

Commission Delegated Regulation (EU) No 153/2013 of 19 December 2012 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council with regard to regulatory technical standards on requirements for central counterparties (Text with EEA relevance)

## CHAPTER XII

### REVIEW OF MODELS, STRESS TESTING AND BACK TESTING

(Article 49 Regulation (EU) No 648/2012)

#### SECTION I

##### *Models and programmes*

##### *Article 47*

##### **Model Validation**

- 1 A CCP shall conduct a comprehensive validation of its models, their methodologies and the liquidity risk management framework used to quantify, aggregate, and manage its risks. Any material revisions or adjustments to its models, their methodologies and the liquidity risk management framework shall be subject to appropriate governance, including seeking advice from the risk committee, and validated by a qualified and independent party prior to application.
- 2 A CCP's validation process shall be documented and at least shall specify the policies used to test the CCP's margin, default fund and other financial resources methodologies and framework for calculating liquid financial resources. Any material revisions or adjustments to such policies shall be subject to appropriate governance, including seeking advice from the risk committee, and validated by a qualified and independent party prior to application.
- 3 A comprehensive validation shall, at least, include the following:
  - a an evaluation of the conceptual soundness of the models and framework, including developmental supporting evidence;
  - b a review of the ongoing monitoring procedures, including verification of processes and benchmarking;
  - c a review of the parameters and assumptions made in the development of its models, their methodologies and the framework;
  - d a review of the adequacy and appropriateness of the models, their methodologies and framework adopted in respect of the type of contracts they apply to;
  - e a review of the appropriateness of its stress testing scenarios in accordance with Chapter VII and Article 52;
  - f an analysis of the outcomes of testing results.
- 4 A CCP shall establish the criteria against which it assesses whether its models, their methodologies and liquidity risk management framework can be successfully validated. The criteria shall include successful testing results.

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5 Where pricing data is not readily available or reliable, a CCP shall address such pricing limitations and, at least, adopt conservative assumptions based on observed correlated or related markets and current behaviours of the market.

6 Where pricing data is not readily available or reliable, the systems and valuation models used for this purpose shall be subject to appropriate governance, including seeking advice from the risk committee, and validation and testing. A CCP shall have its valuation models validated under a variety of market scenarios by a qualified and independent party to ensure that its models accurately produces appropriate prices, and where appropriate, it shall adjust its calculation of initial margins to reflect any identified model risk.

7 A CCP shall regularly conduct an assessment of the theoretical and empirical properties of its margin model for all the financial instruments that it clears.

#### *Article 48*

### **Testing programmes**

1 A CCP shall have in place policies and procedures that detail the stress and back testing programmes it undertakes to assess the appropriateness, accuracy, reliability and resilience of the models and their methodologies used to calculate its risk control mechanisms including margin, default fund contributions, and other financial resources in a wide range of market conditions.

2 A CCP's policies and procedures shall also detail the stress testing programme it undertakes to assess the appropriateness, accuracy, reliability and resilience of the liquidity risk management framework.

3 The policies and procedures shall include at least methodologies for the inclusion of the selection and development of appropriate testing, including portfolio and market data selection, the regularity of the tests, the specific risk characteristics of the financial instruments cleared, the analysis of testing results and exceptions and the relevant corrective measures needed.

4 A CCP shall include any client positions when performing all tests.

#### *SECTION 2*

### **Back testing**

#### *Article 49*

### **Back testing procedure**

1 A CCP shall assess its margin coverage by performing an *ex-post* comparison of observed outcomes with expected outcomes derived from the use of margin models. Such back testing analysis shall be performed each day in order to evaluate whether there are any testing exceptions to margin coverage. Coverage shall be evaluated on current positions for financial instruments, clearing members and take into account possible effects from portfolio margining and, where appropriate, interoperable CCPs.

2 A CCP shall consider the appropriate historical time horizons for its back testing programme to ensure that the observation window used is sufficient enough to mitigate any detrimental effect on the statistical significance.

3 A CCP shall consider in its back testing programme, at least, clear statistical tests, and performance criteria to be defined by CCPs for the assessment of back testing results.

4 A CCP shall periodically report its back testing results and analysis in a form that does not breach confidentiality to the risk committee in order to seek their advice in the review of its margin model.

5 Back testing results and analysis shall be made available to all clearing members and, where known to the CCP, clients. For all other clients back testing results and analysis shall be made available by the relevant clearing members on request. Such information shall be aggregated in a form that does not breach confidentiality and clearing members and clients shall only have access to detailed back testing results and analysis for their own portfolios.

6 A CCP shall define the procedures to detail the actions it could take given the results of back testing analysis.

### *SECTION 3*

#### *Sensitivity testing and analysis*

##### *Article 50*

#### **Sensitivity testing and analysis procedure**

1 A CCP shall conduct sensitivity tests and analysis to assess the coverage of its margin model under various market conditions using historical data from realised stressed market conditions and hypothetical data for unrealised stressed market conditions.

2 A CCP shall use a wide range of parameters and assumptions to capture a variety of historical and hypothetical conditions, including the most-volatile periods that have been experienced by the markets it serves and extreme changes in the correlations between prices of contracts cleared by the CCP, in order to understand how the level of margin coverage might be affected by highly stressed market conditions and changes in important model parameters.

3 Sensitivity analysis shall be performed on a number of actual and representative clearing member portfolios. The representative portfolios shall be chosen based on their sensitivity to the material risk factors and correlations to which the CCP is exposed. Such sensitivity testing and analysis shall be designed to test the key parameters and assumptions of the initial margin model at a number of confidence intervals to determine the sensitivity of the system to errors in the calibration of such parameters and assumptions. Appropriate consideration shall be given to the term structure of the risk factors, and the assumed correlation between risk factors.

4 A CCP shall evaluate the potential losses in clearing member positions.

5 A CCP shall, where applicable, consider parameters reflective of the simultaneous default of clearing members that issue financial instruments cleared by the CCP or the underlying of derivatives cleared by the CCP. Where applicable, the effects of a client's default that issues financial instruments cleared by the CCP or the underlying of derivatives cleared by the CCP shall also be considered.

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6 A CCP shall periodically report its sensitivity testing results and analysis in a form that does not breach confidentiality to the risk committee in order to seek its advice in the review of its margin model.

7 A CCP shall define the procedures to detail the actions it could take given the results of sensitivity testing analysis.

#### *SECTION 4*

#### ***Stress testing***

#### *Article 51*

#### **Stress testing procedure**

1 A CCP's stress tests shall apply stressed parameters, assumptions, and scenarios to the models used for the estimation of risk exposures to make sure its financial resources are sufficient to cover those exposures under extreme but plausible market conditions.

2 A CCP's stress testing programme shall require the CCP to conduct a range of stress tests on a regular basis that shall consider the CCP's product mix and all elements of its models and their methodologies and its liquidity risk management framework.

3 A CCP's stress testing programme shall prescribe that stress tests are performed, using defined stress testing scenarios, on both past and hypothetical extreme but plausible market conditions in accordance with Chapter VII. Past conditions to be used shall be reviewed and adjusted, where appropriate. A CCP shall also consider other forms of appropriate stress testing scenarios including, but not limited to, the technical or financial failure of its settlement banks, nostro agents, custodian banks, liquidity providers, or interoperable CCPs.

4 A CCP shall have the capacity to adapt its stress tests quickly to incorporate new or emerging risks.

5 A CCP shall consider the potential losses arising from the default of a client, where known, which clears through multiple clearing members.

6 A CCP shall periodically report its stress testing results and analysis in a form that does not breach confidentiality to the risk committee in order to seek its advice in the review of its models, its methodologies and its liquidity risk management framework.

7 Stress testing results and analysis shall be made available to all clearing members and, where known to the CCP, clients. For all other clients, back testing results and analysis shall be made available by the relevant clearing members on request. Such information shall be aggregated in a form that does not breach confidentiality and clearing members and clients shall only have access to detailed stress testing results and analysis for their own portfolios.

8 A CCP shall define the procedures to detail the actions it could take given the results of stress testing analysis.

## Article 52

### **Risk factors to stress test**

1 A CCP shall identify, and have an appropriate method for measuring, relevant risk factors specific to the contracts it clears that could affect its losses. A CCP's stress tests shall, at least, take into account risk factors specified for the following type of financial instruments, where applicable:

- a interest rate related contracts: risk factors corresponding to interest rates in each currency in which the CCP clears financial instruments. The yield curve modelling shall be divided into various maturity segments in order to capture variation in the volatility of rates along the yield curve. The number of related risk factors shall depend on the complexity of the interest rate contracts cleared by the CCP. Basis risk, arising from less than perfectly correlated movements between government and other fixed-income interest rates, shall be captured separately;
- b exchange rate related contracts: risk factors corresponding to each foreign currency in which the CCP clears financial instruments and to the exchange rate between the currency in which margin calls are made and the currency in which the CCP clears financial instruments;
- c equity related contracts: risk factors corresponding to the volatility of individual equity issues for each of the markets cleared by the CCP and to the volatility of various sectors of the overall equity market. The sophistication and nature of the modelling technique for a given market shall correspond to the CCP's exposure to the overall market as well as its concentration in individual equity issues in that market;
- d commodity contracts: risk factors that take into account the different categories and sub-categories of commodity contracts and related derivatives cleared by the CCP, including, where appropriate, variations in the convenience yield between derivatives positions and cash positions in the commodity;
- e credit related contracts: risk factors that consider jump to default risk, including the cumulative risk arising from multiple defaults, basis risk and recovery rate volatility.

2 In its stress tests, a CCP shall also give appropriate consideration at least to the following:

- a correlations, including those between identified risk factors and similar contracts cleared by the CCP;
- b factors corresponding to the implied and historical volatility of the contract being cleared;
- c specific characteristics of any new contracts to be cleared by the CCP;
- d concentration risk, including to a clearing member, and group entities of clearing members;
- e interdependencies and multiple relationships;
- f relevant risks including foreign exchange risk;
- g set exposure limits;
- h wrong-way risk.

### Article 53

#### **Stress testing total financial resources**

1 A CCP's stress-testing programme shall ensure that its combination of margin, default fund contributions and other financial resources are sufficient to cover the default of at least the two clearing members to which it has the largest exposures under extreme but plausible market conditions. The stress testing programme shall also examine potential losses resulting from the default of entities in the same group as the two clearing members to which it has the largest exposures under extreme but plausible market conditions.

2 A CCP's stress-testing programme shall ensure that its margins and default fund are sufficient to cover at least the default of the clearing member to which it has the largest exposures or of the second and third largest clearing members, if the sum of their exposures is larger in accordance with Article 42 of Regulation (EU) No 648/2012.

3 The 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.

4 A CCP shall, where applicable, consider in its stress tests, the effects of the default of a clearing member that issues financial instruments cleared by the CCP or the underlying of derivatives cleared by the CCP. Where applicable, the effects of a client's default that issues financial instruments cleared by the CCP or the underlying of derivatives cleared by the CCP shall also be considered.

5 A CCP's stress tests shall consider the liquidation period as provided for in Article 26.

### Article 54

#### **Stress testing liquid financial resources**

1 A CCP's stress-testing programme of its liquid financial resources shall ensure that they are sufficient in accordance with the requirements laid down in Chapter VIII.

2 A CCP shall have clear and transparent rules and procedures to address insufficient liquid financial resources highlighted by its stress tests to ensure settlement of payments obligations.

A CCP shall also have clear procedures for using the results and analysis of its stress tests to evaluate and adjust the adequacy of its liquidity risk management framework and liquidity providers.

3 The stress testing scenarios used in the stress testing of liquid financial resources shall consider the design and operation of the CCP, and include all entities that might pose material liquidity risk to it. Such stress tests shall also consider any strong linkages or similar exposures between its clearing members, including other entities that are part of the same group, and assess the probability of multiple defaults and the contagion effect among its clearing members that such defaults may cause.

## SECTION 5

### **Coverage and use of test results**

#### *Article 55*

#### **Maintaining sufficient coverage**

1 A CCP shall establish and maintain procedures to recognise changes in market conditions, including increases in volatility or reductions in the liquidity of the financial instruments it clears, so as to promptly adapt calculation of its margin requirement to appropriately account for new market conditions.

2 A CCP shall conduct tests on its haircuts in order to ensure collateral can be liquidated at least at its haircutted value in observed and extreme but plausible market conditions.

3 If a CCP collects margin at a portfolio, as opposed to product level, it shall continuously review and test offsets among products. A CCP shall base such offsets on prudent and economically meaningful methodology that reflects the degree of price dependence between the products. In particular, a CCP shall test how correlations perform during periods of actual and hypothetical severe market conditions.

#### *Article 56*

#### **Review of models using test results**

1 A CCP shall have clear procedures to determine the amount of additional margin it may need to collect, including on an intraday basis, and to recalibrate its margin model where back testing indicates that the model did not perform as expected with the result that it does not identify the appropriate amount of initial margin necessary to achieve the intended level of confidence. Where a CCP has determined that it is necessary to call additional margin it shall do so by the next margin call.

2 A CCP shall evaluate the source of testing exceptions highlighted by its back tests. Depending on the source of exceptions, the CCP shall determine whether a fundamental change to the margin model, or to the models that input into it, is required and whether the recalibration of current parameters is necessary.

3 A CCP shall evaluate the sources of testing exceptions highlighted by its stress tests. The CCP shall determine whether a fundamental change to its models, their methodologies or its liquidity risk management framework is required or if the recalibration of current parameters or assumptions is necessary, on the basis of the sources of exceptions.

4 Where the results of the tests show an insufficient coverage of margin, default fund or other financial resources, a CCP shall increase overall coverage of its financial resources to an acceptable level by the next margin call. Where the results of the tests show insufficient liquid financial resources, the CCP shall increase its liquid financial resources to an acceptable level as soon as is practicable.

5 A CCP shall, in reviewing its models, their methodologies and the liquidity risk management framework, monitor the frequency of reoccurring testing exceptions to identify and resolve issues appropriately and without undue delay.

## SECTION 6

### **Reverse stress tests**

#### *Article 57*

### **Reverse stress tests**

1 A CCP shall conduct reverse stress tests which are designed to identify under which market conditions the combination of its margin, default fund and other financial resources may provide insufficient coverage of credit exposures and for which its liquid financial resources may be insufficient. When conducting such tests, a CCP shall model extreme market conditions that go beyond what are considered plausible market conditions, in order to help determine the limits of its models, its liquidity risk management framework, its financial resources and its liquid financial resources.

2 A CCP shall develop reverse stress tests tailored to the specific risks of the markets and of the contracts that it provides clearing services for.

3 A CCP shall use the conditions identified in paragraph 1 and the results and analysis of its reverse stress tests to help in identifying extreme but plausible scenarios in accordance with Chapter VII.

4 A CCP shall periodically report its reverse stress testing results and analysis in a form that does not breach confidentiality to the risk committee in order to seek their advice in its review.

## SECTION 7

### **Default procedures**

#### *Article 58*

### **Testing default procedures**

1 A CCP shall test and review its default procedures to ensure they are both practical and effective. A CCP shall perform simulation exercises as part of the testing of its default procedures.

2 A CCP shall, following testing of its default procedures, identify any uncertainties and appropriately adapt its procedures to mitigate such uncertainty.

3 A CCP shall, through conducting simulation exercises, verify that all clearing members, where appropriate, clients and other relevant parties including interoperable CCP's and any related service providers, are duly informed and know the procedures involved in a default scenario.

## SECTION 8

### **Validation and testing frequency**

#### *Article 59*

#### **Frequency**

1 A CCP shall conduct a comprehensive validation of its models and their methodologies at least annually.

2 A CCP shall conduct a comprehensive validation of its liquidity risk management framework at least annually.

3 A CCP shall conduct a full validation of its valuation models at least annually.

4 A CCP shall review the appropriateness of the policies specified in Article 51 at least annually.

5 A CCP shall analyse and monitor its model performance and financial resources coverage in the event of defaults by back testing margin coverage at least daily and conducting at least daily stress testing using standard and predetermined parameters and assumptions.

6 A CCP shall analyse and monitor its liquidity risk management framework by conducting at least daily stress tests of its liquid financial resources.

7 A CCP shall conduct a detailed thorough analysis of testing results at least on a monthly basis in order to ensure its stress testing scenarios, models and liquidity risk management framework, underlying parameters and assumptions are correct. Such analysis shall be conducted more frequently in stressed market conditions, including when the financial instruments cleared or markets served in general display high volatility, become less liquid, or when the size or concentrations of positions held by its clearing members increase significantly or when it is anticipated that a CCP will encounter stressed market conditions.

8 Sensitivity analysis shall be conducted at least monthly, using the results of sensitivity tests. This analysis should be conducted more frequently when markets are unusually volatile or less liquid or when the size or concentrations of positions held by its clearing members increase significantly.

9 A CCP shall test offsets among financial instruments and how correlations perform during periods of actual and hypothetical severe market conditions at least annually.

10 A CCP's haircuts shall be tested at least monthly.

11 A CCP shall conduct reverse stress tests at least quarterly.

12 A CCP shall test and review its default procedures at least quarterly and perform simulation exercises at least annually, in accordance with Article 61. A CCP shall also perform simulation exercises following any material change to its default procedures.

## SECTION 9

### ***Time horizons used when performing tests***

#### *Article 60*

#### **The time horizons**

1 The time horizons used for stress tests shall be defined in accordance with Chapter VII and shall include forward-looking extreme but plausible market conditions.

2 The historical time horizons used for back tests shall include data from at minimum the most recent year or as long as a CCP has been clearing the relevant financial instrument if that is less than a year.

## SECTION 10

### ***Public disclosure***

#### *Article 61*

#### **Information to be publicly disclosed**

1 A CCP shall publicly disclose the general principles underlying its models and their methodologies, the nature of tests performed, with a high level summary of the test results and any corrective actions undertaken.

2 A CCP shall make available to the public key aspects of its default procedures, including:

- a the circumstances in which action may be taken;
- b who may take those actions;
- c the scope of the actions which may be taken, including the treatment of both proprietary and client positions, funds and assets;
- d the mechanisms to address a CCP's obligations to non-defaulting clearing members;
- e the mechanisms to help address the defaulting clearing member's obligations to its clients.

#### *Article 62*

#### **Entry into force and application**

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

Point (h) Section 2 of Annex I shall apply from three years after the date of entry into force of this Regulation in respect of transactions on derivatives, as referred to in points (b) and (d) of Article 2(4) of Regulation (EU) No 1227/2011 of the European Parliament and of the Council<sup>(1)</sup>.



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(1) OJ L 326, 8.12.2011, p. 1.