

CME's Tech Breakthroughs in the Last 25 Years

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Abstract: Since its inception in 1898 (and that of its precursor, the Chicago Board of Trade, in 1848), the CME has opened and enriched the commodities industry by introducing simple derivatives instruments and offering more complex alternatives over time. In addition to innovations in financial products, CME has made multiple trailblazing strides in financial technology since its Globex product -- first introduced in 1992 -- became the first electronic trading system to enter wide use. This report is a deep dive into the specific technologies that CME has pioneered since then, leveraging the materials presented by Ari Studnitzer and secondary materials sourced online.

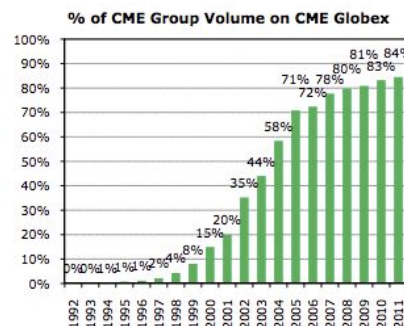
A Short History of the Chicago Mercantile Exchange

Like many incumbent financial institutions in America (along with Hamilton's founding of the Bank of New York in the years after the Revolution, or Wells Fargo launching to finance the journeys of Western pioneers), the Chicago Mercantile Exchange can trace its origin to a fundamental point in American economic history. The original entity -- the Chicago Board of Trade -- was founded in that city in 1848 as a means of stabilizing the revenue of Midwestern farmers. Chicago was poised to become the financial capital of a vast agricultural region, and -- while futures contracts have existed for thousands of years amongst farmers and merchants -- the CBOT was the first formal futures exchange built to prop up the market¹. The CBOT popularized forward contracts, futures, and later options in the 19th century. It originally allowed farmers to manage risk for commodities like eggs, butter and grain; later on, it expanded to a vast number of commodities: livestock, precious metals, currencies, and even interest rates themselves. The CME also popularized the archetypical commodities trader: a tall man in the octagonal pit, yelling and signaling to partners elsewhere in the crowd, buying and selling each transaction manually. This is how order books were 'maintained' for almost 100 years -- and it was, in fact, an innovation over not having an exchange at all.

Today, the CME is by far the world's largest commodities market, managing \$3.16 trillion worth of open interest in its Eurodollars product (one of its most widely traded products)² at a given time. Its growth has coincided with an incredible new set of innovations -- many of which have occurred in the very recent past. This paper will describe three in detail.

The CME Globex: an End to Manual Transacting

Globex is a highly complex electronic trading platform that the Chicago Board of Trade built in the late 1980s. Rather than anticipating the eventual demand for electronic trading, the use case for Globex was to solve a practical problem of the day: demand for US Treasury futures was rising in international markets, and the US markets were closed when London and Hong Kong were open.³ Globex was originally conceived as a system to provide low-touch, after-hours access to liquidity for these international traders. Its convenience and reliability made traders realize that the tech could be generalized to all hours of the day -- and, all asset classes. Today, the majority of non-OTC products cleared and managed by the CME takes place on Globex. Its market share produced a natural monopoly for liquidity, and today Globex remains one of the world's largest options and futures ECNs.



¹ 'Timeline of CME Achievements'.

<https://www.cmegroup.com/company/history/timeline-of-achievements.html>

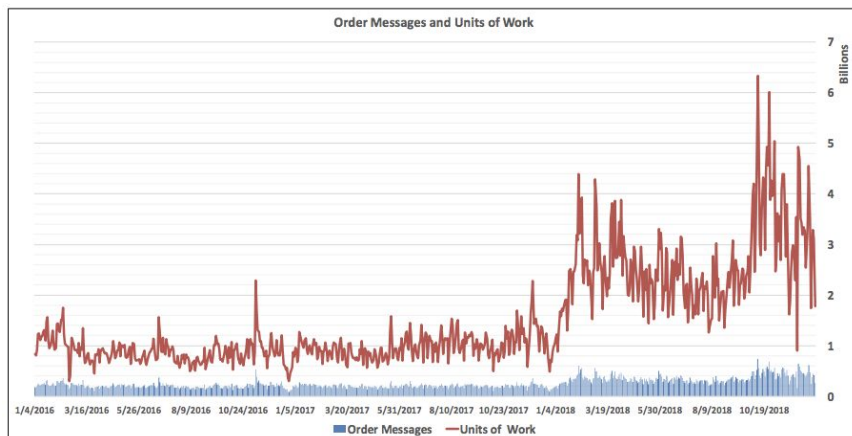
² 'Introducing CME Group', slide deck from lecture.

<http://web.stanford.edu/class/cs349f/slides/CME%20Group%20overview%20Stanford>

³ 'Twenty Years of CME Globex.'

<https://www.cmegroup.com/education/files/globex-retrospective-2012-06-12.pdf>

Increasing Liquidity Through Speed



The CME has embraced the era of high-frequency trading by investing heavily in infrastructure to support high data volumes. The number of order messages (and cancellations) has significantly outpaced the growth in volume traded, and the Globex gateways and matching engine and designed to accommodate this. While the platform

routes billions of order messages on a daily basis, the median latency for any one message hovers around 200 milliseconds -- a dramatic drop from 25 years ago.⁴ The architecture has also reduced the number of session gateways through which an order can propagate on its way to the matching engine -- decreasing uncertainty without sacrificing robustness.

Extreme Vertical Integration

As our class speaker mentioned, CME's value proposition is a combination of bleeding-edge tech, and a vertical pipeline of adjacent products all housed in CME platforms. (The CBOE acquisition is consistent with this strategy.) CME has historically grown its business by becoming involved in the transacting of ever more asset classes -- to the point where there are few standardized financial products you can't find on the Globex ECN. Additionally, though, this scale has made it possible for CME to stand up complementary products to the trading itself. The CME market data product is valuable enough to sell to every trader interested in buying or selling a Globex-listed product. The CME clearing solution is extremely convenient when coupled with use of Globex. These network effects enable the company to operate a very easy vertical integration for its customers -- guaranteeing future market share for volume, while creating a massive barrier to entry for any would-be competitor.

What Might the Future Hold?

Our guest speaker didn't mention much about the CME's future plans -- of course they've listed an index for cryptocurrencies⁵ -- but my speculation is that they will continue innovating in similar ways. The markets are increasingly faster (chasing *instant* latency), increasingly well-connected, and increasingly vertical - my hunch is that this will continue.

⁴ 'Introducing CME Group', slide deck from lecture.

<http://web.stanford.edu/class/cs349f/slides/CME%20Group%20overview%20Stanford>

⁵ 'CME CF Cryptocurrency Indices'.

https://www.google.com/search?q=cme+crypto+futures&rlz=1C5CHFA_enUS791US791&oq=cme+crypto&aqs=chrome.0.0j69i60j69i57j0l3.4041j0j7&sourceid=chrome&ie=UTF-8