



European Securities and
Markets Authority

Methodological Framework

2017 EU-wide CCP Stress Test Exercise



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1 Executive Summary

In accordance with 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), ESMA shall, at least annually, initiate and coordinate Union-wide assessments of the resilience of CCPs to adverse market developments.

ESMA published on 29 April 2016 the first ever EU-wide stress test and it is now launching the execution phase of the next exercise. The present document describes the design of the new stress test exercise including the background, the scope, the objectives, the methodology and the next steps. ESMA is committed to evolve and improve the methodology and a number of key changes are envisaged compared to the previous exercise. The key changes reflected in the design of the new stress test exercise aim to improve the scenario design and implementation, extend the scope to cover liquidity risk and strengthen the validation process to increase the data quality assurance. The suggested changes will evolve the methodology and the scope of the EU-wide CCP stress test and improve the robustness of the exercise. 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.

ESMA has launched the execution phase of the new exercise and the CCPs have been requested to calculate and deliver the exposures on the basis of predefined templates and detailed instructions. The data will then be validated and analysed. ESMA expects to publish a final report in Q4 2017.

2 Background, Scope and Objectives

2.1 Introduction and Background

1. The present document sets out the framework of the 2017 EU-wide CCP stress test exercise 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.
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 the 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 also verified in the first EU-wide stress exercise, 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;
 - 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 2017 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, while the scenario design shall also reflect the EMIR prudential requirements. 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

7. The new exercise will cover all 17 EU CCPs that were authorised at the time of publication of the current framework. 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 was focused on the counterparty credit risk that EU CCPs would face as a result of clearing member defaults and simultaneous market price shocks. With reference to the risk types that will be assessed in the new exercise, the scope is now extended to cover liquidity risk. The liquidity stress test is a separate component of the new stress test framework and is further discussed in section 3.2.
9. Counterparty credit risk and liquidity risk are the core types of risks faced by CCPs. However, 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 risk challenge their resilience. In particular, risks stemming from price shocks to collateral that go beyond the applicable CCPs' haircuts will not be assessed again, in an effort to limit the data request and the required effort. Moreover, risks linked to the investment policies of CCPs, including also wrong way risk¹, will only be assessed in the context of potential liquidity implications in the liquidity component. Finally, 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 the 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 and the Colleges. As in the first exercise, 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

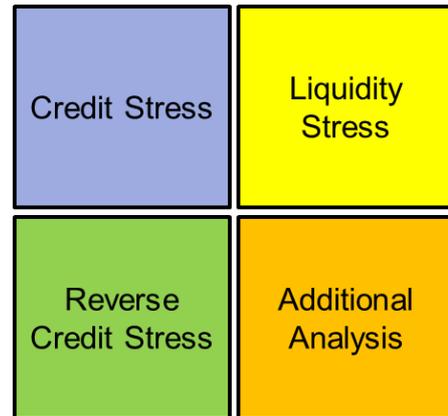
¹ Wrong way risk would materialise if collateral or cleared instruments were issued by one of the defaulting entities.

challenge their resilience but are beyond what will be considered in the course of this exercise.

3 Methodology

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

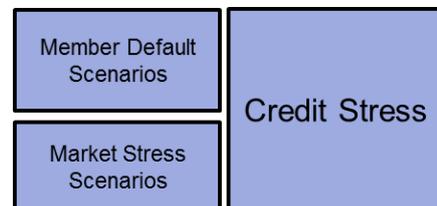
- **Credit Stress:** Assess the sufficiency of CCPs’ resources to absorb losses under a combination of market price shocks and member default scenarios.
- **Liquidity Stress:** Assess the sufficiency of CCPs’ liquid resources under a combination of market price shocks, member/liquidity provider default scenarios and additional liquidity stress assumptions.
- **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.
 - **Concentration analysis:** Assess the degree of concentration of CCPs exposures.
 - **Inter-connectedness:** Assess the degree of inter-connectedness of CCPs through common clearing member groups.



3.1 Credit Stress Test

12. 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.

13. 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.



3.1.1 Member Default Scenarios

14. With regards to the member default scenarios, no change is currently envisaged compared to the first exercise. In particular, the following scenarios will be employed.

15. **MD-A:** For each CCP, to identify the n_A (set to 2) clearing members with the highest exposure under a particular market scenario. These members are considered to be in default across all CCPs. This means that a CCP can face multiple members (more than 2) defaulting at the same time. We have already acknowledged in the first exercise that this member default scenario, may lead to an implausible number of clearing members defaulting, because of the cross-default condition. This will be further assessed during the execution phase, considering also that it has the merit of ensuring that members will default in all CCPs and thus all CCPs will be stressed at the same time.
16. **MD-B:** Across all CCPs (EU-wide), to identify n_B (set to 2) corporate groups with the highest aggregate exposure under a particular market scenario. All clearing members that belong to an identified corporate group are assumed to default across all CCPs. Also in this case, this may count for more than 2 members per CCP but the number of members defaulting at each CCP is expected to be smaller when compared to the MD-A scenarios. The reason for that is that the initial condition requires the default of 2 groups across all CCPs as opposed to 2 members per CCP.
17. **MD-C:** Across all CCPs (EU-wide), to identify n_C (set to 2) corporate groups with the highest aggregate exposure weighted by the probability of default under a particular market scenario. The weighting is based on the multiplication of exposures with default probabilities (which is not contemplated in MD-B), while the probabilities of default (PDs) will be provided by ESRB as in the previous exercise. One should note, that the PDs will be used to weight the exposures only when selecting the top groups, while the unweighted exposures will be used to assess the sufficiency of the resources of CCPs. Therefore, by construction the MD-B scenario will always generate more losses than MD-C. However, MD-C would represent a more likely scenario to materialise, as it takes into account the probability of the default of an entity. So from this perspective it would be useful to keep it. Again, all entities belonging to a defaulting group are assumed to default for all CCPs and also in this case this may count for more than 2 members per CCP.

3.1.2 Market Stress Scenarios

18. One of the key methodological changes of the new exercise has to do with the design and use of the market stress scenarios. The stress results in the new exercise will be based on a set of pre-defined and internally consistent market stress scenarios that are provided by the ESRB and will be common across all CCPs. The market stress scenarios and narrative are published together with this framework².
19. The shocks are provided for a set of high level risk factors and the CCPs will be asked to calculate and deliver the stress results for these specific market stress scenarios. This way the results across CCPs will be based on the same scenario and not on different scenarios meeting minimum risk factor shocks (as it was the case in the first EU-wide CCP stress test exercise). The scenarios are also internally consistent and were calibrated to take into account historical dependencies reflecting realistic assumptions of co-movements of risk factor prices, also in times of stress. In order to respect that condition, it was not possible

² <http://www.esrb.europa.eu/mppa/stress/html/index.en.html>

to simply combine the maximum shocks for different asset classes. For that reason, in order to ensure that all CCPs clearing a wide range of financial products are subject to sufficient stress, it was needed to use multiple (three) scenarios. They differ from each other with respect to the market segment, from which a shock is assumed to originate. Each shock scenario is consistent in that dependencies of all risk factors vis-à-vis the shock origin are accounted for.

20. The set of common and internally consistent price shocks will need to be run by individual CCPs. Given that it was not feasible to define scenarios for each and every risk factor of all CCP-cleared contracts, the scenarios were defined for a set of (approximately 550) high level risk factors across six 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 has provided the CCPs, together with the data request templates and the high level market stress scenarios, a set of instructions that explain how these are expected to be implemented. The instructions were drafted to provide clarity and address all material implementation challenges.

21. Some of the key provisions in the instructions are listed below for illustration purposes.

- The test will be run for a single reference date (across all CCPs for credit and liquidity stress). The selected stress date is Saturday 17 September 2016. This specific date was selected in order to reflect in the results of the exercise the increased activity and exposures from quarterly expiries (3rd Friday), while also avoid having CCPs improving their positions in anticipation of the exercise.
- The default scenario will simulate a 'weekend' default, where all obligations are covered until Friday close of business, the members are declared to be in default on Monday morning and do not cover obligations that are due on Monday.
- The CCPs are asked to report separately the minimum required collateral, not including any excess amounts, and the total available collateral. The minimum required collateral is meant to reflect a scenario where members would withdraw under stressed conditions any collateral exceeding the minimum required to avoid being declared into default.
- The CCPs are asked to report separately any Powers of Assessment³ that can be called from non-defaulting members and additional own resources subject to further conditions.
- The CCPs are instructed on how to identify or adjust when needed the shocks to be applied to their own cleared 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.

³ Additional not-prefunded resources that CCPs can call from non-defaulting clearing members subject to their rules.

22. The role of the NCAs is critical to ensure through the validation process that the instructions are consistently implemented by all CCPs. In order to facilitate this process, ESMA and NCAs agreed the checkpoints for the validation process and have decided on the allocation of work across the participating authorities.

3.1.3 Residual limitations for Credit Stress

23. Although a number of the limitations identified last year are intended to be addressed this year, some limitations still remain due to the need to limit the amount of required data and maintain the overall effort within manageable constraints. In particular:

- Any risks stemming from CCPs policies/decisions to invest the available resources including the provided collateral will not be covered as the CCPs will be asked to report the required amounts in cash equivalent.
- Similarly, any residual market risks in case of collateral prices falling more than what is reflected in the CCPs haircuts are not considered.
- Wrong way risks linked to the default of the issuer of instruments that are cleared or used as collateral / investment can also not be considered as the defaulting entities will be identified after the data delivery.
- Potential 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 - MD-A, MD-B, MD-C - 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.

3.2 Liquidity Stress Test

24. As anticipated in the first stress testing exercise, ESMA is considering the liquidity risk dimension in its 2017 approach. Liquidity will be assessed in addition to counterparty credit risk and not as a separate exercise.

25. 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.

26. 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.
27. Article 32(4) and (5) of the RTS 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.
28. ESMA reflects some of the above regulatory requirements in the design of Union-wide liquidity stress test of CCPs. However, due to the complexity linked to the first time this exercise is carried out, some aspects will only be addressed in future exercises.

3.2.1 Methodological principles for the Liquidity Stress test

29. 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 and absence of sufficient liquidity resources.
30. 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.



31. 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.
32. A final assessment is made on the relative contribution of the different tools at CCPs' disposal to fill the liquidity mismatch.

3.2.2 Definition of the scenarios for the liquidity stress test

33. As mentioned earlier, the market shocks are the ones applied in the context of counterparty credit risk. 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.
 - **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 result 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.
34. ESMA intends to design and implement scenario types following a similar logic to the member default scenarios of the Credit Stress Test but considering liquidity exposures from institutions whose defaults may have implications on the liquidity needs or sources of the CCP. Additional liquidity stress assumptions will complement the different scenarios.
35. 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.
36. The capacities considered are the following
1. Clearing member
 - a) VM payments
 - b) Premium payments
 - c) Settlement of assets
 2. Investment counterparties
 - a) Credit institutions (secured / unsecured)
 - b) Custodian of collateral or investments
 - c) Issuer of collateral or investments
 3. Liquidity provider
 - a) Committed credit lines
 - b) Committed Repo counterparties for assets from collateral / investments
 - c) Committed Repo counterparties for assets from settlement.

4. Payment / Settlement / Concentration bank or agent.

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

1. FX counterparty (i.e. for providing FX conversion facilities for liquidity management upon default).
2. Security settlement system operator.
3. Interoperable CCPs.

3.2.3 Timings

38. It is assumed that the default occurs on a week-end. Margins are collected as required on Friday. Payment of margins by the defaulting members fails on Monday morning. The shocks are applied to the prices used for the last 'good' VM payment.

39. The selected stress date is Saturday 17 September 2016 (same as for the credit stress). It corresponds to a quarterly expiration.

40. The market shocks will be assumed to be instantaneous, and the market factors will be then assumed to stay unchanged for the considered duration of the liquidity horizon.

41. The liquidity stress test will require in and out cash flows to be provided for the whole duration of the liquidity horizon considered. The liquidity horizon will be set at 7 days. A final bucket will aggregate any cash flows that come after the maximum horizon.

3.2.4 Residual limitations of the liquidity stress test

42. Given that this is the first supervisory liquidity stress test exercise of CCPs at EU-level, there will be a number of limitations. Some have already been identified and are summarised below, others might emerge during the implementation phase.

- Any residual market risks in case of prices of liquid resources falling more than what is reflected in the CCPs haircuts are not considered.
- Wrong way risks linked to the default of the issuer will be considered for liquid resources, but not for cleared instruments as the defaulting entities will need to be identified after the data delivery and it would require the CCPs to report data of the clearing activity per individual instrument.
- 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 (i.e. the price shocks are the ones provided by the ESRB and the number of defaults are the ones described above - LD-A, LD-B, LD-C - but the two are taken exogenously).

- 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.

3.3 Reverse Stress Test

43. The first EU-wide stress test exercise, included a reverse stress test analysis by further increasing the number of defaulting entities under the member default scenarios up to 10.

44. For this year exercise. The same approach on the increase of the number of CMs defaults will be maintained. In addition, the analysis will be complemented by also increasing the market stress shocks. The CCPs are asked to calculate and report the losses also after scaling up the shocks in the provided market scenarios for a number of steps.



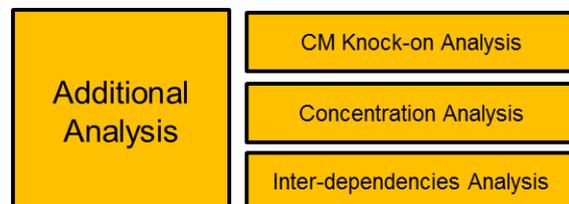
45. The reverse stress analysis will be limited to the credit stress component and will not cover the liquidity risk, given the already sufficient degree of complexity of the liquidity stress test component for the first time this is performed. The extension of the scope to liquidity risk can be considered for future exercises.

46. 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.

47. 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. 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.

3.4 Additional Analysis

48. The first EU-wide stress test exercise, included also the following three additional components and ESMA will repeat this analysis.



3.4.1 CM knock-on analysis

49. 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.

3.4.2 Concentration analysis

50. The goal is to assess the degree of concentration of CCPs exposures using the same methodology that was used for the first exercise. Therefore, 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 (max and weighted average across DFs)
- EU-wide level (after aggregating at CM and Group level across all CCPs)

3.4.3 Inter-connectedness

51. Also in this case, we will repeat the analysis performed in the first exercise. The aim is to assess the degree of inter-connectedness of CCPs through top common clearing member groups.

52. As in the concentration analysis case, we plan to use Default Fund contributions as a proxy for the exposures. We will then identify the EU-wide top-n clearing member groups in terms of aggregate Default Fund contributions across all CCPs and provide an illustration and further insight of the degree of inter-connectedness of CCPs through their clearing members.

4 Next Steps

53. ESMA has launched the data request and asked the CCPs to deliver data based on specific templates, also providing detailed instructions on how CCPs are expected to calculate and report the data on the basis of the common market scenarios provided by the ESRB.

54. The next steps/milestones are

- | | |
|--------------|---|
| ➤ March 2017 | CCPs to deliver the requested data |
| ➤ Q2 2017 | Validation first by the NCAs and then by ESMA |
| ➤ Q3 2017 | Finalise data analysis |
| ➤ Q4 2017 | Publish Final Report |

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	CME Clearing Europe Ltd
6	European Commodity Clearing
7	Eurex Clearing AG
8	European Central Counterparty N.V.
9	ICE Clear Europe
10	ICE Clear Netherlands B.V.
11	KDPW_CCP
12	Keler CCP
13	LCH.Clearnet SA
14	LCH.Clearnet Ltd
15	LME Clear Ltd
16	Nasdaq OMX Clearing AB
17	OMIClear – C.C., S.A.