## CME Clearing Europe

### Risk Disclosure

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1. **Introduction**

1. Both the CPSS-IOSCO *Principles* for central counterparties and EMIR’s provisions on central counterparties aim to build on established clearing house practice by promoting greater formality and consistency across clearing houses in the publication of information about key risk management policies and practices. EMIR refers to the provision of some of the information that it requires EU clearing houses to provide as ‘public’ risk disclosures. The information presented below consolidates the information referred to in EMIR, following its headings, and offers additional information in systematically describing and documenting CMECE’s risk management approach.

2. The information draws on CMECE’s formal risk policies on:
   - membership;
   - variation margining;
   - initial margining;
   - concentration;
   - model validation;
   - stress-testing;
   - guarantee funds;
   - collateral;
   - treasury investment risk;
   - liquidity risk;
   - back-testing;
   - wrong-way risk; and
   - credit risk;

3. These policies are supported internally by risk-operational procedures used by CMECE risk management team. The governance arrangements for risk policies and their implementation and oversight are described in section 8. The information is completed with complementary information on CMECE’s default resources, and other financial resources, its clearing members’ default management arrangements, and the overall risk governance arrangements.
2. Structure of the Information

4. The structure of the information presented is as follows:

- Margin models, stress testing, liquidity and collateral valuation and haircutting: general principles
- Detail of margin models and back-testing of the output of the models: initial margin models – exchange-traded derivatives and OTC commodity derivatives; interest-rate swaps; validation of CMECE's initial margin models: back-testing, independent validation and risk committee review
- Stress testing: coverage and nature of stress tests, and use in risk policy re-assessment; market risk stress tests for OTC commodity and exchange-traded derivatives; Market risk stress tests for IRS
- Default resources available to CMECE
- Default management arrangements
- Risk governance arrangements

3. Margin Models, Stress Testing and Collateral Valuation and Haircutting: General Principles

5. CMECE uses initial margin models and various types of stress testing to quantify the core risks that it must manage as a CCP, and accordingly to inform decisions on the initial margin requirements that it establishes and the size of other default resources put in place as backstops to initial margin. At the same time, it establishes haircuts from the market value of non-cash collateral that it collects to cover initial margin requirements and clearing member contributions to its other default resources\(^1\), and monitors its liquid resources and tests their adequacy in extreme circumstances through further stress tests. In the description that follows these quantitative approaches to risk measurement and containment are referred to collectively as “risk models”.

6. The general principles on which CMECE’s choice and use of risk models is based are as follows:

3.1 Initial Margin Models

7. Our initial margin models are designed and chosen to ensure, for all derivative product types cleared, that the initial margin collected and under the control of CMECE is adequate in most cases to absorb the market risk that must be managed in the event of clearing member default. This design objective is embodied in our initial margin policies which are implemented by CMECE risk management team.

\(^1\) Other default resources comprise CMECE’s contributions to the Company’s Guarantee Funds and clearing members’ contributions to those Funds.
3.2 Stress Testing of Other Default Resources

8. CMECE has no direct control over the circumstances that could cause clearing member default, or over the market conditions that it may encounter during the process of default management. In consequence, CMECE uses stress tests to assess the size of default resources, supplementary to initial margin, judged necessary to absorb market risk in significantly more extreme market conditions than those reflected in margin calculations. The stress tests cover a range of consequential or coincidental extreme but plausible historical and hypothetical price movements, covering both house and client accounts, and a combination of presumed multiple clearing member defaults.

3.3 Ensuring the Adequacy of the Value of Collateral Held

9. The adequacy of CMECE’s initial margin and other default resource calculations would be undermined if the market value of non-cash collateral accepted and held by CMECE to cover initial margin requirements and clearing members’ contributions to its Guarantee Funds fell sharply immediately before or during the management of a clearing member default. For that reason, CMECE maintains a buffer against such market movements by recognising only current market value less haircuts based on at least two-day historically extreme plausible price moves in the collateral. The continued conservatism of those haircuts is also subject to stress testing. The adequacy of cash collateral accepted and held by CMECE could be undermined through adverse cross-rate movements in cases where cash in one eligible currency covers risk in contracts denominated in another. For that reason CMECE maintains a buffer by taking a haircut of 5% where there are cross-currency exposures.

10. The adequacy of initial margin could also be undermined if the non-cash collateral held by CMECE to cover a defaulter’s liabilities was adversely affected by price movements in the same way as the value of long positions in the defaulter’s portfolio of cleared contracts. For that reason, CMECE’s Wrong-Way Risk Policy restricts use of generally accepted collateral in particular circumstances.

3.4 Testing of Liquidity

11. The adequacy of CMECE’s initial margin and other default resource calculations, and the conservatism of its haircutting of the recognised value of non-cash collateral, would be undermined if CMECE did not have adequate liquidity to meet its daily obligations as central counterparty or, more particularly, if it did not have adequate liquidity during the management of a clearing member default. In the context of a framework of liquidity measurements and stress testing of available liquidity, CMECE’s approach is designed to ensure that it can meet all day-to-day cash flow requirements including during default management covering the presumed failure of the two largest clearing member exposures.

4. Detail of Margin Models and Backtesting of the Output of the Models

4.1 Initial Margin Models

a) Exchange-Traded Derivatives and OTC Commodity Derivatives

12. CMECE employs CME SPAN as the core margin algorithm for establishing initial margin requirements for these derivatives. For OTC commodity derivatives CME SPAN is used in conjunction with a volatility matrix as a check and potential over-ride to ensure the adequacy of margins for options, and a scaled Historical Value-at-
Risk (HVaR) check and potential over-ride to ensure the adequacy of the margining of spreads. For exchange-traded Foreign Currency (FX) futures, HVaR is used as a more comprehensive check and potential over-ride to SPAN calculations.

13. As a parametric margin model, the resilience of the initial margin requirements deriving from the CME SPAN algorithm relies to a considerable extent on the input parameter assumptions that are used by the model. The parameters are reviewed on a monthly cycle and on an ad hoc basis in response to large market moves.

14. At the member portfolio level, for all separate margining accounts, CMECE’s policy is that initial margin requirements are set to cover at least 99% of each account portfolio’s two-day mark-to-market losses over a one-year period.

15. In order to achieve this confidence level for commodity portfolios, when determining margin parameters for each contract all price and volatility parameters are set to cover at least 99% of 2-day contract value changes over a 1 to 3 month period and 95% of 2-day contract value changes over a 6 to 12 month period.

16. In order to achieve this confidence level for FX futures portfolios, when determining margin parameters for each contract all price parameters are set to cover at least 99% of 2-day contract value changes over the last 3, 6 and 12 months. Furthermore, the price parameters are floored at the level indicated by the Historical Value at Risk (HVaR) calculation.

17. In setting the margin parameters described above, CMECE reviews estimates of the realised volatility of prices and implied volatility over shorter-term, intermediate-term and longer-term timeframes. A number of different parametric and non-parametric statistical analyses are employed to generate these estimates including historical percentile; Extreme Value Theory (EVT); Exponentially Weighted Moving Average (EWMA); and Normal Mixtures analyses.

18. In addition to the analysis described above, a separate statistical calibration routine is run for each contract which is used to inform the Risk Executive’s decision when setting parameters. The calibration routine is a rule-based calculation which generates price and volatility levels for each day for each contract for a past period (the ‘back-testing period’). The routine is calibrated so that the levels it generates for each contract are greater than each contract’s price or volatility move over its liquidation horizon on at least 99% of days in the back-test period.

19. The current calibration routine uses:

   • calculated percentile daily changes in settlement price and implied volatility;
   • over a number of time horizons; and also
   • takes account of the length of available data history in such a way that levels generated from shorter price histories are subject to a penalty (upward adjustment) which gradually reduces as the available history increases, reflecting an increased level of confidence in the calculation.

20. Qualitative information is also incorporated into the analysis before setting the parameters; one example of this is when a change in market fundamentals pertaining to the contracts occurs that may not yet be reflected in the quantitative information. Another example is when further investigation into the cause of a period of increased volatility indicates that the increase was temporary and that therefore the margin may be set at a
level lower than suggested by the quantitative estimates whilst still ensuring margin coverage over the liquidation horizon with at least a 95% confidence level is maintained. In addition, to ensure prudent margining of FX futures in particular in cases of currencies that are deemed to be pegged, Implied Volatilities derived from respective option prices are monitored on a daily basis against changes or trends.

21. In order to ensure that portfolios containing options are margined appropriately, an additional analysis is performed using the Extended Revaluation Matrix (ERM).

22. ERM is run daily for each member’s portfolio, and in addition also run for a selection of hypothetical portfolios in order to enhance assessment of the risks involved in certain portfolios, and to ensure that the specified margin coverage can be maintained for all contracts.

23. ERM replicates the SPAN calculation, but whereas SPAN uses 16 scenarios, ERM assesses portfolios at a much more granular level. The number of scenarios currently utilised by ERM is 404, but this number may be increased or decreased to reflect the tick size of the products listed by CMECE.

24. ERM is run alongside the SPAN margin calculation each day and the worst case loss results produced by each will be compared to determine whether any portfolio is exposed to non-linear risk which the SPAN algorithm is not covering adequately.

25. In addition to the SPAN model a HVaR model using price differences is run in parallel to ensure that the SPAN inter- and intra-commodity spreads are captured appropriately.

26. Individual spread portfolios representative of each of the spreads that are recognised by the CME SPAN model (both inter- and intra-) are constructed and run through both the HVaR model and the CME SPAN model on a daily basis. For each spread portfolio, the HVaR requirement is compared to the SPAN requirement and if the HVaR requirement is greater than the SPAN requirement on 3 or more days in any consecutive 10-business day period the relevant inter- or intra- parameters (or the actual outright parameter for those contracts) is reviewed and amended, either increasing SPAN intra-spread charges or decreasing SPAN inter-commodity offsets). In all cases, actual SPAN margin reductions are no greater than 80% of the difference between the sums of SPAN margins for each product calculated on an individual basis. On a quarterly basis the HVaR model will be assessed to determine whether there is an under-estimation of the risk due to the use of price differences rather than price returns. The model will also undergo back-testing, see the back-testing policy for further details.

Concentration (Illiquidity Risk) Add-on

27. Supplementary initial margin is collected, additional to the model-derived requirement described above, in cases where clearing members’ portfolios, house or client account or potentially both, are judged to contain concentrated positions whose size relative to market liquidity might our close-out assumptions.

28. In relation to foreign currency derivatives, particular attention is paid to potential extreme movements in currencies whose cross-rates are pegged to another currency should the pegs be removed or adjusted.

Procyclicality

29. Procyclicality occurs when margin requirements are linked to market condition. In this situation, margin requirement will rise during periods of increased volatility and fall during boom times when volatility is low.
Under a distressed market condition, the transmission from the financial sector to the real one will materialize by higher collateral requirements. One way to mitigate the procyclicality of margin rules is to make them less dependent on near-term market conditions. CMECE addresses procyclicality and reduces the variability in margin with an outright increase of the initial margin by a constant 25% factor.

b) Interest Rate Swaps

30. The model used to calculate initial margin requirements for IRS is a Historical Value at Risk (HVaR) model. This model uses Exponentially Weighted Moving Average (EWMA) volatility re-scaling to determine the margins for a given IRS portfolio, scaling the historical returns based on current forecast volatility to a measure of volatility realised at the point in time the shock was sampled.

31. The HVaR historical simulation model uses five years of history - 1260 business days.

32. The initial margin requirement is calculated to cover losses over a 5-day holding period – the core holding period – during 99% of days for house accounts and a 7-day holding period for client accounts. This differentiation reflects the default management treatment of house and client accounts. The proprietary (house) account IRS of a defaulting clearing member enter the hedging stage of CMECE’s default management procedure shortly after default is declared by CMECE. In contrast, CMECE tries to facilitate the transfer of client positions, together with the related collateral, and for that reason is more exposed to value erosion during the period before it is known whether ‘porting’ is achievable or not. The core holding period is calibrated on the basis of polls of IRS dealers in which their opinions of liquidation periods in the market are sought. The core holding period and the extended holding period for client accounts are reviewed annually.

33. The margin methodology consists of the steps shown in the diagram below, each of which is outlined in more detail in the following sections:

![Diagram](image_url)

*Creation of Historical Return Matrices*

34. Historical interest rates and FX rates for all currencies are obtained from Reuters and Bloomberg. On an exceptional basis, data from those sources may be adjusted where CMECE’s risk department feels that they are incorrect when compared with other data and would affect the quality of the margining. The discretion to make any such adjustments is documented in CMECE’s risk policies.
35. For each of the observed tenors and FX rates for each currency 5-day log return matrices are calculated for the prior five years as the logarithm of the ratio of the continuously compounded zero rates on that date and the fifth business day thereafter.

*Scaling of Returns by Volatility*

36. It is an important principle of our model that it should react quickly to changes in interest-rate and volatility regimes. In order to achieve that design principle the historical interest and FX rate returns are scaled by EWMA volatility.

37. A time series of volatility forecasts is calculated. For each tenor and FX rate, the time-series of the 5-day log returns is used to calculate the EWMA volatility forecast for each day in the time-series.

38. In order to prevent the volatility, and subsequently the margins, from dropping too low, a currency-specific volatility floor is used.

39. The volatility floors are subject to review at least annually, or more frequently if deemed necessary by CMECE’s risk department.

40. For each tenor/scenario, the forecast volatility is used to compute a scaling coefficient by dividing it by the historical EWMA volatility of that tenor/scenario. This coefficient scales the scenario-return up if the forecast EWMA is higher than that scenario’s historical volatility and down if the forecasted EWMA volatility is lower than that scenario’s historical volatility.

41. For each scenario and each tenor the scaled return is calculated by multiplying the scaling coefficients by the historical 5-day log return.

42. For multi-currency portfolios, each scenario takes into account volatility scaled FX shifts.

*Calculation of Shocked Zero Curves*

43. The scaled return matrix is applied to the base curve as of the margin date to create 1260 shocked zero curves.

*Calculation of Portfolio Margin*

44. The subsequent steps are all specific to a portfolio and derive the margin for the portfolio of interest rates on a given day:

45. Step 1 - From the shocked zero curves, the value of the portfolio under each scenario is calculated.

46. Step 2 - The portfolio gain or loss is calculated as the difference between the Portfolio Value under each scenario and the Base Portfolio Value on the margin date.

47. Step 3 - For multi-currency portfolios only the portfolio gain or loss under each scenario is calculated in the base currency, incorporating the FX rate for this scenario.

48. Step 4 - The Profit and Loss (P&L) distribution is sorted from maximum gain to maximum loss and then the targeted confidence value of 99.7% is used to extract the margin from the loss side of the distribution.

*Concentration (Liquidity Risk) Add-on*
49. In order to take account of potentially greater risk in large and concentrated portfolios, analysis is undertaken based on liquidity in particular tenors in order to determine liquidity multipliers.

50. For relevant multi-currency portfolios, liquidity multipliers are applied based on the naked margin requirements for EUR and USD swaps within a Clearing Member’s House Account and each individual Customer Account.

51. In a multi-currency portfolio, margins are computed for each currency sub-group, and then liquidity margins calculated for each currency. The sum of those liquidity margins gives the overall liquidity margin in US Dollars. The base FX rate is used to compute the aggregate liquidity margin in US Dollars.

**Procyclicality**

52. CMECE addresses procyclicality and reduces the variability in margin with an outright increase of the initial margin by a constant 25% factor.

53. The initial margin models described above have been developed internally and validated both internally and independently by external risk specialists, and reviewed by CMECE’s risk committee before Board approval for implementation.

54. One of the core internal requirements is that the models should demonstrate through back-testing using historic data that the initial margin requirements they generate meet the specified risk outcomes laid out above and in the formal risk policies of the company. The back-testing data are made available to the independent risk validator and at a high level to our risk committee in the papers presented for their consideration ahead of sign-off of the models.

55. Another internal requirement is that the models should be adapted to the characteristics of the clearing contracts.

56. The models in use met the back-testing requirements set internally through an iterative process of adjustment and re-adjustment of the model if the requirements were not fully met, and also received further review and adjustment as necessary after independent risk evaluation reports.

57. In the case of the independent risk validations, our policy is to implement all recommendations for improvement of our risk techniques contained in the final, agreed validation reports. At the same time, we have directed the independent validators to look with particular attention at certain aspects of our models with a view to proposing adjustments or to assisting in our final choice of approach.

58. In relation to the margining of commodities, FX futures and IRS we have modified the approach to the setting of floors on margin requirements, introduced techniques for more detailed assessment of options, and developed detailed of the coverage of particular portfolio in response to independent validations, risk committee review and dialogue with regulators.

59. Once the models are implemented our back-testing is undertaken daily at the level of all accounts cleared. They are also subject to annual independent validation of performance. We have not had occasion to modify the core features of the models on the basis of experience to data. If the daily monitoring or validator’s
conclusions indicated that the model was not producing the consistent risk coverage specified in our risk policies, we would make adjustments to parameters or floors or the volatility responsiveness features in the first instance.

5. Stress Tests

5.1 Coverage and Nature of Stress Tests, and use in Risk Policy Reassessment

60. CMECE employs stress-testing to explore and ensure the adequacy of: its market risk protections, that is, the market risk of handling clearing member default; and its liquidity risk.

61. The suite of stress tests comprises those that investigate and inform our policies on: margin adequacy, Guarantee Fund adequacy and the adequacy of collateral haircuts in terms of market risk; and those that assess the adequacy of current liquidity and liquidity lines. The market risk tests are designed to cover potential scenarios that would affect all clearing activity as well as those designed to target the specific product groups cleared. The scenarios employed cover historically extreme price moves in the markets cleared, subject to our objectively justifying the discounting of the recurrence of certain moves because of the particularity of the historic event, a radically changed market or economic environment, or other factors: in the language first coined in a CPSS-IOSCO paper, our core scenarios are “extreme but plausible” in nature. The historically-informed scenarios are supplemented by hypothetical scenarios which combine elements of historical simulation with exploration of different combinations of movements including correlations. The tests for the OTC commodity and exchange-traded derivative market risk differ from those for IRS.

62. The market risk stress tests can inform decisions on the need for: additional margin requirements; increases in the size of Guarantee Funds; and adjustments in collateral haircuts or other changes in collateral policy. The liquidity risk stress tests can inform decisions on: our investment policy; our collateral policy; and the size and composition of liquidity lines.

5.2 Market Risk Stress Tests for OTC Commodity and Exchange-Traded Derivatives

63. CMECE employs three separate stress testing models to assess potential Clearing Member exposures for these derivative:

a) Largest Net Debtor (LND) stress testing

64. The Largest Net Debtor (LND) stress tests are designed to stress initial margin adequacy across the relevant clearing membership of CMECE in order to ensure that the Standard Guarantee Fund is maintained at an appropriate size. The tests are run for each Clearing Member with open positions in one or both of the product groups covered by the Standard Guarantee Fund, with separate calculations for each account maintained by each Clearing member, and separate calculations per cleared product group. For each Clearing Member the LND calculation is the sum of the stress test result for their exchange-traded business and their OTC derivatives business if they are active in both areas. However, a conservative constraint is applied. If the tests for either product set show stressed losses below initial margin (leaving a net initial margin amount) the result is re-set to zero, rather than allowing a net initial margin amount to offset stress losses greater than initial margin.
65. The Clearing Member default coverage requirement in the Standard Guarantee Fund Policy is that the Fund should always be adequate to cover at least the default of the two largest member exposures, which we define in terms of the two highest LND results.

b) **LND tests for exchange-traded derivatives (CME Europe)**

66. These tests cover a set of historical and hypothetical scenarios, with:

- Historical scenarios representing extreme moves in at least the level, slope and curvature of the FX futures price curves;
- Various complementary hypothetical stress tests, in particular covering un-pegging scenarios for pegged currencies in the cleared pairs, correlation breakdown, and various macro-economic scenarios.

67. CMECE Risk and Membership team will review most traded strategies to determine if their empirical distributions contain sufficient data to estimate extreme shocks. If the data are insufficient, an appropriate hypothetical scenario is included in the stress tests.

c) **LND tests for OTC commodity derivatives**

68. The price moves used are the largest historical price moves observed over the timeframe of the product or market’s existence. Scenarios are updated when new, more extreme, moves are observed. For new or recently launched products where there is little or no data history available, stress moves will be estimated using proxy data.

69. Each market is stressed up and down individually and the largest hypothetical loss in each market is added together to arrive at the largest hypothetical loss for each Clearing Member account. Hypothetical gains or excess collateral in the house account are used to offset losses in the customer account, but not vice versa.

70. The stress test scenarios (either up or down) in each market that result in the largest hypothetical Clearing Member loss are then applied to all other Clearing Member portfolios to assess the next largest hypothetical loss under the same combination of market scenarios.

d) **Concentration margin stress testing**

71. On a daily basis, all Clearing Member portfolios are subject to a Concentration Margin stress test that includes market moves equal to 150% of the price move covered by the product margin, attempting to identify firms with excessive directional risk.

72. Each market is stressed up and down by 150% and the largest hypothetical loss in the market is compared to several thresholds for the Clearing Member, per account, in order to determine whether any additional margin is required to cover the risk of concentrated positions. Hypothetical gains in the house account are used to offset losses in the customer account, but not vice versa.

e) **Trend analysis stress testing**

73. Trend Analysis stress testing consists of shifts based on standard deviation price moves for all markets cleared by CMECE that are applied to all Clearing Member portfolios on a daily basis and measured over time.
74. Each key contract’s price history is assessed to determine the largest historic move observed; this move is then assessed to determine the number of standard deviations of the move at the time it was observed. This number of standard deviations is then applied to the current one-year rolling standard deviation to determine the stress shift.

75. There is review of these stress tests results daily by risk staff to identify any changes in clearing member potential exposures over time, seeking to identify changes in behaviour or risk profile that warrant additional investigation. For example, potential correlations between clearing members due to known similarities in business models or regional and/or sectorial customer concentrations results are summarised on a daily basis in a risk dashboard which is signed off by the Chief Risk Officer.

5.3 Market Risk Stress Tests for IRS

76. The stress testing framework is designed around event-driven stresses augmented with a re-combined Principal Component Analysis model.

a) Historical Scenarios

77. Historical scenarios are established using a variety of measurements across different historical time periods. The historical scenarios are reviewed monthly by the risk staff, who will adjust the scenarios and parameters as necessary to measure the risk faced by the clearinghouse in the event of clearing member default.

b) Tenor scenarios

78. To identify the historical scenarios the 7-day rate change for each tenor (3m – 30yrs) is individually measured across various time periods. For each of the time periods, a specific percentile is used to identify appropriately extreme rate changes. The time periods and respective percentiles are defined by CMECE.

c) Tilt scenarios

79. Tilt Scenarios are used to identify the changes in the slope of the curves of each cleared currency.

80. The 7-day change in each of these is calculated for the same four time periods used in the Tenor Scenarios. Using each period’s assigned percentile, the associated dates are identified for each currency.

81. These identified Tilt Scenarios are used to identify dates with severe steepening and flattening of the rate curves for each cleared currency. The observed curves on these dates are used as stress tests for current IRS portfolios.

d) Curvature scenarios

82. Curvature Scenarios are identified using historical changes across multiple tenors of the rate curve,

83. The sum of these differentials is calculated for each day in the time period, and the 7-day change between each of the sums established. The same four time periods are used to calculate each period’s assigned percentile and identify the associated dates for each currency.

84. The Curvature Scenarios are used to identify historical dates with extreme changes across multiple tenors that cause a change in the shape of the curve of each cleared currency. The observed curves on these dates are used as stress tests for current IRS portfolios.
e) Synthetic scenarios for ten years

85. Several synthetic scenarios are constructed, including some based on PCA factors. To construct the scenarios, the 7-day absolute returns for each currency are decomposed into PCA factors. Once PCA factors are identified, their extreme moves are combined in different patterns to come up with PCA based scenarios.

f) Additional Event based and Hypothetical Scenarios

86. In addition to the historical and PCA based scenarios for sizing the Largest Net Debtor and Guarantee Fund, Risk Management has defined a number of event based and hypothetical scenarios based on previous financial shocks. These are included in the regular reviews to determine the suitability of the scenarios given current portfolios and market conditions.

g) Caps

87. Caps are applied to each tenor within the curve for each stress scenario. Caps are defined individually for each currency and applied at the scenario level in a Capped regime.

h) Currency correlation

88. Under the correlated currency regime, stress scenarios and dates are defined for each currency individually and then applied to every currency cleared at CMECE. The Stress Tests are then run for each currency for every scenario and the resulting Stressed P&L for each currency are converted and aggregated to a common currency equivalent.

6. Default Resources and Other Financial Resources

6.1 Default Resources

89. The policy goal of the risk models employed by CMECE is to ensure that the company is able to discharge its role as central counterparty in relation to the contracts cleared. The aim with the market risk models – margining and stress-testing models is to ensure that the resources available in the case of clearing member default, for whatever reason, are adequate to enable CMECE to absorb the costs of default and to provide as much continuity as possible to clients of the defaulter and absolute continuity and certainty to non-defaulting clearing members and their clients.

90. As described earlier, the core market risk quantity is initial margin. The resilience of initial margin requirements is protected by routine re-valuation and variation margin payments and by intra-day margin calling. But clearly in the case of default prompted by failure of the clearing member firm, or by non-payment of variation margin or incremental initial margin or both, all likelihood of further payments from the defaulter disappears and the strength of the clearing house’s default management rests on a combination of the assets it controls and can apply to meet any losses arising from the default and the efficiency of its organisation of the default.

91. In order of recourse in the event of need, CMECE can call upon the default resources shown in the table below. The two Guarantee Funds, defined as the sum of clearing member contributions and CMECE’s
contributions, are sized so as always to cover at least the two largest stress-test modelled hypothetical losses (above initial margin) amongst the clearing membership.

### 6.2 Default Resources of CMECE in Order of Recourse

<table>
<thead>
<tr>
<th>Asset or legal claim, in order of recourse</th>
<th>For exchange-traded derivatives and OTC commodity derivatives</th>
<th>For interest-rate swaps</th>
<th>Comments</th>
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<tr>
<td>A. Assets held by CMECE</td>
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<td></td>
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<tr>
<td>1. Initial margin of defaulter</td>
<td>n/a (1)</td>
<td>n/a (1)</td>
<td>Only the initial margin of the defaulter can be used by CMECE; not the initial margin held in relation to the position accounts of non-defaulting clearing members.</td>
</tr>
<tr>
<td>2. Product Guarantee Fund (2) contribution of defaulter</td>
<td>Minimum of $2mn</td>
<td>Minimum of €20mn (3)</td>
<td>Clearing member contributions can be made in cash or government securities only. The cash and government securities are held in CMECE accounts.</td>
</tr>
<tr>
<td>3. CMECE contribution to product Guarantee Fund (2)</td>
<td>$20mn</td>
<td>€40mn</td>
<td>CMECE’s contributions to the two funds are the cash proceeds of specific capital injections by CME. The contributions are held separately from the general capital of CMECE and are reserved exclusively for use in the event of default.</td>
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<tr>
<td>4. Contributions of non-defaulting clearing members to the product Guarantee Fund</td>
<td>$40mn less the contribution of the defaulter (4)</td>
<td>€80mn (5) less the contribution of the defaulter</td>
<td></td>
</tr>
</tbody>
</table>
B. Legal claims

| 5. Additional funds callable from non-defaulting clearing members under contractual powers (powers of assessment) | $151mn (5) | Variable but no less than €60mn (6) |

Table Notes

92. Initial margin requirements are specific to the position accounts of the defaulter.

93. The default resources that can be used to cover defaults for the two product groups – exchange-traded derivatives and OTC commodity derivatives, and interest-rate swaps – are separate and cannot be used to cover defaults in the other product group.

94. & (5) For the exceptional period at the commencement of IRS clearing a lower minimum of €10mn is applicable. The lower contribution of €10mn is used in the total shown for the contributions of non-defaulting clearing members (5).

95. Exceptionally, the $40mn includes additional CMECE funds to the extent that the contributions of all clearing members (including the defaulter) fall below $40mn.

96. Each clearing member is committed to meet potential assessments equivalent to 5.5 times its Guarantee Fund contribution at the time of the loss-making default if the default resources held by CMECE are inadequate to cover the losses incurred. The $150mn is based on 5.5 times the minimum contributions of the current clearing members less one (the presumed defaulter).

97. The potential commitments under assessments for IRS relate to the stress test modelled losses (above initial margin). Clearing members are notified of the third and fourth largest hypothetical losses amongst the membership, and they are collectively committed to meet assessments equivalent to the sum of the two hypothetical losses. The minimum size of total commitments is set at 50% of the Guarantee Fund (which is based on coverage of at least the two largest hypothetical losses amongst the membership).

Other Financial Resources

98. As explained in the table, the contributions of CMECE to the two Guarantee Funds take the form of supplementary capital that is ring-fenced and held separately from the core capital base of the company.

99. That core capital is not put in place as a potential default resource but rather to cover general business needs and regulatory capital requirements. In that respect it differs markedly in design from the capital of banks which is a key resource to cover the costs of client default. The applicable regulatory capital requirements have been changed by EMIR and comprise additive requirements related to potential wind-down costs, operational including legal risks, uncovered credit and foreign exchange risks, and general business risks.
CMECE meets the regulatory capital requirements with core capital and the capital dedicated to the Guarantee Funds is excluded from consideration.

7. Management of Default by a Clearing Member

100. CMECE’s default rules, which form part of its overall Rulebook (link to website location), explain the steps that would be taken in the event of clearing member default. Those steps range from default declaration by the clearing house, through provisions covering the transfer of client positions and related collateral (‘porting’), to the determination and allocation of ‘net sums’ relating to the net balances of defaulted clearing member’s position accounts after the conclusion of all default management actions.

101. The default rules are framed with reference to UK legislation that affords special insolvency law protection to clearing houses in respect of all cleared contracts, exchange-traded and OTC. CMECE’s settlement finality rules are framed with reference to UK legislation on settlement finality that derives from the European Union directive covering the same subject and provide additional protection and certainty in respect of cash payment and security transfer settlements.

102. Default management follows default declaration by CMECE. The Rulebook provides general powers of default declaration but in practice the most likely triggers are non-payment of margin amounts due to CMECE, an event immediately visible to CMECE if payment is not received by any of its payment deadline times, and an insolvency filing by a clearing member : the two often but not invariably being linked. The CEO of CMECE has the sole authority to declare a default but may choose to convene an Emergency Committee. In the case of the default of MF Global UK Ltd in 2011, the CEO of CMECE declared the default without convening an Emergency Committee. The insolvency trigger was unambiguous although no payment deadline had been missed.

103. Once CMECE has declared a clearing member to be a defaulter CMECE is legally responsible for the open positions of the defaulter in CMECE’s accounts. Until those positions are either closed out or transferred CMECE faces market risk on the open positions. The default rules provide for CMECE:

- hedging risk before close-out or transfer of the defaulter’s positions;
- closing them out by any means;
- allowing them to settle;
- Transferring client positions to clearing member or clearing members that are not a defaulter.

104. In the case of IRS CMECE has introduced a formal approach to default management that involves the convening of a default management committee (DMC) immediately after default declaration to advise the clearing house on hedging the defaulter’s swap positions before the auctioning of those positions. The DMC advisers are drawn from the non-defaulting IRS clearing members and at any given time would be a sub-set, decided by rotation, of the full membership of the DMC. The full membership is involved in regular default management rehearsals (‘drills’).
105. The IRS auction process involves bidding for the defaulter’s hedged positions and all non-defaulting IRS clearing firms must bid for positions in currencies in which they have cleared swaps. Insofar as the prices bid are lower than the current valuation of the defaulter’s positions CMECE would absorb the loss by using available default resources, starting with the initial margin of the defaulter. Because of the clear need to ensure the adequacy of the default resources, the auction rules have been designed to incentivise competitive bidding. There is in effect a tranching and a recourse hierarchy within the aggregate contributions, with seniorised bidders more exposed to their contributions being used than those of juniorised bidders.

106. The timelines for the IRS default management process target conclusion of the auction of the defaulter’s proprietary positions within five days of the declaration of default. Client account positions that in the event could not be ported, would be subject to a parallel process lagged by two days or potentially longer depending on the margin adequacy of the ‘un-portable’ positions.

107. The default management process for non-IRS products is at this stage less formally structured. As mentioned above, hedging is an option to reduce market risk and therefore the erosion of default resources at an early stage. CMECE has hedging and broking facilities, and ad hoc auctions, drawing on the experience of CME in the case of MF Global, are also in the range of default management choices.

8. Governance of Risk Models and Risk Policies and Implementation

108. The risk governance procedures are summarised in the table below.

<table>
<thead>
<tr>
<th>Subject of governance/level of governance</th>
<th>Oversight 1</th>
<th>Oversight 2</th>
<th>Oversight 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design of risk models</td>
<td>Models/significant model changes proposed by risk specialists subject to independent risk evaluation</td>
<td>Review by risk committee (1)</td>
<td>Recommendation of risk committee subject to board approval</td>
</tr>
<tr>
<td>Risk policies</td>
<td>Policies principally subject to independent risk evaluation</td>
<td>All policies reviewed by risk committee at least annually</td>
<td>Recommendations of risk committee on acceptance of and changes to policies subject to board approval</td>
</tr>
<tr>
<td>Maintenance of risk models</td>
<td>Internal reviews of model performance by specialised risk staff including senior risk officers</td>
<td>Management reporting of controls and oversight by senior executive</td>
<td>Internal audit of controls including maintenance of risk models. Oversight of risk committee on basis of reporting on initial</td>
</tr>
<tr>
<td><strong>Policy implementation</strong></td>
<td>Management reporting and oversight by senior executive</td>
<td>Allowable exceptions to policy reported to and reviewed by risk committee</td>
<td>Board oversight on basis of management and audit committee and risk committee reporting</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internal auditing and reporting to audit committee and senior management oversight</td>
<td></td>
</tr>
</tbody>
</table>

*Table Notes*

109. The risk committee comprise risk specialists from clearing member and end-use client firms as well as independent non-executive directors of CMECE, one of whom chairs the committee.

110. In the case of a new risk model or a significant adjustment to an existing model regulatory sign-off is required following completion of CMECE board approval.