




Technology drivers
of the post-trade
operations:
An analysis of
the landscape and
solutions



Parthenon 博智隆

Building a better working world



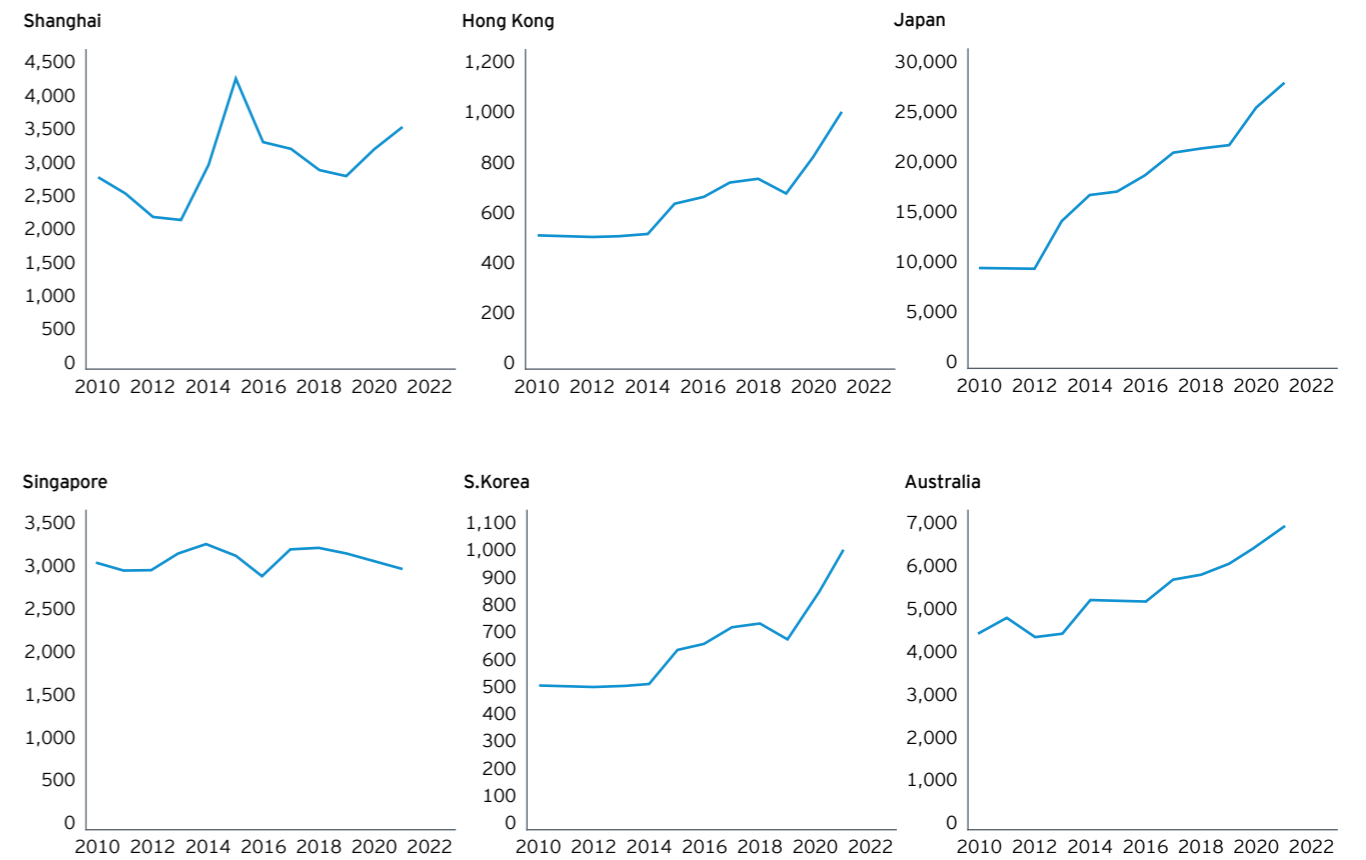
Despite fundamental changes to the frontend of the capital markets, middle and back office of the trade has remained largely intact in the past decade. The inherent complexity of post-trade process makes it both a legacy stronghold and a goldmine of potentials. And in this sense, most financial services companies are both the implement and the victim of the current arrangements. Technology advancement, however, offers new possibilities and in some cases, as we will see, heralds changes that are on the way.

Growth of Asia-Pacific capital markets

Asia-Pacific capital markets is big and fast growing

By any measure, capital markets in Asia have been in a boom. Total market capitalization of the stock market has gone from US\$13trillion in 2010 to 29trillion in 2020. Share price is rising on every major exchanges. In Japan, the major index went from 9,272 to 27,995, making it the best performing stock market in the region.

Stock indexes of key markets: Shanghai Composite, HSI, Japan, Singapore, S. Korea and Australia



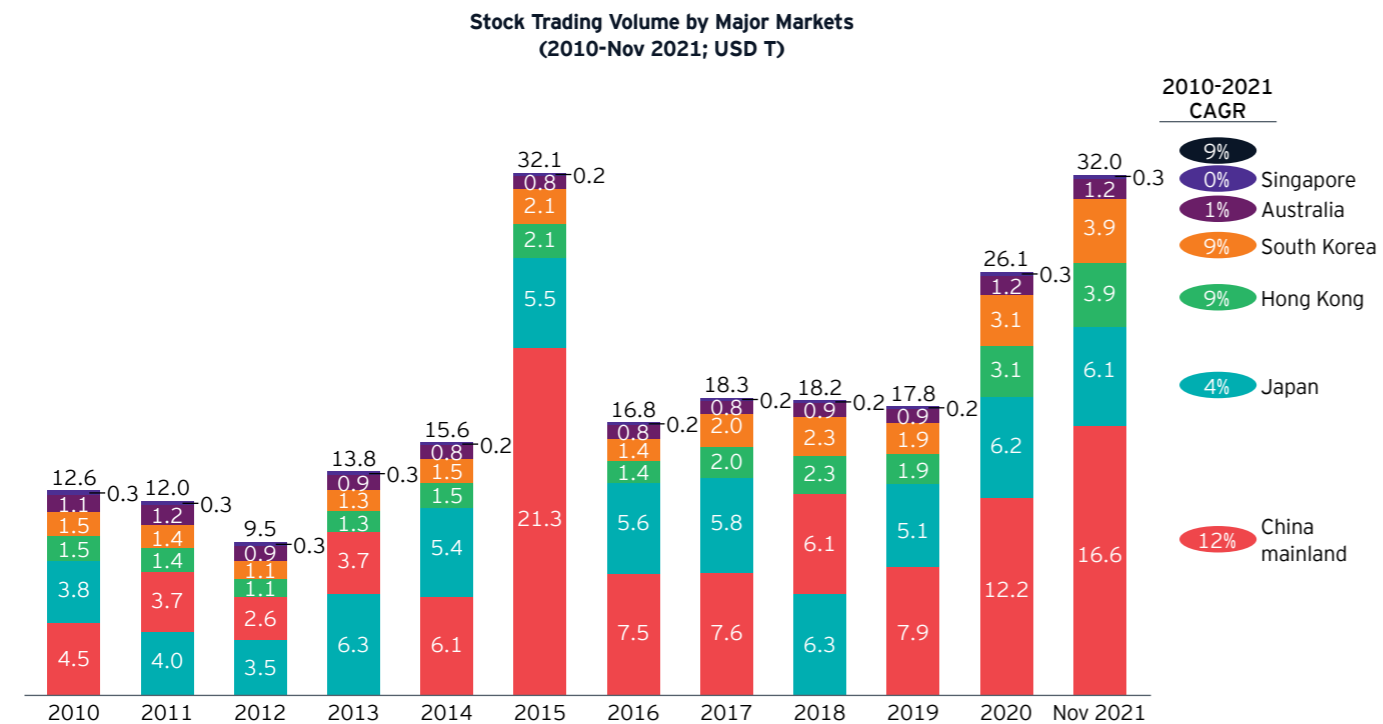
Source: W.ind, EY Analysis

The upswing has lifted the trading volume. Total trading volume of the six key stock markets in Asia-Pacific rose by 253% between 2010 and 2021. Mainland China is the fastest growing one, followed by Hong Kong and South Korea.

And it's not the stock market only. Fixed income market in Asia-Pacific has also seen fast growth. Total size of the key Asia-Pacific bond markets went from US\$4trillion in 2010 to 28trillion in 2020, representing a 22% ten-year CAGR. The trading volume of the bond market in the region has also grown from US\$17trillion a year in 2010 to 75trillion in 2020.

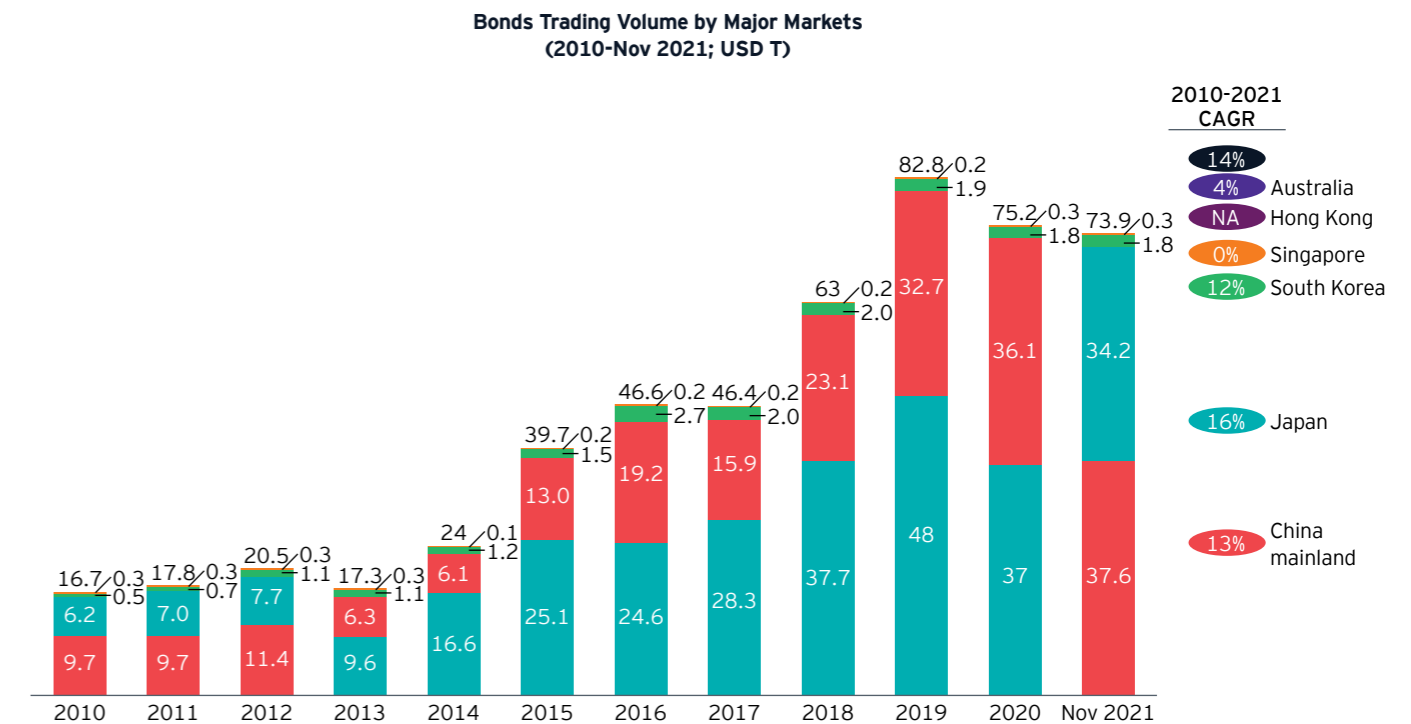


Asian stock trading volume has shown a steady growth overall, while mainland China ballooned in 2015



Source: W.ind, EY Analysis

The trading volume of Japan and mainland China bonds market has been steadily increasing since 2010



Source: W.ind, EY Analysis



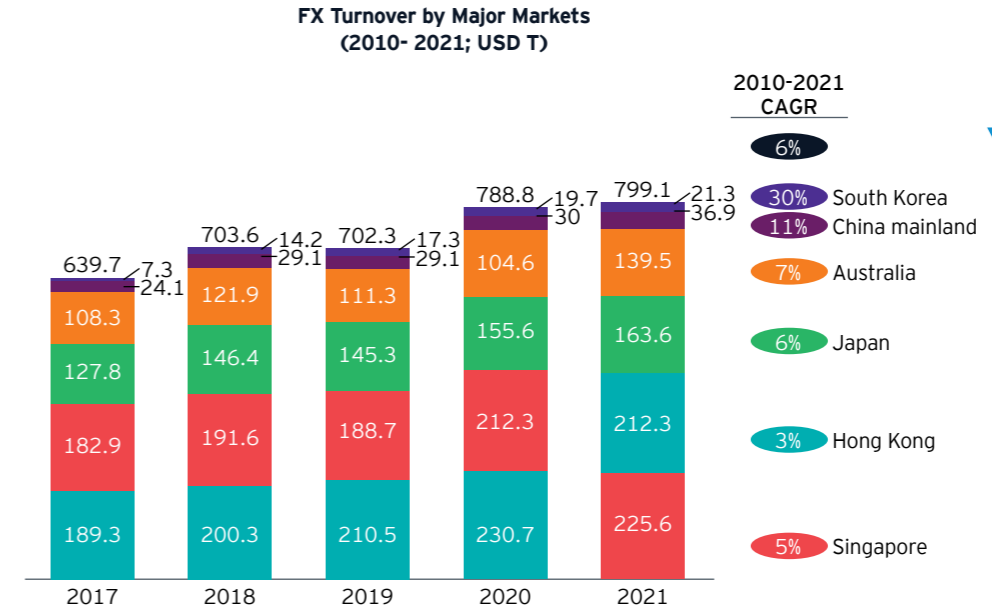
Cross-border fund flow

Asia-Pacific capital markets is becoming more complex

The growth of market size and trading volume means that the infrastructure of the capital markets in Asia-Pacific need to upgrade. While the front office of trading organizations is typically lean and therefore less impacted by a spike of volume, the middle and back office have felt the mounting pressure from higher requirement on the processing speed and volume. But required changes go beyond speed, as the market is also becoming more complex.

The first new complexity comes from more cross-border fund flows. Public assets in Asia-Pacific used to be bought and sold mostly by domestic parties, but now the region sees more inflows from the rest of the world, as well as more cross-border investments within the region. This is partly driven by the rising significance of Hong Kong as an international financial hub. On back of Mainland China's economy growth, Hong Kong has solidified its status as Asia-Pacific's capital markets center. In 7 of the last 12 years, Hong Kong Exchange was the world's biggest IPO market. On the other hand, Asia-Pacific also benefited from the growing intra-regional fund flows. This is mostly driven by money coming from mainland China or going towards Chinese assets. Multiple bilateral programs, such as the Stock Connect, Bond Connect and ETF Connect, have also been put in place to facilitate such trading and investments.

Asian FX turnover remains strong, turnover in Singapore hit new high and became the largest FX center in Asia



Source: W.ind, Public Information, EY Analysis

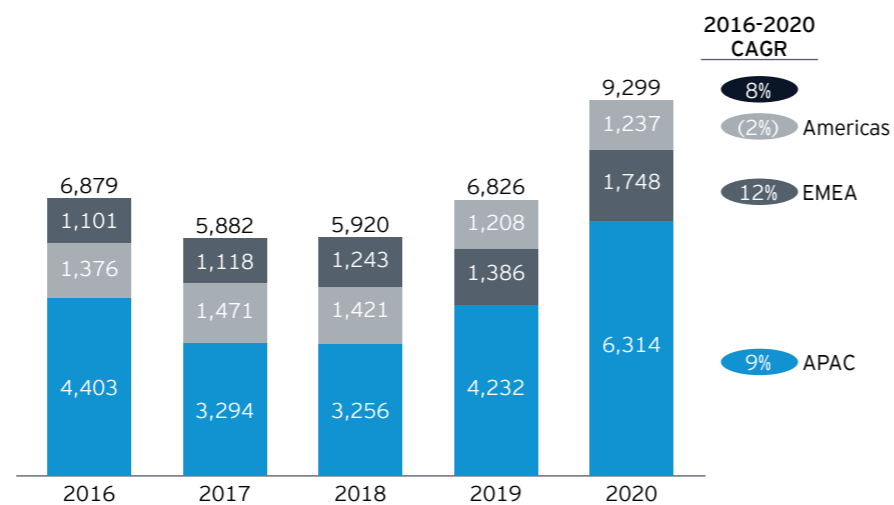
Commodities



Secondly, the trading assets in the region is also quickly becoming more diverse. Asia-Pacific investors used to focus mostly on stocks and bonds, but now they are buying and selling a wide range of securities, from currencies and commodities to other alternative assets. This is driven by three forces. The first is China's search for commodities to fuel its economy growth, which has driven up the trading volume and prices of commodities

The largest share of commodity derivatives trading takes place in APAC with a steady increase each year

Number of commodity futures and options traded worldwide (2016- 2020; Mn of Contracts)

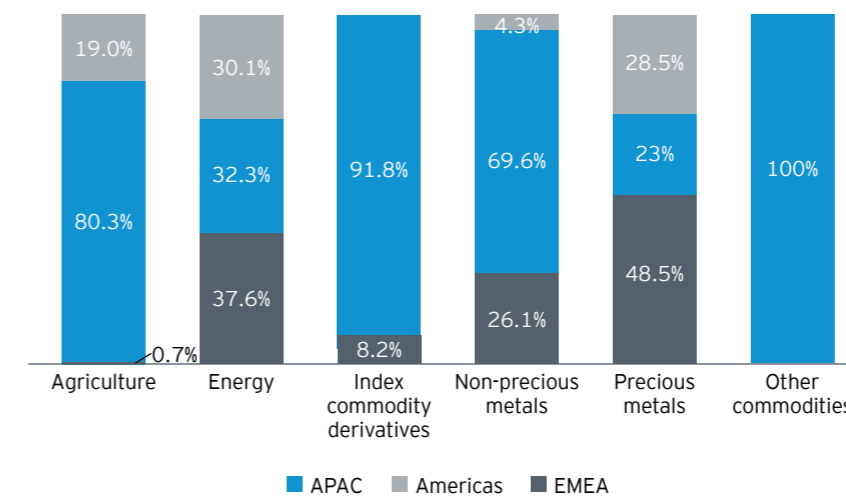


Source: WFE Report, Public Information, EY Analysis

and relevant currencies across all major bourses in the region, if not the world. The second is investors' relentless pursuit for alternative assets, including private credit, private equities, real estate, and infrastructure, in search of higher returns and lower correlation with their current portfolio. These two factors have driven Asia-Pacific to be world's fastest growing derivatives market.

APAC accounts for majority of total volumes traded for commodity derivatives

Share of total commodity derivative volume by commodity type and region in 2020



Source: World Federation of Exchanges, EY Analysis

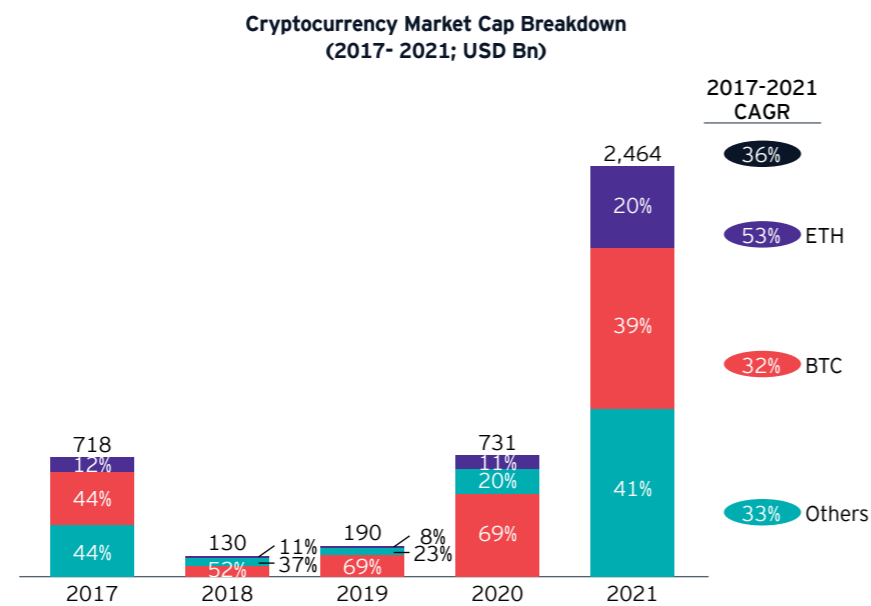


The last force is the rise of crypto assets. Crypto currencies, as a trading asset class, have been around for only about a decade, and yet have seen phenomenal growth both in the price and trading volume. Despite initial reluctance, the investment industry is developing a grudging affection for crypto assets. Venture capital funds have now replaced hedge funds as the biggest sponsors of crypto investment funds, indicating that the asset class is still at a young stage. And more private equity managers, private banks and family offices are also adding crypto assets to their portfolios.

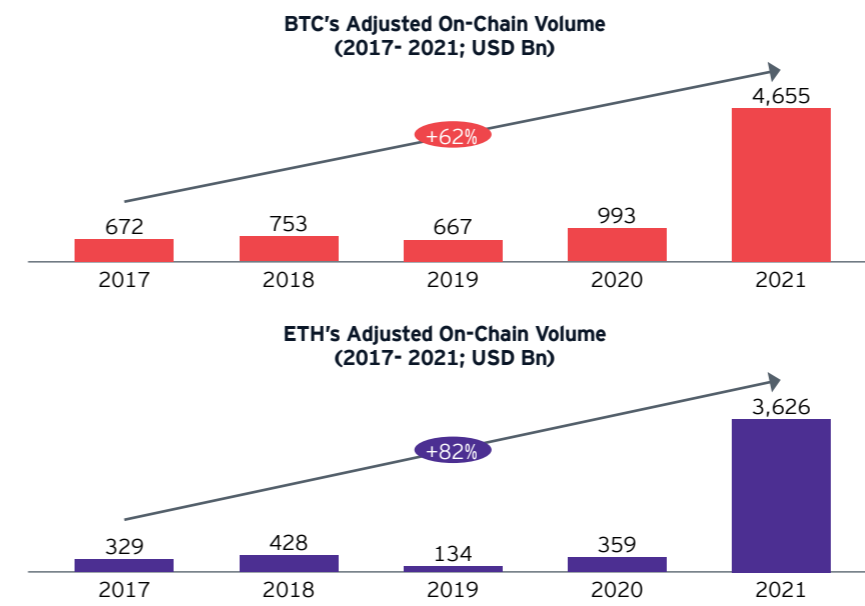
Asia-Pacific has always been a major marketplace of crypto assets. Japan and South Korea see the most crypto trading outside of the United States; and Singapore, historically a crypto-friendly jurisdiction, has recently also accelerated its regulatory development to attract more crypto asset trading. The Hong Kong Monetary Authority and Securities and Futures Commission have recently issued a joint circular that for the first time allows banks and brokers to offer crypto asset trading services.

Cryptocurrency market capital is rising in turmoil and hit a record of \$2.4 trillion in 2021

BTC and ETH are two major dominants of cryptocurrency, growing slightly between 17-20, but surged in 2021



Source: Messari, Public Information, EY Analysis



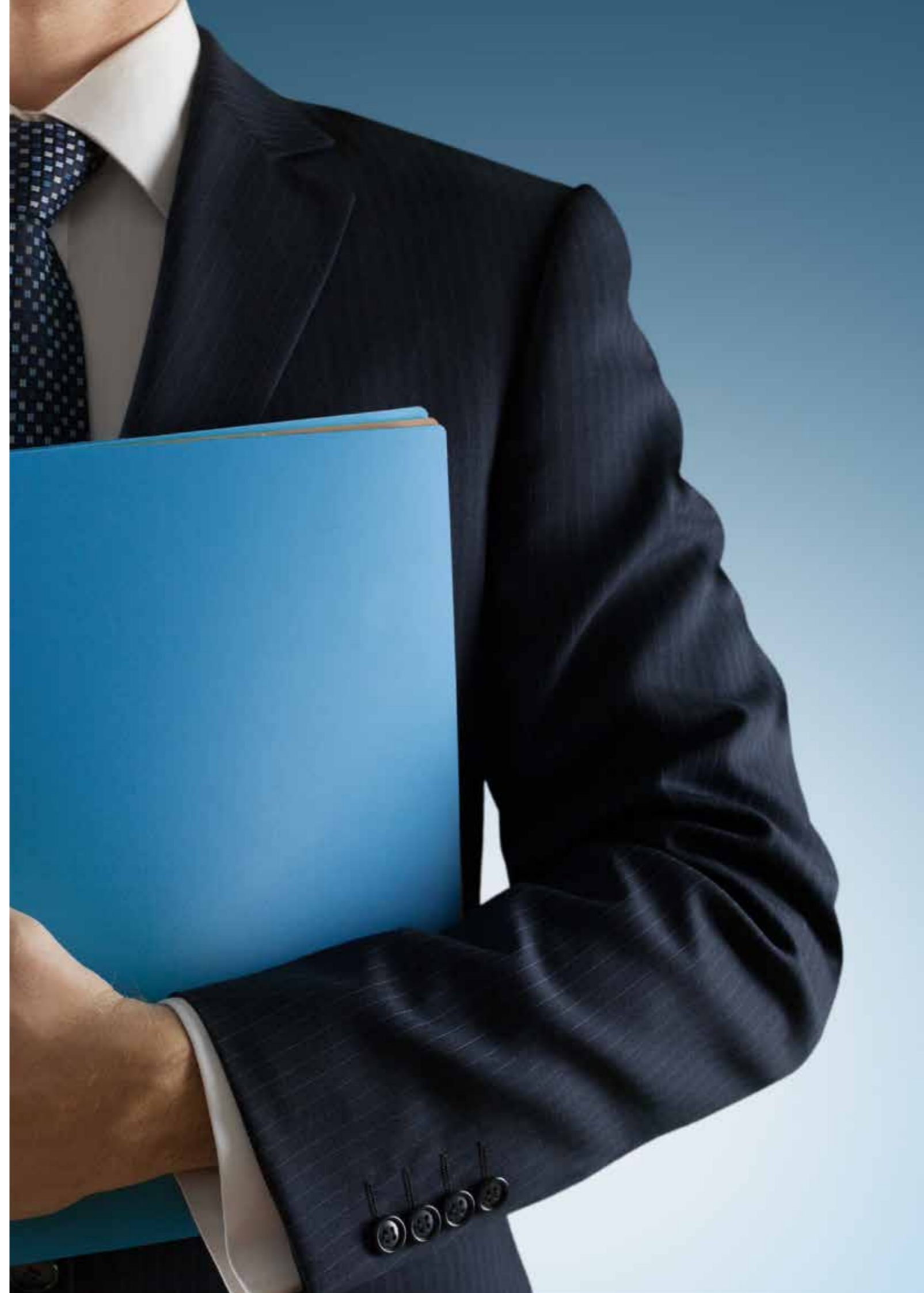
Source: Coin Metrics, Public Information, EY Analysis

Growing investor sophistication and increasing regulatory requirements ask more from the trade process

Market participants not only need to keep pace with a fast-growing trading volume and increasing complexity but are expected by their clients to enhance reporting services too.

Asset managers, banks, and insurers have been under increasing regulatory pressure to enhance the trade-related accountability and are making higher demand of the sell-sides they work with. Since 2008, a series of regulatory requirements has been introduced to strengthen financial services companies' capital base and internal control systems, improve market resilience, and ensure a more equitable environment for all types of investors. Among them, the Dodd-Frank Act demands better accuracy and timeliness of financial institutions' disclosure. Basel III requires banks to apply stricter loan provision rules and to apply a more rigorous reporting system. Solvency II and other types of risk-based capital regime demand better transparency and disclosure from insurance companies. AIFMD sets the disclosure bar higher for alternative asset managers. MIFID sets out standardized regulatory disclosures required for investment managers and intermediaries operating in the European Union.

Sell-side institutions hold most of the data needed to meet rising regulatory requirements. These data include the ones on operations, accounting, and tax. Additional services also help post-trade processors differentiate themselves and protect the margin. As the current gatekeep of the post-trade process, they are in an inherently good position to help buy-side companies with such challenges.





Need for change

A fast-growing market and a more demanding client base have exposed several operational weak points of the industry's current operations.

Current pain points

So far, the market participants have done a good job to make hundreds of millions of trades happen on a real time basis. But the speed at which the trades are processed remains slow, mostly due to that they are processed in batch order rather than on a real-time basis. As volume and complexity keep growing, this will increasingly become a bottleneck of the industry. For institutions and retail investors alike, lack of speed results in capital being locked up, and exposes them to more counterparty risks. This is a more serious challenge for more complex assets, such as derivatives and structured products, which typically take longer to process and therefore brings up more risks. Additionally, the increasing complexity of the trades also requires a higher level of human intervention, which further slows down the whole process.

The current operations to process trades is costly too. Various estimates put the global post-trade processing cost at US\$20-40billion a year (and counting). As the competition intensifies and other costs rise, financial

institutions have become increasingly aware of the trading costs' effect on their margins. In some markets, new regulations will make the financial pressure more acute. There has been regulatory development, for example, that will result in stiffer penalties for sell-side companies when trades fail to settle on time.

Speed and costs aside, market participants are also exposed to more operational risks. The current setup means that the post-trade processing can face a variety of problems including the data being not readily available, system becoming excessively complicated, operational risks creeping into other risks, risks management functions becoming duplicated, monitoring cost rising, and new types of risks emerging.

More stringent regulatory requirements also mean that institutions are more likely to see compliance issues. Applying a legacy system to a new business means that the disruption or even failure is more likely. Being transaction- and data-focused business, capital markets participants are also more vulnerable to continuity issues, which are exacerbated by the multiple layers of patches on their current systems. A more inter-connected capital markets and the underlying systems also bring more cyber security issues.

Root causes

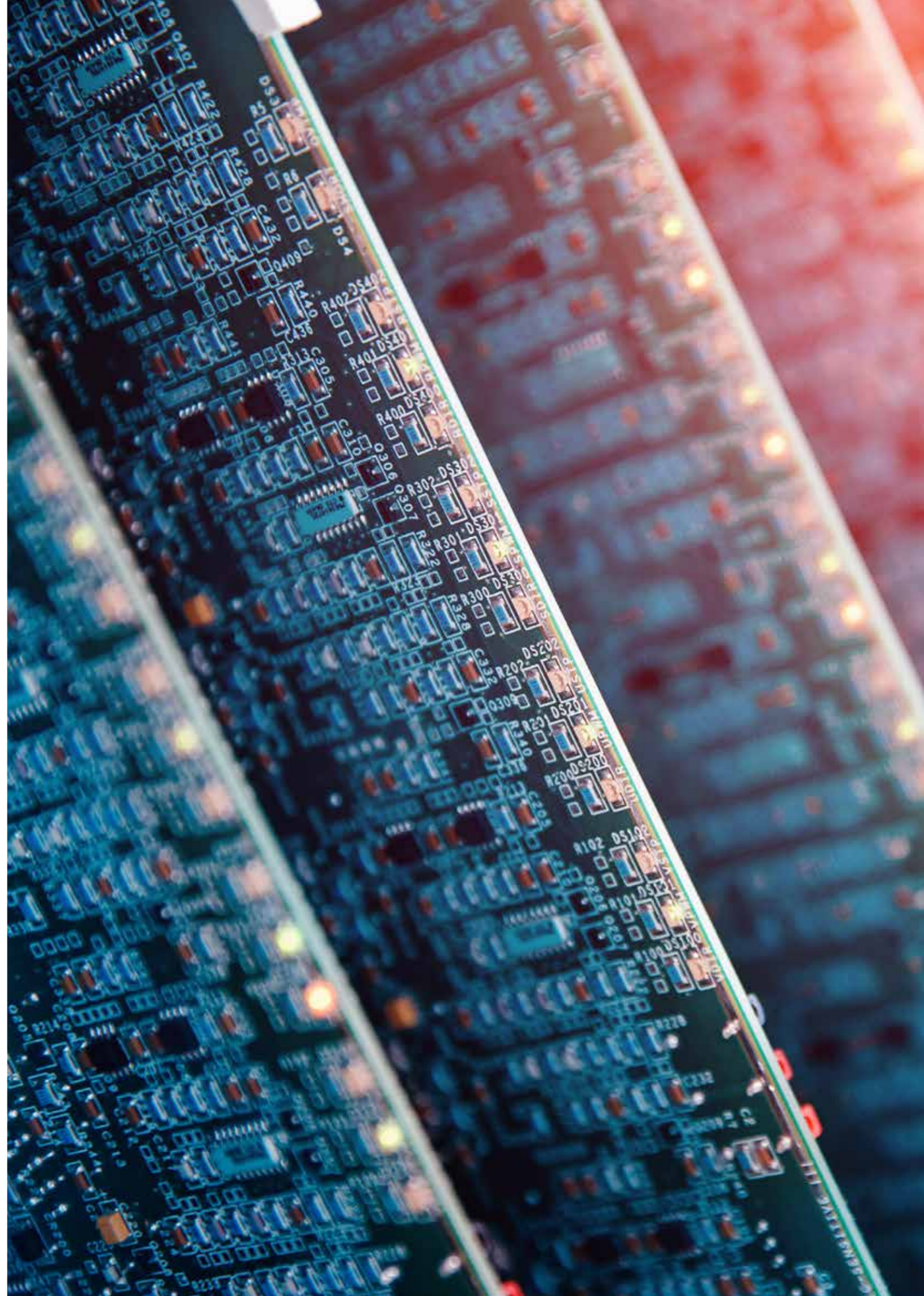
The operational risks and the mounting cost result from various legacy issues including missing accounts or instruments, and lack of synchronization, made worse by lack of automation and lack of straight-through processing. Human intervention is thus required across the whole process, to cleanse and reconcile the data that flows within the firm or from one firm to another. This problem has been worsening in recent years due to the spiking volume of retail trading and the heightened volatilities it caused, especially in collateral management and the margin call management. As a result, a growing number of brokers and dealers are scrambling to enhance their core process and internal controls, to contain the rising operational risks and to improve their operational efficiency.

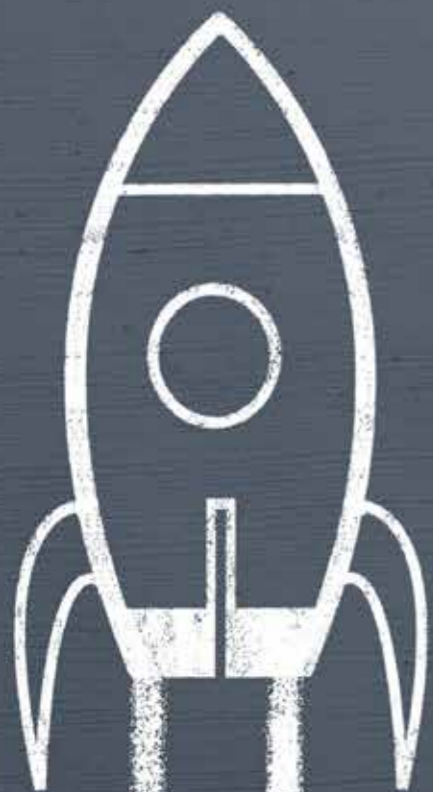
They can optimize their operations by streamlining their process. But to codify the changes and to drive further efficiency gains, they will need to deal with the core systems that the processes are built on. Currently most of the financial services companies run on legacy systems. These systems share several characteristics: deployed more than 10 years ago, written in the Common Business-Oriented Language (COBOL), usually with millions of lines of codes, developed and maintained by numerous vendors, some, if not most of which already defunct. These systems also often run with complex databases and miss documentation. And because they perform the most critical functions of the business, they need to be running all the time.

The consequent rigidity makes these systems neither very scalable nor expandable. The marginal cost to add bandwidth rises fast, along with quickly deteriorating performance. And even when no attempt is made to change these systems, it is more and more difficult to find professionals to attend to them, due to the scarcity of IT professionals well versed in COBOL.

The commercial characteristics are just as restricting. These systems are usually the result of global procurement, with development and maintenance sitting far away from where the system is being deployed. And the cost of maintenance keeps rising. This might not be as critical a problem in more matured markets as North America or Western Europe, but surely is crucial in Asia-Pacific, where market development is swift and requires quicker responses from the middle and back office to maintain the same operational capabilities.

Relying on a legacy system also makes system integrity more difficult to keep. While these systems can be quite versatile, most buyers start with a minimum viable setup in the beginning and gradually add on more functions. Sometimes this is done out of economic reasons, and sometimes regulatory. Even when cost and licenses are not the top concern, the changes in the capital markets usually demand new functions being added, and new asset classes being supported. Sell-side firms are also trying to compete by providing differentiated services and multi-asset workflows to their clients. The legacy setup forces the firms to patch their current systems up to meet such demands, and in turn, create more information silos. While this might be a stopgap with some instant appeal, the increasing fraction only aggravates the identified problems: less speed, more human interventions, and lower capital efficiency. Such a siloed situation also feeds a piecemeal approach towards system development and maintenance, where the user is forced to employ multiple vendors, further inflating the cost and the complexity.





Solutions

Despite the challenges, the technology development has provided the industry with possibilities to make the post-trade processing cheaper, faster, and better. More firms are rethinking their post-trade operations and trying new ways to upgrade them.

New technologies available

Technologies such as cloud computing, event-driven stream computing, and micro service architecture have offered companies with a more agile approach.

Cloud

Cloud provides capital markets participants with multiple dividends, including a lower threshold, cost flexibility, on-demand scalability, and location independence. With cloud, new post-trade functions can be quickly developed and incorporated without taking the time to commission new servers and waiting for deployment windows. New solutions can be built, and updates can be centrally and automatically managed across business lines and regions. Data archiving and distribution are also made automatic and cheaper on a cloud structure.

Cloud can be coupled with automated and intelligent systems, such as Application Programming Interface (API) and microservices, to further boost the efficiency of post-trade activities, identify error trades, predict reasons for breaks, analyze exception handling, and come up with improvement suggestions. These features are particularly relevant in Asia-Pacific, where the fast growth of the market has allowed more new firms and smaller firms to enter.

Event streaming

The second technology that is reshaping the landscape of the industry is stream computing. It allows to process multiple data feeds from different sources alive. Being able to analyze the data in real time is a huge boost to

both speed and accuracy. Stream computing has seen wide applications and is behind the fast development of various big data technologies, such as internet of things. In the capital markets, stream computing has allowed trade processing to move from a command architecture, (the batch order employed in the legacy systems,) to a triggering one (real-time processing). The event-driven design of the triggering setup has several advantages over the conventional one. It is asynchronous and thus removes the potential blocking between producer and consumer of the message. The asynchrony also allows loose coupling and lowers the inter- and intra-system interdependencies.

The event streaming architecture enables a series of real time insight that helps better use of the capital management and risk control. It also allows the systems to better utilize unused data, a strong attraction for the data-rich business of trading, and can act as an outlet to generate more value for clients.

Microservices

And lastly, microservices rearranges the whole system as a network of loosely coupled services. By doing so, the interdependencies and complexity of the system are both reduced, and thus allows the system to be developed and upgraded in a more agile, and usually quicker, manner. The microservices engineered this way can be technology-agnostic and deployed in different computer languages and in different environment. Its decentralized nature also allows it to be built around business functions and not the other way round. In the post-trade processing business, these features enable a modular approach towards system development, which are usually quicker, easier, and better protects system integrity. Microservice architecture is also more scalable, as different services are implemented independent of each other. The independence allows different teams to work together in parallel with each.

Application of these technologies

While continued technology development has presented the industry with more options to upgrade and develop the systems, embracing them comes at its own cost. Besides, such a crucial business decision is never fully technical or economic. The system buyers have to consider regulatory concerns, emerging of disruptive technologies, geographic dispersion of business, and potential merger and acquisition activities in the future. Below we have identified three major options and analyzed their pros and cons.

Modernizing the legacy systems

For most established companies, modernizing the legacy system is a politic, if expedient choice. The systems are still working and are mission-critical. A long history of patching and the lack of inhouse IT manpower usually make migrating to something new more difficult. Sometimes the company also need to factor in that the investment in the system has not been fully recovered yet.

Also, the new technologies not only present brand new solutions, but also possibilities to optimize and upgrade the existing systems. The agility and flexibility coming with microservices and native cloud technologies

are of considerable worth in modernizing the legacy systems. It makes continuous refactoring easier and the integration of new system and the legacy one possible.

Established service providers have spared no effort to renovate their offerings. Adenza, formerly known as Calypso, now writes its software in Java rather than COBOL. FIS, the parent company of Sungard, have sped up their capability buildout via deals.

DIY

Some of the financial services companies may decide to build a new solution by themselves or try to acquire such capabilities through deals.

In 2020, CICC, China's leading securities company teamed up with Tencent Digital, a subsidiary of the eponymous Chinese technology giant, for a FinTech joint venture called Jinteng Technology. Jinteng provides software development, information system integration and maintenance, and data processing services to other securities firms to support their wealth management and trading business. More and more financial institutions in the region have set up such subsidiaries or joint ventures or have announced the intention to do so.



Try new solutions

Many companies in the Asia-Pacific region find themselves in expansion mode, and thus may find new solutions more appealing a choice. As we have seen, more trading asset classes and cross-border fund flows give both sell-side and buy-side institutions the justification to upgrade their middle and back office. This is made more urgent by the quick geographic expansion of the business. A growing number of mainland Chinese firms are entering Hong Kong and Singapore for example. Similarly, more foreign companies are gearing up their mainland China entry to tap into the onshore opportunities. Growing business and technology development have turned more financial companies towards new solutions.

Alphalion Technology, a FinTech company from Hong Kong, has combined microservices architecture, cloud-native computing, and event streaming technologies to help capital markets participants modernize their post-trade process. Bypassing the legacy technologies means that the new solutions can offer fully real-time processing and position valuation. The highly automated processing for multi assets, ranging from core assets to derivatives, currencies, cryptocurrencies, and over-the-counter products, supports embedded workflow management and lifecycle management tools. The transparency and availability are also improved thanks to the use of new technologies.

The agile nature of such solution makes the solution more customizable, with flexible setup and by-module installation, and can be offered on a Software-as-a-Subscription basis. While the system supports multi asset, it can be set up with one installation or implemented asset class by asset class. The compatibility features also support direct clearing for major global clearing houses and supports most of world's major exchanges in product processing.

Pros and cons

All three strategic paths come with distinct costs and benefits but can be evaluated through the same lens. Sticking with the legacy system presents most of the mature buyers a good balance between risk and reward. These systems have proven their reliability with decades of track record and continue to perform the critical functions on all-time basis. Some of the chronic issues though, such as the high latency, the monolith, and the relatively high cost of adding scale or new functions, can only be solved as quickly as the current vendors modernize their whole solution.

A small but growing number of capital markets participants find it increasingly rewarding to try the new solutions. This makes more sense for companies with fast-growing business, as the coupling between the front and middle/back office are usually more thorny issues. The more ambitious and better funded firms will be tempted to build everything by themselves, either internally or via an affiliate, perhaps with partners with a technology background, if there is a plan to make the solutions developed available to third-parties too. The major attraction of this approach is the maximum customization. But it also entails a higher investment, longer development cycle, and the most uncertainty. This means that this option is reserved for no more than a handful of the industry leaders.

And for the bigger group of companies in growth mode, working with a nimbler vendor offers the various benefits enabled by both the application of new technologies and the deliverance from the legacy problems. Doing so, however, does require committing to completely outsourcing of a crucial function and brings up its own path dependencies issues.

Most of the challenges faced by the industry will persist unless the industry is willing to change. Capital market participants will have to deal with heightened regulatory requirements, pressure on margin, intensifying competition, all while managing growth rate unique to the Asia-Pacific market. Nevertheless, they do not have to continue to deal with these challenges the same way they used to. And it is the new way of doing business that will carry them far despite those seemingly insuperable obstacles.



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