

Dear Sir / Madam,

18th January 2017

RE: SR-NYSE-2016-92, 34-79730

Large exchanges are essentially monopolies because of their captive customer bases. While the financial products traded on an exchange are indeed fungible, an exchange's supporting data products and services are not. In particular, the larger an exchange is, the more powerful its monopolistic power.

Exchange Revenue Generation Disguised as Innovation

If an exchange introduces a 'speed advantage' product, every participant that requires lower latency, is now forced to buy that product, or be left at both a speed and commercial disadvantage.

Examples of these 'innovations' include - colocation, direct feeds and even low latency direct feeds. Quite alarmingly, as products grow in data volumes, so do an exchange's ability to charge more in bandwidth fees, for its 'fat' data products.

Every time a large exchange makes the market 'better' through innovation, customers are forced to pay for the upgrade. Customers are even coerced to buy 'B' feeds, as insurance from an exchange's mistakes and then pay extra for the additional network bandwidth consumed. What a great business!

Cap Exchange Fees

At what point do exchange market data prices become too exorbitant? Is it OK that NYSE arbitrarily increases prices +10% and simply modifies a few descriptions to 'shield' its price hikes? Why are some exchange's market data prices, hundreds of thousands of dollars and another's zero dollars?

NYSE Market Data 'Quality'

I do not believe it is appropriate that the NYSE increase ANY prices. Since NYSE has MANY market data quality issues (see Page 3 onwards) and its non public disclosure of those issues. Shouldn't customers get rebates for NYSE's market data problems?

Can a Leopard Change its Spots?

It is possible that NYSE has fixed the 'whistle blower' problems I identified to the SEC, but since NYSE was unaware of these issues and struggled to comprehend them, when they were initially raised, it is doubtful NYSE fixed every problem and probably still has 'spot' problems.

Kind regards,

Massoud Maqbool
SEC Whistle Blower Contra NYSE
CEO Latency Innovation

- The following pages are **NYSE PROBLEMS EXCERPTS**, from material I provided the SEC as an official SEC, contra NYSE, whistle blower. I was actually waiting for the SEC to finish its investigation before I published this material, but given the unexpected presidential election of “Tiny GoldFinger” and the knock-on expected changes at the SEC, its better to put this into the public domain now. I’d also like to take this opportunity to write the word ‘kompromat’ before it gets banned, by presidential order, from ‘the cyber’;-)
- It is important to note that I went to the NYSE first- BEFORE I went to the SEC. Unfortunately the NYSE believed, “as the world’s largest exchange, with some of the world’s most sophisticated clients”, that it was highly unlikely my research was correct.
- In fact, NYSE initially laughed, when I raised problems I had discovered with its systems and market data, but after months of contesting my research, it finally conceded to me and the SEC, that it did have market data problems it was unaware of.
- Initially, NYSE did not believe it had sequence ordering and time stamp problems that corrupted the order book. The irrefutable erroneous time stamp evidence I provided NYSE (Page 6), forced them to finally accept it was wrong.
- The erroneous time stamps means clients probably made ‘faulty trades’ because of incorrect pricing data. Financial losses as a result of trading off corrupt data will be firm specific. I can understand why NYSE has not discussed this publicly. The liabilities are enormous.
- Unfortunately what’s worse for NYSE, its Time Source based, primary data sorting methodology exposes a fundamental misunderstanding of basic software design...For some reason, NYSE’s clients didn’t identify this critical design flaw either. Not having any unique sequence numbers didn’t help them either!
- Enjoy;-)

NYSE's Book Has NO Unique Event Identifier!

- NYSE uses Source Time as its book's sorting identifier.
- However, since multiple events can occur within the same time period, Source Time stamps will not be unique and cannot be used to determine the correct order/occurrence of each book event.
- If a unique identifier is not employed, when an update occurs it can become impossible to determine the correct order of an event's occurrence. Since NYSE has time stamp problems determining the correct order of events will prove especially problematic.
- If events are processed in the wrong order there is a high probability that book errors will occur.
- Worse! Using time stamps as the main identifier or 'primary key' exposes a weak understanding of computer systems, networks and time.
- NYSE's Message and its Source Sequence numbers are also not unique! Multicore servers, preemptive operating systems, multi-threaded software, GPUs and FPGAs all process data in parallel. NYSE can not guarantee its clients process its data in the correct expected order.
- Without a unique identifier, NYSE's clients will process events in an unpredictable order with unpredictable results.
- It's highly probable NYSE's erroneous pricing data resulted in 'bad' trades by its clients.

NYSE Common Order Book Data Pattern

My SeqNo*	Msg SeqNo	Src Seqno	Send Time	Symbol	SrcTime milli	SrcTime micro	Price	Volume	Side
218095	148890	102	34364808	TXN	34364807	843	32.5	0	B
218096	148890	102	34364808	TXN	34364807	843	30.82	0	B
218097	148890	102	34364808	TXN	34364807	843	29.14	0	B
218098	148890	102	34364808	TXN	34364807	843	27.46	0	B
218099	148890	102	34364808	TXN	34364807	843	25.78	0	B
218100	148890	102	34364808	TXN	34364807	843	24.1	0	B
218101	148890	102	34364808	TXN	34364807	843	22.42	0	B
218102	148890	102	34364808	TXN	34364807	843	20.74	0	B

- The above is a typical pattern of multiple OpenBook Ultra feed records. They have the **SAME** Message Sequence Number, Source Sequence Number AND Source Time (milli and micro secs).
- Since Source Time is **not unique** it should never have been used as the primary and only sort identifier!
- This pattern typically appears with decreasing price numbers for Bid/increasing numbers for Sell. It would suggest the “book snapshot” is **always ordered**....but it is **not**.

*Note: Since NYSE does not employ a unique sequence number, in order to do this research, I added my own unique identification number (My SeqNo) for each trading day's data. This number is an ordered incremental sequence number for the total daily data file (not per Symbol). Which means sequence numbers will always be unique and increase, but may not be consecutive per Symbol, this is expected and ok.

But This Pattern Also Occurs!

My SeqNo	Msg SeqNo	Src Seqno	Send Time	Symbol	SrcTime milli	SrcTime micro	Price	Volume	Side
381158	269202	193	34886293	TXN	34886293	580	30.97	100	B
381159	269202	193	34886293	TXN	34886293	580	29.29	100	B
381160	269202	193	34886293	TXN	34886293	580	27.61	100	B
381161	269202	193	34886293	TXN	34886293	580	25.93	100	B
381162	269202	193	34886293	TXN	34886293	580	24.25	100	B
381163	269202	193	34886293	TXN	34886293	580	32.65	100	B
381164	269202	193	34886293	TXN	34886293	580	22.57	100	B
381165	269202	193	34886293	TXN	34886293	580	34.12	100	B

- Typical OpenBook Ultra pattern with the **SAME** Message Sequence Number, Source Sequence Number and Source Time (milli and micro secs), BUT with '**UNORDERED**' price numbers. Is the book supposed to be ORDERED or UNORDERED?
- It is possible to order this data INCORRECTLY based on NYSE's book logic, since NYSE requires data to be sorted by Source Time, which is not unique, neither are NYSE's Msg or Src Sequence numbers. Any '**zero**' volume (cancellation/removal events) may be processed in the wrong order and corrupt the order book.
- NYSE's incorrect design methodology means its clients have no way to process its data accurately – since NYSE did not employ a UNIQUE sequence number as a 'primary key'!

But there is “Worse” - WRONG Time Stamps!

On this particular day there were at least 500,000 incorrect time stamp errors during normal trading hrs

My SeqNo	Msg SeqNo	Src Seqno	Send Time	Symbol	SrcTime milli	SrcTime micro	Price	Volume	Side
15246993	10735188	426391	49768631	AIG	49768631	674	36.34	0	B
15246994	10735188	426391	49768631	AIG	49768631	674	36.35	4140	B
15246995	10735189	426392	49768631	AIG	49768631	793	37.13	0	B
15246996	10735189	426392	49768631	AIG	49768631	793	37.14	1300	B
15247001	10735194	426394	49768638	AIG	49768638	324	37.52	2700	B
15247002	10735195	426395	49768638	AIG	49768638	324	37.53	100	B
15247005	10735197	426396	49768638	AIG	49768638	324	37.53	200	B
15247006	10735198	426397	49768638	AIG	49768638	450	37.52	2600	B

Note: In the original image, the SrcTime micro for the row with price 37.52 is 450, which is lower than the preceding row's 324. A red arrow points to this value with the text: "Wrong time"- this number is lower than the preceding!

My SeqNo	Msg SeqNo	Src Seqno	Send Time	Symbol	SrcTime milli	SrcTime micro	Price	Volume	Side
23894877	16664578	300691	54225651	CRM	54225651	283	165.76	100	B
23894879	16664580	300693	54225652	CRM	54225652	45	165.55	100	B
23894881	16664582	300695	54225652	CRM	54225653	217	165.76	100	B
23894883	16664584	300696	54225653	CRM	54225653	217	165.76	100	B
23894888	16664589	300701	54225654	CRM	54225654	217	165.76	100	B

Note: In the original image, the SrcTime micro for the row with price 165.76 is 217, which is lower than the preceding row's 45. A red arrow points to this value with the text: "Wrong time"- this number is lower than the preceding!

- Users of NYSE’s real time feed will face unpredictable results, including the possibility of prices being 'reshuffled' or discarded because the 'next' price's time is earlier than the 'current' price’s time and is 'out of sequence'.
- NYSE’s book building methodology means all users of its historical/replay data will have book ordering errors.
- If NYSE employed a unique sequence number, many (but not all!) of the problems would be eliminated.

Summary

- NYSE software design approach is fundamentally flawed.
- Book flaws will materialize in multiple cases and will impact prices at all levels
- NYSE has significant time synchronization problems at network and server level.
- These problems could have quite easily been avoided.
- NYSE should seek external help – cannot rely on those who created the problem to develop solution.
- NYSE should inform customers quickly!

- **UPDATE: Please note NYSE attributed the 'wrong' time stamp errors to a software rounding error it had and was not previously aware of. At this point it is still unknown if NYSE has additional problems with monotonic time.**