

FEATURE	Simplified Description
1-trading-days-lookback_MELO-hist-orders_buy-over-total-orders_proportion	Measures the proportion of BUY orders compared to all orders in the M-ELO orderbook over the last day, on a per ticker basis, during regular trading hours.
1-trading-days-lookback_MELO-hist-orders_buy-shares-over-total-shares-orders_proportion	Measures the proportion of shares of BUY orders compared to all shares in the M-ELO orderbook over the last day, on a per ticker basis.
1-trading-days-lookback_MELO-hist-orders_unique-firms-total-orders_count	Measures the count of unique firms that placed orders in the M-ELO orderbook over the last day, on a per ticker basis, during regular trading hours.
1-trading-days-lookback_MELO-hist-orders_unique-firms-buy-orders_count	Measures the count of unique firms that placed BUY orders in the M-ELO orderbook over the last day, on a per ticker basis, during regular trading hours.
1-trading-days-lookback_MELO-hist-orders_unique-firms-sell-orders_count	Measures the count of unique firms that placed SELL orders in the M-ELO orderbook over the last day, on a per ticker basis, during regular trading hours.
5-trading-days-lookback_MELO-hist-orders_buy-over-total-orders_proportion	Measures the proportion of BUY orders compared to all orders in the M-ELO orderbook over the last 5 days, on a per ticker basis, during regular trading hours.
5-trading-days-lookback_MELO-hist-orders_buy-shares-over-total-shares-orders_proportion	Measures the proportion of shares of BUY orders compared to all shares in the M-ELO orderbook over the last 5 days, on a per ticker basis, during regular trading hours.
5-trading-days-lookback_MELO-hist-orders_unique-firms-total-orders_count	Measures the count of unique firms that placed orders in the M-ELO orderbook over the last 5 days, on a per ticker basis, during regular trading hours.
5-trading-days-lookback_MELO-hist-orders_unique-firms-buy-orders_count	Measures the count of unique firms that placed BUY orders in the M-ELO orderbook over the last 5 days, on a per ticker basis, during regular trading hours.
5-trading-days-lookback_MELO-hist-orders_unique-firms-sell-orders_count	Measures the count of unique firms that placed SELL orders in the M-ELO orderbook over the last 5 days, on a per ticker basis, during regular trading hours.
1-trading-days-lookback_NBBO-hist-price_average-bam_price	Average of the historical best ask and best bid prices over the last trading day, per ticker, including after-hours trading.
1-trading-days-lookback_NBBO-hist-price_kurtosis-bam_price	Kurtosis of the distribution of historical best ask and best bid prices over the last trading day, per ticker, including after-hours trading.
1-trading-days-lookback_NBBO-hist-price_max-bam-minus-min-bam_price	Maximum difference between the best ask and best bid prices over the last trading day, per ticker, including after-hours trading.
1-trading-days-lookback_NBBO-hist-price_max-spread-bam_price	Maximum spread (difference between highest bid and lowest ask) over the last trading day, per ticker, including after-hours trading.
1-trading-days-lookback_NBBO-hist-price_skewness-bam_price	Skewness of the distribution of historical best ask and best bid prices over the last trading day, per ticker, including after-hours trading.
1-trading-days-lookback_NBBO-hist-price_standard-deviation-bam_price	Standard deviation of the historical best ask and best bid prices over the last trading day, per ticker, including after-hours trading.
5-trading-days-lookback_NBBO-hist-price_average-bam_price	Average of the historical best ask and best bid prices over the last 5 trading days, per ticker, including after-hours trading.
5-trading-days-lookback_NBBO-hist-price_kurtosis-bam_price	Kurtosis of the distribution of historical best ask and best bid prices over the last 5 trading days, per ticker, including after-hours trading.
5-trading-days-lookback_NBBO-hist-price_max-bam-minus-min-bam_price	Maximum difference between the best ask and best bid prices over the last 5 trading days, per ticker, including after-hours trading.
5-trading-days-lookback_NBBO-hist-price_max-spread-bam_price	Maximum spread (difference between highest bid and lowest ask) over the last 5 trading days, per ticker, including after-hours trading.
5-trading-days-lookback_NBBO-hist-price_skewness-bam_price	Skewness of the distribution of historical best ask and best bid prices over the last 5 trading days, per ticker, including after-hours trading.
5-trading-days-lookback_NBBO-hist-price_standard-deviation-bam_price	Standard deviation of the historical best ask and best bid prices over the last 5 trading days, per ticker, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_sum-all-shares-traded_shares	The sum of all the trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_0%-quantile-shares-per-trade_shares	The minimum trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_25%-quantile-shares-per-trade_shares	The 25th percentile of trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_50%-quantile-shares-per-trade_shares	The median trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_75%-quantile-shares-per-trade_shares	The 75th percentile of trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_100%-quantile-shares-per-trade_shares	The maximum trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
1-trading-days-lookback_NBBO-hist-trades_average-shares-per-trade_shares	The mean trade volume over the last day, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_sum-all-shares-traded_shares	The sum of all the trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_0%-quantile-shares-per-trade_shares	The minimum trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_25%-quantile-shares-per-trade_shares	The 25th percentile of trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_50%-quantile-shares-per-trade_shares	The median trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_75%-quantile-shares-per-trade_shares	The 75th percentile of trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_100%-quantile-shares-per-trade_shares	The maximum trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
5-trading-days-lookback_NBBO-hist-trades_average-shares-per-trade_shares	The mean trade volume over the last 5 days, on a ticker-by-ticker basis, including after-hours trading.
timer	The current timer in milliseconds (ranges from [0.25, 2.5] inclusive with a step size of 0.25)
FR	Measures the proportion of simulated trades that get traded compared to the total number of orders, per ticker
step_MO_baseline_AT	Average markout of the trades in the baseline model, weighted by the size of the trade, where markout is negative if the trade is a sell-side trade, using 1 second for the markout window, per ticker.
step_MO_baseline_A	Average markout of the trades in the baseline model, only for the trader adding liquidity, weighted by the size of the trade, where markout is negative if the trade is a sell-side trade, using 1 second for the markout window, per ticker.
step_MO_action_AT	Average markout of the trades made by the agent, weighted by the size of the trade, where markout is negative if the trade is a sell-side trade, and using 1 second for the markout window, per ticker.

step_MO_synthetic_AT	Average markout of the trades made by the agent, weighted by the size of the trade, where markout is negative if the trade is a sell-side trade and a corrective timer of (10-timer) is added for the calculation of markout, using 1 second for the markout window, per ticker.
step_MO_action_minus_synthetic_AT	Difference between the average markout of the trades made by the agent, and the average markout of the trades made by the agent, where the corrective timer of (10 - timer) is added for the calculation of markout, taking into account the size of each trade, where markout is negative if it is a sell-side trade, using 1 second for the markout window, per ticker.
step_MO_action_A	Average markout of the trades made by the agent, only for the trader adding liquidity, weighted by the size of the trade, where markout is negative if the trade is a sell-side trade, and using 1 second for the markout window, per ticker.
step_MO_synthetic_A	Average markout of the trades made by the agent, only looking at the trader adding liquidity, weighted by the size of the trade, where markout is negative if the trade is a sell-side trade and a corrective timer of (10-timer) is added for the calculation of markout, using 1 second for the markout window, per ticker.
step_MO_action_minus_synthetic_A	Difference between the average markout of the trades made by the agent, and the average markout of the trades made by the agent, where the corrective timer of (10 - timer) is added for the calculation of markout, and both average markouts are only for the trader adding liquidity, taking into account the size of each trade, where markout is negative if it is a sell-side trade, using 1 second for the markout window, per ticker.
BUY_trade_qty_mean	The average of buy-side trade quantity that comes from the simulated trades made by the agent's action, per ticker.
BUY_trade_qty_std	The standard deviation of buy-side trade quantity that comes from the simulated trades made by the agent's action, per ticker.
BUY_trade_qty_min	The minimum of buy-side trade quantity that comes from the simulated trades made by the agent's action, per ticker.
BUY_trade_qty_max	The maximum of buy-side trade quantity that comes from the simulated trades made by the agent's action.
BUY_bam_time_of_trade_mean	Average of the best ask and best bid prices, at the time of each trade, per ticker.
BUY_bam_time_of_trade_std	Standard Deviation of the best ask and best bid prices, at the time of each trade, per ticker.
BUY_bam_time_of_trade_min	Minimum of the best ask and best bid prices, at the time of each trade, per ticker.
BUY_bam_time_of_trade_max	Maximum of the best ask and best bid prices, at the time of each trade, per ticker.
BUY_signed_markout_1000ms_bps_mean	Average of the markouts of the simulated trades in the action model, taking into account the size of each trade, where markout is always positive (buy side), using 1 second for the markout window, per ticker.
BUY_signed_markout_1000ms_bps_std	Standard deviation of the markouts of the simulated trades in the action model, taking into account the size of each trade, where markout is always positive (buy side), using 1 second for the markout window, per ticker.
BUY_signed_markout_1000ms_bps_min	Minimum of the markouts of the simulated trades in the action model, taking into account the size of each trade, where markout is always positive (buy side), using 1 second for the markout window, per ticker.
BUY_signed_markout_1000ms_bps_max	Maximum of the markouts of the simulated trades in the action model, taking into account the size of each trade, where markout is always positive (buy side), using 1 second for the markout window, per ticker.
SELL_trade_qty_mean	The average of sell-side trade quantity that comes from the simulated trades made by the agent's action, per ticker.
SELL_trade_qty_std	The standard deviation of sell-side trade quantity that comes from the simulated trades made by the agent's action, per ticker.
SELL_trade_qty_min	The minimum of sell-side trade quantity that comes from the simulated trades made by the agent's action, per ticker.
SELL_trade_qty_max	The maximum of sell-side trade quantity that comes from the simulated trades made by the agent's action.
SELL_bam_time_of_trade_mean	Average of the best ask and best bid prices, at the time of each trade, per ticker.
SELL_bam_time_of_trade_std	Standard Deviation of the best ask and best bid prices, at the time of each trade, per ticker.
SELL_bam_time_of_trade_min	Minimum of the best ask and best bid prices, at the time of each trade, per ticker.
SELL_bam_time_of_trade_max	Maximum of the best ask and best bid prices, at the time of each trade, per ticker.
SELL_signed_markout_1000ms_bps_mean	Average of the signed markouts of the simulated trades in the action model, taking into account the size of each trade, where signed markout is always negative (sell side), using 1 second for the markout window, per ticker.
SELL_signed_markout_1000ms_bps_std	Standard deviation of the signed markouts of the simulated trades in the action model, taking into account the size of each trade, where signed markout is always negative (sell side), using 1 second for the markout window, per ticker.
SELL_signed_markout_1000ms_bps_min	Minimum of the signed markouts of the simulated trades in the action model, taking into account the size of each trade, where signed markout is always negative (sell side), using 1 second for the markout window, per ticker.
SELL_signed_markout_1000ms_bps_max	Maximum of the signed markouts of the simulated trades in the action model, taking into account the size of each trade, where signed markout is always negative (sell side), using 1 second for the markout window, per ticker.
last_step_incl_lookback_BUY_trade_qty_sum	The total buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_BUY_trade_qty_min	The minimum buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_BUY_trade_qty_max	The maximum buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_BUY_trade_qty_mean	The average buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_BUY_trade_qty_std	The standard deviation of buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_BUY_trade_qty_kurtosis	The kurtosis of buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_BUY_trade_qty_skew	The skew of buy-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_SELL_trade_qty_sum	The total sell-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.
last_step_incl_lookback_SELL_trade_qty_min	The minimum sell-side trade quantity that came from the simulated trades made by the agent's action over the last 30 seconds, per ticker.

last_10_min_incl_lookback_SELL_trade_qty_mean	The average sellside trade quantity that came from the simulated trades made by the agent's action over the last 10 minutes, per ticker.
last_10_min_incl_lookback_SELL_trade_qty_stdev	The standard deviation of sellside trade quantity that came from the simulated trades made by the agent's action over the last 10 minutes, per ticker.
last_10_min_incl_lookback_SELL_trade_qty_kurtosis	The kurtosis of sellside trade quantity that came from the simulated trades made by the agent's action over the last 10 minutes, per ticker.
last_10_min_incl_lookback_SELL_trade_qty_skew	The skew of sellside trade quantity that came from the simulated trades made by the agent's action over the last 10 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_sum	The total buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_min	The minimum buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_max	The maximum buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_mean	The average buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_stdev	The standard deviation of buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_kurtosis	The kurtosis of buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_BUY_trade_qty_skew	The skew of buyside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_sum	The total sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_min	The minimum sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_max	The maximum sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_mean	The average sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_stdev	The standard deviation of sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_kurtosis	The kurtosis of sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
last_30_min_incl_lookback_SELL_trade_qty_skew	The skew of sellside trade quantity that came from the simulated trades made by the agent's action over the last 30 minutes, per ticker.
asks_left_in_book	The total amount of eligible shares per price level on the ask side, that remain in the melo order book at a given point in time, per ticker.
bids_left_in_book	The total amount of eligible shares per price level on the bid side, that remain in the melo order book at a given point in time, per ticker.

Glossary:

Agent	Used interchangeably with the Dynamic M-ELO Reinforcement Learning based holding timer deciding system, excluding the Instability Protection System. See White Paper, section 3.1, "Reinforcement learning"
Simulation	Replication of the M-ELO trading environment with varying holding period timer, which allows for the model to interact and learn about optimal market conditions. See White Paper, section 3.2, "Developing a Simulation of M-ELO with a Non-Static Holding Period"
Synthetic	Evaluation of trade conditions corresponding to shifting the timestamp at which a trade occurred, per our simulation, to the timing corresponding to a hypothetical analogous trade with a static timer of 10ms, to ensure that we measure gains in a comparable, fair scale. See White Paper, section 5.1, "How are Gains Measured?"
Standard Deviation	Standard deviation measures the spread or dispersion of data points around the mean. It indicates how much the values deviate from the average.
Skewness	Skewness measures the asymmetry of a probability distribution. It indicates whether the data is skewed to the left (negative skew) or to the right (positive skew) of the mean.
Kurtosis	Kurtosis measures the peakedness or flatness of a probability distribution. It indicates whether the data has a sharp peak (leptokurtic) or a flatter shape (platykurtic) compared to a normal distribution.
Markout	See White Paper, section 2.2.1, "Defining Fill Rate and Markout"
Fill rate	See White Paper, section 2.2.1, "Defining Fill Rate and Markout"
Buyside trade attribute	Evaluation of trade attributes corresponding to the perspective of the buyer of the instrument
Sellside trade attribute	Evaluation of trade attributes corresponding to the perspective of the seller of the instrument
White Paper	Diana Kafkes et al., "Applying Artificial Intelligence & Reinforcement Learning Methods Towards Improving Execution Outcomes," SSRN, October 19, 2022, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4243985 (the "White Paper")