Backtesting

Backtesting

Introduction

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." ESMA Article 49 paragraph 1

- LME Clear executes a number of back tests using different parameters and assumptions.

- Where applicable this is performed via factor backtesting and on Clearing Member accounts using portfolio back testing. LME Clear will also use the methodology on back testing the performance of collateral haircuts.

- LME Clear uses the BASEL traffic light approach (BASEL II coverage test) and Kupiec-POF test to analyse the results of backtesting.

Backtesting

Governance - Generic

- Backtesting is performed on a daily basis.

- Any breaches are analysed and reported to the Clearing Risk Committee on a monthly basis.

- At the point at which the number of breaches in a historical look-back period exceeds pre-determined thresholds then this will be immediately escalated to the Clearing Risk Committee with a full explanation and where appropriate the proposed actions.

- A quarterly report will be provided to the Board Risk Committee.

- The results of backtesting will be made available to Clearing Members on a regular basis.

Backtesting

BASEL Traffic Light and Kupiec – POF tests - Generic

- The coverage test has been derived from BASEL II practices to estimate the maximum number of breaches allowed per time window.
- LME Clear chose a traffic light approach that is derived from the Basel II regulation Annex 10a (page 315) which defines three zones; Green, Yellow and Red.
- The Basel Traffic Light approach uses a yellow zone beginning at the confidence interval at 95% of not achieving the stated margin methodology. The red zone begins at the point such that the probability exceeds 99.99%.
- Instead of calculating the start of the red zone as defined by the Basel approach, LME Clear utilises the more conservative Kupiec-POF test at a 99% confidence interval to provide a more statistically robust measure.
- LME Clear calculates the maximum number of breaches allowed per time window derived from the rules above.

Backtesting

Factor Margin Backtesting

- LME Clear performs the backtesting of all SPAN margin parameters using one and two day non-overlapping returns over a rolling period of 500 data points.

- This is carried out by comparing price returns over a one day and two day period against the margin parameter set by LME Clear.

- Margin parameters are compared to a forward absolute return, mirroring what would happen in the event of a Member default where LME Clear Initial Margin would need to cover the price moves on the subsequent days.

- This tests the appropriateness of the rates set by LME Clear and ensures those rates cover both one and two day returns sufficiently.

Backtesting

Factor Margin Backtesting – April 2018 results

- The table below summarises the results.
- For NASAAC a single tier combination shows 10 breaches in the look-back period, with no additional breaches within the recent testing period
- Zinc has been the scope of a specific review presented to the Clearing Risk Committee and resultant actions implemented
- For Cobalt (CO), two tier combinations (Tier 1v1 and 4v5) have 10 breaches following price returns in early and late February 2018. A review will take place but no actions proposed due to materiality - total CO inter-prompt spread charge is only $26,044 (less than 0.01% of IM).
- All other inter-prompt results are within the green threshold
- All scanning range, volatility shifts, inter-currency shifts and inter-commodity spread credits are in the green threshold.

Contract	Scanning Range	Volatility shift	Interprompt
AG	0	-	0
AU	0	-	0
AA	0	1	6
AE	1	-	0
AH	0	3	3
AN	0	-	0
AS	2	-	0
AW	1	-	0
CA	0	5	2
CO	1	-	10
MO	0	-	4
NA	1	4	10
NI	2	5	4
PB	4	5	8
SC	0	-	0
SN	0	3	7
SR	0	-	0
ZS	1	4	10

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Portfolio Margin Backtesting

- The LME Clear risk appetite states that LME Clear's margining model seeks to ensure that at each position account level a minimum 99.5% of observed losses will be less than the initial margin held.

- LME Clear will perform daily portfolio backtesting on all Members, for each position account.

- LME Clear will look to pass portfolio backtesting at a confidence interval of 99.5% on both one day and two day clean P&L.

- All portfolio backtesting will use 500 data points on each account to analyse backtesting results.

- For any new Member accounts, LME Clear will analyse and report on any breaches. However a minimum number of data points are required for the account level portfolio backtesting to be statistically relevant. LME Clear deems 250 data points to be sufficient.

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Portfolio Margin Backtesting assumptions

- While analysing the backtesting results, the known SPAN margin algorithm limitations will be taken into account. Where breaches at an account level are caused by a known limitation, which are managed outside of the Initial Margin calculation, these will be documented. This may require no action to be taken or new model proposed, even if the number of breaches falls into the Red threshold.

- While the backtesting data will use a significant and realistic spread of real portfolios covering a substantial range of instruments and strategies, LME Clear will identify specific hypothetical strategies to prove the effectiveness of the algorithm and backtest these in conjunction with real portfolios.

- For the purpose of further validating the model LME Clear has included fixed representative portfolios within the analysis. This allows LME Clear to perform some relevant statistical analysis.

Portfolio Backtesting – April 2018 results

- The maximum number of breaches on a single member portfolio is one and there are currently no breaches on any hypothetical or representative portfolios. Therefore all results are in the green threshold.

Backtesting

Collateral Backtesting

- Member collateral back testing follows the same reporting and governance process as cleared positions.

- Back testing performed in 2 areas;
  - Risk Factor; Securities – zero coupon curves with volatility converted to prices, Gold – spot prices, FX – spot rates, LME Warrants – cash price
  - Member Portfolio – Position account level, clean portfolio

- Results measured on same Basel II combined with Kupiec-POF basis as margin collateral against a 99.5% confidence level

- Results capture 1,000 data points of 1 day historical movements, 500 data points of non-overlapping 2 day historical movements.