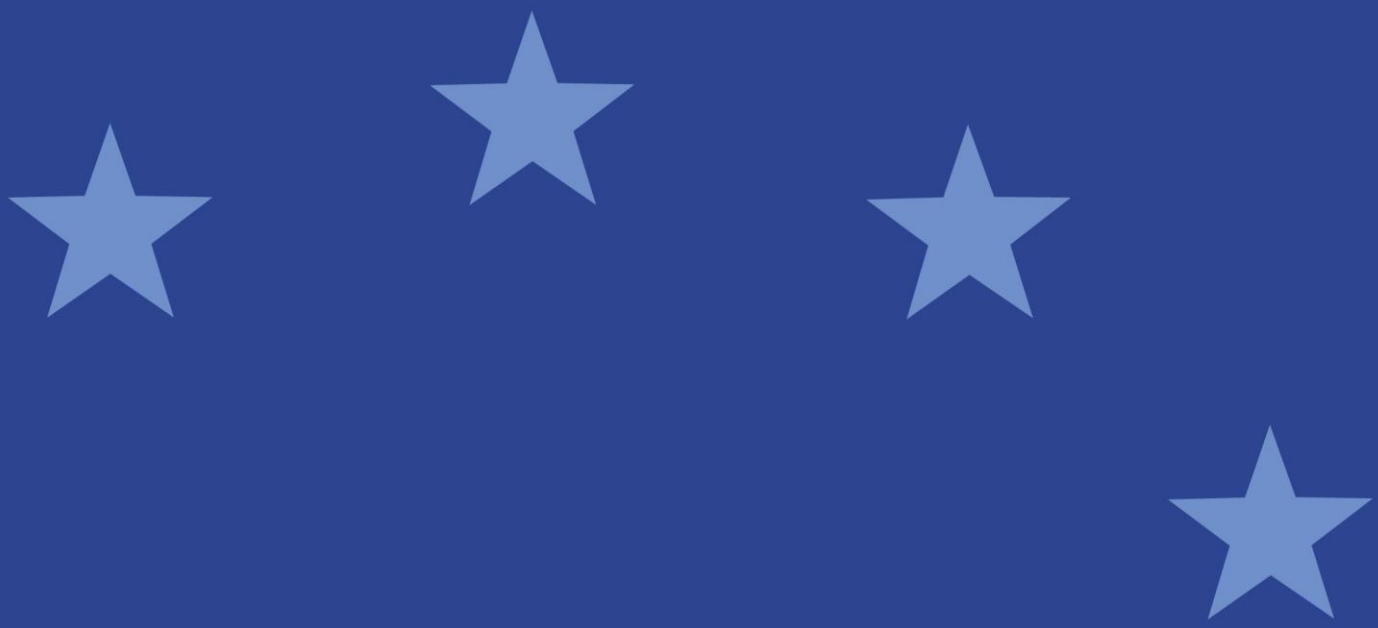
esma European Securities and Markets Authority

Methodological Framework

3rd EU-wide Central Counterparty (CCP) Stress Test Exercise



03 April 2019 | ESMA70-151-2198

esma European Securities and Markets Authority

Table of Contents

1 Executive Summary

In accordance with EMIR[1], the European Securities and Markets Authority (ESMA) shall initiate and coordinate Union-wide assessments of the resilience of Central Counterparties (CCPs) to adverse market developments.

ESMA completed in 2016 the first ever EU-wide stress test exercise for Central Counterparties (CCPs). It was followed by the second stress test published on 2 February 2018. ESMA is now launching the execution phase of the next and third exercise. The present document describes the design of the new CCP stress test including the scope, the objectives, the methodology and the key milestones. The exercise covers again both credit and liquidity risks and further develops the applied methodologies with targeted improvements. In addition, the exercise now includes for the first time an assessment of the impact of liquidation costs for concentrated positions (concentration risk). The envisaged changes evolve the methodology and the scope of the EU-wide CCP stress test and improve the robustness of the exercise.

The present report illustrates the high-level design of the framework under which the EU-wide CCP stress test exercise will be run. ESMA has launched the execution phase of the new exercise and the CCPs will be requested to calculate and deliver the exposures on the basis of predefined templates and detailed methodological instructions. The data will then be validated and analysed by the National Competent Authorities (NCAs) and ESMA. Publication of the final report is expected in Q2 2020.

[1] Article 21(6) 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)

2 Background, Scope and Objectives

2.1 Introduction and Background

1. The present report illustrates the framework of the new EU-wide stress test exercise for Central Counterparties (CCPs) including the background, the objectives, the scope, the methodological approach and the key milestones. The framework sets out the current high-level design of the exercise and may need to be adapted during the execution phase. The final design including any residual limitations will be reflected in the final report, accompanying the results of this exercise.
2. Central Counterparties are systemically important and ensuring their resilience is critical to achieve the stability of the financial system. CCPs were set up to reduce systemic risk stemming from bilateral relationships. They are still however, counterparties to all their clearing members, and thus any shortcomings leading to a failure to mitigate risks could potentially lead to spill-over effects and exacerbate systemic risk. Moreover, as it was verified in previous EU-wide stress exercises, the CCPs are also highly interconnected through common participants. Therefore, the EU-wide picture is necessary to identify emerging systemic risks. The CCPs run daily stress tests on the basis of stringent prudential requirements that focus on their own environment (participants, cleared products, activity). Therefore, the individual stress tests run by CCPs are necessary but cannot always reveal implications from system-wide events because of their limited scope.
3. 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 at least annually, in cooperation with the ESRB, initiate and coordinate Union-wide assessments of the resilience of CCPs to adverse market developments. 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;
    - common approaches to communication on the outcomes of these assessments of the resilience of financial market participants; and
    - 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.
4. Where the assessment exposes shortcomings in the resilience of one or more CCPs, ESMA shall issue the necessary recommendations.

2.2 Objectives & principles

5. The objectives of the 2019 EU-wide Stress test exercise result 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.
6. The overall design of the Stress Test framework was also guided by a number of overarching principles. ESMA will assess the resilience of all scoped CCPs, 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 EU-wide CCP stress testing exercise is not aimed at assessing the compliance of the CCPs with regulatory requirements nor at identifying any potential deficiency of the stress testing methodology of individual CCPs. It may however expose individual shortcomings in which case ESMA will issue the necessary recommendations.

2.3 Scope & overview

7. The exercise will cover all authorised EU CCPs, including the three UK CCPs, unless a no-deal Brexit takes place. Currently, 16 CCPs are authorised and will be included in the scope of the exercise. The list of all CCPs included in the scope of the exercise is provided in Annex 5.1.
8. The first exercise conducted by ESMA 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 conducted by ESMA introduced several methodological improvements as well as incorporating an assessment of liquidity risk. This third exercise will extend the coverage by including a new concentration risk component.
9. Counterparty credit risk and liquidity risk are the core types of risks faced by CCPs. The methodology has now evolved to cover additional risk sources. The methodology now includes (i) the new concentration risk component, (ii) the revaluation of collateral and resources based on the market stress scenarios without relying on the CCPs' haircuts and (iii) adjustments for wrong way risks linked to defaulting clearing members or affiliates being issuers of instruments they assume for clearing. 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 credit and liquidity risks challenge their resilience. In particular, operational, legal and any type of business risks will again be left outside the scope of the exercise, because of their largely idiosyncratic nature and may be considered in future exercises.
10. As mentioned above, the compliance of CCPs with EMIR is not part of the exercise and it is actually assumed and taken as one of the starting points of this exercise, as it is

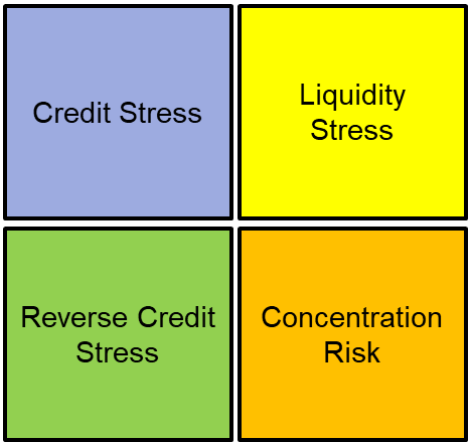
expected to be ensured through the supervisory process involving the National Competent Authorities (NCAs) and the Colleges. As in previous exercises, the stress test will not review, and will not be able to conclude on, whether individual CCPs meet the minimum regulatory requirements. Also, potential shortcomings in policies and practices of individual CCPs, such as for example in the operationalisation of default handling procedures can also challenge their resilience but are beyond what will be considered in the course of this exercise.

11. It is also noted that the exercise does not target all possible market movements, in particular the relative movements between each pair of assets. Indeed, while the architecture of the Stress Test is based on internally consistent scenarios, where N securities or contracts are cleared and possibly in the same portfolio, the number of possible basis risk movements is 2^N. The value of N is at least thousands in the case of an equity clearing service and thousands for derivatives. This makes it impossible to apply consistently all the potentially damaging scenarios consistently across all portfolios of CCPs. This risk is therefore outside the scope of this exercise.

3 Methodology

12. The new stress test exercise has the following components:

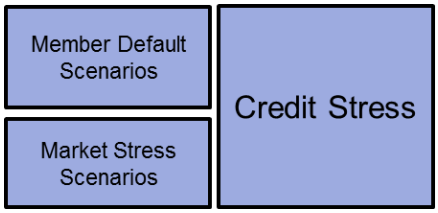
- **Credit Stress**: Assess the sufficiency of CCPs' resources to absorb losses under a combination of market price shocks and member default scenarios.
- **Liquidity Stress**: Assess the sufficiency of CCPs' liquid resources under a combination of market price shocks, member/liquidity provider default scenarios and additional liquidity stress assumptions.
- **Concentration risk**: Assess the impact of liquidation costs derived from concentrated positions.



- **Reverse Credit Stress**: Increase the number of defaulting entities and level of shocks to identify at which point resources are exhausted.
- Additional Analysis
  - **CM knock on analysis**: Assess the impact of the loss sharing mechanism of CCPs (default fund contributions and power of assessments) on the capital of the non-defaulting clearing members.
  - **HHI concentration analysis**: Assess the degree of concentration of CCPs' credit and liquidity exposures using the HHI Index.
  - **Inter-connectedness**: Assess the degree of inter-connectedness of CCPs through common clearing members, custodians or liquidity providers.

3.1 Credit Stress Test

13. 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.



14. First, the CCPs will be asked to report for each member the losses the CCP would face in case of the member's default under specific market stress scenarios. ESMA will then identify, based on the member default scenarios, the entities with the top exposures by aggregating for each market scenario the losses across clearing members and CCPs in order to compare the losses to the resources that are available to cope with the default.

15. The methodology applied for the credit stress test has evolved with targeted changes that aim to improve further the credibility of the results. Beyond the methodological improvements, we are also providing more granular and clearer instructions to the CCPs in order to ensure consistency and improved quality of data.

3.1.1 Member Default Scenarios

16. The member default scenarios define the conditions that are used to select the entities that are considered to be in default. We will restructure and reduce the number of scenarios using the experience from the previous exercises. Two scenarios will be dropped, i.e. MD-A[2] and MD-C[3], in an effort to use scenarios that are more informative and avoid scenarios that may be deemed as unrealistic. In all cases, the defaulting members will be selected for each stress date individually and using only the required margin (i.e. excluding excess). The following scenarios will be employed:

- **MD-B (Cover-2 groups EU-wide)**: Across all CCPs (EU-wide), identify n_B (set to 2) corporate 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. In general, the MD-B 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 EU-wide 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.

[2] Under the MD-A member default scenario, we first assumed the default of the top-2 members per CCP and then all these top-2 members would default in all CCPs. This scenario led to an extremely large, rather unrealistic number of entities defaulting at EU-wide level because of the cross default condition.

[3] The MD-C scenario is in practice only a variation of MD-B, where the probability of default will be used to weight the exposures when selecting the top groups. Across all CCPs (EU-wide), one would identify the two groups with the highest aggregate exposure weighted by the probability of default under a particular market scenario. During the second stress test exercise, it was identified that the results from this scenario would be very similar to the results of the MD-B scenario, leading to broadly the same defaulting members. Therefore, it was decided not to present these results in the final report, as also by construction the MD-B scenario will always generate more losses (more conservative).

- **Cover-2 groups per CCP:** For this scenario, we will select the defaulting clearing members as the members belonging to the top-2 groups of clearing members for each CCP. The defaulting clearing members will be different for each CCP and are not considered to be in default in other CCPs. This scenario includes the rather unrealistic assumption that an entity would default in only one CCP, but will help assess the resilience of individual CCPs and interpret the results. The MD-B scenarios, where we select the top-2 groups EU-wide, 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.

3.1.2 Market Stress Scenarios

17. The ESRB General Board has approved the adverse scenario and transmitted it to ESMA. The ECB, in close collaboration with the ESRB and ESMA, has developed the narrative and has calibrated the adverse scenario for the 3rd stress test exercise[4]. The shocks were produced using the tool that is employed for the calibration of financial shocks in stress test design framework for adverse scenarios at the ECB and has been in use for the calibration of financial shocks for the EBA, EIOPA and ESMA scenarios starting from 2014. The scenario that was produced reflects the ESRB's assessment of prevailing sources of systemic risk for the EU financial system. It reflects the triggering of one or more of the sources of systemic risk to the EU financial system identified by the ESRB. These risks could materialise jointly and reinforce each other. The results are derived using a methodology that considers the joint empirical distribution of historical observations of the risk factors deemed relevant to EU CCPs to produce a coherent joint scenario. The scenario is obtained by choosing the mean response of the conditioned variable in an adverse scenario for the triggering variables with a joint probability of 0.1% over a five-day horizon. The starting point of the sample is 2004 and the shocks were produced for more than 800 risk factors across different asset classes.

18. It is important to note that the EU-wide 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.

19. The exercise needs to assess the resilience of EU CCPs to a potentially unprecedent crisis. Consequently, should we restrict to only replicating past historical shocks on the basis of minimum regulatory requirements, we could miss a wide range of stress events with no historical precedent, especially for new products / risk factors with short lookback periods. Overall, it is a very difficult task to produce potential future scenarios for such a wide range of financial variables covering all major asset classes, which are at the same time sufficiently severe, internally consistent and plausible. The methodological tool used can combine a large number of time series and has allowed for the calibration of a more

[4] ESRB publication of the scenarios.

granular scenario, covering more than 800 risk factors. There is no single test that can ensure that all variables are jointly sufficiently severe and plausible. The overall severity of the shocks was compared with the severity of shocks used for past CCP supervisory stress tests, including the previous EU-wide CCP stress exercises and was found to be overall comparable. Having said that, there are cases where the shocks are more/less severe. Moreover, the increased granularity of risk factors allowed to differentiate between risk factors within one asset class and produce shocks that are more/less severe for individual risk factors if compared to the "blanket" shock used in the previous exercise. The magnitude of the shocks was also compared for key risk factors with the maximum historical shocks over a long lookback period. Overall, the shocks were found to be below the maximum historical 5-day changes for the key risk factors considered and below or above the 2-day worst historical shocks. In many cases, it makes a big difference if one considers the full available history or only more recent observations. Of course, the "full-history" shocks are more severe but may also include observations from a structurally different environment (e.g. higher rates or lower commodity prices).

20. The Regulation mandates ESMA to assess on an EU-wide basis the resilience of CCPs to adverse market developments. This EU-wide assessment is not necessarily to be restricted by the minimum regulatory requirements that set the minimum level of severity of the shocks that are used by individual CCPs in their own stress tests. The purpose of the stress test is not to assess the compliance of CCPs to the minimum regulatory requirements but assess their resilience to macro-economic scenarios that can have an EU-wide impact.

3.1.3 Methodology for the implementation of Credit Stress Scenarios

21. The set of common and internally consistent price shocks will need to be run by individual CCPs. Given that it is not feasible to define scenarios for each and every risk factor of all CCP-cleared contracts, the scenarios are defined for a set of high level risk factors across different asset classes and the CCPs will need to translate the risk factor shocks into P&L for their cleared products and the members' portfolios. Therefore, ESMA has developed and we will provide to the CCPs together with the data request and the high level market stress scenarios a set of instructions that explain how these are expected to be implemented.

22. Some of the key elements are listed below for illustration purposes and to better represent the assumptions and possible limitations.

    - In the previous exercise we selected one stress date and three market stress scenarios. The new stress test will be run on the basis of one common market stress scenario. This has allowed us to use two stress dates for the credit stress test and keep the overall required effort manageable. Therefore, the results will not be dependent only on the positions of a single date. The default event is modelled as a weekend default. The selected stress dates are Friday, 21 December 2018 and Friday, 8 March 2019. The dates were selected in order to reflect in the results of the exercise credit / liquidity exposures from expiries in equities and fixed income derivatives. The default event is modelled as a

weekend default. Therefore, all payments/obligations due on Friday prior to the default are assumed to be met in full. After the default (which occurs during the week-end), no payments are exchanged between the CCP and the defaulting member.

- As in the previous exercise, the CCPs will need to report data at member (and not account) level in order to limit the amount of data. The CCPs will still need to reflect all applicable segregation rules, e.g. that client's resources cannot be used to cover losses from house positions.
- The CCPs are again asked to report separately the minimum required collateral, not including any excess amounts, and the total available collateral. The minimum required collateral are meant to reflect a scenario where members would withdraw under stressed conditions any collateral exceeding the minimum required to avoid being declared into default. A significant methodological change incorporated in the new exercise is that the CCPs are asked to revalue the collateral alongside the cleared products using the market stress scenarios shocks. We will therefore not rely on the haircuts applied by CCPs.
- The new exercise will reflect an assessment of the wrong way risk for cleared positions where the issuer is the clearing member or an affiliate.
- The data request templates were updated to allow the reporting of surplus collateral that could be used for the same clearing member across default funds subject to specific conditions. This will allow us to calculate the impact and report results with and without this effect, where relevant.
- The CCPs are asked to report separately any Powers of Assessment that can be called from non-defaulting members and additional own resources.
- 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.
- The amounts will be reported in currency (EUR) also accounting for the provided FX shocks.
- It will be assumed that no porting of clients will occur, hence clients' portfolios are covered along with the proprietary positions of the defaulted clearing members.

23. The new elements that were introduced in this third exercise are discussed in detail below:

Applying shocks to collateral

24. In the previous stress test exercise, we used for the credit stress test the collateral requirements, i.e. the post-haircut value of collateral that had to be provided by clearing participants. Also for excess collateral, CCPs were instructed to report separately the excess value after accounting for the haircut. Therefore, one of the underlying

assumptions was that the CCPs could realise the actually posted collateral at least at its haircut value.

25. The CCPs are now asked to revalue the collateral alongside the cleared products using the market stress scenarios shocks.

26. Although in principle, this methodological change improves scenario consistency and gives us the ability to check haircut adequacy, it is not necessarily in all cases the most conservative choice. For example, it can be that the collateral value increases following the shocks, while when relying to (CCPs') haircuts the collateral value is always reduced.

27. The following assumptions are considered:

    - CCPs to report and use for the credit stress component the stressed values of margin & 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.
    - CCPs to report and use for the credit stress component the stressed values of "skin-in-the-game" and own resources but excluding resources meant to meet minimum capital requirements.
    - Any market risks stemming from re-investment of collateral are not reflected in the exercise.

Wrong-way risk for cleared positions where the issuer is the clearing member or an affiliate

28. In the previous exercises we did not consider the effect that the default of specific entities (clearing members) would have on the price of related cleared instruments, i.e. instruments issued by the defaulting clearing member or by one of its affiliates (or having as underlying an instrument that is issued by the defaulting clearing member/affiliate).

29. Ideally, when assuming that an entity is in default, one should also reflect this in the price of the cleared instruments for all clearing members and CCPs. However, this is not possible using the current setup because the P&L is first calculated by the CCPs using the common markets stress scenario shocks, while the selection and identification of defaulting entities is only performed after the submission of the data. Moreover, CCPs don't report the detailed stressed positions in terms of cleared instruments per member in order to identify which instruments / members are affected.

30. Therefore, the CCPs are instructed to incorporate, in the P&L calculations for each member, this effect for all cleared instruments issued by this specific clearing member or its affiliates. This will affect securities, corporate debt, covered bonds, derivatives on securities/debt and single-name CDS's. Index products are left out of scope for avoiding complexity. CCPs are instructed how to reflect this effect in the price of the impacted instruments. The CCPs shall apply this adjustment, only when the net effect (for all instruments within one clearing member) is negative, i.e. the wrong-way-risk adjustment for the clearing member results to a loss.

31. The residual limitation would be that we cannot model the effect from the default of all entities, e.g. when we assume the default of two clearing members we will only have for each clearing member the effect from instruments issued by itself. Therefore, the scope of this adjustment is limited and is also not applied consistently across all members.

Usage of surplus defaulter's margin collateral across default funds

32. In the previous exercises, we did not allow the usage of surplus house margin collateral to cover a deficit for the same member in a different default fund, even if CCPs rules would allow it. The reason is that the CCPs calculate margin per default fund and it cannot be ensured that a clearing member would in a real-world default situation have both positions in both default funds (e.g. a position in Electricity generating losses and a position in Equity generating profits).

33. However, since in many cases the CCPs do allow/require the usage of the defaulter's collateral across default funds, we have updated the templates to allow the CCPs to report such amounts. The fact that this amount will be reported separately, will allow us to quantify the impact, report both results where this is relevant, highlighting cases where such an assumption may not be prudent, including also if the CCP is in practice considering such amounts in its own stress tests when testing daily for cover-2 coverage. In all cases, only CCPs that explicitly allow in the rules setting the default waterfall, the usage of defaulter's collateral across default funds will be allowed to report such amounts.

3.1.4 Residual limitations for Credit Stress

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

- All positions are closed at the stressed market prices. The credit stress test component does not account for any additional losses due to the market impact or other related costs, e.g. auction premium, following the liquidation of the position. The impact from the liquidation of the position is assessed in the new concentration risk component.
- Investment risks, including credit risks arising from the default of an issuer or custodian of collateral or other resources are not assessed in the exercise. The exercise does incorporate an assessment of the market risk for provided collateral using the common market stress scenarios. Any additional market or credit risks 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 that would materialise if one defaulting clearing member clears instruments issued by another defaulting clearing member. This limitation is due to the fact that the selection of which combination of clearing members are assumed to default needs to be performed after collecting the stress exposures. 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 out of scope of the EU-wide stress test exercise. These are considered idiosyncratic in nature and thus difficult to model consistently across CCPs.
- Any additional second round effects to prices following the default of entities will not be modelled (i.e. the price shocks are the ones provided by the ESRB 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 because the scope of the exercise is limited to CCPs exposures. The potential of second round effects to non-defaulting members via the risk-sharing mechanism of CCPs (e.g. default fund and powers of assessment) will be assessed as part of the additional analysis (CM knock on analysis), but only the defaults implied by the member default scenarios will be considered when testing the sufficiency of the resources.
- 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. That would require modelling several thousands of risk factors and then all their co-movements. Since the exercise has to be run on the basis of common methodology and criteria, it cannot be aimed to identify topical deficiencies of individual CCPs.

3.2 Concentration Risk Analysis

3.2.1 Objectives of the EU-wide Concentration Risk Analysis

35. The Credit component of the Stress Test applies a market shock to all positions regardless of their size. In particular, all positions are valued at the so-called mid-price, regardless of their size and direction. This price is the result of the market shock applied to the market prices as they were prior to the market event. This is the common way in which stress testing work.
36. However, in reality, it may be expected that a CCP would incur transaction costs, in other words the price at which the defaulting member's portfolio will be sold off by the CCP is likely to be worse that the price resulting from the application of the market scenario described in the Credit Component. This inability to perform market transactions at the current mark-to-market value is the Market illiquidity risk. Its magnitude depends on the size of the position and the depth of the market.
37. Market illiquidity can be broken down in two parts:
    - an exogenous factor which is the relative size of the bid-ask spread. This cost would be incurred even for small positions.

- an endogenous factor representing the fact that when positions are too large, they cause the market to move against them (one can think of a forced liquidation). Market impact depends on the comparison of the size of the position and the market depth, which is the ability of the market to absorb a substantial amount without materially impacting the mid-price.

38. For the world's main future and currency markets, the exogenous liquidity adjustment is of negligible importance. It could be larger in some other markets like credit or energy. For large positions, market impact is usually much larger than bid-ask spreads. Therefore, we propose to focus the Concentration component on the market impact and not capture the exogenous factor.

39. In other words, the Concentration component will model the increase in the cost of liquidating in the market a large position in a short amount of time (in practice the time allocated to the management of a default by a CCP).

40. In the context of a portfolio containing a single asset, e.g. an equity, the concept is quite straightforward: there is only so much the market can absorb in one day before the market price of the security moves in an adverse direction. From this basic concept the model needs to propose a way to answer two questions:

    a. How does the cost increase as a function of the size of the position? The following paragraphs of this document will detail how the cost increases by detailing how parameters are defined, and until which size the cost will be considered negligible.

    b. When a portfolio contains more than one asset/contract, how do these assets/contracts combine? (i.e. if the portfolio is long asset X and short asset Y, are the transaction costs additive, do they offset each other?). To answer this, it is important to detail how positions are aggregated.

3.2.2 Regulatory background of the EU-wide CCP Concentration Risk Analysis

41. 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.

42. 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.

43. ESMA intends to reflect the above regulatory requirements in the design of Union-wide Concentration Risk Analysis of CCPs.

3.2.3 Scope and methodological principles

3.2.3.1 General structure of the Concentration Risk analysis

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

- CCPs calculate the aggregated positions per instrument/asset class
- CCPs compare the aggregated positions to specific thresholds to determine which aggregated positions are categorized as concentrated positions and need to be reported for the concentration risk analysis.
- CCPs estimate liquidation costs estimates for the asset classes they clear following specific guidelines.
- ESMA will develop liquidation cost models (i.e. a functional form which computes the cost as a function of the position size) for all asset classes using the aggregate of 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.

3.2.3.2 Methodology and assumptions of the concentration risk analysis

45. The analysis of concentrations risk will not replicate an actual default situation[5] but aims at identifying and quantifying potential risks due to concentrated positions. In order to do this, CCPs will be requested to provide:

- The details of the positions defined as concentrated positions (i.e. which are above a certain threshold),
- Sensitivity tables providing the expected market impact of liquidating in stressed conditions large positions relative to the average volumes.
- 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). This is to be used as a point of comparison but not used to calibrate the model.

[5] By this it is meant that CCPs may have specific default management methods, for example a hedging phase followed by an auction phase, yet the approach is not an attempt at replicating the cost of the hedge followed by an attempt at replicating the cost of the auction which may depend on the number of participants and a number of other variables, and the modelling of which may be quite complex. The proposed analysis is based on an overall estimation of the market impact of the position.

46. From all the contributions received, ESMA will then propose a common EU-wide sensitivity table for each asset class.

47. The concentration risk analysis will be carried out by ESMA using the same modelling and parameters for all CCPs in scope. In other words, the same position cleared at different CCPs will lead to the same concentrated risk estimate.

48. ESMA 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.

49. In order 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.

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

51. 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.

52. The analysis will assume that there is no porting of accounts and it will be limited to an aggregate calculation of concentrated positions and potential costs per Clearing Member without doing a distinction between the internal positions of different client / house accounts. Indeed, the market will need to absorb the overall amount of the position regardless of whether the position is from a client or a house account. This does not mean that the framework assumes a mingling of positions and PNL or resources between House and Client but it models what the market reaction may be.

53. This limits the ability to allocate losses to each account and makes the estimated liquidation cost not directly additive to the credit stress test losses:

- If the house and the client have each a position of e.g. 2 times the tradable volume, then the market impact is the impact of a position of 4 times the tradable volume. So, the market impact PNL of each account cannot be computed in isolation.

- The losses due to the clients' positions are in the first place offset against client margins; therefore, in order to compute how much of the losses due to concentrated positions affect the default fund, it would be necessary to have access to all client and house positions and resources and apply the waterfall. However, the EU-wide CCP stress test is organised on the basis of the CCPs' own calculation for PNL due to the market shock, while the concentration PNL is run by ESMA.
- A concentration PNL will be computed and compared to the magnitude of the losses at the CCP. This will provide with a breakthrough in terms of understanding how concentrated positions may represent a risk to financial stability.

3.2.3.3 Features out of scope

54. Modelling any auction mechanism presents many theoretical and practical challenges. This would even more challenging in an EU-wide exercise with a large variety of market and service structures. Therefore, modelling the auction mechanism is out of reach for this exercise.
55. The concentration framework will not be applied to collateral in this first exercise due to the complexity of doing so. For instance, it would have been necessary to model the change in the order with which resources are used for each CCP and depending on which CM is in default.

3.2.4 Proposed modelling

3.2.4.1 Asset class scope

56. The equity and bond securities markets are in scope.
57. Equity, Fixed Income, Commodities, Credit, Freight and Emission allowance derivatives are covered.
58. As this is the first such exercise and to limit the overall complexity, some asset classes and sub-classes have been excluded from the scope. Foreign exchange derivatives, cross-currency and inflation swaps, structured finance products, ETCs and ETNs bond types, securitised derivatives, CFDs, volatility index derivatives and dividend derivatives are not covered.
59. The choices of asset classes to be excluded have been done following different criteria:

- Small volumes in CCPs (structured finance products, ETCs and ETN bond types, securitised derivatives, CFDs)
- Highly liquid markets (Foreign exchange derivatives)
- Complex sub-asset classes decided on a case-by-case basis to limit overall complexity of calculations (volatility index derivatives, dividend derivatives, inflation and cross-currency swaps).

60. 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.

3.2.4.2 Determination of the common market-impact sensitivity tables

61. For each asset class it clears in, 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 CCP should be able to justify the numbers provided to its NCA as realistic measures of potential liquidation costs during a stress situation.
62. 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.
63. From all the contributions received, ESMA will then propose a common EU-wide sensitivity table for that asset class. This step will likely involve the scrutiny for accuracy, the removal of outliers and taking the average of the results.
64. The final report is expected to provide an order of magnitude of the market impact for a representative large position in each asset class. This will provide transparency so that the market can duly understand ESMA results and the inputs provided by CCPs. This transparency should also act as an incentive for CCPs to provide adequate estimates.

3.2.4.3 Computation of concentration risk

65. CCPs are expected to report the concentrated positions of each of its clearing members.
66. ESMA will evaluate the size of each position (or its hedge) relative to the average daily volume (or such relevant parameter). Then, using the common EU-wide sensitivity tables, the liquidation market impact of the position will be determined.
67. When estimating concentrated positions, ESMA will allow for hedges with economic rationale such as delta hedging single stock derivatives with the underlying stock.
68. 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.

3.2.4.4 Analysis of results

3.2.4.4.1 Descriptive analysis

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

70. The computed concentration risks will be compared to the reported concentration add-ons and required margins of the CCPs. We will also analyse whether there is a statistical relationship between the total margin required and the liquidation costs of the model. 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 the absence of concentration add-ons in the required margins of the CCPs.

3.2.4.4.2 Credit Risk Scenario

71. For each credit scenario (MD-B Cover-2 groups EU-wide and Cover-2 groups per CCP) and for each CCP, the concentration PNL will be computed and compared to the magnitude of the losses and the remaining resources at the CCP. A “what if” analysis will be performed by testing different propagation assumptions of the concentration PNL to the waterfall.

72. An analysis would also be performed to check whether the inclusion of concentration risk would have changed the choice of Cover 2 defaulting clearing members.

3.2.5 Residual limitations of the Concentration Risk Analysis

73. As the market impact estimates are provided by the CCPs, there is a risk to have an underestimation of the real risks in stressed markets. For some asset classes, there will only be a few CCPs contributing to the estimates. The publication of the order of magnitude of such estimates should alleviate somewhat the issue though transparency.

74. In this exercise, we are not modelling the whole default management procedure. More specifically, there is no attempt to factor in the impact of an auction which could 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.

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

76. The impact of a successful porting of some or all client accounts will not be assessed. Porting could significantly increase the concentration of remaining positions as a netted position between house and client could become a large concentrated position when the client is ported.

3.3 Liquidity Stress Test

3.3.1 Objectives of the EU-wide CCP Liquidity Stress Test

77. As was performed for the second EU-wide CCP Stress Test Exercise, the third exercise will incorporate the Liquidity Stress Test. Changes from the previous vintage will be targeted at two objectives: improve transparency of the Liquidity component and improve the consistency with the Credit component of the stress test.

78. The liquidity Stress Test will aim to:

- Assess the resilience of EU CCPs to market wide and idiosyncratic liquidity stress events.
- Capture the systemic dimension of liquidity risk in addition to the analysis of resilience of individual CCPs.
- Enable ESMA to identify potential shortcomings and issue recommendations to address those.

79. However, the following items are not objectives of the EU-wide exercise:

- Check compliance of CCPs with regulatory requirements;
- Identify deficiencies in individual CCPs stress testing frameworks.

3.3.2 Regulatory background of the EU-wide CCP Liquidity Stress Test

80. 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.

81. Article 32(4) and (5) of the RTS prescribes the framework to be designed and implemented by individual CCPs in order to accurately address 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.

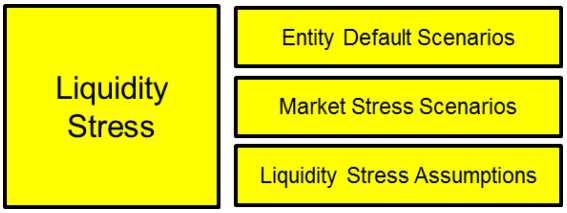
82. ESMA intends to reflect the above regulatory requirements in the design of Union-wide liquidity stress test of CCPs. Some requirements may only be introduced in future exercises.

3.3.3 Methodological principles for the Liquidity Stress test

83. For the purpose of the ESMA Union-wide Stress Test 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

unexpected generation of liquidity needs or (and) absence of sufficient liquidity resources.

84. The first stage involves the combination of market shocks with the simultaneous default of market participants. The scenario design shall reflect EMIR requirements with severe but plausible shocks. The shocks will be the ones applied in the context of counterparty credit risk. The default of market participants is the actual or technical insolvency of Clearing Members and/or providers of liquidity and services with impact on the liquidity profile of an individual CCP.



85. The second stage is a liquidity mismatch analysis of individual CCPs under the different scenarios; all projected cash in- and outflows, linked to clearing, facilitating settlements and payments and investment activities but also other cash flow relevant operational activities of the CCPs for the predefined time horizon are aggregated per time bucket and the counterbalancing capacity assessed.

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

3.3.4 Definition of the scenarios for the liquidity stress test

87. As a key methodological improvement over the previous Stress Test exercise, the collateral will be valued using the same market shocks applied in the context of counterparty credit risk. This is detailed in 3.1.3 relative to the Credit component.

88. This change brings greater consistency between the Credit and Liquidity components of the exercise.

89. However, only one date will be used for Liquidity stress testing.

90. Where an asset held by the CCP as collateral is issued by an entity assumed to be in default, the asset will be considered as unavailable for liquidity purposes. This does not mean the scenario assumes the final recovery will be zero, but it assumes that for the time when the CCP needs to use it for liquidity management, it is not usable. This affects all collateral issued by the LEI in question, regardless of which Clearing Member provided it. However, the non-defaulting Clearing Member is 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 the Stress Test framework makes no assumptions) 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. Given the break-down of collateral exposures studied in the previous Stress Test exercise, the amounts concerned are expected to be a minor.

91. Liquidity risk is generated by the following channels:

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

- **Reduction of initial margin of non-defaulting CMs:** changes in initial margin requirements of non-defaulting CMs need to be accounted for. 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.

- **Settlement of obligations of defaulted CMs:** cash flows are linked to fulfilment of the settlement of physical 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 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.

92. ESMA proposes to design and implement scenario types based on the following general assumptions:

    - **Group Cover 2:** For each CCP, to identify the set of 2 groups defaulting in all capacities creating the highest liquidity exposure under a particular market scenario are identified. For this selection, the exposures are the net exposures across all currencies. A different selection could be run for each currency but this will not be performed in this exercise. 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.

- **LD-B:** Across all CCPs (EU-wide), to identify 2 corporate groups with the highest aggregate liquidity exposure under a particular market scenario. ESMA proposes to calculate liquidity exposures aggregating results to a Union-wide exposure per group.

- It is worth noting that, as is done for the credit part of the exercise, the scenarios known as LD-A and LD-C are removed from the third Stress test exercise.

- Also, it is reminded that the collateral will be valued using the market shock laid out in the description of the market scenario for the Credit Component. The computation will be run for only one of the dates, which is a difference between the Credit and Liquidity components.

93. 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 central bank assistance. It should not be seen as an assessment of an event affecting the reliability of central bank resources.

94. We will consider an assumed default of a Clearing Member/Liquidity Provider to imply an automatic default of this entity in all other functions relevant to the liquidity profile of a CCP.

3.3.5 Capacity of the defaulting entities

95. The capacities considered are the following:

    - clearing member:
        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.

96. It is noted that the following aspects will not be modelled:

- CSDs, Central Banks or issuers of government fixed income securities are never defaulted in the exercise. The interoperability between CCPs is not taken into account. The impact of market access of a default of a firm providing brokerage services to the CCP is also out of scope.
- The tightening of the liquidity 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.
- 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. It would also imply modelling the way the CCP would manage its APC buffer in the face of a suddenly increased market volatility. 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, as it was last year. This is consistent between credit and liquidity.

97. A non-exhaustive list of capacities that will not be covered by the exercise at this stage includes:

- FX counterparty (i.e. for providing FX conversion facilities for liquidity management upon default);
- security settlement system operator;
- interoperable CCPs.

3.3.6 Methodology for the implementation of Liquidity Stress Scenarios

98. The CCP will need to report the resources it would use in a default situation for this particular date, according to its rules.

99. The reported resources may include CCP own funds, Committed Lines, Default Fund Contributions, Excess Collateral, Required Collateral / IM and SIG. The powers of assessment will be ignored for the liquidity stress testing exercise. Likewise, any recovery tools that a CCP may apply to fund liquidity shortfalls in the recovery phase will not be considered as they should not have an impact within the liquidity horizon.

100. The variation in value during market shocks that non-cash assets should experience is to be modelled by the market shock. As noted previously this is a significant departure from the previous stress test exercise.

101. The CCPs will report the schedule of flows arising from Variation Margin, Premium Settlements, IM change and Settlement. 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. In addition, the CCPs should report the same cash flows but taking into account actions that the CCP would take in order to manage its credit and liquidity position according to its rulebook and in compliance with regulation. This could include hedging, sell-offs and anticipated buy-ins.

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

103. The CCPs will be asked to report the list of their repo counterparties. The CCP will also be asked to report all expected additional outflows such as business as usual outflows and provision of liquidity to facilitate settlement needs.

104. The liquidity stress test will be run for each CCP in each currency that it clears in. A conservative assumption is that resources should be in the currency of the obligation and the CCP should not assume access to the short-term FX markets. If the CCP has the ability to settle in other currencies or other forms of collateral, ESMA will have the possibility to run the liquidity stress test under that assumption.

105. The CCPs will be asked to report the minimum cash amount required for required collateral IM and default fund contributions, according to CCP rules and regulations. This will be used to test collateral substitution assumptions.

3.3.7 Liquidity Exposures computations

106. 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 schedule under the default assumptions;
- identify liquidity requirements, distinguishing inflows and outflows.

3.3.7.1 Identifying liquidity resources

107. Within the chosen default fund and the chosen currency, we will select all the liquid resources (defined in Article 47(1) of Regulation EU No 642/2012 and Annex II of the RTS (Commission Delegated Regulation EU No 153/2013)) that :

- are not in the custody of or issued by the defaulting entities;
- are not of a specifically excluded asset type (for example Equities);
- are not excess collateral;

- are not an uncommitted credit line (not allowed under EMIR).

108. 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 taken into account. This could include resources not used in one default fund, that could be used in another one. The CCP will be able to define the largest usage possible for each resource (i.e. clearing member, default fund or CCP level).

109. Liquid resources must be of one of the following types: Cash - Central Bank, Cash - Commercial Bank Secured (Reverse Repo), Cash - Commercial Bank Unsecured (Deposit), Government Fixed Income Securities, Other Fixed Income Securities, Equities or Committed Line. Banks guarantees are not considered.

110. The liquid resources considered are the ones allocated to CCP own funds, committed lines, default fund contributions, required collateral / IM or SIG (skin in the game).

111. 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. It will measure the impact of a market access delay of one day when attempting to sell liquid resources, of a settlement lag of 2 days for sell-offs of liquid resources and securities, and of including or not the excess collateral in the liquid resources, by contemplating the situation where each of these assumptions is used or not.

112. 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.

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

In addition, when CCPs have access to central bank liquidity and although this liquidity resource is highly reliable, the ST will quantify how largely this tool is used by the CCPs. This by no means puts into question the availability of this

tool, but it is the only way to test the degree of reliance on it, which is one of the objectives of the exercise.

3.3.7.2 Identifying liquidity requirements

114. Relevant flows from both defaulting and non-defaulting members (such as initial margin variation) will be aggregated.

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

- net cash flows resulting from variation margin[6], premium, initial margin variation;
- cash inflows and outflows from settlement payments.

These flows represent the flows 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.

116. The close of business schedule will add cumulative relevant cash flows per clearing member.

3.3.7.3 Identifying other counterbalancing capacities

117. The impact on the liquidity resources from access to the repo markets will be assessed. This will take into account the list of repo counterparties and their respective capacity per currency.

118. A cumulative schedule of cash flows resulting from entering new repos will be built. It will be assumed that repos are entered up to the maximum capacity given the available collateral for the maximum duration.

119. ESMA will be able to run the liquidity stress under the assumptions listed in the previous section of this document.

3.3.7.4 Liquidity exposure profile

120. The schedule 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).

121. It takes into account the list of repo counterparties and their respective capacities per currency. It is assumed that repos are entered up to the maximum capacity per currency given the available collateral for the maximum duration.

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

[6] 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.

123. 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 taken into account. This could include resources not used in one default fund, and that could be used in another one.

124. The CCPs will define the largest usage possible for each resource (i.e. clearing member, default fund or CCP level). Some resources are restricted to clearing member or default fund level.

125. 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 “IM change” and “Premium Settlements”. The “Variation Margin” and “Settlement” flows are unaffected as they are passed through.

126. It is assumed that all resources of defaulting CMs can be used at CCP level. We make the simplifying and lenient assumption here that even client margin of a defaulting member can be used for liquidity purposes only at CCP level.

127. We then perform the aggregation and get the final position per currency. The worst position over the schedule is taken as the liquidity position.

128. 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.

3.3.7.5 Identifying the largest liquidity exposures

129. As required in the definition of some scenarios, the largest liquidity exposures per CCP need to be identified.

130. Given the market stress scenario, we will perform the selection of entities using the most conservative end of day liquidity assumptions. No selection to 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)

131. When performing further analysis by varying the liquidity assumptions, we will assume that the entities defaulting are 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.

132. As a CCP may clear in more than one currency, we will aggregate all the exposure schedule into the reference currency (EUR). This will be done using the stressed FX rates.

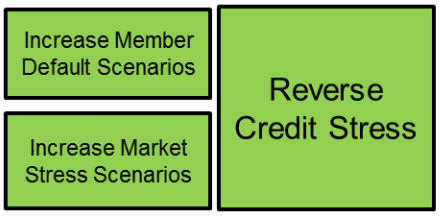
133. We will then sort the liquidity exposures using the maximum peak exposure.

3.3.8 Residual limitations of the liquidity stress test

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

- the tightening of the liquidity 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;
- as for the credit stress test, 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;
- actual liquidity needs may differ from the modelled liquidity needs based on the individual CCPs default management rule and procedures, including because of hedging transactions or optimisation of intraday cash use;
- as mentioned in the section on Concentration, the concentration of collateral is not modelled, so the value of the securities used as collateral will not depend on the size of the collateral amount.

3.4 Reverse Stress Test



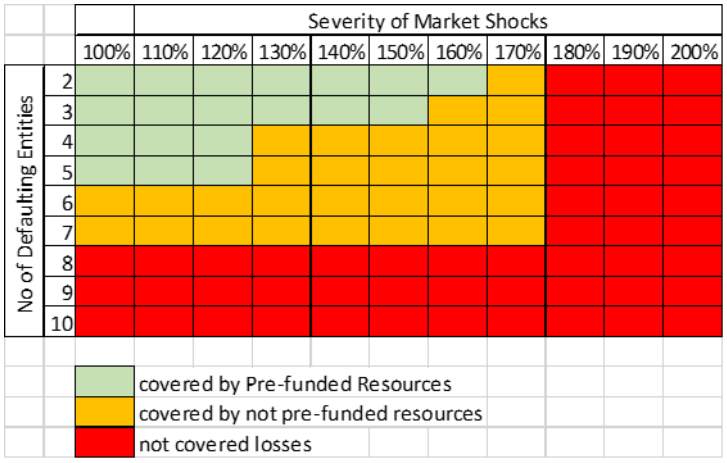
135. For this year exercise, there will be no methodological changes to the reverse stress test methodology. The analysis will consider a number of defaulting entities under the member default scenarios. The analysis will be complemented by also scaling the market stress shocks. The CCPs are asked to calculate and report the losses also after scaling the shocks in the provided market scenarios for a number of steps.

136. 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).

137. The reverse stress analysis will be limited to the credit stress component and will not cover the liquidity risk in order to limit the required effort as it can be very complex and demanding in terms of data. The extension of the scope to liquidity risk can be considered for future exercises.

138. The objective of this analysis is to identify whether there are plausible combinations of market stress scenarios and member default scenarios 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.

139. ESMA will perform a two-dimensional analysis of the absorption capacity of the system of CCPs by stepwise increasing the number of defaulting entities and the severity of the market shocks.

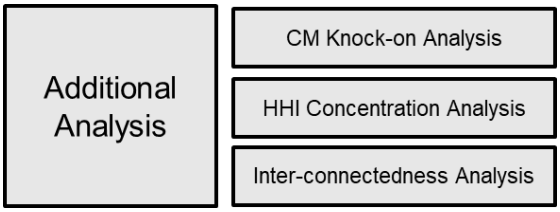


140. As in this exercise we will not rely on haircuts, but will revalue the collateral and resources using the stress shocks, the stepwise changed market shocks will now affect the collateral available under the reverse stress scenarios.

141. 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.

3.5 Additional Analysis

142. The first and second EU-wide stress test exercises included also the following three additional components and ESMA will repeat this analysis.



3.5.1 CM knock-on analysis

143. The aim of this analysis is to assess whether there are potential systemic risk implications from non-defaulting clearing members losing resources because of the loss sharing mechanism of CCPs. ESMA will calculate for all clearing members the amount of prefunded and not-prefunded resources that would be lost under each combination of member default scenarios and market stress scenarios. It will then identify the non-defaulting members for which the aggregate loss would exceed a certain absolute amount and a certain percentage of the clearing member's capital.

3.5.2 HHI Concentration analysis

144. The goal is to assess the degree of concentration of CCPs exposures. We plan to use the Default Fund contributions as a proxy for the exposures and use the HHI (Herfindahl - Hirschmann) Index in order to assess the degree of concentration of DF contributions at:

- CCP level
- EU-wide level

3.5.3 Inter-connectedness

145. Also in this case, we will repeat the analysis performed in the second exercise. The aim is to assess the degree of inter-connectedness of CCPs through top common clearing member groups, custodians and liquidity providers.

4 Next Steps

146. ESMA will launch the data request and ask the CCPs to submit the required data. The request will be performed on the basis of predefined templates combined with detailed guidance on how they are expected to calculate and report the data.

147. The next steps are:

- Submission of data by CCPs;
- Validation of the data provided by CCPs first by the NCAs and then by ESMA;
- Determination of sensitivity parameters for concentration risk;
- Analysis and Computation of the results;
- Reconciliation of aggregate results;
- Finalisation and publication of the report;

148. ESMA expects to publish the final report in Q2 2020.

5 Annexes

5.1 List of CCPs included in the scope of the exercise

no	CCP
1	Athens Exchange Clearing House
2	BME Clearing
3	Cassa di Compensazione e Garanzia S.p.A.
4	CCP Austria Abwicklungsstelle für Börsengeschäfte GmbH
5	European Commodity Clearing
6	Eurex Clearing AG
7	European Central Counterparty N.V.
8	ICE Clear Europe
9	ICE Clear Netherlands B.V.
10	KDPW_CCP
11	Keler CCP
12	LCH.Clearnet SA
13	LCH.Clearnet Ltd
14	LME Clear Ltd
15	Nasdaq OMX Clearing AB
16	OMIClear – C.C., S.A.