STOCK EXCHANGE DRIVERS FOR PUBLIC CLOUD

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Introduction

Welcome to our series of point-of-view articles on public cloud enablement for Stock Exchanges. Written by Vijay Rathore, Head of Cloud Sales for EMEA, the four-part series will explore business drivers for transformational change within exchanges and the technologies shaping the future direction of stock market trading.

Vijay draws on his 25 years of expertise in building Stock Exchange infrastructure, developing High-Performance Computing (HPC) for financial risk analytics, engineering low-latency application development for capital markets and expertise in public cloud to offer an unbiased view on the need for cloud led digital transformation to drive innovation.

The four-part series will each cover a different aspect of cloud enablement for exchanges.

i) This current article is an introduction, looking at the business and regulatory drivers to prompt the intellectual shift away from highly optimised private on-premises infrastructure to the public cloud.

ii) The second paper will look at low latency in the cloud. Debating recent advancements in low-latency services and cloud blueprints would assuage many of the reservations for cloud transformation.

iii) The third in the series will look at data and AI. Data is the bedrock of all exchanges and is their most valued asset. Some of the topics to be discussed are data security, standardisation, nationalisation, dissemination, and monetization.

iv) Lastly, the fourth and final paper will conclude by looking to the future, discussing the impact of blockchain, smart contracts, digital asset trading and Web 3.0.

Why Cloud Computing?

The first Stock exchange was created in 1611, a simple paper-based ledger system listing a single company. Today's exchanges cater for many markets (FX, equity, options, derivatives and crypto). The NASDAQ Stock Market is credited as the largest single exchange, actively trading over 3,000 companies and 250 billion dollars per day using purpose-built data centres and technologies. Recent and continued market de-regulation has fostered greater trading competition, fragmenting the market and diluting existing revenues. In parallel technical debt has steadily increased the costs of maintenance and system enhancement. Motivating institutions to investigate new public cloud-based operating models, reduce technical debt, and exploit technology innovations for increased revenue.

Ultimately the key drivers for change are regulatory compliance, deregulatory competition and the increasing cost of business-as-usual as existing systems become legacy and cloud innovation to provide new revenue streams.

Compliance, deregulation, and risk

The main function of an Exchange is to supply a fair and orderly market providing liquidity and volume for efficient execution. Exchange services are the foundations for a wide range of financial market services critical to the national infrastructure and use technology as the cornerstone for delivery.

As these technologies underpin more and more of our financial markets' economy, governmental regulation has tried to keep pace to make sure the rules that govern them, give adequate protection to drive growth and unlock innovation.

Compliance

The EU's MiFID framework regulates financial markets and improves protections for all investors by obligating exchanges to accurately report on all transactional market data. Market data is monetised, highly profitable and represents a major Exchange revenue stream.

Greater competition has reduced trading-brokerage profitability, as Exchange market data fees rise resulting from technical debt. Prompting calls for reform from the brokerage firms who consume that data and bewail monopolistic fees.

Cloud computing could drastically cut costs through automation, using rule-based engines to marshal the ingestion, normalising, and validation of trade data, ensuring a timely, cost-effective, secure way to discharge their obligation to both the regulators and clients. Data-as-a-Service with lower-priced storage, data refinement and PAYG advanced analytics could create differentiated Exchange revenues powered by blockchain, AI and cloud self-service.

Exchange Revenues from Information Services 2005-2019

Annual growth rate 2005-2019: 12.6%
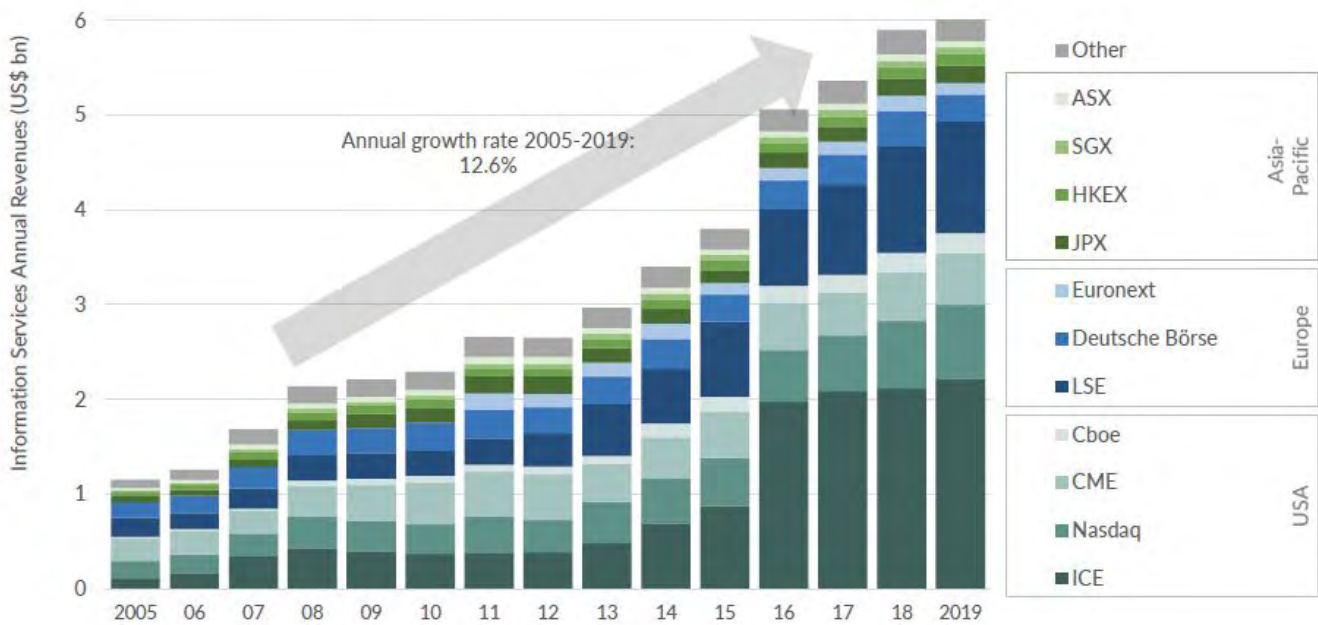
Source: Company reports, Opimas analysis

Exchange data revenues have steadily grown – many believe out of proportion to rest of trading environment reaching US$6 billion in 2019

Deregulation and competition

One of the two main areas of concern for stock exchanges are MiFID's objective of de-regulation to increase competition, fragmenting the market. It is hoped that competition will drive overall efficiency and create a level playing field. However, given that liquidity is in part a function of market depth and free float availability, market fragmentation could well have the opposite effect.

Public cloud innovation could play a vital role in attracting liquidity, with a digital-first strategy incorporating hyper-scale resourcing, big-data analytics, AI and other emerging technologies. A paper by Saglam, Mehmet and Tuzun, Tugkan and Wermers, Russell R., showed that ownership of new technology-driven offerings like Exchange Traded Funds (ETF) was associated with increases in liquidity. This is a perfect example of how cloud-based innovation and technology advances could help to re-establish liquidity.

Risk planning and resiliency

Cloud computing is essentially an outsourcing model and can represent systemic and/or institution-level concentration risk. Prompting regulatory authorities to mandate specific obligations on all financial institutions to contain those risks.

The incoming EU Digital Operational Resilience Act (DORA) specifically addresses these operational resilience issues and stipulates an institution's ability to recover from operational disruptions that could be caused by a cloud outage.

The European Banking Authority's (EBA) guidelines on outsourcing require institutions to have a documented and tested exit strategy or reverse migration plans when they outsource "critical functions" to a Cloud Service Provider.

Most Exchanges have opted for a hybrid, multi-cloud infrastructure approach. A 'reverse migration' policy, from the cloud to on-premises, and from one cloud provider to another.

On-premises capabilities retain ultra-low-latency workloads involving real-time ticker plants, reliant on multicast and dedicated hardware accelerators, none of which are easily available on the public cloud.

Open Source and software vendors figure prominently in promoting multi-cloud workload portability and data fungibility, including containerisation and cross-platform managed data services.

Cloud technologies and innovation

Some of the more interesting technologies motivating exchanges to pursue cloud enablement are the innovative cloud services of Cloud Security, GPUs, AI, and Quantum computing.

Cloud Security

An everything-is-code (EaC) approach to software development, creates unique challenges for security, risk and compliance.

The Cloud Security Alliance Cloud Controls Matrix is a cloud-native foundational, control framework of (CCM) benchmarks designed to help businesses and governments better understand, manage, and reduce their security risks.

Frameworks only represent supporting structures and require additional cloud-based architectural blueprints, secure application design patterns, and 3rd party ISV products for a complete security posture.

Cloud GPU Computing

Previously we discussed the high cost of buying market data, producing that data in a more cost-efficient automated fashion would alleviate some of the criticisms levelled at the exchanges and possibly create a new differentiated income stream.

A paper entitled "GPU Extended Stock Market Software Architecture", by Alisa Krstova(B), Marjan Gusev, and Vladimir Zdraveski looked at GPU technology to overcome the constraints of performing statistical analysis on stock market datasets.

Cloud-provisioned GPUs could shorten compute times thus dramatically reducing costs whilst offering greater customisation and value by using a self-service portal, managed by cloud-based security and encryption.

Cloud Quantum Computing

On May 6, 2010, $1 trillion in market value disappeared from the global stock markets within a matter of a few seconds. Analysis revealed how automated computer algorithms created a cascade of unchecked futures contract E-minis hedges. The speed at which these electronic networks processed made it impossible to predict and intercede, with classical computing technologies.

Cloud Quantum computing consumed as-a-service, coupled with AI market surveillance systems could sense similar anomalous patterns to trigger a market circuit breaker.

Summary

A recent paper from McKinsey reported that 75% of the cloud's predicted value comes from boosting innovation, with the value of the cloud core estimated at $770 billion in innovation-driven growth compared to $430 billion in cost and risk reduction.

Innovation, risk mitigation and compliance are the main catalysts for stock exchange investments. Reacting to declining margins through increased competition, rising legacy expenses and regulatory pressures. Embracing a cloud-centric operating model with high degrees of automation will have significant ramifications on global market structures, cross-border regulation, risk and technological safeguarding.

Based on our interactions with senior executives globally. We see a strong appetite to understand these coming waves of structural and technological changes and incorporate an on-demand operating model, as the global cloud computing market is expected to exceed $1 trillion by 2028, (Precedence Research).

What do these statistics tell us? They tell us that the rate of innovation and investment in the cloud cannot be matched by any single company – that the future of creation is the accumulative learnings and trends from thousands of companies and investments from billions of dollars.

While predicting the future is always nuanced, we believe that the waves of technological changes should be embraced wholeheartedly to act now in a prudent fashion. We hope this paper provides inspiration.

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