

Low intensity competition for prosperity of overall markets

Market data reform was originally a raised concern for fairness of access and cost burden for market participants. The Financial Conduct Authority (FCA) said the [Consolidated Tape \(CT\) for UK equities would not happen until 2028](#) is in effect a diplomatic move without saying the obvious. The European Securities and Markets Authority (ESMA) [MiFIR Review Final Report](#) contains FATAL FLAWS that will lead the European equities markets to a death spiral. [Switzerland](#) is NOT a part of the EU. It may sit on the fence and observe if other National Competent Authorities (NCAs) REJECT this faulted 'Regulatory Technical Standards' (RTS) at the European Commission (EC) level. Meanwhile, the US Market Data Infrastructure Rule ([MDIR](#)) is set to be implemented in November 2025 with [odd-lot](#) information to be included by May 2026. The following pinpoints the key flaws and how to turn it around positively for the best interest of investment firms and the overall markets.

Flaw #1: Timing Mismatch of European Best Bid & Offer (EBBO) and the Most Relevant Market in terms of Liquidity (MRMTL)

ESMA opted for anonymity of trading venue with the best price, yet they ask the CT provider to show the MRMTL that is calculated annually per [Article 4 of Commission Delegated Regulation 2017/587](#), alongside the real-time EBBO. The public will be misled! It is a deliberate act to direct order flow to the larger exchanges, when the smaller / remote exchanges or multilateral trading facilities may have the best price and sufficient quantities to fill orders. Not only is it counter-productive to the [CMU](#) or the new '[Savings and Investment Union](#)' (SIU) objective, with its intent to *"attract institutional investor participation, better connect savers and borrowers irrespective of their geographical location, and ensure that ordinary savers can benefit from the wealth creation of the corporate sector"*, Europe is digging its own grave – money would flee when markets can no longer be trusted!

Flaw #2: One single currency to represent both the best bid and the best offer in Europe

Following Flaw #1, where larger exchanges have dominated turnover volume, especially during close and/or open. It is likely that smaller or remote trading venues will rarely be reported on the MRMTL because of the bias. The next distortion is which currency to show for EBBO. Securities in Europe can be denominated in various currencies other than Euro. The best bid could be in Swedish Krona, while the best offer in Sterling Pound, or vice versa or a mix of different currencies. Pairing the best bid and the best offer is indeed concentrating volume at the larger exchanges. It reduces the serendipity of cross-market trading opportunities. Rail ticketing in Europe accepts different currencies. It is one of its conveniences, how can the EU equities CT not to have real-time multi-currencies capabilities?!

Flaw #3: Tolerating latency timeliness standards and leaving loopholes for ecosystem degradations

It is totally practical for CT to mimic how High Frequency Trading firms (HFTs) aggregate ultra-low latency data across venues. Yet, ESMA relaxes the *"as close to real time as technically possible"* clause to allow Exchanges and Approved Publication Arrangements (APAs) transmit data to the CT Providers within 50 milliseconds with a 95% confidence interval from the timestamp of the order submission for pre-trade data. The Europe CT's benchmark should be at least better than the US SIP [realized latency in tens of microseconds](#), amid those that subscribe to PPs are receiving more detailed data in nanoseconds or microseconds at most. One of the US Consolidated Audit Trail [fatal flaws is its 50± milliseconds tolerance](#). Hundreds-of-thousands trade messages at any given point in time is not suitable for analytics. Although ESMA preserved the timestamp granularity for trading venues with a gateway-to-gateway latency below 1 millisecond to be set at 0.1 microseconds, the amendment to Regulation (EU) No 648/2012, and Article 22c grants a Maximum Divergence from UTC of 100 microseconds is a loophole. There is no obligation for Exchanges or APAs to report *"clock drift averages and peaks and number of instances of clock drift greater than 100 microseconds"*.

The ESMA's expectation of "data contributors send the data to the CT Provider as soon as possible and without artificial delays compared to sending of data for other purposes, including proprietary feeds, to meet such requirements" is substantially weaker than the US Securities and Exchange Commission (SEC) Rule 603(a) that "*prohibits an SRO from making NMS information available to any person on a more timely basis.*" The SEC recognizes the Securities Information Processors (SIPs) were not modernized alongside markets evolution and technologies development; therefore, it requires the "*same manner same methods*" provision (see page 186 or footnotes 608 and 609 of MDIR). Yet, we argue that the US SEC MDIR does not go far enough because [Co-location ≠ Latency equalization ≠ Market data available Securely in Synchronized Time](#).

Shared versus dedicated switch, temperature, network time rather than precision time protocol, etc. can affect performance and influence the EBBO spread. What you see may not be what you get. One will need to upgrade to higher bandwidths and add depth-of-book data, or else face being disadvantaged to proprietary feed subscribers. Trading venues' products differences are often determining success or failure in a few nanoseconds and/or altering bandwidth for blocks. Losing a few basis points per trade could accumulate to hundreds of millions if not a billion.

Flaw #4: Crappy clauses such as 'authentication, authorization, and non-repudiation' is within the RTS requirement

Did ESMA forget that they once acknowledged these concerns raised by market participants – "*(i) onerous administrative obligations on data users, for example through frequent and detailed requests on the use of data; (ii) ambiguous language in the agreement; (iii) frequent unilateral amendments to the agreement; (iv) general lack of transparency on terms and conditions; (v) excessive fees; (v) increase of fees through penalties; and (iv) overly burdensome audits*"?! Investment firms want to have Enterprise license with free redistribution on '[fair use](#)' basis, rather than all the onerous and burdensome charges per device, professional/ non-professional users fees, and restricted redistribution of data contents that were originally [belongs to the broker-dealers](#) themselves. The [Facebook case](#) affirmed that contents (quotes and trades contributions) belong to the content creators (broker-dealers with passthrough back to retail), NOT the streaming platforms (stock exchanges). [Empirical evidence](#) proves Exchanges optimally restricting access to price information is undeniable. It exacerbated the latency gap between Proprietary Products (PPs) and CT that caused data fragmentation. If NCAs are not rejecting the faulted RTS at the EC level, the public would feel betrayal. Elites in alleged cahoots with politicians rather than upholding justice leads to social unrest and possible change in regimes as seen all around the world.

Flaw #5: Denial of innovations and lack understanding of how encryption can level playing field and lower costs

ESMA's statement of "*innovation-related aspects are not of direct relevance to the specific nature of the proposed RTS on the input/output data RTS*" reflected their naivety. Not sure if this [poorly written EC equities DEG report](#) (that I refused to have my name affiliated with) has swayed the RTS. I urge policy makers around the world and the broader industry to distinguish truths versus myths.

- (i) EuroCTP partners with Amazon Cloud, may use AWS "time sync service" over Network Time Protocol (NTP) has an observed accuracy around 400 microseconds that is insufficient for some applications that require even higher precision. We at Data Boiler advocate for Precision Time Protocol (PTP) which is widely used by HFTs and is substantiated to improve performance and reduce the observed error to under a microsecond (see [this](#)). The unmerited or non-substantiated "stab" at PTP by the EC equities DEG report was 'a clumsy denial resulting in self-exposure' of their incapacibilities.
- (ii) Field program gate array (FPGA) enables execution of a trade at as little as 13.9 nanoseconds which is documented in the [STAC-TO benchmark report](#). FPGA hardware acceleration can [reduce server resource consumption](#) by as much as 10-20 times. FPGA has been adopted in [processing market data](#) with tremendous successes, blowing the competition away.
- (iii) [Time-lock encryption](#) (TLE) was first invented in 1976, the widely used RSA algorithm was used since 1999. Even the online gaming industry is using it to promote fairness, yet the electronic trading equities market is behind. Those who can afford proprietary feeds or data center co-located trading venues have an unfair advantage to access market data ahead of the general public and the remote venues. The phenomenon is like [Animal Farm](#).

The purpose of requiring Encryption is NOT ONLY about confidentiality of data. Given the geographic disperse of trading venues, the way for CT to overcome 'latency hop' is by having a [SECURE and SYNCHRONIZED start line](#) and going fast by traveling light (i.e. streaming only the essential core data for pre-trade equities tape with data compression). TLE eliminates the problem of where the CT data center is located. Thus, the financial industry no longer needs to be subservient to telecom vendors and move away from overcrowded data centers to other remote locations that offer cheaper prices, hence saving money for the public in the long-term.

Indeed, one of the root causes of rising market data and connectivity costs is related to trading venues passing on fee increases by [data centers](#) and telecom infrastructure vendors to market participants. The latency arms race bids up the infrastructure costs and waste energy. If TLE can be implemented throughout the US, Texas Stock Exchange and other trading venues' data centers would not need to be concentrated in or near Secaucus, Mahwah, Carteret, but could move back to their home states to benefit the local economy and lower costs. Same goes with Europe.

As trading volume may be maturing in London, Paris, and Frankfurt (amid "*participants on Euronext Paris and London Stock Exchange set a new EBBO price substantially more frequently than CBOE, Aquis, and Turquoise... In Germany, Xetra improves the EBBO less often than both Aquis and CBOE*" per [research](#) by Plato Partnership), Eastern Europe presents itself at a driver of fast growth for the EU. Eastern Europe may replicate the success of Nordic markets in equities trading despite their currencies not being denominated in Euro. TLE would provide seamless trading experience across Europe and infuse trust by providing a level playing field to draw institutional and retail investors to increase participation. Nevertheless, CMU / SIU emphasized "*irrespective of their geographical location*". Instead of skewing policies toward Euro based trading centers in central Europe, let's give smaller and remote trading venues a fighting chance to flourish by adopting TLE.

The secret ingredients of how the US equities markets have structural advantages over Europe and others:

- a) Canada spent approximate 60% of their retail trading platforms' total cost on subscription and redistribution of market data. Europe and other regions would not be far off from this number if they purchase depth-of-book feeds from respective trading venues or non-display vendors. Whereas in the US, non-display direct access is indeed subsidizing display indirect / internet access, hence US retail platforms are able to offer zero trading commission and other investor education programs that other markets cannot.
- b) Investment firms in the US, including Self-Aggregators (SAs) and Alternative Trading Systems (ATs), the equivalent of Multilateral Trading Facilities (MTFs) in Europe, connect to 30+% less trading venues in average instead of all the 11 most active PPs to save costs. This [SIFMA / BCG analysis](#) provides valuable insights into different categories of firms and their respective spending on a mix of the US SIP / CT with selected PPs. One does not need to know how many people are in queues of all markets across European markets if he/she may be shopping within neighborhood distance.
- c) From the [NASDAQ SIP Accounting 101](#), tech / running cost is approximately 6% of SIP total revenue, the remaining US\$424 million per annum in quote and trade revenue are indeed being split between trading venues to divide the cake. This source of income from 'Revenue Distribution Scheme' (RDS) in turn is used by Exchanges to pay for 'access fee rebates', similar to market-makers' payment for order flow (PFOF). Park aside the alleged potential conflict of interest, to some extent the rebates serve in effect as an incentive or a royalty payment to reward the order flows bring-in by the elites (see [this](#)). The US\$400+ million can be used towards a lot of good, the only trouble is – the payout is not standardized, i.e. some got 32 mils in super tier rebates, some got nothing. The SEC's access fee cap update is a wrong dose of medication, the 'Haves' never worry about insufficient incentives to go around in markets because they can exploit or squeeze the 'Have-Not' (see [this](#)).

Amid the EU goes with 'Reasonable Commercial Basis' (RCB) for regulatory price control, and the elements of RDS consisted of 'small trading venue', 'young instruments', and 'pre-trade transparent trading venue' that carry the highest to lowest respective weight in computing how the cake would be divided. It omitted a key component of an equitable incentive to reward broker-dealers and trading platforms on new natural liquidity in improving the overall trading

volume of European markets. Do not get us wrong, we are NOT against stock exchanges. Just that RDS should cover data, connectivity, and API testing costs, while any upside of revenue sharing to trading venues and APAs should be based on growing the overall pie in increasing the Europe markets total trading volume, rather than compensate for potential lost in PP revenue.

We at Data Boiler, computed 5 scenarios:

- Scenario 1 (S1) is a Display indirect / internet access CT that is priced with onerous fee categories similar to the existing PPs or the US SIPs. Without the non-display direct access subsidization, trading venues' lead CT contender(s) would not mind the CT acting as a "SECOND LINE PRODUCT", fund and pay for by the public to generate additional profits for them, so long as CT does not compete with PPs. S1 would push "total spend" on equities market data and connectivity across PPs, vendors' solutions, and CT to be up at least 5% on top of a year-on-year increase of 7.1%.
- S2 is a scenario modeled after the US SIP's subscription mix, where approximately one-third of CT subscribers would choose non-display direct access. Our results show that, not only S2 can proportionally lower price to both direct and indirect access fees by at least 15% than S1, the onerous of per device, prof. vs non-prof. users, redistribution fees can also be waived to grant investment firms the enterprise license in 'fair use' of data per their request. We envisage S2 would avert the 7.1% year-on-year increase and lower the "total spend" by 1.5%.
- S3 is a scenario where direct access subscription reached critical mass. S3's price can proportionally lower by up to 20% than S2, while the subsidization effect would lower the indirect / internet access fee to as little as €100 per month, assuming an annual cost of living adjustment of 3% compares to today's inflation rate. We believe if more market participants adopt electronic trading and encourages cross-trade over 2 or more platforms (especially for trading venues in remote locations) would improve the 4Vs – 'variety' and 'veracity' in price discovery, 'velocity' in EBBO refresh rate, and total trading 'volume' for healthy development of European markets. Under S3, we envisage the industry would yield over 5%, or over US\$100 million, in overall savings on their "total spend".
- While S3 is the optimal point, where CT Provider should be rewarded in delivering a truly usable CT in benefiting the investing community, we simulate a S4 scenario to assume further price drop of CT in an intense rivalry with the PPs. We foresee the "total spend" would achieve 10+% savings, which is good for the markets but hurting trading venues and a diminishing return for the CT Provider. Our pricing mechanism ensures a smooth transition to new equilibrium rather than overly disruptive to shaking the bread-and-butter of Exchanges' PPs' revenue stream.
- S5 is a full-fledged price war scenario, where the frienemies equilibrium between CT Provider and vendors' value-added services would be broken for a 20+% reduction in "total spend" compares to today's market size. Under S5 the diminishing return for CT Provider would exacerbate (back to S1 or S2), while some smaller vendors may not survive or be merged with larger players. The evolution from S1 to S5 could be a roadmap for a healthy market data reform over a 10-years racecourse with flexibility to respond to changes in PP, vendors, and CT dynamics. The mechanism sets the CT as a reasonable compromise, but not a close substitute product to PPs, while encouraging modernization of CT alongside markets evolution and technologies development. It is the ONLY effective way to achieve the regulatory goal in applying the right amount of *"competitive pressures for existing sellers of market data, resulting in cheaper, higher quality and more accessible data for its users."*
- Amid the initial cost and energy consumption would likely be higher for the CT Provider in the beginning years, the year-on-year multi-millions in savings and the benefits of a constant refreshing tight spread EBBO to the industry will out weight its costs. This CT business model is viable because different needs in the markets will be fulfilled and enhances the competitiveness of European markets. Rather than letting trading venues split the cake of about US\$200 million a year under RDS and creating more data fragmentation to convolute the ecosystem, our proposed mechanism would craft out certain percentages of revenue as Rebates* to investment firms (IFs) on top of the pricing discount as described in S1-S5.

IFs may use the rebates* towards investment in the CT Provider for dividends/ profit sharing, as well as obtaining board seats to improve governance. Rebates may also be used towards purchase of value-added services with affiliated vendors, or cash out at a discount (given this substantial amount nevertheless is an incentive to drive increased trading volume to Europe).

CT Provider oversees data suppliers to address the 3 main causes of Data Quality problems + Value-added Services:

Trading venues' PPs exacerbate the data fragmentation issue and is unfair to latency disadvantaged market participants.

There are 3 main causes of Data Quality problems:

- i. Man made issues for self-interest and favoritism: e.g., crappy data (i.e., 100,000 messages at any given point in time that mused everything up) and/or hold off the advancement of CT for ecosystem degradation to exacerbate gap between PPs and CT. CT with a wide bid-ask spread and delay refreshing of the US National / European best bid offer (NBBO/ EBBO), i.e., to make the tape unsuitable for Best Execution (BestEx) analysis, in turn, majority of market participants are not aware that they have been receiving inferior price.
- ii. Poor controls, system glitch, operational resiliency: e.g., technical issues with a trading venue's volatility interruption mechanisms can send shares on a wide ride (e.g. Berkshire price erroneously down 90+% in June 2024); system glitch such as the Knight Capital \$440 million software error; and data center redundancy (outage), operational resilience (some see the price some don't), and cybersecurity issues. Vulnerability is high for the EU given Limit Up Limit Down (LULD) mechanism is NOT thoroughly implemented in Europe. Accountability to adopt certain best practices to ensure price continuity, and reluctant to conduct data consistency checks with peer Approved Publication Arrangements (APAs) attributed to incomplete or potentially erroneous information as cited by RTS 13 Article 10.
- iii. Inadvertent or honest mistakes during trade reporting, such as duplicated positions and/or misuse of taxonomy flag(s) by IFs during trade reporting to APAs. CT Provider in its consolidated trade system is required to pass along a 'duplicated positions' flag, or such, to data subscribers, while awaiting regulator to investigate potentially erroneous information, typically reviewing event lifecycle details in clearing and settlement system. CT Provider must NOT add, amend, or remove any data, except at the direction and discretion of the regulator. APAs as a Trade Reporting Facility (TRF) may allow a, e.g. 5%, tolerance level before taking action against an IF.

This empirical research uncovered a "preferencing" phenomena. The finding shows that *"86% of all reported off-exchange trading volume, trades reported in the NASDAQ TRF experience significantly poorer execution quality."* Be mindful if trading venues lead contenders / APAs may influence off-exchange fragmentation and reporting across APAs if they become the CT Provider to benefit from the RDS using daily trading volume to divide the cake. We will curb any inequitable access, degradation, or exploitation issues, and prevent any attempts (be it intentional or unintentional caused by trading venues/ APAs' competition) that impair the interests of IFs.

Do NOT believe those who claim some taxonomy "flags" would magically help you profile liquidity. By no means we are critical to FIX MMT that serves regulatory transparency purpose. The truth is liquidity in equities electronic trading or best execution involves comprehensive analysis. Fill rate, execution speed, effective versus realized spread, order-to-execution ratio, VWAP, slippage, etc. are some of the common metrics. Yet, metrics are rarely effective to deal with rapidly evolving issues proliferated by hidden problems and silos.

Be in the know of techniques such as tracking and responding to the level of toxic (or likely toxic) orders, deciphering dynamics of HFT activities and adverse selection, assessing market makers' risk profile and market timing, and recognizing that hidden orders could be placed deep down away from the best quotes. Including five price levels in CT / SIP is no safe bet that markets would not come up with a workaround. Optimization between speed and richness of contents would be an ongoing exercise to response to competition with both PPs and other jurisdictions. If Europe regulators and investment firms have concerns with "order duplication and liquidity measurement in EU equity markets", data vendors may provide "values-added services" to offer such intelligence on HFTs' propensity of cancellation or sponsor academic studies on related

implications to toxic versus natural liquidity. Yet, these are outside CT Provider's scope of responsibilities of aggregate and disseminate market data.

NOTE: HFTs are indeed taking risks in their multiple positions. They are obligated to take the exposures if unmatched orders are not cancelled in time. Under no circumstances can the CT Providers curb HFTs legally permissible activities in cancelling orders. The capabilities difference between lit exchanges, MTFs, and Systematic Internalizers may be a worthwhile but are a separate topic to market data reform that policy makers around the world should consider.

Other Remarks and Conclusions:

Do not underestimate the negative consequences where a faulted RTS can hurt the overall Europe markets. If NCAs lets the EC approve it "as-is", market participants would lose faith in the integrity of European markets. The public is no fool, divest money away or social unrest to protest an unfair system are their options. The only interested parties to seek trading opportunities in Europe would be those who can exploit and segment order flow away from the EU. We will wait and see how the Switzerland and the UK would play out when the EU markets go down the drain. However, a death spiral in one market is likely contagious to others. Inadvertently, the negative sentiment or mistrust towards the EU capital markets may also spread globally to affect the US.

Act now to REJECT the faulted RTS in the EU and the [disastrous report](#) by 'Europe Economics' in the UK. Remember: CT / EBBO is an advertised price. Low intensity competition among CT, PPs, and vendors' solutions per the 5 scenarios we looked at, indeed maximize and optimize the promotion of European markets. By infusing trust through TLE and facilitate increase cross-platforms trading (give smaller/ remote trading venues a fighting chance), that is the ONLY way to achieve the desire outcomes of CMU / SIU - *"attract institutional investor participation, better connect savers and borrowers irrespective of their geographical location, and ensure that ordinary savers can benefit from the wealth creation of the corporate sector."*

There are plenty of low-latency infrastructure data vendors out there. Think about why none have emerged to become the equities CT contender thus far. Think about why Europe failed to attract expatriates. How sad that even [HSBC](#), a prominent global bank with their headquarters in UK, is retreating from the equities market. It is now or never to encourage investments to turnaround the Europe markets' weaknesses. Like laying new high speed rail network for the next century, why should FinTech go about investing in Europe instead of other jurisdictions? We pour our heart out to provide our open and honest comments. At Data Boiler, we already located an expansion team in Europe and will bring the world best talents to support the sustainable development of the Europe markets. Moving on, we may consider the competing consolidator and other opportunities in the US and around the world. Contact us if you are interested to learn more.



By [Kelvin To](#), Founder and President of Data Boiler Technologies

Data Boiler is a Type C organization member of the European Commission's Data Expert Group. Between my patented inventions in signal processing, analytics, machine learning, etc. and the wealth of experience of my partner, Peter Martyn, we are about Market Reform, Governance, Risk, Compliance, and FinTech Innovations to create viable paths toward sustainable economic growth.