0.

217. Regarding the definition of volumes, each asset class will have its own definition. This does not come at the expense of consistency, as they are applied only for comparisons within an asset class, while comparisons across asset classes will be based on initial margins.

218. For CDS, clearing volume is defined as the notional of the CDS contract. Options are ignored, as they do not relate to single names nor sectorial indexes.

219. For equity and equity derivatives, the clearing volume is defined as the value of the securities referenced by the contract (regardless of the maturity of the future or the option and of the moneyness of the option).

220. For commodity and energy derivatives, the clearing volume is the value of the underlying referenced in the contracts.

2.7.5 Approach to collateral replacement risk

2.7.5.1 Rationale and definition

221. The securities held by a CCP as collateral may be affected by the transition to a carbon-neutral economy over a long time. This could be the result of three phenomena:

- Some hypothetical future set of rules on eligibility of collateral depending on environmental considerations.
- An increase in the volatility of the price of the securities leading the CCP to increase the haircuts it applies to the securities, or in extreme cases, leading the CCP to stop accepting the securities as collateral.
- A decrease in the market value of the securities.

222. In all cases, it remains the duty of the clearing member to maintain the appropriate amount of collateral to meet their margin (and default fund) requirements.

223. Because of this, the degree of exposure of the collateral held by CCPs will translate into the collateral the overall ecosystem may need to replace as a result of the impact of the transition on the securities held as collateral. This comes as a contrast to risks incurred directly by the CCP, such as business model risk.

224. However, the analysis will not engage in a measure of the consequences of the transition to specific assets, and will not attempt at quantifying the collateral to be replaced nor a change of value. Instead, a breakdown of the degrees of exposures of the types of assets will be performed in a more general manner.

225. Investments of CCPs are not considered.

2.7.5.2 Data and relevant asset classes

226. To perform this analysis, the collateral is analysed using the same criteria as for the business model. The quantification of the assets is however much simpler, as only the nominal value, pre-haircuts, is needed.

227. Cash in any currency accepted by a CCP and bonds issued by government or quasi-government entities are assumed to be immune to transition risk. This is a simplification but is realistic as we do not anticipate large amounts of securities or cash in currencies

from countries whose GDP and ultimately creditworthiness or currency value depend greatly on fossil fuels.

228. Securities issued by corporates are more likely to be affected, depending on the sector of the economy to which belongs the issuer. The analysis will be based on the value of the security per LEI of the issuer. A mapping to NACE codes and therefore to TECs will be performed.

2.7.6 Approach to physical risk

2.7.6.1 Rationale and definition

229. The previous two pillars are linked to what is generally referred to as transition risk. In addition to transition risk, physical risk is a key aspect of climate risk.

230. Physical risk is generally defined as the risk of losses resulting from the material impacts of climate change. This can be further broken down into chronic physical risk and acute physical risk. The former is a long-term and progressive effect, for example the impact of soil erosion or temperature changes on the productivity of crops. While over the long term this could impact the market price of some commodities, this will not be considered under the scope of CCP climate stress tests. Acute physical risk is the risk associated with the occurrence of an extreme weather event. This can be approached from a large statistical point of view, for example insurance companies may want to assess the occurrence of damages to property resulting from drought-induced soil subsidence or floods over a longer period of time and across a large geographical zone. However, for CCPs, the relevant approach is to focus on a specific event, delimited in time and space, as opposed to a large number of events analysed from an aggregated point of view.

231. Would data allow for it, the modelling would be a comprehensive and coherent scenario containing a narrative of an extreme weather event, delimited in time and space, causing operational disruption in the CCP and its counterparties, and at the same time a set of market shocks resulting from this event, most likely affecting commodities and energy markets the most.

232. However, taking into account the availability of data, a more systematic approach is undertaken, and the assessment is further broken down into two sub-components: an assessment of the exposure to operational disruptions, and an analysis of the potential impact of adverse market movements linked to a climate event.

2.7.6.2 Approach to the operational disruption

233. Climate change is expected to increase the likelihood of occurrence and severity of such extreme weather events as: floods, draught-induce subsidence, landslides, hurricanes...

234. The occurrence of this risk differs greatly as a function of the physical location of a CCP or a clearing member, and two offices (e.g. of a clearing member and of a CCP) located only a kilometre apart could have a very different exposure to some of these risks, in particular floods, which are very localised. This creates a challenge for the data necessary to conduct the analysis.

235. An example of such analysis in the context of banks has been developed by the ECB[9], using maps of each type of event risk and over 10 million data points.

236. Capitalising on this analytical approach, the assessment will analyse the location of the CCPs and their largest clearing members (e.g. in this initial analysis, the location of their headquarters as this is easily available on the basis of public data), in order to analyse the physical risk for these locations driven by climate hazard scenarios (e.g. flood scenarios occurring once over 100 years). It is noted that the analysis will not necessarily assume that the exactly same hazard event happening to the clearing ecosystem. This will result in a mapping or scoring of potential disruption caused by physical risk.

2.7.6.3 Approach to the resilience of the CCP's financial resources in climate-driven market scenario

237. The other type of consequences of an extreme weather event relate to the resulting market shocks. These shocks are likely to be more prevalent in commodity and energy markets, where contracts reference a product for a specific geography. For example, electricity futures distinguish between the country of the delivery point. In case of an extreme weather event, the difference between the prices of the same energy in the zone most affected by the event and the rest of the market can be expected to change significantly and this change is expected to materialise in the course of only a few days.

238. An exploratory analysis is developed to understand the way in which these shocks can affect a CCP's resources and ultimately resilience.

239. The first step of the analysis is therefore to identify risk factors that are the most likely to be exposed to extreme weather events.

[9] See Towards climate-related statistical indicators (europa.eu)

240. The second step will be to analyse through a reverse stress test, the resilience of the CCP to these shocks.

241. In addition, depending on the availability of quantified market scenarios, it will be possible to assess the losses in these scenarios and also to compare the intensity of the market shocks against the levels of the reverse-stress test analysis.

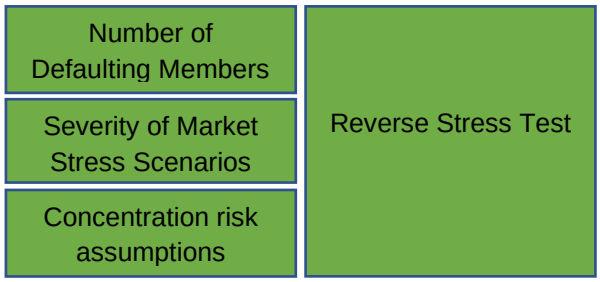
242. To maximise the capacity to identify relevant market scenarios, part of the data requested from CCPs will be to disclose stress test scenarios deriving from a narrative related to climate change or extreme weather events.

243. The methodology to compute losses in these scenarios will be common with the theoretical analysis detailed in the credit stress test.

2.8 Reverse Stress Test

244. The reverse stress test analysis is used to assess the absorption capacity of CCPs under more severe assumptions.

245. For this year exercise, the credit reverse stress test results will also incorporate for one of the dates (17 March 2023) the impact from concentrated positions and wrong-way risk.



246. Moreover, the analysis will be extended into one additional dimension. In particular, the analysis will consider not only the number of defaulting entities and the severity of the market shocks, but for one of the dates (17 March 2023) also the impact of assuming different levels of severity in the assumptions underlying the estimation of the concentration cost.

247. The analysis will again consider a number of defaulting entities under the member default scenarios of up to 5. Different level of severity of the market stress scenarios are considered by scaling the market stress shocks. The CCPs are asked to calculate and report the losses also after scaling the shocks in the provided market scenarios for a number of steps (i.e. x0.7, x1.2, x1.5, x2). CCPs will need to recalculate losses after scaling the shocks and cannot scale directly the P&L as this will not be correct especially for products with leverage / non-linear pay-offs (e.g. options).

248. The objective of this analysis is to identify whether there are plausible combinations of stress assumptions with systemic risk implications. The analysis will be focused on the systemic risk and not on individual CCPs. Results of individual CCPs will be analysed only if needed to explore the source of events that may have systemic relevance. We will try to capture the sensitivity of the results to the considered market stress scenarios and understand how the results are affected by changing the underlying conditions.

249. One of the limitations of this exercise is that second round effects are increasingly relevant as scenarios become more extreme. However, as in the core credit stress analysis, second round effects will not be accounted for in this year's exercise.

250. Reverse stress test analyses will also be performed for liquidity and climate risks and are described in their respective sections.

3 ESMAs Implementation Plan

3.1.1 Overview of the process

251. The implementation plan for the 5th ESMA CCP stress exercise consists of a design phase, which includes a description of the scope and improvements compared to the previous exercise, as well as six steps to conduct the stress test.

252. The design phase of the 5th stress test exercise will be completed in May 2023 when the ESMA Board of Supervisors (BoS) approves the framework, including the annexes on the market stress scenarios, the data request, the instructions and the validation rules.

253. The next steps will be:

1) the launch of the data request;

2) the validation by the NCAs of the data provided by (EU) CCPs;

3) the validation of the data by ESMA;

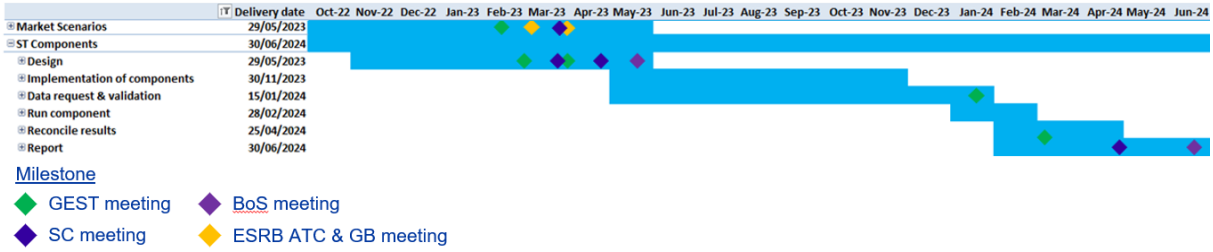
4) the validation of the common sensitivity tables;

5) The computation of the results;

6) The finalisation of the report

We also plan to reconcile the aggregate results with CCPs before finalising the analysis and discuss the results with NCAs before sending for discussion at the CCPSC and approval at the BoS.

254. According to the projected plan, the exercise would be finalised in H1 of 2024.



3.1.2 Implications on Resources

255. As discussed, there are a number of suggested changes for the implementation of the new exercise compared to the previous exercise. In addition to limited changes to the credit and concentration components, liquidity risk is resumed and a new climate risk component is introduced, therefore additional resources are expected from CCPs. This effort should however be compensated by the exclusion of the operational risk component this time.

256. The draft framework, data request, instructions and timeline were shared with EACH to collect the feedback from EU and Tier 2 CCPs and to inform the CCPs of required actions and challenges. It is envisaged to ask the CCPs to provide the required data within 12 weeks from the launch of the data request.

257. A continued involvement of NCAs during the validation process is necessary to ensure overall data quality and safeguard the credibility of the exercise. In particular, there is a need to validate the individual CCPs' credit and concentration calculations with help of the provided instructions.

258. In order to streamline the validation procedure, to ensure a level playing field across CCPs, and to further reduce the overall efforts required from NCAs, ESMA drafted the validation document with details about minimum checkpoints that will need to be validated by the NCAs. The validation document also describes the validation process including the deadlines and response times. This document is attached to this note for approval (Annex 2).

259. Each NCA is expected to appoint one officer (per CCP or for all CCPs) that will be the single point of communication between the NCA and ESMA staff during the data request and validation phases. This officer is expected to be in regular contact with ESMA staff and fellow officers from other NCAs during the validation phase in order to facilitate the consistent implementation of the scenarios across all CCPs. ESMA staff will coordinate and facilitate the convergent interpretation of the modelling requirements if material divergent approaches are identified.

260. For the first phase of the validation process, the NCAs are requested to perform a series of checks that are detailed in the validation document and can be summarised as follows:

A. **Completeness** of the data delivered, e.g. all required fields are reported in all cases and the number of records match the expected number;

B. **Format** of the data delivered conforms to the data request, e.g. numbers or text subject to the maximum or minimum restrictions are reported as required;

C. **Consistency** of the data delivered, e.g. the data reported across identical or linked fields can be matched, or that the total P&L across members is 0;

D. **Sanity** of the data delivered, e.g. amounts reported are in line with data reported regularly to NCAs;

E. **Scope** of the data delivered, e.g. data covers all services, products and members;

F. **Amounts** reported comply with the instructions;

- Amounts reported respect the conditions set in the instructions, e.g. for credit not including / including excess collateral;
- EMIR / Rules of the CCP are respected, e.g. no use of client's collateral for house losses or reported data to meet all settlement obligations unless the CCP has specific provisions to defer, postpone or cancel settlement;
- The position levels and average daily notional amounts reported respect the aggregation rules of the concentration component.

G. **Calculations** comply with the instructions;

- Use of reference data as required by the instructions, e.g. use of the appropriate base prices to apply the shocks or FX rates to change currency;
- The CCP applies the provided stress shocks also adjusted where required by the instructions, e.g. calibration of multipliers for more volatile instruments or adjustment of implied volatility;
- Use of the pricing models as required in the instructions.

261. We expect that the NCAs will be able to finish the first set of checks (i.e. A - E) using a maximum of 1 FTE for 1 week, where they supervise one CCP, even for multiple default funds or business lines. A maximum of 2 FTEs for 1 week would be required where one

NCA supervises more than one CCP, since the authority would be able to automate a large portion of the checks across CCPs. The second set of checks (F – G) is more complex and may also require on-site visits. We believe that the NCAs can finish this task within a period of 2 weeks by assigning 1 FTE for each CCP. According to the suggested time plan, the NCAs will need to provide the validated data to ESMA within 8 weeks from the time that the data was delivered by the CCP. NCAs that supervise more than one CCPs could extend the working period in order to limit the total number of resources. Therefore, we believe that NCAs that supervise 1 CCP can carry out this task using 1 person, while even for NCAs that supervise more than one CCP, this task can be completed within the given timeframe using a maximum of 2 persons including potential interactions with the CCPs.

262. Following the NCA's validation (when applicable, i.e. for EU CCPs), ESMA staff will first verify within 2 week its ability to use the data (complete, in the correct format, able to import and use the data) and then perform a second level of validation (timing specified below) that will include (a) check of selected samples of data and where possible that the reported data conform to the requirements included in the instructions; (b) Verify the consistency of data reported across tables and CCPs; (c) Verify on the basis of available data that reported quantities are reasonable; (d) Assess the overall plausibility of results, and on the basis of the comparison between CCP results (to detect any outlier). Where ESMA staff detect issues, the NCA will need to obtain from the CCP the updated data and submit it to ESMA within 5 business days from ESMA request. In exceptional cases of major gaps, the deadline can be extended for an additional 5 days. Overall, we expect the second phase of validation to last a maximum period of 10 weeks. The level of involvement and number of resources needed for NCAs for this phase will depend on the identified issues and the quality of the validation performed by the NCAs during the first phase.

263. Overall, in terms of the maximum number of resources needed, we believe that NCAs supervising one CCP can carry out the tasks by committing 1 person, while NCAs that supervise more than one CCPs will need a maximum of 2 persons.

264. By agreeing to this work plan, BoS members would be also committing the availability of those resources at NCA level, so that the joint exercise can be performed simultaneously and successfully.