-- Technical Paper Series --

Deriving the NBBO from TAQ Level 1 Quotes

A Guide to Calculating the NBBO for US Equities

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Summary

Tick Data's US Equities data set is based on the TAQ (Trade And Quote) database administered by NYSE. It contains level 1 quotes and trades from all the exchanges that contribute to TAQ. Our level 1 quotes are provided as a time series, and are sorted by time. This document describes a method which may be used to derive the National Best Bid and Offer (NBBO) for a US equity from our quote data. Please note that there are alternative methods for determining the NBBO, which are equally valid. This document solely deals with the methodology that Tick Data uses.

Process

To derive the NBBO for an equity you must evaluate each quote for that equity in chronological order.

The first step is to determine whether the quote should be considered for NBBO. Tick Data employs the following criteria to eliminate a quote from NBBO consideration:

- If the quote is crossed (bid price > ask price) – eliminate quote
- If the quote ask price or bid price is 0 (zero) – eliminate quote

NOTE: It may be desirable to eliminate quotes based on other criteria, such as: a spread greater than an absolute value, a spread that is greater than a function applied to the prices, prices which differ from the previous NBBO by some weighted value, or if one side meets a criteria such as bids of .01 or asks of an absurd value such as 999999. Market makers regularly make such quotes with ridiculous spreads and these quotes typically should not be reflected in the NBBO.

If a quote is deemed worthy for NBBO consideration, then the next step is to add the current quote to a list of prevailing quotes by exchange. The prevailing quote for an exchange is the most recent quote for on that exchange.

From the list of prevailing quotes by exchange, you then determine the best (maximum) bid price, and the best (minimum) ask price.

Next, using your prevailing quote list, sum the bid sizes for quotes at the best bid price, and sum the ask sizes for the quotes at the best ask price.

The result is the NBBO at the time of the quote.

Finally, it is only valuable to print the NBBO if it has changed from the previous NBBO. That is, if the bid price, bid size, ask price or ask size has changed.

Example:

Take this snippet of a time series for MSFT on 01/30/2007:

Time	Bid	Ask	Bid Size	Ask Size	Exchange
09:45:00.114	30.4	30.41	19	15	D
09:45:00.368	30.4	30.41	23	76	C
09:45:00.378	30.4	30.41	41	76	C
09:45:00.420	30.4	30.41	51	105	P
09:45:00.620	30.4	30.41	61	105	P
09:45:00.729	30.39	30.4	132	1	T
09:45:00.730	30.39	30.4	132	3	T

At time 09:45:00.730 the prevailing quote list would look like this:

Time	Bid	Ask	Bid Size	Ask Size	Exchange
09:45:00.114	30.4	30.41	19	15	D
09:45:00.378	30.4	30.41	41	76	C
09:45:00.620	30.4	30.41	61	105	P
09:45:00.730	30.39	30.4	132	3	T

Sum the Bid Sizes at the Best Bid, which is $30.40. So you add 19 + 41 + 61.
Sum the Ask Sizes at the Best Ask, which is $30.40. There is only one, so you get 3.

The resulting NBBO would look like this:

Time	Bid	Ask	Bid Size	Ask Size
09:45:00.730	30.4	30.4	121	3

This would be compared against the previous NBBO, and if it differs, then you would print this as the NBBO.