



LIQUIDITY PROTECTION RULE

The purpose of the CODA Liquidity Protection Rule* (LPR) is to prevent a CODA Fuse or CODA Block auction from moving a stock's price an unreasonable distance based on the size of the print and the liquidity profile of the stock. The rule is driven by an equation that is calibrated individually for every stock based on the pattern of its trades over the last 20 trading days. The calibration methodology is designed to reflect the typical price variance of each stock as a function of its notional turnover. The LPR takes the size of a CODA print as an input and returns the maximum distance the CODA engine will allow the auction to go up outside the NBBO as the output.

1

Trade Data Filtering

The calibration acts on all regular way trades reported to the SIP during regular market hours, exclusive of opening and closing auction volume as well as other trades that appear to be reported out of sequence or are otherwise unrelated to the prevailing market conditions.

2

Data Point Generation

For every trade, 5 windows are randomly created spanning sequential trades summing to a notional value of \$100k - \$250MM. The price variance of the trades in the window is measured, creating a large set of (window size, price variance) data point pairs.

3

Regression Calibration

All data point pairs spanning the most recent 20 trading days are aggregated and organized into bins of similar notional value. A regression runs upon the median price variance for each notional bin to generate an equation that characterizes price variance as a function of notional turnover.

4

Optimizations

Several rules are applied to ensure that the results don't offend our common sense, including but not limited to: a. Enforce monotonicity - the equation curve is flattened out if necessary to guarantee that it never has a negative slope, i.e., it never gives a smaller answer for a larger number of shares b. Not enough data - if a symbol does not trade enough to generate a statistically significant number of data points, we default to logic that hardcodes the LPR value at twice the average daily range of the stock, regardless of auction size. In such stocks, the minimum CODA auction size is large relative to the stock's ADV so a more granular determination of a reasonable distance to move the stock's price cannot be made.

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Open: Price and size of opening print from primary market for prior trading day; 5 and 20 days averages of size only.

Close: Price and size of closing print from primary market for prior trading day; 5 and 20 days averages of size only.

VWAP: Volume Weighted Average Price of regular way trades during regular market hours (exclusive of opening & closing volume).

NBBO Median: Typical size found on one side of the NBBO. Calculated as follows: all exchange quotes are aggregated and the total size (bid size + offer size at the NBBO). The median value is divided by two and reported in shares and notional terms.

NBBO Spread: Typical NBBO spread width. Calculated as follows: all exchange quotes are aggregated and the NBBO spread width is calculated for each unique state of the NBBO. The median value is reported in dollar and notional terms.

NBBO Midpt Change: Likelihood the NBBO midpoint will change in a random 100ms window of time. Calculated by dividing the trading day into 100ms segmented and counting what % of them contains NBBO midpoint change.

Please visit www.codamarkets.com & register to access the CODA Liquidity Protection Rule Calculator.

*The Liquidity Protection Rule is the result of data analysis performed by ALISA (Advanced Liquidity Studies and Analytics), a data platform operated by PDQ Enterprises, LLC.

LIQUIDITY PROTECTION RULE CALCULATOR
A for 09-24-2021

Ticker: A
Type number of shares: 2000
Min Trade Size Outside NBBO (shares or \$): 2,000 or \$10,000
Assumed Stock Price: \$172.45
Notional Value: 344,900

Symbol Data	09-24-2021	5-days	20-days
Open	16,583 @ \$172.09	size: 18,651	size: 26,343
Close	109,518 @ \$172.40	size: 138,955	size: 186,573
VWAP	\$172.45	\$170.70	\$174.06
Price Range	\$1.91 / 110.76 bps	\$2.49 / 144.00 bps	\$2.92 / 167.00 bps
Largest Print	5,000	8,846	24,010
Volume	657.11K	857.65K	963.49K
Notional	\$113.32MM	\$147.49MM	\$168.2MM
Trades	15,469	19,907	20,446
NBBO Median Size	300/\$52k	300/\$51.5k	300/\$53.5k
NBBO Spread	\$0.07 / 4.07 bps	\$0.09 / 4.90 bps	\$0.07 / 3.94 bps
NBBO Midpt Change	4% (100ms)	5.00% (100ms)	4.00% (100ms)

7.88 (bps)
0.14 (\$)

More Info

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In this example, a trader has queried the Liquidity Protection Rule value for 2,000 shares of symbol A. Based on an analysis of all trades in A over the last 20 days, the LPR Calculator has returned that the maximum distance outside the NBBO that the LPR will allow CODA to print 2,000 shares of A is 3.76 basis points or \$0.07.