Backtesting of Initial Margin Historical Simulation Methodology

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Objective of Initial Margin (IM)

IM is a collateral deposit, posted by a trading participant to protect against the financial consequences of default.

IM Covers the time period between the last auction clearing and the expected unwinding of the portfolio in the event of default.

IM is **not** a fixed quantity set at the position inception, but is computed and updated at the time of every auction and, if necessary, more frequently.

Review of IM-H Methodology

Simulate scenarios of price movements over the liquidation period for all paths in a portfolio using historical price data

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Use price movement scenarios to generate the distribution of portfolio value changes

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IM is the 1st percentile of the distribution; portfolio value changes are above this quantity 99% of the time

Review of IM-H Methodology (Continued)

Tenor Calculations

- The IM for Balance of Planning Period positions are evaluated by the methodology for each monthly contract. The monthly IMs are then aggregated to obtain one IM quantity for the portfolio.
  - Two aggregation methodologies for computing Balance of Planning Period IM are employed for this backtesting exercise:
    - IM for the Balance of Planning Period = SUM of Monthly IMs
    - IM for the Balance of Planning Period = SQRT (SUM of SQUARES of Monthly IMs)
- The IM for long term positions are evaluated by the methodology for each annual contract.

Review of IM-H Methodology (Continued)

Liquidation Period

- Time period between the last auction clearing and the expected unwinding of the portfolio in the event of default
- Three different liquidation periods were considered
  - To Settlement: Holding the positions until settlement
  - 1: One Auction Period
  - 2: Two Auction Periods

Backtesting Objective

Verify that the failure rate is consistent with target risk percentile fixed in IM calculation methodology.

- Assuming a targeted 99% Confidence Interval, results expected to fall within a 1% failure rate.
- Expected results:
  - Failure rates will fall between 0.5% and 1.5%, whereby
    - ~ 0.5% implies more conservative IM estimations, and
    - ~1.5% implies less conservative estimations

Backtesting Process

Demonstrate that the IM methodology historically behaves as expected.

- Fix FTR portfolios at a particular time in the past, called the **measurement date**
- Calculate IM using historical data prior to the measurement date
- Calculate the actual move of the fixed portfolio over the time period equal to the liquidation period (i.e. 1 Auction Period, 2 Auction Periods, or to Settlement)
- Compare the actual move during the liquidation period with the computed IM
- Repeat this test for various measurement dates
- Compute the **failure rate** which is the percentage of times IM was less than an actual loss

Backtesting Results

Results based on the sum of the monthly IM values as an aggregation method to produce the Balance of Planning Period IM value

Liquidation Period	Failure Rate
To Settlement	0.37%
1	0.31%
2	0.28%

- This result indicates a more conservative approach to the calculation in that the value is less than the expected 1%

Backtesting Results

Results based on the square root of sum of squares to aggregate the monthly IM values into the Balance of Planning Period IM value

Liquidation Period	Failure Rate
To Settlement	2.79%
1	1.78%
2	1.86%

- This result indicates a less conservative approach to the calculation in that the value is greater than the expected 1%

Next Steps

- Continue backtesting analysis and provide results
- Finalize and propose the method of aggregating Monthly Initial Margin values into Balance of Planning Period Initial Margin value
- Discuss and finalize approach to calculating a Total Credit Requirement for FTR positions
  - Considerations of the Total Credit Requirement include, but are not limited to ARR Credits, Mark-to-Auction, per-MWh
- Quantify impacts to Member Portfolios

Appendix
Illustrative Backtesting Example

Illustrative Example - Backtesting Process

Assume historical measurement and/or auction date of 7/1/2018

- The Initial Margin is calculated using historical pricing data prior to 7/1/2018
  - 11 Monthly values are calculated, one each monthly contract from July 2018 through May 2019
  - 3 annual Long Term contract values are calculated, for the 2019/2020, 2020/2021, and 2021/2022 planning years
- Perform calculations for three different liquidation periods
  - To settlement
  - 1 auction period
  - 2 auction periods

Illustrative Example – Backtesting Process

Calculate actual moves; where actual moves = (Price at the end of the liquidation period minus measurement auction price) x MW quantity

The following tables illustrate the end of the liquidation period for the various monthly and long term contracts:

Monthly Contract	Liquidation Period: To Settlement	Liquidation Period: 1	Liquidation Period: 2
July 2018	July 2018 Settlement Prices	N/A	N/A
August 2018	August 2018 Settlement Prices	AUG 2018 Auction Prices for the AUG period	August 2018 Settlement Prices
September 2018	September 2018 Settlement Prices	AUG 2018 Auction Prices for the SEP period	SEP 2018 Auction Prices for the SEP period
…	…	…	…
May 2019	May 2019 Settlement Prices	AUG 2018 Auction Prices for the MAY period	SEP 2018 Auction Prices for the MAY period

Long Term Contract	Liquidation Period: To Settlement	Liquidation Period: 1	Liquidation Period: 2
19/20	19/20 Settlement Prices	19/22 Long Term Auction Round 2 for the YR1 period	19/22 Long Term Auction Round 3 for the YR1 period
20/21	N/A - 20/21 Settlement Prices not available	19/22 Long Term Auction Round 2 for the YR2 period	19/22 Long Term Auction Round 3 for the YR2 period
21/22	N/A - 21/22 Settlement Prices not available	19/22 Long Term Auction Round 2 for the YR3 period	19/22 Long Term Auction Round 3 for the YR3 period

Illustrative Example – Backtesting Process

Compare the actual moves and the IM

- For the Balance of Planning Period the aggregated IM is compared with the sum of actual monthly moves over the liquidation period
  - If the losses of the actual move exceeded the IM, the IM methodology is considered to have failed
- For the Long Term positions:
  - The planning period IM value was then compared with the actual moves for each liquidation period
  - If the losses of the actual move exceeded the IM, the IM methodology is considered to have failed

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