

FinTech in Asia

JAPAN

Japan's Securities Markets and FinTech

Yuta Seki / Nomura Institute of Capital Markets Research

CHINA

FinTech in China's Capital Market

Xingnan Wang, Rui Huang / Guangdong University of Finance

MALAYSIA

Developing a Facilitative Ecosystem for Digital Innovation in the Malaysian Capital Market

Chin Wei Min, Azrina Azmel / Securities Commission Malaysia

SINGAPORE

Singapore's Smart Financial Centre Vision

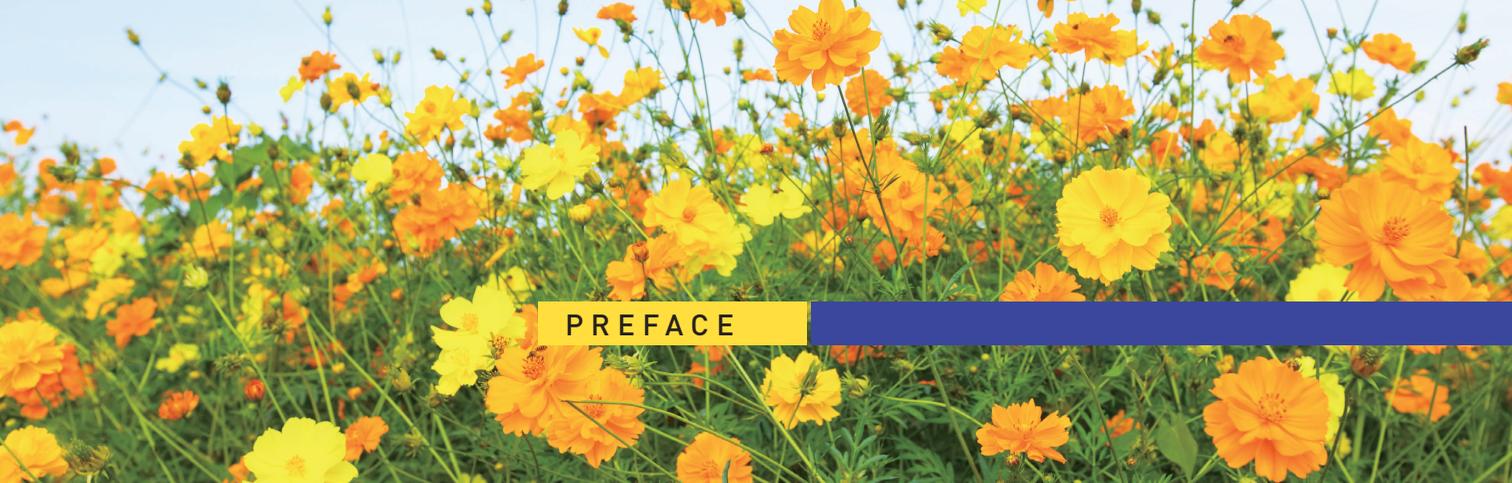
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INSIGHT

Business Analytics – a rising star in FinTech

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PREFACE

Financial inclusion, the providing of available and affordable financial services to disadvantaged and low income individuals and small and medium-sized enterprises (SMEs) is one of the foremost pressing issues faced in developing Asia. The idea of promoting greater financial inclusion is not a new one. Governments, together with financial institutions, have long strived to implement initiatives making financial services more accessible to wider parts of society. Yet, with the cost of financial inclusion remaining high until recently, large segments continue being underserved, even unserved, by conventional financial institutions.

Today, the potential of innovative digital financial services to spur greater financial inclusion in Asia is widely recognized. The FinTech wave is impacting the financial landscape in a variety of ways, leading to the introduction of new business models and solutions, such as digital payment, peer-to-peer lending and equity crowdfunding platforms, making financial products and services available to more people and SMEs by lowering costs and access barriers. This (r)evolution is driven by a number of factors, from changing demographics and investment behavior, increased financial literacy and consumer expectations, a growing need for alternative funding channels for SMEs, to technological advances.

Furthermore, a growing middle class with disposable income and the appearance of digitally proficient HENRYs (high earners, not rich yet), has led financial service providers to look for innovative ways to extend their services at appealing rates to lure in these new potential investor segments. In response to the growing demand, regulators have begun implementing new regulatory frameworks opening the way for low cost digital investment management services. These so called Robo-Advisors are expected to play a key role in enabling increased investor participation, leading to new opportunities in capital markets.

The change in market expectations led well established financial institutions to set up in-house FinTech units stimulating a startup culture to innovate themselves from within, and are collaborating with FinTech companies. This collaboration is mutually beneficial – FinTech solutions offer financial institutions opportunities to improve customer experiences and serve new customer segments at a lower cost, while collaboration with financial institutions helps FinTech companies to broaden their reach.

FinTech has not only challenged the conventional approach to financial services provision, but is also revolutionizing how regulations are handled with the increasing popularity of regulatory sandboxes enabling market players to conduct innovative experiments in a safe and supervised environment. With FinTech companies continuously increasing their cross-border financial transactions, regulators have also begun looking beyond their borders to build collaborative partnerships with their counterparties in other jurisdictions.

This issue of *Nomura Journal of Asian Capital Markets* features articles on FinTech developments by financial regulators and researchers discussing regulatory frameworks, challenges, and the future outlook in the region, with insights on the potential of FinTech in capital markets.



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Japan's Securities Markets and FinTech

FinTech's Infrastructure and Service Layers

FinTech, a term created as an abbreviated form of “financial technology,” refers to the use of information and communication technology (ICT) to promote innovations and rebundling of finance, financial settlements, and financial services. FinTech is now being used to refer to financial-related technologies in a wide range of fields. It is increasingly used with the adjective “disruptive” because FinTech is also a phenomenon that is significantly innovating the functions provided by conventional financial services and reconfiguring the value chain.

The ICT industry is generating a constant stream of innovations through its efforts to accelerate data processing and support open forms of contracts, such as cloud computing, and resource procurement management. These innovations include artificial intelligence (AI) and machine learning, robotics, the Internet of Things (IoT), and self-driving vehicles (i.e., the fourth industrial revolution). In addition, the widespread use of smartphones and the expansion of e-commerce and so-

cial networking services (SNS) are bringing about dynamic changes to consumer behavior and lifestyles. The emergence of people and ideas from outside the financial industry that are trying to shake the existing financial order by bringing together various innovations may be considered another FinTech-induced trend.

The financial functions that FinTech seeks to innovate and rebundle can be broadly divided into two layers – the infrastructure layer and the service layer.

FinTech's core technologies and concepts are its infrastructure layer. Blockchains or distributed ledger technology (DLT), which are the mechanisms supporting the Bitcoin virtual currency are part of FinTech's infrastructure layer, as are the mechanization and automation of financial services or digitalization of transactions using machine-learning AI and big data.

Meanwhile, the technologies and concepts used to provide financial services that end users access are called the service layer. An example of this service layer of FinTech is the ability to display the status of a customer's assets and make investment portfolio proposals using an application programming interface (API), an interfacing and linking mechanism that enables customers to use remote programs and software to connect to a system and use its functions.

The figure below shows the areas of the securities business value chain that FinTech can impact. The rest of this article presents the current status of the main ar-

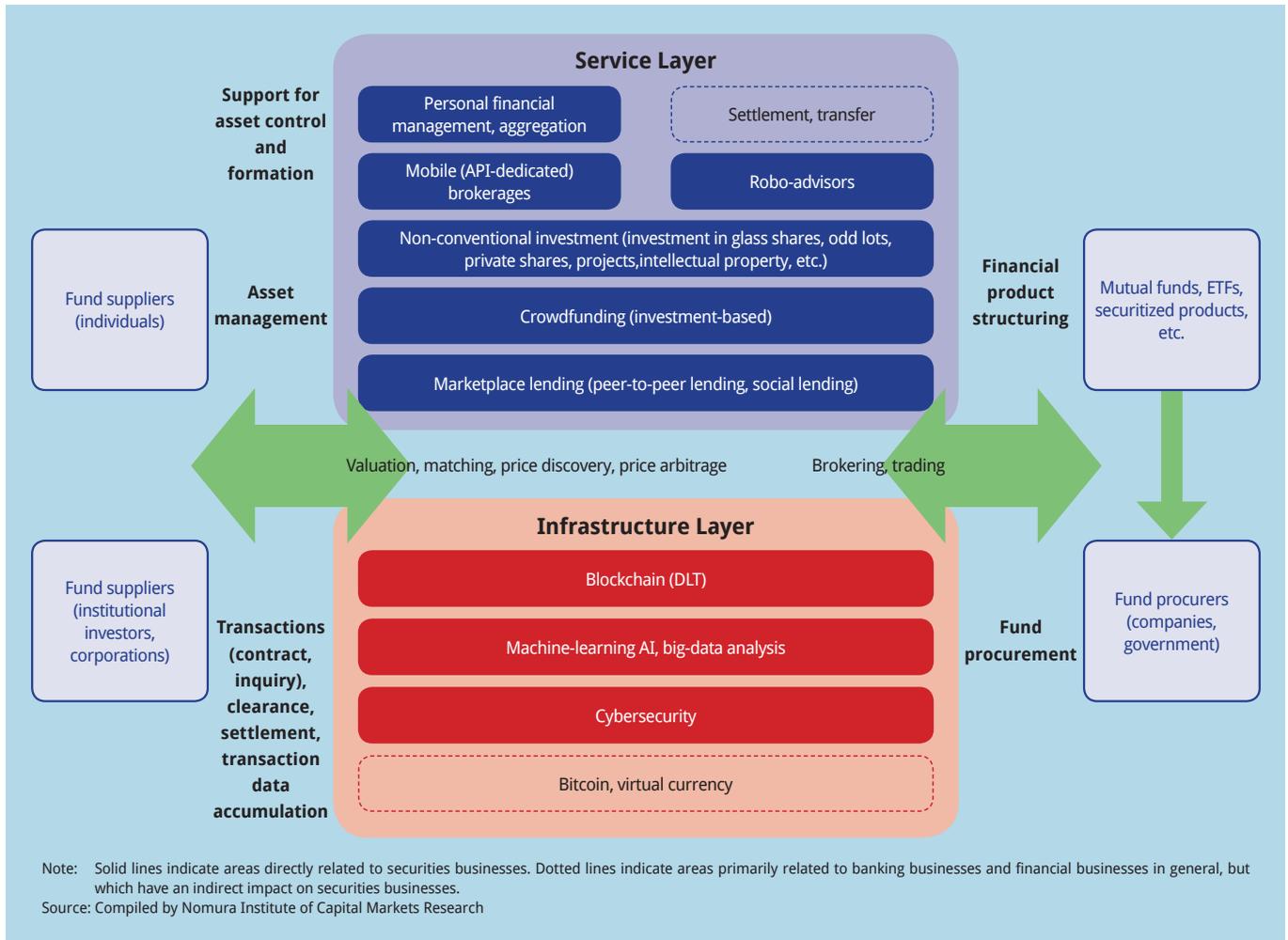
reas in which FinTech is having an impact on Japan's securities industry and an overview of representative business models.

FinTech in Japan's Securities Industry

Customer services, information management, investment advisory, and asset management

Personal Financial Management (PFM): PFM refers to a service for generating household accounts by aggregating data from banks, credit card companies, electronic money accounts, point cards, and other sources. By enabling automated aggregation from various sources and envisioning of financial status, PFM can enhance financial service business' ability to deliver essential value to their retail customers. Using the log-in ID and password provided by a customer, financial managers utilize a technology known as “scraping” to access the website of the customer's financial institution. However, it has been pointed out that this practice exposes customers to information security breaches. In response, financial managers have begun to access a customer's accounts at fi-

Figure 1: Securities Business Value Chain and FinTech



financial institutions by connecting through APIs, which does not require submission of the customer’s ID and password.

In the U.S., FinTech services such as Intuit’s Quicken Online, Yodlee, and Mint.com appeared soon after the Internet became widely used in the 1990s. More recently, we have seen the emergence of companies that are providing services that bring additional value to PFM. For example, Credit Karma offers advice on improving credit scores, Digit offers an automatic savings function, and Personal Capital provides an automated asset management function combined with consulting services offered over the phone or by financial planners.

In Japan, the rapid proliferation of smartphones since 2010 has led to the emergence of startups offering app-based services, such as Zaim, Money Forward, and Moneytree. In recent years, we have seen these mobile app providers begin to integrate their services and promote tie-

ups with traditional financial services. For example, Money Forward has begun collaborating with SBI Sumishin Net Bank, a number of regional banks, and Tokai Tokyo Securities.

Robo-Advisors: Robo-advisors are online services that (1) create an investor profile that is then used to (2) formulate an individualized investment policy that is used to provide an automated asset management service, including discretionary investment in ETFs, investment trusts, and other instruments. An algorithm based on the customer’s answers to a simple questionnaire automatically puts together an optimal investment portfolio and conducts automated rebalancing and reallocation during the management period.

In the U.S., a number of startup firms offering robo-advisor services – such as Betterment, Personal Capital, Future Advisor, Wealthfront, and SigFig – were established in the years immediately following

the 2008 financial crisis. The past 2–3 years have seen the startup of robo-advisor services by a number of major well-established investment advisors, including Vanguard, Charles Schwab and BlackRock, which acquired Future Advisor. Other recent trends include combinations with aggregators, such as Envestnet’s 2015 acquisition of Yodlee, and the emergence of companies specializing in providing system tools to independent registered investment advisors (RIAs).

In Japan, “THEO” was launched by Money Design in February 2016 and “WealthNavi” was launched by WealthNavi later that year in July. These independent service providers are offering discretionary asset management services for investment in ETFs and investment trusts, based on discretionary managed account agreements signed with their customers. In addition, several financial institutions have established robo-advisor services, including SBI Securities’ “SBI FundRobo”, 8 Securities’ “8 Now!”

and “Chloe”, Nomura Securities’ “Nomura Goal-Based”, Matsui Securities’ “Toshinkobo”, Monex-Saison-Vanguard Investment Partners’ “MSV Life”, and Rakuten Securities’ “Raku Wrap”. However, these financial institutions’ robo-advisor services are positioned as a tool for leading customers to invest in wrap (balanced) funds. In any case, it is anticipated that these services will provide a means to approach asset-forming households that may not have been sufficiently serviced in the past.

Fund procurement: Crowdfunding

Crowdfunding is an example of Fin-Tech used in the field of fund procurement. Crowdfunding is a new form of financial service that enables the procurement of small amounts of funds via the Internet from a large number of unspecified small-scale investors. Crowdfunding is categorized according to the type of return received by fund providers. Crowdfunding types seen thus far include lending-based (interest is earned and principal is repaid), investment-based (shares are received in exchange for investment, with the possibility of dividend payments), donation-based (donations with zero return to fund supplier), and prepurchase-based (products and services are received, with no monetary return). Among these, lending- and investment-based types of crowdfunding are considered to be closely related to securities businesses.

Lending-based Crowdfunding: Lending-based crowdfunding is a financial intermediation service that connects fund providers and fund procurers via the Internet. This type of crowdfunding has also been called social lending, marketplace lending, and peer-to-peer (P2P) lending. Lending-based crowdfunding uses AI to analyze various types of personal data not previously used in lenders’ credit checks. These include PFM and cloud accounting data, credit card settlement information, records of e-commerce transactions, and information extracted from social media. This multifaceted analysis is expected to enable lending to a class of borrowers who previously were not eligible for bank loans. Intermediaries providing the platform receive fees equivalent to around 1–3% of the value of the loan. Borrowers receive better terms than they would from conventional financial institutions, and lenders can expect to earn a higher return than when investing in traditional financial assets. The actual loan is extended by a bank that has partnered with the intermediary, and in many cases beneficiary rights are issued

to the lenders. It has therefore been pointed out that this type of crowdfunding may lead to the creation of a new collateralized loan obligation (CLO) market.

Growth of the lending-based crowdfunding market in the U.S. was driven by the startup firms Prosper and Lending Club, respectively founded in 2005 and 2006. In October 2016, Goldman Sachs launched its own online lending platform, called Marcus, and going forward the market is likely to see the entry of other major financial institutions.

Japan’s Money Lending Business Act, which requires money lenders to be registered, has inhibited the emergence of P2P transactions, but alternative methods of transferring funds from lenders to borrowers are being devised, such as the use of silent partnerships. The first lender to use this form of lending was Maneo, a startup established in 2007. Similar services have since been launched by AQUISH, SBI Social Lending, Crowd Bank and others. Lending-based crowdfunding in Japan accounts for a small share of the global market for this type of lending, but the domestic market is growing and is expected to continue developing in the years ahead.

Investment-based Crowdfunding: Investment-based crowdfunding is an Internet-based scheme that enables soliciting capital subscriptions to share issues from large numbers of unspecified investors. Investment-based crowdfunding makes it possible for startups to procure a certain amount of capital by issuing shares to many investors without listing on a stock exchange. This scheme also has the potential for creating new types of relationships between companies and their shareholders by, for example, turning the fans and supporters won over through Internet-based presentations of their business models into shareholders. Unlike donation-based and other types of crowdfunding, investment-based crowdfunding is likely to be subjected to national regulations regarding the issuance and trading of securities.

In the U.S., enactment of the Jumpstart Our Business Startups (JOBS) Act in 2012 removed the ban on investing in shares through crowdfunding websites. AngelList, founded in 2010, and other companies have established platforms to connect investors (nicknamed “angels”) and entrepreneurs through social media. However, these platforms have not been fully utilized to date, partly due to delays in the establishment of Securities and Exchange Commission rules needed for implementation of the JOBS Act.

In the UK, both fund-based crowdfunding using collective-investment schemes and equity-based crowdfunding exist. However, the former is subject to strict restrictions on investment solicitation. As a result, equity-based crowdfunding is currently the core form of investment-based crowdfunding in the UK. In 2014, the UK’s Financial Conduct Authority introduced new regulations pertaining to equity-based crowdfunding, which included specific requirements regarding the information to be provided to investors and other conditions to be met by intermediaries. Following these improvements in the regulatory environment, the number of crowdfunding deals and the total amount procured increased sharply in 2015. As a result, equity-based crowdfunding is steadily becoming a core fundraising method for startups in the UK. Founded in 2010, Crowdcube has become well known as the country’s largest equity-type crowdfunding platform.

Japan has two main types of investment-based crowdfunding – silent partnership-based and equity-based crowdfunding, with the silent-partnership type being the main market growth driver to date. A representative player in this market is Musci Securities, which was founded in 2001. The company mainly manages funds for local specialty products, with cumulative investments exceeding JPY 50 billion yen. Meanwhile, a regulatory framework for equity-based crowdfunding was created by the 2014 revision of the Financial Instruments and Exchange Act. The revised Act lowers the minimum capitalization requirements for Type I financial instruments business operators from JPY 50 million to JPY 10 million. The revised Act also stipulates that total value of small-scale electronic equity offerings must be less than JPY 100 million and sets the maximum subscription from an individual investor at JPY 500,000. Following the changes to the regulatory framework, Japan Cloud Capital registered as a Type I small-amount electronic public offering business operator in October 2016. In January 2017, the company launched its FUNDINNO equity-based crowdfunding platform. Equity-based crowdfunding offerings in Japan are still relatively few, but the availability of a new fund-raising method for startups should be welcomed. This new fund-procurement method is expected to see greater use in the future.

Brokering and trading

In the institutional brokerage and trading domain, technologies for automation, mechanization, and high-speed processing were introduced at an early stage, and various ICT innovations have been enthusiastically adopted. On the other hand, research and other areas have been slow to adopt innovations in automation and mechanization. However, the application of AI and big data could produce major changes in these areas. In particular, advances in social media, IoT, and sensor technologies have led to an explosive increase in unstructured data that is expected to generate new value when combined with machine-learning AI. For example, natural language processing is already being used in the U.S. to automatically generate regular reports, such as earnings releases. Two prime examples of these natural language generation platforms are Narrative Science's Quill and Automated Insights' Wordsmith. These innovations will probably lead to more advanced analysis of market fluctuation factors and momentum in the near future.

Securities brokerage and trading businesses targeted at individual investors are developing new investment services, such as social trading and copy trading based on shared information available to members of an online community, and taking advantage of the proliferation of smartphones by introducing apps that make it

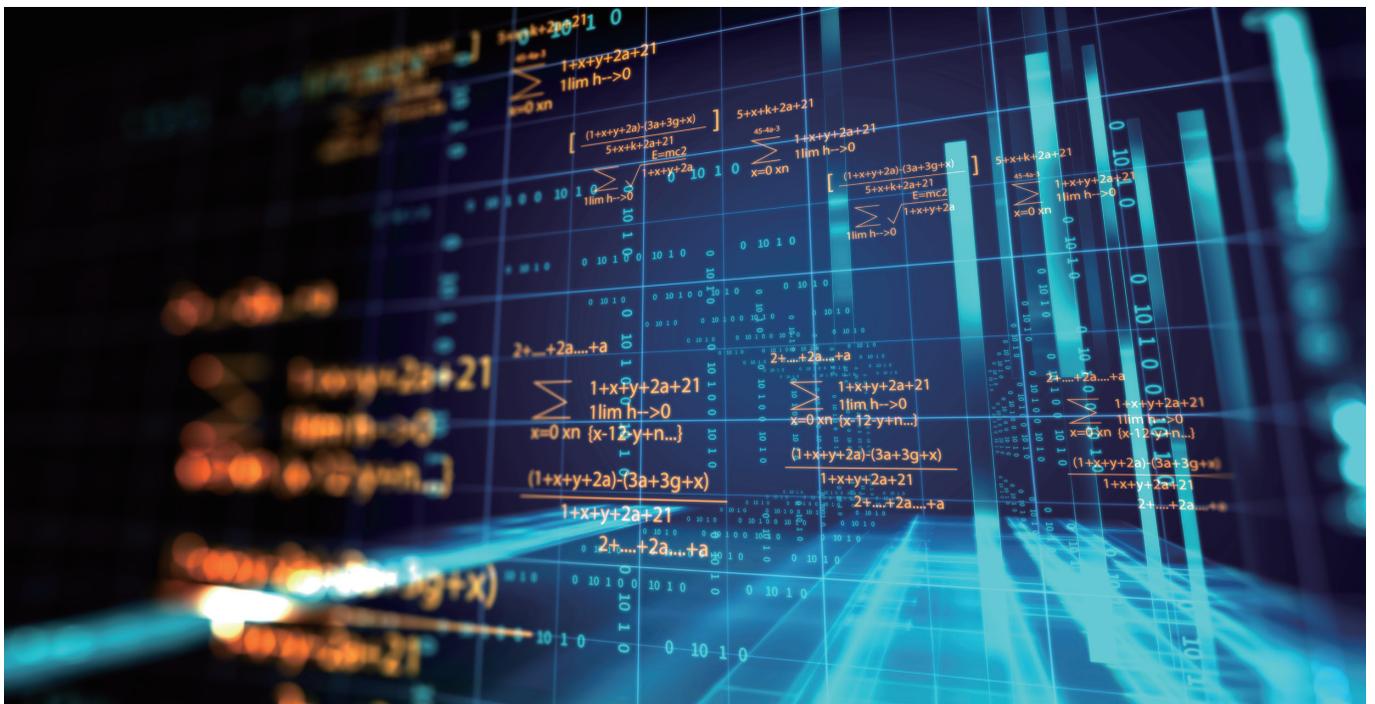
easy for individuals to conduct trades on their devices.

The smartphone era has seen the emergence of mobile brokerages, which specialize in providing services via smartphone apps. Robinhood, a U.S. company established in 2013, offers customers commission-free trading and instead derives its revenues from interest earned on investing customer funds deposited with the company and from charges for its premium service. Acorns, another U.S. mobile broker, provides a service where amounts on purchases made using credit cards and debit cards are rounded up to the nearest dollar, with the rounded-up amount automatically transferred into specified ETF and investment trust accounts. Both companies are enjoying strong support from young adults.

In Japan, One Tap BUY launched a service in June 2016 for easily trading 30 U.S. blue chip stocks using only three taps on a smartphone. The company makes investment decisions easier for its target customer base of younger, inexperienced investors by providing information on the companies targeted for investment and historical stories about their founders in easy-to-understand cartoon strips. Imitating Acorns, WealthNavi in spring 2017 started a service for SBI Sumishin Net Bank customers that transfers to investment accounts a rounded-up amount tacked on to purchases made using electronic money and credit cards.

Settlements and infrastructure: Blockchains

Blockchain is a technology that compiles transactions made during a defined period of time into one unit (block) and then registers the blocks to form a continuous link. Instead of maintaining encrypted transaction ledgers in a central institution such as a stock exchange, the information is distributed and shared among participants in P2P networks (DLT). Blockchain technology is expected to improve safety and stability of transactions while also lowering costs. Possible uses in the securities field include trading in unlisted shares and bonds and over-the-counter derivatives. Blockchain was made famous as the core component of the digital currency Bitcoin, but the application of this technology to securities transactions faces a number of hurdles. First, all transactions are visible to all participants, which means that large transactions and positions, as well as prices in negotiated transactions, are exposed to public view, which is unacceptable to most users. Second, authentication takes too much time in proof-of-work mining. To overcome these hurdles, consideration is being given to designing systems that require approval for network participation, appointing an actual network administrator, and not requiring agreement from all participants when making transactions. At present, numerous standards, including Ethereum, Hyperledger, and Corda,



are competing to become the mainstream standard.

In Japan, the Japan Exchange Group launched a two-part blockchain verification test in April 2016. In one part, Hyperledger was used in a test jointly conducted with IBM Japan. In the second part, Ethereum's consortium/private standard was used in a test jointly conducted with Nomura Research Institute and CurrencyPort. According to a report published in August 2016, the tests confirmed cost reduction and business continuity planning-related advantages in settlement and other post-trade operations. On the other hand, the report identified several issues that need to be resolved to realize widespread use. In the short run, data privacy requirements must be satisfied and smart contracts must be developed; in the long run, throughput performance must be enhanced to enable processing of large amounts of data and DLT-based settlements involving large amounts of funds must be realized.

FinTech and Japan's Securities Market

Japan's securities industry has undergone dramatic changes since the 1990s as a result of such developments as liberalization of stock brokerage commissions and the emergence of Internet and online securities trading. In light of this past experience, the view that established securities players are under immediate threat from changes brought about by FinTech is rather muted when compared with the perceived threat to other financial businesses, such as those that are directly impacted by changes in settlement, transfer, lending, credit examination, and other systems. Nonetheless, assuming that FinTech will continue bringing innovations to the various parts of the infrastructure and service layers of the securities business, all players will eventually have to devise and implement FinTech strategies.

Lastly, the promotion of FinTech is likely to impact Japan's securities markets in three important areas.

The first will be the promotion of investment in securities as a means for building up the financial assets of Japanese households. At present, 52–53% of

the estimated JPY 1,800 trillion in Japanese individuals' financial assets are deposited in bank accounts with interest rates near zero. Investment in securities accounts for only 16% of Japanese households' financial assets. Despite the rather high IT literacy in Japan and concerns about the future of pension systems, conventional securities business operators have had difficulty attracting young people and the working-age population. FinTech may encourage these groups to invest in securities.

In addition, the use of FinTech and the development of new services are expected to promote greater use of new systems supporting asset formation by Japanese individuals. These new systems include the Nippon Individual Savings Account (NISA), a tax-free small-lot investment program, which will be enhanced by the start of an installment-type NISA in January 2018, and iDeCo, a defined-contribution pension plan for individuals (similar to individual retirement accounts in the U.S.), eligibility for which was greatly expanded in January 2017.

The second area likely to be significantly affected is the supply of risk money. Amid concerns about sluggish future economic growth in Japan, revitalizing the capital markets and securing an adequate supply of risk money to emerging and growth companies have become key issues. Crowdfunding, social lending and other FinTech developments are expected to facilitate angel investment and venture investment, thereby increasing the flow of risk capital to promising startups, technologies, and entrepreneurs. FinTech also may lead to the creation of new capital markets, such as markets for secondary trading in unlisted shares, securitized P2P lending, and big-data transactions.

The third area where we expect FinTech to have a significant impact is Japan's position as an international financial center. The highly skilled individuals and startup firms that are driving the advances in FinTech and the fourth industrial revolution increasingly are assembling teams without regard to nationality and have their sights set on global markets from the outset. This in turn is generating international competition for outstanding human resources and ideas. Japan's creation of an attractive ecosystem for FinTech entrepreneurs and startups could lead to an increase in inward foreign direct investment that would also contribute to maintaining and enhancing Japan's position as an international financial center. In addition, securing Japan's position as an international financial center will attract a large number of financial

institutions, asset management companies, venture capital firms, law firms, accounting firms, and other specialized businesses with an interest in pursuing FinTech innovations, which in turn will have a large positive impact on the Japanese economy.

Given the potential significance of FinTech for the Japanese securities market and economy as a whole, Japan's policy-makers and regulatory authorities need to be more aggressive in creating an environment conducive to the development of FinTech. Meanwhile, FinTech's generation of new products and services could give rise to issues and challenges that were not anticipated in the existing legal and regulatory framework. Going forward, all market participants must be ready to aggressively adopt FinTech innovations that add to the value of Japan's capital markets or enhance their international competitiveness, while also safeguarding the critical functions of the securities market, such as investor protection, market efficiency and fairness, and the stability of the financial system.

Notes

This article is an updated and abridged version of the "Report of the Survey Group for Research on the Securities Industry and Fintech" (January 2017). The author served as chair of the survey group.

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FinTech in China's Capital Market

Introduction

China has been a world leader in FinTech. In some financial technology industries, such as digital payments, China is in the forefront of the world. In the area of financial products and services, FinTech is reducing costs, improving service quality, and promoting market liquidity and efficiency. Until recently, FinTech has been focused on payments, peer-to-peer (P2P) lending and equity crowdfunding. However, the evolution of FinTech in capital markets has accelerated; technological advances such as artificial intelligence (AI), robotic process automation, blockchain and cloud technology have appeared.



Why FinTech is so Hot in China

China's FinTech sector is fueled by several factors such as the rise of the BAT (Baidu,

Alibaba and Tencent); hot investment; explosive growth in e-commerce and digital payment systems; soaring financial services demand; and regulatory pressure. Unlike in the U.S. or Europe, in China disruption by FinTech firms is not occurring at the periphery of the financial sector. It has gone past the infection point, with technological innovation reshaping the financial landscape.

The rise of the BAT

Baidu, Alibaba and Tencent rank as the top three internet-based companies in

Figure 1: China Fintech Investment Activity of Venture Capital-Backed Companies

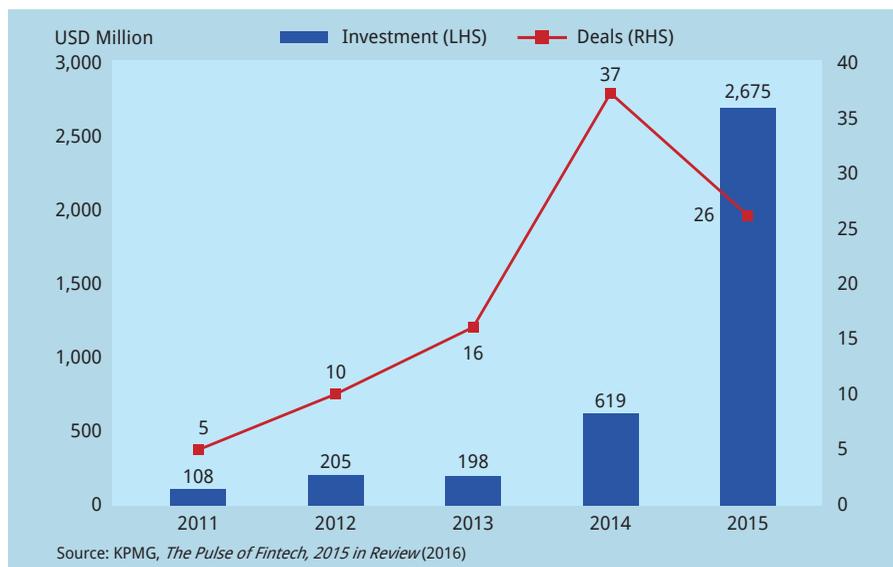
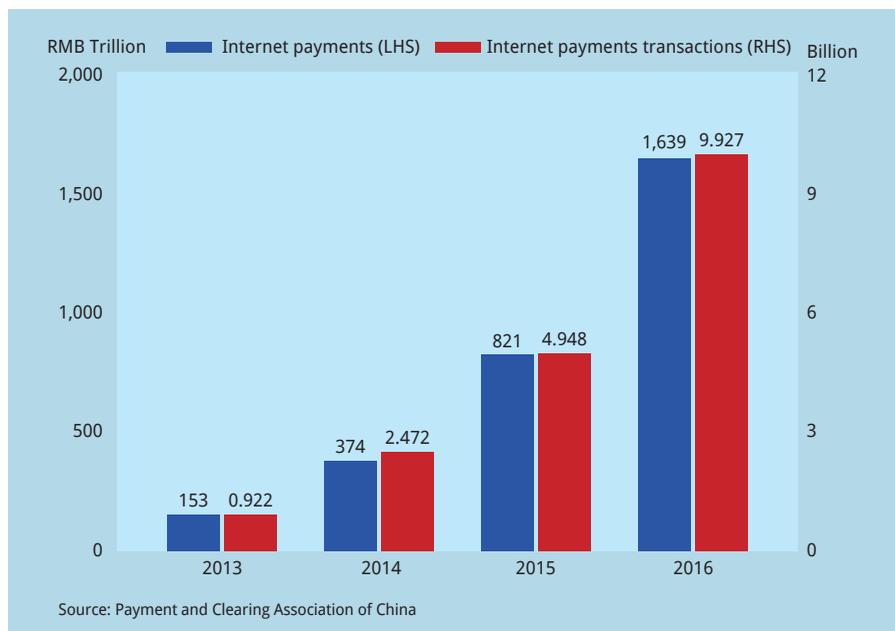
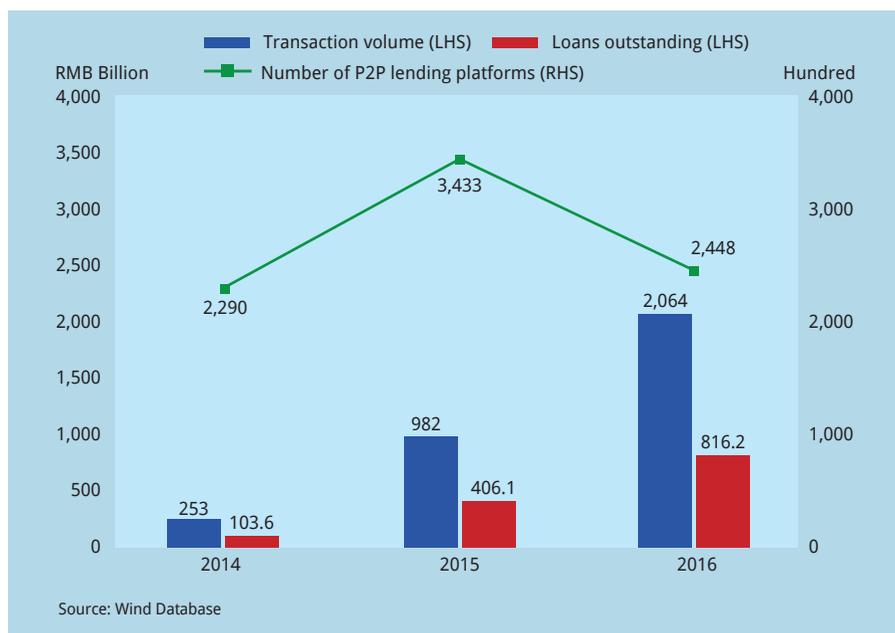


Figure 2: Internet Payments (including mobile) in China**Figure 3: China P2P Lending**

China. They are all entering into FinTech to challenge the traditional financial services industry. Taking advantage of their large customer bases and competitive advantages, they provide FinTech solutions across a variety of subsectors. Alibaba started as the largest e-commerce platform in China, and it has now become a giant in digital payments with its AliPay app; moreover, through its financial arm, Ant Financial, it is actively tapping into the opportunity in

China's fast-growing FinTech market. Actually, founder and chairman, Jack Ma, said Alibaba is not a retail company, but a data company which makes the most of big data from its e-commerce transactions. In addition, Tencent, through its social media app WeChat, also uses a "red envelope" function to train customers' digital payments habit and occupies a dominant position in FinTech. According to JPMorgan, what will drive a large part of the FinTech market in

China is online payments, and Alibaba and Tencent combined could control 50% to 60% of the FinTech market. Baidu also started up its Baidu Brain project to consolidate its FinTech status.

Hot investment

From above, China has been quite active in FinTech solutions for the past few years. Meanwhile the investment boom in FinTech is on the way. According to KMPG, VC backed investments in China boomed in 2015 (Figure 1) and in 2016. Furthermore, Ernst and Young (EY) estimates that FinTech investment in China reached USD 8.4 billion among which 46% was raised by Ant Financial. The sources of funding include government-guided funds, private funds and IPOs. More than 750 government-guided funds have been launched, which stimulates the private funds to support startups. For late-stage FinTechs, Chinese FinTechs also benefit from an active IPO market, completing more IPOs in the past 10 years than the leading U.S. and UK exchanges. All provinces in China also have provincial industrial funds allocated to encourage technology investment, from which the FinTech sector naturally benefits.

Explosive growth in e-commerce and digital payments

Due to a large population and internet consumption habits, China has built the world's largest e-commerce market (accounting for 47% of global digital sales) and digital economy. Over 25% of the population, about 358 million Chinese customers, used mobile payments in 2015. In 2016, internet payments totaled about RMB 1,639 trillion (Figure 2), among which RMB 200 trillion were mobile payments, nearly 50 times the amount of mobile payments in the U.S. Additionally, Chinese SMEs have historically been underserved by the traditional banking system. This is one vital reason why P2P lending has prospered in the past few years (Figure 3), and now faces tightened supervision. Soaring demand for financial services creates a significant base of financial institutions to generate corporate demand for FinTech solutions.

Regulatory pressure

The People's Bank of China (PBOC) plays a central role in formulating guidelines and has adopted an open and tolerant stance while designing the regulatory framework for internet finance which will leave certain space for the continued development of internet finance while drawing the bottom line clearly. However, a large number of internet finance compa-

nies are turning into FinTech fields. There are at least two reasons for this phenomenon. For one thing, FinTech firms focus on technology and circumvent regulations on internet finance; for another, the regulators seek novel solutions like regulatory technology (RegTech) to better comply with regulations, which impose pressure on traditional financial institutions to taken more seriously on FinTech.

FinTech Development of Capital Market in China

According to KPMG's *China Leading FinTech 50 Report* for 2016, big data ranked top in the business models of the top 50 companies in the sector, while blockchain, internet securities, investment management, and crowdfunding ranked 9th, 11th, 12th, and 13th, respectively. Since data is at the heart of recent developments in the financial services sector, companies that seek to harness the power of big data enjoy a significant competitive advantage over their peers.

Blockchain

A new report from Goldman Sachs Investment Research projects that the implementation of blockchain technology could streamline the clearing and settlement of cash securities, saving capital markets USD 11-12 billion globally on an annual basis. The adoption of blockchain technology provides operational transparency for the asset, which greatly enhances the efficiency, safety and traceability of the product. Blockchain technology is not new to China – about 80% of bitcoin volume is now exchanged into and out of Chinese yuan – but when it comes to its app in the capital market, blockchain startups are mainly at the experimental stage. In 2016, China's Ministry of Industry and Information Technology published *China Blockchain Technology and Application Development White Paper* and organized a special government-industry working group to speed up promoting R&D and deployment of blockchain applications. Several consortiums that focus on the application of blockchain in finance, commerce, public service, and other industries, have been established in China. Some examples are China Ledger Alliance, Financial Block-

chain Shenzhen Consortium, Qianhai International Blockchain Ecosystem Alliance, which focus on the application of blockchain in finance, commerce, public service, and other industries.

Representative cases: Baidu Finance announced the issuance of the first blockchain-based asset-backed security (ABS) product in China in May 2017, backed by RMB 424 million worth of personal car leases; Tencent has released the blockchain consortium platform, TrustSQL, and launched the Financial Blockchain Cooperation Alliance (Shenzhen), which carries out research on the application of blockchain in the financial services sector. Alibaba has adopted blockchain technology for its charity project with the Chinese Red Cross Foundation. JD Finance tested the first blockchain consortium with China Unionpay. Taiyiyun Technology is a blockchain-based enterprise that is listed on the National Equities Exchange and Quotations (NEEQ). It has recently begun collaborating with a number of public bodies on using blockchain technology in financial services and insurance. It is a member of Hyperledger, an open source project that seeks to promote the development of blockchain globally. Antshares, which was launched by Shanghai Haike Internet Financial Information and Services (Onchain) in June 2014, is one of the first blockchain services in China that provides enterprises with customized blockchain solutions including asset register transitions, enterprise internal risk control and voting and resolution.

These blockchain initiatives are baby steps into the finance services sector and maybe will prosper in the future. However, this trend is creating enormous challenges including difficulties in integrating with current ecosystems; lack of security protection for application data, logic and operating environment; and issues around trust and protection of individuals' and business' privacy.

Big data & AI

To meet demand from a growing generation of consumers for a richer landscape of investment vehicles, wealth management firms are launching smartphone apps to appeal to this younger, newly rich demographic.

Representative cases: WeBank has applied several innovative technologies such as face recognition, voice recognition and robotics in its mobile apps such as Credit Particles, WeCar Credit, etc. WeBank has

also launched We Zhong Financial Management, a mobile app for rural banking, as well as another app for the interbank market. FUTUNN.COM provides services to support the front, middle and back office functions of securities companies. JFZ is an internet wealth management company that provides wealth management services for high net worth individuals. Wacai Money Manager is the company's personal wealth management platform and Wacai Bao is designed to provide its users with bespoke financial management services. Shenzhen Suishou Technology was established in July 2011 and is well-known in China for providing wealth management services.

Meanwhile, an even newer digital tool introduced in mid-2016 by digital wealth management firms provides simplified investment advice through sophisticated automated online platforms. These platforms, so-called robo-advisors, are modeled on U.S.-based automated investment advisers such as Wealthfront and Betterment. They incorporate big data and AI to eliminate or reduce the need for face-to-face interaction with substantially lower costs, yet provide customised online financial advisory services. Robo-advisory first-movers in the Chinese market include CreditEase which launched its robo-advisory product ToumiRA using trading algorithms to match investors risk preferences and objectives to their optimal portfolios. Another notable player is PINTEC with Xuanji, which automatically rebalances a global portfolio, including onshore RMB and offshore USD assets, for retail investors.*¹ Zipeiyi develops AI systems for securities and other financial services companies. Based on the concept of making asset allocation more straightforward and efficient, the company applies AI technology to the asset management industry. Tiger Brokers uses a variety of internet technologies, which are designed to improve efficiency in the financial services sector and to facilitate investment in global securities markets. Others offering machine-assisted investment advisory include Baidu Gupiao, PingAn One, MiCai and Clipper Advisor.

Robo-advisory could well reshape the future of China's wealth management business. Which players succeed will depend on their developing clever partnerships with global peers. They will also need broad and deep asset offerings, portfolio allocation, and technological superiority in big data analytics and machine learning.

FinTech's Influence on China's Capital Market

Serving more low-income groups at lower costs

Due to the costs, a large number of low-income customers (with annual net income less than RMB 100,000) cannot meet the threshold to invest in traditional financial products. Chinese SMEs also have the same problem. Despite this, about 358 million Chinese customers use mobile payments, which create a solid foundation for FinTech development. Actually, FinTechs focus on serving the vast majority of people, including the low-income group, and improving existing financial services. They help promote efficiency without raising costs through automation and simplification. They also enable disaggregation of the traditional value chain in the capital market as they become more embedded in business and consumption.

Boosting rural-inclusive financial system

The establishment of a leading digital finance sector is increasingly expanding beyond the cities into the rural areas. FinTechs such as online-only banks can reach unbanked individuals in line with the Chinese Government's policy to promote financial inclusion. 71% of the country's 234 million unbanked adults and 54% in the poorest two quintiles of households live in rural areas. There are few physical branches of banks in rural areas, but mobile phones are another story. With the help of financial apps, large banks like Postal Savings Bank of China (PSBC) and FinTech firms have expanded aggressively into rural China.

Promoting cooperation between financial institutions and FinTechs

In order to increase revenue and market share, more and more firms in the securities industry will seek to cooperate with FinTechs. The FinTechs know how to innovate products and services to deliver more value to underserved clients and market segments. FinTechs have data and technology; they have customer data, consumption patterns and intimate relation-

ships with customers; they will take full advantage of structured and unstructured databases, or big data, on which sophisticated analytics will be processed easily and quickly to develop pricing and service strategies.

Delivering regulatory-driven change at acceptable cost

Farsighted regulators in China are seeking to establish mechanisms to reduce regulatory uncertainty and time cost in financial market. The PBOC, the country's central bank, announced on 15 May 2017 that it has set up a committee, namely People's Bank of China Financial Technology Committee, to enhance research, planning and coordination of work on financial technology. The central bank will also increase the use of RegTech to boost its capabilities in identifying, preventing and dissolving financial risks, including both cross-sector and cross-market risks, with technology such as big data, AI and cloud computing. FinTechs will likely benefit from the transparency of RegTech to lower the complexity and costs of maintaining regulatory compliance.

Gaining competitive advantage

Technological innovation will disrupt the competitive advantages of participants in global capital markets. Regulation may cause disruption and uncertainty. However, it is also creating opportunities for new players. In many ways technology is making it possible for new entrants to compete with or enhance existing players and value chains – examples include the use of AI to displace 'voice'-dominated markets and alternative research providers that leverage unstructured data to generate deeper insights into existing trends and market opportunities. In short, technology will touch and transform business models in a vast array of areas, such as data management, market surveillance, cyber security, regulatory reporting, funding and alpha capture.

The Future of Chinese FinTech

As China will continue its policy of opening up to the outside World, its FinTech

firms face great opportunities. Chinese FinTech firms will expand out of China and foreign FinTech firms with competitive advantage will enter China. How can we seize the opportunity? Here are some points which relate to the future of Chinese FinTech.

Blockchain

In China, blockchain initiatives are still in the early stages of development, where major banks have only just started to commission proofs of concept and pilot projects for blockchain applications. FinTechs in Europe and America have more mature technology solutions and can leverage these innovations, capabilities and expertise to develop the Chinese blockchain market further.

RegTech and regulatory sandbox

FinTech firms abroad have developed solutions related to compliance, advanced data analytics and risk evaluation. These techniques and knowledge could all be leveraged to great effect in the Chinese marketplace as its FinTech sector and regulatory framework mature further. Besides, the regulatory sandboxes in the UK, Singapore and elsewhere are friendly and experienced with FinTech startups; their authorization processes and guidance are worth learning.

Foreign Exchange

China will gradually relax control over Qualified Domestic Institutional Investors (QDII) and Qualified Foreign Institutional Investors (QFII) to show its determination to speed up the yuan's convertibility under the capital account. Money transfer FinTechs and traditional financial institutions can supply FX services and ensure strict observance of laws in the Chinese market.

Chinese investment demand

With much investment flowing between China and overseas, there is likely a strong demand to meet the needs of FinTechs and investors in China. We may start to see more direct competition between, for example, Baidu and Google, Alibaba and Amazon, Tencent and Facebook. Whatever happens in China, there is no denying that incumbents and FinTech firms alike will need to transform to remain relevant in this new world order. The next few years will be an exciting time for the industry. Chinese FinTechs should look to partner with firms and financial institutions to develop cross-border partnership to serve this sizeable market.

Needless to say, China's FinTech sector will flourish in regulation, blockchain, trading, clearing, and settlement and create a safe and efficient capital market for the near future.

Notes

*1 Regulations regarding offshore investments in foreign currency by retail investors are not covered under the current legal framework. Therefore, investors using this service provided by PINTEC are not protected by law. (China Securities Regulatory Commission: http://www.csrc.gov.cn/pub/newsite/djffzqqhhdj/ffzqqhjs/201607/t20160726_301171.html)

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Developing a Facilitative Ecosystem for Digital Innovation in the Malaysian Capital Market

Introduction

The potential of digital finance to spur greater financial inclusion is widely recognised. The digital wave is impacting the global financial landscape in a multitude of ways, leading to the introduction of new business models and solutions, making financial products and services available to more people by lowering costs and barriers to access. This evolution is being driven by a variety of factors, from changing demographics and investment



behaviour, increased consumer expectations, growing demands for alternative financing for small businesses, to technological advances.

At the Securities Commission Malaysia (SC), we believe that socially-beneficial financial innovation should be encouraged given that such developments not only address growing demands by consumers but also hold promise for greater democratisation of markets by complementing traditional channels of intermediation through greater ease of entry and use, enabling fundraisers and investors to benefit from accessibility, cost-savings and convenience.

This paper addresses the approach taken by the SC to facilitate digital innovations in the Malaysian capital market. The first part highlights key efforts undertaken to introduce innovative market-based financing avenues to cater for growing financing needs of small businesses, including targeted initiatives to garner awareness and catalyse greater interest in digital finance. This is followed by a high-level overview of the digital strategy which the SC has crafted to enhance access to finance, increase investor participation, augment the institutional market and develop synergistic ecosystems. A dedicated section illustrates innovations impacting the investment management domain, with a focus on SC's recently launched framework on digital investment management services. The final section looks into the SC's policy stance and guiding principles in embracing the digital innovations which are enabling new opportunities in the capital market.

Road to Digitisation

Providing new sources and innovative mechanisms for market-based financing

One of the features of the entrepreneurial landscape of recent years has been the transformation of the early stage risk capital raising through advancements in technology. In this regard, digital technologies can provide solutions for micro, small and medium enterprises (MSMEs) by lowering the costs of obtaining capital and increasing transparency, thus making them more attractive to potential funders. Through market-based financing avenues such as equity-based crowdfunding (ECF) and peer-to-peer (P2P) financing,^{*1} digital innovations have democratised financing by enabling the connectivity between businesses and funders.

Against this backdrop, the SC has embarked on efforts to enable both businesses and investors to benefit from a regulatory framework that will facilitate wider accessibility to market-based financing avenues as well as utilising technology to enable greater investor participation. Our journey

began with the development of a facilitative regulatory framework for ECF in 2014 which saw its release in February 2015. In June 2015, the SC registered six ECF operators as Recognised Market Operators. ECF is a form of “patient capital” where investors take equity stakes in new companies and are expected to maintain that stake in a long-term manner. Continuing the momentum from ECF, the SC focused its efforts in 2016 to facilitate P2P financing, a form of digital innovation which broadens the ability of entrepreneurs and small business owners to unlock capital from a pool of individual investors in small amounts. This has led to the introduction of the P2P framework in April, followed by the registration of six P2P operators in November 2016.

Garnering awareness on digital finance

At the time when the SC was still developing the ECF framework, the SC organised its inaugural SCxSC Digital Finance Conference (SCxSC) in 2014 to explore issues of fundraising for small businesses and raise public awareness on the potential of new technologies to provide market-based financing solutions to MSMEs. The SCxSC which was held in partnership with other government agencies and market participants, drew a large crowd ranging from investors, start-ups, market players and the public who were interested to learn more about the rise of alternative finance such as ECF. The positive feedback received has led the SC to hold SCxSC as an annual event given that it serves as a useful platform to socialise the SC’s on-going digital finance initiatives and build public awareness of local and global developments in digital finance. For the past three years, the SCxSC conference has featured expert speakers on ECF, P2P financing, digital investment services and distributed ledger technology. Conference attendees were also able to listen to business pitches by various MSMEs and entrepreneurs that are raising capital through ECF platforms approved by SC.

Unlocking the potential of digital finance development

As part of the SC’s initiative to catalyse greater interest and visibility towards nurturing the development of digital finance, the SC launched the “Alliance of FinTech Community” or “aFINity” at the World Capital Market Symposium (WCMS) in September 2015. To date, over 100 industry participants have registered with aFINity. These participants represent a wide spectrum of stakeholders, from large financial institutions and reputable core

banking technology providers to innovative fintech start-ups in areas such as P2P financing, crowdfunding, digital investment services, online trading and distributed ledger technology.

The objective of aFINity is twofold. Firstly, aFINity functions as the SC’s outreach program for the digital finance community, aimed at understanding their needs, concerns on the ground and to provide steer in terms of regulatory and policy guidance to promote responsible financial innovation.

Secondly, through establishing “Innovation Labs” which are administered under the aFINity umbrella, it also acts as a platform to facilitate the exploration of new digital innovations within our industry. Lab activities would range from discussing business ideas and concepts which are enabled by digital, to developing proof of concept of digital solutions to meet specific industry needs. To ensure that ideas explored in the labs are relevant and aligned with the aFINity community’s interests, the SC has leveraged and will continue to leverage its regular aFINity discussions to generate a pipeline of topics or ideas which could be further explored in the labs.

Since its inception, a total of 72 engagements have been carried out under aFINity, which include:

- community-wide sharing sessions to provide guidance and clarity on SC’s overall regulatory purview and to socialise SC’s newly introduced digital finance initiatives such as P2P financing and digital investment management services,
- targeted focus group discussions to:
 - obtain feedback on SC’s proposed regulatory framework on digital finance;
 - understand the operations of emerging digital finance activities such as crypto currency exchanges;
 - explore new ideas and approaches,
- one-to-one engagement sessions between the SC and business owners to:
 - delve into key aspects of the digital business proposition and understand how it is intended to be deployed in the Malaysian capital market;
 - provide a platform for continuous interactions to prepare them in meeting readiness requirements.

Out of the total engagements, 43%

were related to digital investment management services, 21% covered P2P financing areas, 10% were on distributed ledger technology, 7% on ECF-related matters and 19% on other emerging digital finance solutions.

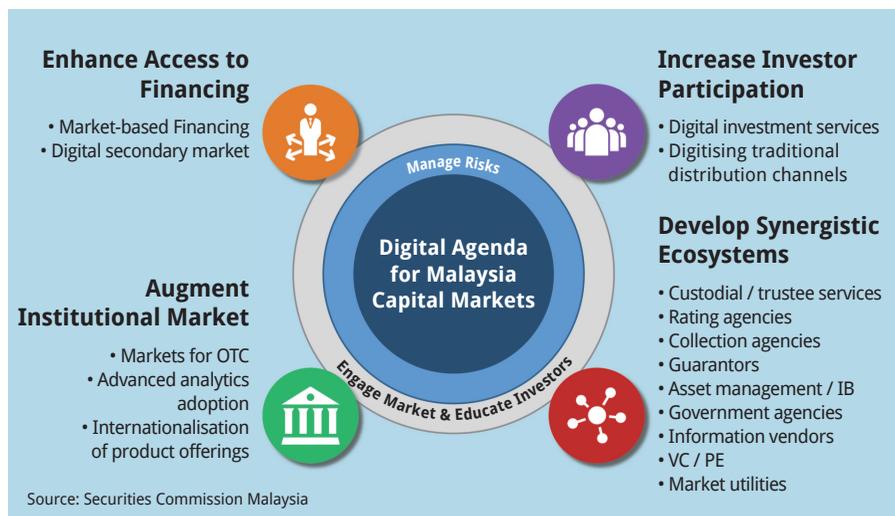
Notably, in developing the P2P financing and digital investment management regulatory framework, the SC socialised and obtained feedback for its proposed framework via targeted focus group discussions and engagement labs with industry participants who have registered with aFINity. The aFINity community was useful in galvanising a network of stakeholders in syndicating SC’s digital finance initiatives and soliciting wider industry feedback for further deliberation.

Digital Agenda for the Malaysian Capital Market

To meet the needs of the underserved and create a more vibrant investment environment, the SC believes in the potential for digital as one of the next engines of growth for our capital markets. We aim to continue our efforts in facilitating innovations to better serve the needs of our economy and participants, while at the same time safeguarding investor trust and confidence. In line with this, we crafted a holistic digital agenda, focused on enhancing access to financing, increasing investor participation, augmenting the institutional market and developing synergistic ecosystems (Figure 1).

Enhance access to financing: The MSME segment is the backbone of the Malaysian economy. Despite the significant role they play, many MSMEs still face challenges in obtaining funding through traditional sources of funding due to inconsistency of financial/credit reporting standards and lack of credit ratings, though many of these MSMEs may be creditworthy.

To address these issues, the SC has introduced ECF and P2P financing to allow for alternative market-based financing avenues for MSMEs to raise funds. Both ECF and P2P financing are expected to fill gaps in either early-stage capital or capital for growth for MSMEs. With ECF, it is possible that investors will not receive any financial returns for an extended period of

Figure 1: Digital Agenda for the Malaysian Capital Market

time; longer term financing arrangements on P2P financing platforms also mean that repayments are stretched out over a long period. Based on specific circumstances, investors might wish to withdraw their investments before ‘maturity’. Creating a secondary market becomes the natural next step of evolution to provide greater flexibility to investors to obtain financial returns from these asset classes. For ECF issuers as well, having a secondary market is also beneficial as it provides liquidity for early shareholders or employees who own equity in the issuer, giving them an avenue to realise capital gains via a marketplace.

Increase investor participation: In today’s world, many of us are finding we have less and less time to deal with our finances and are aware that many traditional investment routes are too expensive and perhaps not even accessible due to high minimum requirements.

Based on the SC’s internal research, it was revealed that the average age of our investor is 45 years old and out of those aged below 30, less than 5% have bought a stock or unit trust. This shows that our investing public is aging. It is imperative that we identify other innovative investment solutions to encourage more participation from the younger generation. While most people would associate the below-30 demographic as more digitally-inclined, further research has shown that the digital generation is not just limited to millennials, but extends across age demographics. Inspired by the digital user experience they encounter in their daily lives, these digital natives are beginning to demand similar level of experience from their financial

services providers, thus necessitating innovative investment solutions which offer greater convenience, access, transparency and lower cost.

To better serve the needs of this new segment of investors which can be customers of the future, the SC is facilitating the provision of digital investment services in our markets. The term “digital investment services” is used to describe a new range of capital market products and services which have emerged due to digital innovations such as digital investment management (which includes robo-advisory), micro-investments, social trading/trade mimicking, and the like. As part of the initial phase of the digital investment services, we have introduced the digital investment management framework to enable the offering of automated discretionary portfolio management services to investors. Details of this framework are further discussed in the next section of this paper.

Augment institutional market: By leveraging digital, greater transparency of information can be achieved within the capital market. With greater transparency, our market would become more efficient and hence be able to attract greater investor participation.

Today, information related to our over-the-counter (OTC) markets, for example our secondary bond, rates and credit market, is highly fragmented among different sources and not easily accessible. Using bond and sukuk as an example, information on a new issuance is generally readily available to all potential investors via offering circulars. However, there is less transparency of bond and sukuk data post-issuance, es-

pecially in areas of credit risk and pricing as these bonds and sukuk are traded between different counterparties. These data, even if available today, are only accessible to large institutional investors and seldom, if at all, available to smaller investors.

To introduce greater transparency and spur further growth in these markets, the SC looks to create a central information repository which would be readily accessible by market participants and investors towards the end of 2017.

Develop synergistic ecosystems: While intermediaries, financial service institutions (FSIs), start-ups and exchanges may be the main drivers of digital markets, there is still a need to develop the surrounding ecosystem of service providers which are also key players in the value chain. These service providers include custodians and trustees, rating agencies and information vendors. ‘Digitising’ these ecosystem players will allow faster, and more seamless access to these services, thereby creating a more transparent and efficient market. The SC is working closely with the capital market ecosystem service providers to build market-relevant digital services and offerings to meet the needs of the ecosystem.

Energising Investment Services for the Digital Era

Digital Investment Management Services

Globally, the digital revolution has been making inroads in the investment management industry as the industry is at a pivotal juncture to respond to changing customer behaviour, new technologies, new distribution and business models. Many investment managers are heavily invested to meet the digital requirements of their clients who are demanding investment tools that enable them to see, track and compare investments in real time. This has led to the emergence of new digital tools to assist investment managers in developing and managing investment portfolios, enabling them to hone in on investors to deliver bespoke and better quality products and services. The advent of digital investment services heralds a new era for goal-based investing

and wealth management, as it promises to take the stresses, burden of unnecessary costs and hidden fees away from investors, and simplify their lives by managing and growing their investments for them, at an affordable cost.

In the context of the Malaysian capital market, SC believes that new technologies can democratise the world of portfolio management by driving down the costs of providing these services and reducing the barriers of access, thus enabling firms to engage with consumers more effectively, while at the same making investments affordable and accessible to all. Focusing on the need to support the evolving fund management industry and emerging investor needs, the SC launched the Digital Investment Management Framework (framework) on 9 May 2017.

As part of the SC's digital agenda for the capital market, this framework aims to increase investor participation in the capital market by providing investors with a new mode of investment, which is more convenient, affordable and accessible channel to manage and grow their wealth. Towards operationalising this framework, the SC has undertaken a review of two key Guidelines, namely the *Licensing Handbook* and the *Guidelines on Compliance Function for Fund Management Companies*, setting out licensing and conduct requirements for those interested to offer automated discretionary portfolio management services to investors.

Regulatory framework to facilitate Digital Investment Management

To facilitate digital investment man-

agement activities to be offered in Malaysia, a new category of portfolio management licence has been introduced (Figure 2). Under this framework, interested applicants who wish to offer automated discretionary portfolio management services to consumers may apply for the new licence if they satisfy all the licensing and other relevant regulatory requirements. Digital investment management is defined as a fund management business which incorporates innovative technologies into discretionary portfolio management services. It aims to replicate many of the key activities performed by traditional fund managers through online access.

One of the key licensing criteria is the requirement for applicants to satisfy a clear digital value proposition, which includes the following:

- **Digital business model** – The business model must have a clear value proposition that demonstrates how digital innovations can deliver positive outcomes to its target investors and any other target beneficiaries.
- **User-centric delivery** – Delivery of services to target investors and any other target beneficiaries must include user-centric interface and experience, integrated investor education on the services offered to create greater confidence, trust and engagement, and transparent fee structure.
- **Automated investment proposition** – Automated proposition must involve core components of portfo-

lio management services including risk profiling, suitability assessment, asset allocation and rebalancing. Applicants may not be eligible if only limited parts or only non-core parts of the investment service are automated.

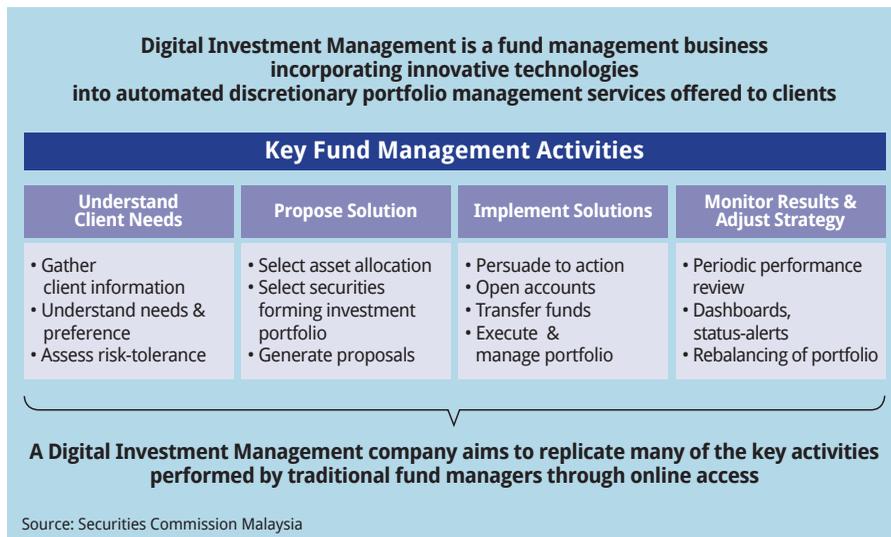
Given the unique aspects of the digital investment management business, the digital value proposition aims to assess the potential benefits of the digital innovations introduced, in particular the broad use of technology across the entire value-chain of portfolio management services, its digital delivery of financial education and client-relevant content, i.e., how they would put the client's needs first when designing their communication and disclosures. In particular, presentation and substance of key disclosures must be clear and effective in a manner that is easily understood to enable investors to make informed investment decisions.

Further, applicants are required to comply with other key entry and competency requirements, including local incorporation, minimum financial requirements and requisite technology capabilities to run the digital investment management business.

To reinforce investor protection, specific conduct requirements matched to distinctive characteristics of this new business model and effective investor redress mechanism safeguards are imposed on digital investment managers. This includes the requirement for the board to ensure that:

- requisite technology capabilities are in place including identification of a competent person or persons within the company who has sufficient understanding of the risks and rules of the algorithm applied
- outcomes produced by the algorithm are consistent with digital investment manager's strategies and securities laws;
- risk management framework is sufficiently robust to manage risks associated with the offering of automated discretionary portfolio management services including cyber security resilience;
- effective oversight on the overall compliance framework including reviewing the effectiveness of compliance programme to take into account the unique and specific aspects of the digital investment management's business model.

Figure 2: Digital Investment Management



In relation to the algorithm design and oversight, the SC requires the digital investment manager to have written policies in place to monitor and regularly test the algorithm employed, including ensuring that only authorised personnel are able to access and make changes to the algorithm. Any use of third party technology and algorithm, must entail on-going due diligence by the digital investment manager.

As a licensed fund manager, a digital investment manager is subject to all other existing regulatory safeguards and investor protection provisions applicable to a fund manager including maintaining custodial arrangements, membership with Securities Industry Dispute Resolution Center (SIDREC) and contribution to the Capital Market Compensation Fund.

Moving Forward

We have seen how advancements in technology have democratised financial services by driving innovative market-based financing solutions such as ECF and P2P financing. In Malaysia, the growth of ECF activities has been encouraging thus far. As of June 2017, 25 issuers have succeeded in collectively raising a total of MYR 17.04 million.*² We observed that a majority of campaigns on ECF platforms were looking to raise less than MYR 500,000 and that 33% of investors are individuals aged 35 and below. This goes to show that ECF financing is truly catering to the needs of small companies and is attracting participation of young investors, who may use this mode of investment as their first asset class due to having a passion or interest in a particular business or venture. We expect the ECF platforms to gain further momentum over the coming years and complement the P2P financing platforms which are expected to be fully operational by the end of 2017.

Similarly, in the portfolio management services domain, the recent launch of the digital investment management framework is part of the SC's on-going efforts to bring financial inclusion to the masses through the use of technology. In this regard, the SC welcomes the introduction of investment services through digital channels to complement the existing suite of

investment channels to enable more consumers, particularly those who have been underserved, to access these services at an affordable cost. The framework is meant to encourage new and existing market players to develop innovative and more effective ways of delivering higher quality products and services to investors by embracing digital.

With the rise of digital distribution channels, it should be noted that there will always be investors who still value the services provided by human financial professionals, even if such services are charged at a premium. In the U.S. for example, hybrid human-digital models such as those offered by Vanguard, Personal Capital and Schwab blend human financial professional services with their digital offerings. This vast array of investment services and channels are meant to cater to the needs of a diverse range of investors with different risk appetites, financial literacy, goals and needs. Ultimately the investors will decide which channels best suit their individual needs.

In implementing key objectives of our Digital Agenda, the SC will proactively pursue initiatives that will facilitate a conducive market environment for continuous innovation. Through our aFINity programme and our regular engagement with industry, we will continue to have open discussions and dialogues to increase both awareness and our capacity to provide guidance and support for innovative developments. This is evident through our efforts in developing a regulatory framework for P2P financing and digital investment management, where we have involved the aFINity community in early stages of drafting the framework to ensure that the finalised framework will be fit for purpose. In parallel, the SC seeks to promote thought leadership via the SCx-SC Digital Finance Conference, which we organise annually to raise awareness on digital finance. We believe that collective thought leadership is essential to enhance skills and competitiveness, particularly for our local digital finance industry.

While we welcome digital innovations which are beneficial to the capital market, nevertheless, we are also cognisant of the potential risks that are associated with digital. In particular, increased adoption of digital in capital market activities, operations of market intermediaries, market infrastructure and market-based financing platforms calls for vigilant management of cyber risk to minimise disruption to the capital market, protect investors' confidential data and preserve market con-

fidence. This is more imperative given the global increase in cyber security breaches. In response to this, the SC released the *Guidelines on Management of Cyber Risks* in 2016, which were intended to strengthen and prepare the capital market entities against the risks of potential cyber threats and security breaches.

Moving forward, the SC will remain vigilant to potential emerging risks, and will continue to develop appropriate market and consumer safeguards. Given these considerations, the SC's position has always been facilitative of digital finance development while keeping a watchful eye over potential sources of risk. The SC believes that having a clear regulatory framework to facilitate digital finance would provide certainty to market players, issuers, as well as investors, and is facilitative towards growth and innovation. To this end, the SC will continue to work towards providing an environment that will enable firms to innovate and investors to be treated fairly, particularly in embracing the digital revolution which is enabling new opportunities in the capital market.

Notes

- *1 ECF and P2P financing are forms of fundraising which allow businesses to seek funding directly from the "crowd" by pitching ideas for a business on a web-based platform.
- *2 Securities Commission Malaysia – internal data collated by SC from ECF platform providers as at end June 2017

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SOPNENDU MOHANTY

Monetary Authority of Singapore

Singapore's Smart Financial Centre Vision

Technology is transforming the way we live, work, play, and interact. At the national level, Singapore has set its sights on becoming a Smart Nation – one that embraces innovation and harnesses technology to enhance productivity and improve the welfare of Singaporeans. A Smart Nation needs a Smart Financial Centre. Indeed, the financial sector offers fertile ground for innovation and the application of technology.

In 2015, the Monetary Authority of Singapore (MAS) laid out its vision of a Smart Financial Centre, where innovation is pervasive and technology is used widely to increase efficiency, better manage risks, create new opportunities, and improve people's lives. Much of this will take place against the backdrop of several big trends/enablers that are likely to transform finance in some shape or form:

- Digital and mobile payments
- Authentication and biometrics
- Blockchains and distributed ledgers
- Cloud computing
- Big data
- Learning machines
- Application Programming Interfaces (APIs)
- Advanced sensors
- Cybersecurity

Since then, MAS has been working closely with the financial industry, FinTech companies, institutes of higher learning, and other stakeholders towards the vision of a Smart Financial Centre. MAS' role in supporting this FinTech journey is multi-

farious:

1. To provide a conducive environment for innovation acceleration
2. To provide regulation that is conducive to innovation while fostering safety and security
3. To make Singapore more attractive for FinTech investment
4. To build up skills and competencies in technology

To Provide a Conducive Environment for Innovation Acceleration

FinTech is fundamentally about ideas and enterprise flowing between cities, and a network of connections between players everywhere. It requires bringing a whole range of stakeholders together across multiple fields: technology, finance, venture capital (VC), and startups. In short, it needs a strong ecosystem. Etymologically speaking, the term ecosystem is derived from the Greek root of 'Oikos', which means home. Just as no man is an island, ideas, too, depend on serendipitous interactions within an environment (or home) to evolve and flourish. Observe the intellectual and cultural fecundity of Renaissance Europe,

and in modern times, the vibrancy of Hollywood and Silicon Valley. On the flip side, the ideas of Gregor Mendel, widely credited as the founder of genetics, remained in obscurity until many years after his death principally because he spent most of his life in relative isolation at a monastery in remote Silesia. Time and place are clearly important for innovation.

MAS' strategy is therefore not to choose between financial institutions and FinTech players but to provide the optimal environment for both to innovate, compete, and collaborate. MAS' aim is to create a FinTech ecosystem where innovation thrives. This is an ecosystem comprising financial institutions, innovation labs, institutes of research and higher learning, the investor community, and connectivity to regional markets.

When the term 'FinTech' first crept into popular discourse, many observers framed this as a contest between nimble 'Davids' against lumbering 'Goliaths'. The reality is more nuanced, mainly because the incumbents have not been sitting still. Several financial institutions have set up in-house FinTech units to replicate the startup culture, and are collaborating with FinTech companies. In fact, there is a natural synergy – FinTech solutions present financial institutions with opportunities to enhance their product offerings, while collaboration with financial institutions enables FinTech players to broaden their reach.

Initiatives introduced by MAS to grow the Singapore FinTech ecosystem include

- **Introducing the SGD 225 million Financial Sector Technology Innovation (FSTI) scheme to support innovation.** The scheme supports the setting up of innovation labs, institutional/industry-wide projects, and proofs of concepts. For example, more than 20 global banks and insurance companies have set up innovation labs in Singapore; some of these have tapped on FSTI funding. These labs are important touch points between the financial institutions and FinTech players. Financial institutions work with FinTech players in the labs to pilot new and innovative solutions for their customers and abroad.
- **Creating platforms for idea-generation, knowledge-sharing, and networking.** In November 2016, MAS, in partnership with The Association of Banks in Singapore (ABS), organised the inaugural Singapore FinTech Festival, which brought together 13,000 participants from over 60 countries. In 2017, we look forward to welcoming the global FinTech community to Singapore once again, for the second edition of the FinTech Festival which will be held from 13 - 17 November.
- **Enhancing connectivity with other FinTech hubs.** As of July 2017, MAS has signed FinTech cooperation agreements with 12 counterparties, including entities in London, Australia, India, Japan, France, Switzerland, and South Korea. These agreements create frameworks for information sharing on FinTech trends and regulatory issues, and potential joint innovation projects. They also help to create greater understanding between FinTech players in different markets, with the ultimate goal of benefiting consumers and businesses.
- **Facilitating industry experiments in new technologies.** MAS, the Singapore Exchange and eight banks embarked on a proof-of-concept project to use blockchain technology for inter-bank payments. This project has allowed us to better understand blockchain technology and the potential that it has for the financial sector.
- **Working with the industry to advocate open APIs.** MAS is encouraging

the development of open APIs among financial institutions to enable efficient data sharing. In November 2016, the API Playbook co-created by ABS and MAS was launched at the FinTech Festival to guide industry stakeholders in their implementation of APIs. The Playbook features a list of over 400 APIs that the financial services industry can consider publishing. To support efficient data sharing and interoperability, the Playbook recommends standards for data exchange, information security and high-level key technical requirements for each of the APIs. The Playbook also sets expectations on API governance structure and risk management practices that should underpin an API-based financial ecosystem.

Singapore's FinTech landscape is fast evolving, with a proliferation of technological innovations and solutions.

- A Deloitte Report published in April 2017 noted that Singapore was 'a serious contender for the global number one spot in FinTech'.^{*1} Deloitte analysed 44 FinTech hubs around the world through quantitative research and interviews with local FinTech subject matter experts in each hub. Singapore (along with London, New York, Silicon Valley, and Hong Kong) was amongst the top five hubs in terms of its Index Performance Score.
- An Ernst & Young (E&Y) Report published in February 2016 ranked Singapore as the fourth leading global FinTech ecosystem in the world, behind the UK, California, and New York. E&Y benchmarked the ecosystems according to talent, capital, policy, and demand.^{*2}
- David Shrier, the New Ventures Officer at Massachusetts Institute of Technology, picked Singapore as its number one contender to displace London as the FinTech capital of the world. He cited Singapore's significant government effort to support FinTech innovators, its proximity to ASEAN, and dynamic incumbent banks as factors for his pick.
- Singapore is home to more than 300 FinTech startups that address different segments of the financial

services value chain. This runs the gamut from payments services to automated fraud monitoring.

To Provide Regulation Conducive to Innovation while Fostering Safety and Security

MAS believes that regulation must not front-run innovation – introducing regulation prematurely may stifle innovation and derail the adoption of useful technology. However, regulators must run alongside innovation and stay abreast of new developments and risks.

MAS applies a materiality and proportionality test, which means that regulation will only kick in when the risk posed by new technology becomes material or crosses a threshold. Further, the weight of the regulation has to be commensurate with the risk posed. Here are a few concrete initiatives that illustrate MAS' approach towards the regulation of FinTech:

- **Streamlined regulation to keep pace with payments innovations.** MAS will streamline the licensing of payments services under a single, activity-based modular framework. This could mean holding just one licence to conduct different kinds of payment activities, meeting only regulations pertinent to the specific payments activities they undertake, and adhering to common standards for consumer protection and cyber security. Streamlined regulation, inclusive governance, interoperable infrastructure, and pervasive digitisation will contribute to Singapore's vision of an e-payments society.
- **Specific guidelines to promote secure cloud computing.** MAS set out specific guidelines on the use of cloud services by financial institutions. Financial institutions are free to adopt private clouds, public clouds, or a combination of these to create hybrid clouds, so long as they conduct the necessary due diligence and apply sound governance and risk management practices to address potential vulnerabilities.

- **A regulatory sandbox to test innovative ideas.** In 2016, MAS launched a “regulatory sandbox” for financial institutions as well as new FinTech players to test their innovations. The sandbox allows experiments to take place, even where it is not possible at the outset to anticipate every risk or meet every regulatory requirement. It provides an environment where an experiment can fail safely and cheaply within controlled boundaries, without widespread adverse consequences. MAS and the applicant will jointly define the boundaries within which the experiment will take place. MAS will then determine the specific legal and regulatory requirements which it is prepared to relax for the duration of the experiment within these boundaries. For example, NTUC Income and Etiqa Insurance have partnered PolicyPal, a Singapore FinTech startup which offers an integrated insurance solution. It digitally aggregates insurance policies, advises on insurance coverage gaps, and recommends and distributes insurance products to their customers within the sandbox.

To Make Singapore More Attractive for FinTech Investment

The investment landscape in Singapore is characterised by a diverse range of players that perform early and later stage investments. Investors run the gamut from angel investors, venture capitalists, corporate venture arms, to government-linked investors. The latter include the likes of Temasek, Government of Singapore Investment Corporation, Economic Development Board Investments, and Singtel. Prominent international investors, such as Sequoia Capital and 500 Startups, are also active in Asia and Singapore. Singapore has the most mature VC ecosystem in ASEAN, followed by Indonesia and Malaysia.^{*3} According to a Deloitte Report, Singapore saw USD 86 million in FinTech VC deals in 2016.

MAS recognises that VC funds are a vital cog in a healthy FinTech ecosystem, due to capital and industry expertise that they provide to startups. Al-

though the VC industry in Singapore has been growing at a healthy rate, there is room to further expand the size and scope of VC funding available for startups. MAS therefore intends to simplify the authorisation process and regulatory regime for VC. Potential areas under consideration include the following:

- A primary focus on fitness and propriety assessment of the VC managers. Unlike the case for fund managers, MAS may no longer require VC funds to have directors and representatives with at least five years of relevant experience in fund management. A potential outcome is a shortened application process for new VC funds.
- New and existing VC managers may no longer be subject to the capital requirements and business conduct rules that currently apply to fund managers in general.
- The base capital requirements and risk-based capital requirements may be removed.
- Independent valuation, internal audits and submission to MAS of audited financial statements may no longer be required.

In summary, the proposed simplified regulatory regime for VC recognises the lower risks they pose, given their business model and sophisticated investor base. The intention is to allow new VC a faster time-to-market and to reduce their ongoing compliance burden. The overarching goal is to attract more VC and spur them to play a greater role in supporting entrepreneurship and innovation.

To Build Up Skills and Competencies

It is tempting to speculate about what jobs technology will destroy and what kinds of new jobs it will create. The likelihood is that many jobs will remain, but most jobs will be transformed, requiring new skills and capabilities to make the most of new

technologies. Finance professionals will need new skills and expertise from other disciplines that are traditionally not associated with finance.

In the financial sector, there is already growing demand for skills in data analytics, digital/mobile user interfaces, and app development, in addition to core finance skills. Take for example bank relationship managers who provide wealth management advisory services. They are unlikely to be completely replaced by robo-advisers. But relationship managers will increasingly use data analytics tools to analyse client profiles and offer better, customised financial solutions.

MAS is working to build up the skills and competencies needed in the new world of finance, starting with the curriculum in our tertiary educational institutions, work placement programmes, and extending through to mid-career retraining and life-long learning.

- MAS is working with the financial industry, training providers, and the universities and polytechnics to provide learning pathways relevant for a Smart Financial Centre.
- Some initiatives include the deep-tech curriculum in our tertiary institutions, work placement programs, mid-career retraining, and life-long learning.

Here are some specific examples of recent initiatives:

- On 3 October 2016, MAS and the five local polytechnics signed a Memorandum of Understanding (MoU) that would build upon an agreed framework in the next three years to prepare and equip their graduates with the skill sets necessary to take on new FinTech-related jobs emerging in the financial sector. The MoU covers curriculum reviews, facilitating internship opportunities in FinTech-related roles and joint projects with the FinTech community. More than 2,500 students who are enrolled in the banking and IT-related courses in the polytechnics each year will benefit from this initiative.
- In January 2017, MAS held its first inaugural Tech Talks session at Republic Polytechnic. Tech Talks is organised by MAS in conjunction with the local universities and polytechnics as part of its outreach efforts to get

more students interested in financial technology. Each month, leaders from the industry share their success stories, challenges and opportunities in the financial industry as well as how technology is transforming financial services.

- The Financial IT Academy (FITA) has developed a digital transformation programme for mid-career professionals that includes topics such as data analytics and agile development. The Institute of Banking and Finance (IBF) will also be offering new learning modules on data science, human-centric design, agile thinking, and cyber security awareness.
- Through the Financial Training Scheme (FTS) and IBF Standards Training Scheme (IBF-STTS), MAS provides funding to support professionals in acquiring specific expertise and competencies in the financial sector. There are also schemes within the TechSkills Accelerator (TeSA), an initiative driven by the Info-communications Media Development Authority (IMDA), which provide support for employers to develop their existing employees in the relevant ICT skills.

Conclusion

Much has been said about technology and FinTech. The larger picture is really about promoting a culture of innovation in our financial industry.

Such innovation is not always about bleeding-edge technology. It is about designing better work processes and creating new business models that will deliver higher growth, more enriching jobs, and better services for the consumer. Technology is likely a key enabler for all of this, and we must make a concerted effort to understand it and use it effectively.

Not everyone can be an entrepreneur. But we all have to build the skills and expertise necessary to power the digital economy. The financial sector in particular has to build new capabilities. The people factor is a critical in Singapore's Smart Financial Centre aspirations, and more broadly in the economy of tomorrow. That is at the heart of what it takes for Singapore to sustain and grow the FinTech movement – the entrepreneurial desire to find new ways and the deep skills and

continuous learning that we need to power innovation.

Notes

- *1 <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-connecting-global-fintech-hub-federation-innotribe-innovate-finance.pdf>
- *2 <http://www.ey.com/Publication/vwLUAssets/EY-UK-FinTech-On-the-cutting-edge-Executive-summary/%24FILE/EY-UK-FinTech-On-the-cutting-edge-exec-summary.pdf>
- *3 Vertex, "Snapshot of the Regulatory Environment for Venture Capital in Southeast Asia," July 2016.

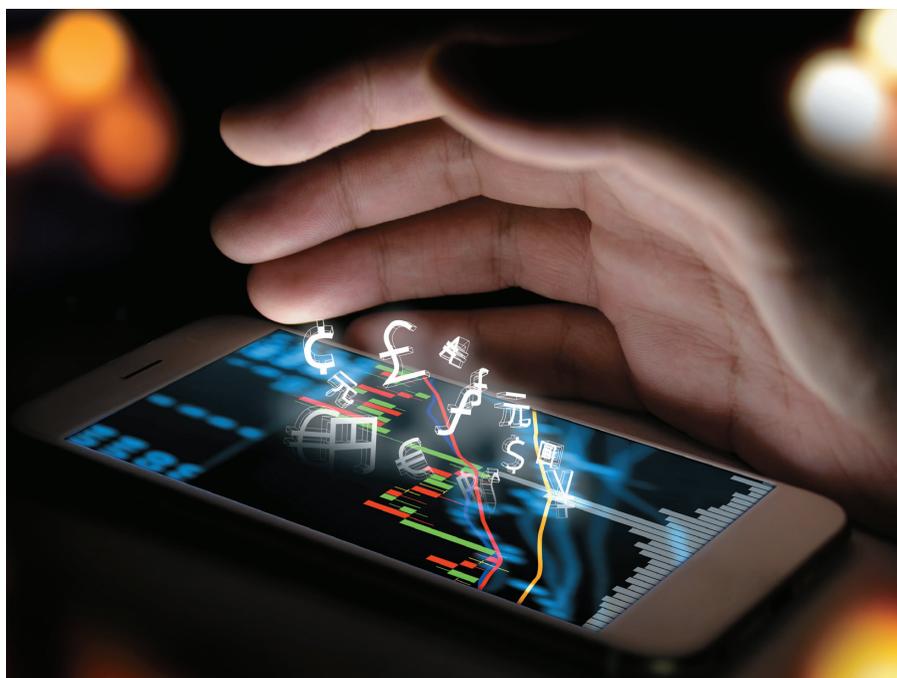
SOPNENDU MOHANTY

Chief FinTech Officer, Monetary Authority of Singapore

Sopnendu Mohanty is responsible for creating development strategies and regulatory policies around technology innovation to "better manage risks, enhance efficiency and strengthen competitiveness in the financial sector". Prior to joining MAS, Mohanty was with Citibank as their Global Head of the Consumer Lab Network and Programs, which included driving innovation programs and managing innovation labs across multiple geographies globally.

Mohanty has spent 20 years in the APAC region and held various roles in technology, finance, productivity, and business development. He was Citibank's APAC regional head of Branch operations along with heading the Consumer Innovation Lab in Singapore. He spent a significant time in Japan, where he was Citibank's Retail Business Development head and also did leadership stints in various functions within operations and technology. Globally, he played a significant subject matter expert role in driving Citibank's global smart banking program, to transform bank's physical network to digital first, smart & innovative, client centric and highly delightful customer engagement center.

Mohanty has co-authored various patented work in area of retail distribution of financial sector. He is based in Singapore, loves travelling, reads history and pursues culinary innovation as a hobby. He was in the list of Fintech's Most Powerful Dealmakers of 2016 by Institutional Investor.





THE CREDIT RESEARCH INITIATIVE, NATIONAL UNIVERSITY OF SINGAPORE

Business Analytics – a rising star in FinTech

Contrary to common beliefs, FinTech traces its origin back to the 1950s when technology was first employed to provide financial services. The credit card was introduced by the Diner's Club in 1950 and the Automatic Teller Machine, invented in the 1960s made banking more convenient to customers. The recent FinTech wave has seen greater demand for a number of FinTech segments – transaction technology, regulatory technology (RegTech) and business analytics – resulting in the proliferation of financial technology startups worldwide. More companies are using business analytics, or big data and artificial intelligence (AI) techniques to get insights for making better business decisions. IT and analytics technologies have indeed reached a level of maturity with which competitive forces are at work to materialize many of people's long-standing wishes/fantasies; for example, AlphaGo has convincingly demonstrated that AI can beat top pros at the game of Go hands down. With these factors in place, we can expect to witness major developments in FinTech in years to come.



FinTech in Different Forms

The application of FinTech stretches across multiple business areas including financial services, bank compliance and business processes. In terms of the technologies it is employing, transaction technology, regulatory technology and business analytics are gaining most of the spotlight.

Transaction technology enables people to perform financial transactions in more efficient and consumer-friendly ways. In recent years, technologies involved in peer-to-peer (P2P) lending, crowdfunding, payment, and electronic currency are developing at a staggering rate. P2P lending, aiming to provide a marketplace where lenders and borrowers can meet and trade directly with each other, has for example grown so rapidly that Goldman Sachs predicted in a research paper published in 2015 that lending platforms could potentially reduce annual profits of the banks by 7% in the next five years. Payment technologies have helped replace cash or credit cards in transactions with the use of mobile phones. Today, dominant technology companies, including Facebook, Apple, and Google, have all tried to disrupt the online payment market.

Blockchain technology also challenges the financial industry with a potential decentralized record/verification system that enables secure, fast and nearly free global financial transactions in many instances. Through Bitcoin, one can already see the power of the blockchain technology.

RegTech is information technology used by financial companies to conduct regulatory monitoring, reporting and compliance. Tightening regulatory requirements has significantly increased the operating costs of financial institutions.*¹ Therefore, there has been a strong incentive to build a more efficient system to control risks and reduce compliance costs in the industry. In October 2014, the Financial Conduct Authority of the UK government recognized the potential of RegTech and a year later announced plans for a regulatory sandbox that will help firms experiment with their RegTech solutions. According to a report by the UK government's chief scientific adviser, RegTech is a growing application of FinTech and is a crucial issue to the future success of the UK financial services industry and FinTech.*²

Besides transaction technology and RegTech, business analytics is another area of FinTech offering real potential. Business analytics makes it possible to manage vast amounts of data and discover new regularities in certain behaviors/functions, for example, factors that better predict insurance claims. Many information technology companies have been set up to collect data via usage of mobile phones and sensor technologies. According to IBM, 2.5 quin-

tillion bytes of data are created every day. Ninety percent of the world's data has been collected during the last two years and its collection rate has been increasing since then.*³ In short, business analytics enabled by modern IT and scientific computing serves to maximize the value of “big data” and acts as a bridge to link problems with solutions. Large corporates like Oracle, IBM, Amazon and Microsoft are all investing heavily in data management and analytics projects. As of 2010, these companies had spent over USD 15 billion on software firms specializing in data management and analytics. The business analytics industry is estimated to be worth more than USD 100 billion by 2018 and is growing roughly twice as fast as the software business as a whole at almost 10% a year.*⁴ As the world becomes increasingly digitalized, aggregating and analyzing data are likely to bring huge benefits to a variety of fields.

The Heightened Importance of Business Analytics

According to KPMG and H2 Ventures research in 2016 on the 100 most distinctive FinTech companies, eight companies are focused on RegTech, eight companies on business analytics, while the remaining run businesses in transaction technology. Anecdotal evidence shows that data collected from consumer transactions and social media can yield rich implications in business developments and profit generation. Providing sophisticated business analytics solutions has so many potential value propositions, and this area seems to be less represented in the current FinTech market and therefore has a greater potential in expanding its presence.

The amount of data increases tenfold every five years, and so will always have an impact on company and individual decisions. Raw data is usually generated from a variety of sources and carries information as well as random noise. Well-managed and objectively analyzed data can be used to unlock new sources of economic value. Today, data serves as one of the essential raw materials for all industries as it can or has potential to provide useful information to help businesses decisions in-house, and it may also be a marketable asset to parties

of interest. Hence, we are likely to see business analytics applied in many more fields.

Take Amazon as an example. It surpassed Walmart as the most valuable retailer in the U.S. by market capitalization in 2015, and its growing online sales are eroding away revenues of American retail stores like Sears, JCPenny and Ascena (owner of Ann Taylor, Lane Bryant, etc.). One reason for Amazon's popularity is its sophisticated blend of personalized and social item recommendations engine. The process can be simply summarized as collecting and analyzing customer data to achieve a higher level of customer relevance. About one third of all sales at Amazon is generated by its recommendation engine,*⁵ showing the importance of its business analytics efforts. Similarly, Netflix whose core business is to provide online stream media also makes use of data science to rate customers' preferences and give highly relevant recommendations.

Financial transaction technology's implementation has already collected and will continue to collect a vast quantity of new data which will aid the further development of business analytics in FinTech; for example, solutions for credit scoring, predicting financial customer behavior, and risk and investment management are presenting unprecedented opportunities to FinTech firms. With business analytics, financial services firms can get a better understanding of their customers, set competitive prices for their products or services, and better handle the risks they may come across in the future. Information gathered by many companies is labelled as big data, but it is not enough to simply collect data. Getting insights through applying smart business analytics is the only way to unleash the power of data and materialize its value.

Most lending platforms face the challenge of accurately assessing their potential borrowers. Credit scoring and risk rating are in fact complex, requiring a vast amount of data and scientific methods to support the analysis. Without enough information and robust models, FinTech companies can still conduct credit analysis in a traditional and intuitive way, but it is a FinTech in transaction technology only. SoFi, a FinTech company that provides loans to students in top universities seems to be such an example. The company bets on the future outlook and the earning potential of students to pay back their loans without conducting a systematic review of their creditworthiness. With sufficient operating experience and data gathering, one can imagine the benefits of business

analytics to a firm like SoFi. To say the least, business analytics arising from its database will serve as an entry deterrent helping ensure its market position in the longer run.

Deep Credit Analytics at the Credit Research Initiative of the National University of Singapore

In the credit analysis space, the Credit Research Initiative (CRI) of the National University of Singapore has pioneered a “public good” approach to creating and maintaining a credit risk analytics infrastructure by consistently transforming massive amounts of economic, market and financial data (“big data”) into directly useful credit information (“smart data”). Established in 2009, the CRI was a positive response to the much-criticized credit rating practices at the time.*⁶ Over the years, it has managed to build up a significant smart credit risk platform that is conducive to deep credit analysis, and has been granting free access to the CRI database to any interested user.

The CRI differentiates itself from others by conducting “deep credit analytics”. “Deep” refers to the complex nature of the problems facing users in the credit domain. It also refers to the multiple dimensions that the CRI's credit analysis gets into. To measure creditworthiness in the first place, the CRI team uses a scientific model calibrated to the big data to generate a probability of default (PD), which is the likelihood of an obligor being unable to fulfil its financial obligations. The granularity in this numerical measure allows users to conduct more in-depth credit analysis than any categorical credit rating system (e.g. AAA, BB, etc.). For example, one can assess a portfolio's credit risk by aggregating the individual PDs together by factoring in their default correlations. The CRI's PD also has concrete term structures as the PDs cover a range of prediction horizons from a month to five years. The PD term structure is essential to any serious credit analysis because debt obligations usually have a tenor, and an obligor with good credit in the short term may turn out to be a bad credit in a longer term, and vice versa. Deep credit analysis is also reflected in the CRI's creation of a CDS-like credit risk

measure referred to as Actuarial Spread.

The CRI platform typifies a new possibility for business analytics in FinTech. As of now, the CRI's analytical platform produces a suite of data products, including the PD, Actuarial Spread (AS), Corporate Vulnerability Index (CVI), CRI Systemically Important Financial Institutions (CriSIFI), etc. These measures cover 65,000 exchange-listed firms in 121 economies and are updated on either a daily or monthly basis, depending on practical needs. They are freely available on the CRI's website (www.rmcri.org) but are also distributed at a cost by Thomson Reuters to users who prefer to leverage on their existing data service infrastructure.

The CRI's analytical platform has been proven valuable in many real-world applications. In a joint undertaking with the International Monetary Fund (IMF), the CRI has developed a Bottom-up Default Analysis (BuDA) toolkit, which is capable of translating a presumed economic turbulence into a change in a portfolio's credit risk profile (i.e., stress testing). This new style business analytics has thus contributed to the IMF's macro-prudential surveillance practices. The CRI has also played a role in the FinTech industry; for example, it has spun off CriAT, a FinTech start-up specializing in deep credit analytics services. Helping a P2P lending platform deepen its credit analysis capacity on Small and Medium-Sized Enterprises (SMEs) lending is another concrete example of how this new style business analytics can contribute.

An Application of CRI's Credit Analytics in SMEs

SMEs are major drivers in both developing and developed economies as they employ a large segment of the workforce and in some cases drive innovation and technology advances, leading to progress in the long run. The approximate number of SMEs in emerging markets alone is between 365 to 445 million and formal SMEs contribute up to 60% of total employment and up to 40% of national income in emerging economies, according to a paper published by the World Bank in 2015.*⁷ However, the key constraint to SME growth is access to finance.

SME financing is different from that for large corporates in that they mainly rely on internal funds and/or cash from friends and family to run their business. According to the World Bank, about 70% of SMEs in emerging markets lack access to credit and the total credit gap for SMEs is USD 2.6 trillion.*⁸ Lending from banks is usually limited for SMEs as it is often difficult for banks to ascertain their financial information and thus the ability to assess their credit quality is limited. From a cost-benefit analysis standpoint, banks can be expected to be less enthusiastic about SME credit business even when funds for lending are available. Credit support programs created by governments, say, to share the credit loss in SME lending are often met with lukewarm responses from lending institutions. In short, the central issue of concern is the limited ability to assess the credit quality of SMEs rather than the availability of funds for lending.

Validus Capital, founded in 2015, is a Singapore-based peer-to-business (P2B) lending company that provides short term financing to SMEs. To help Validus set up a credit analysis system, the CRI has devised a bespoke PD model for SMEs, leveraging

on its existing methodology and “smart data” for public firms. Figure 1 illustrates the stages of the lending decision with information flow and funding flow.

With a large public firm database, the CRI designs models that provide quantitative assessment of credit risk for SMEs. By the use of macroeconomic data and appropriate proxies for market data, the firm level PD model developed by the CRI team can incorporate the economic environmental information together with the target firm's current financial information provided by Validus to compute the PD of the obligor. Applying credit analytics already developed but customized to this specific application into an automated system speeds up credit decisions, helps minimize human error in the process, and benefits from the regularities in data discovered by credit analytics. The system is intended to complement the decision-making process by seasoned credit analysts. It would be hard to imagine that a modern P2P lending platform could effectively function at the expected turnaround time without the help of an automated credit analytics system.

In addition to the firm level PD, the

Figure 1: The Application of CRI Data for Private SMEs

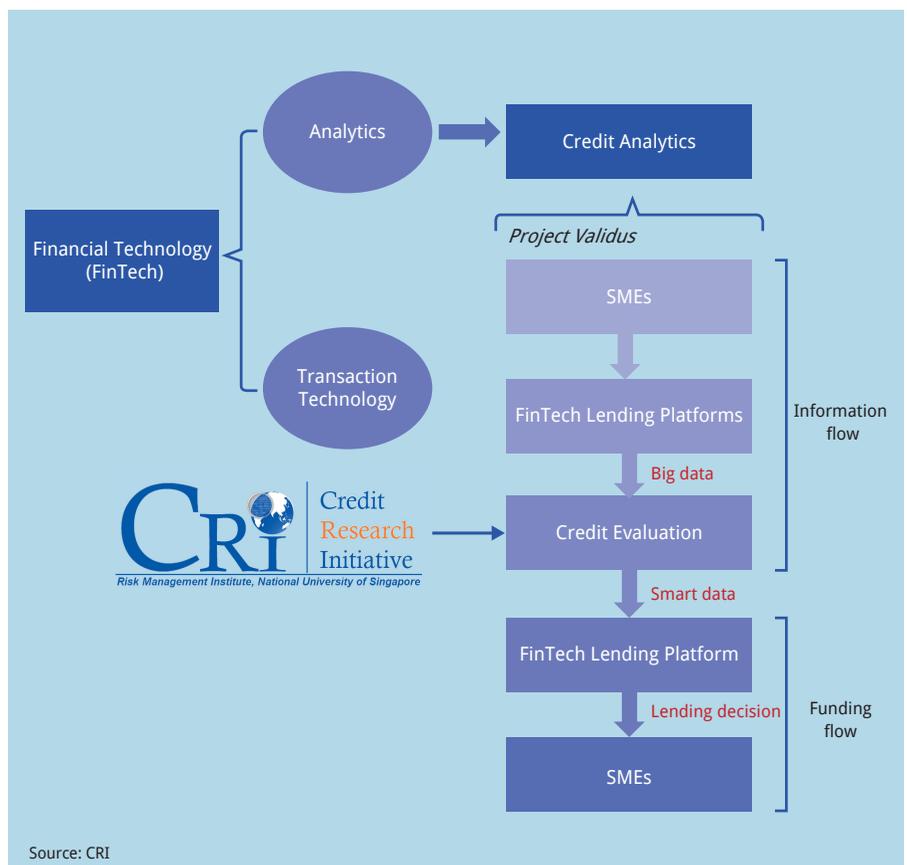
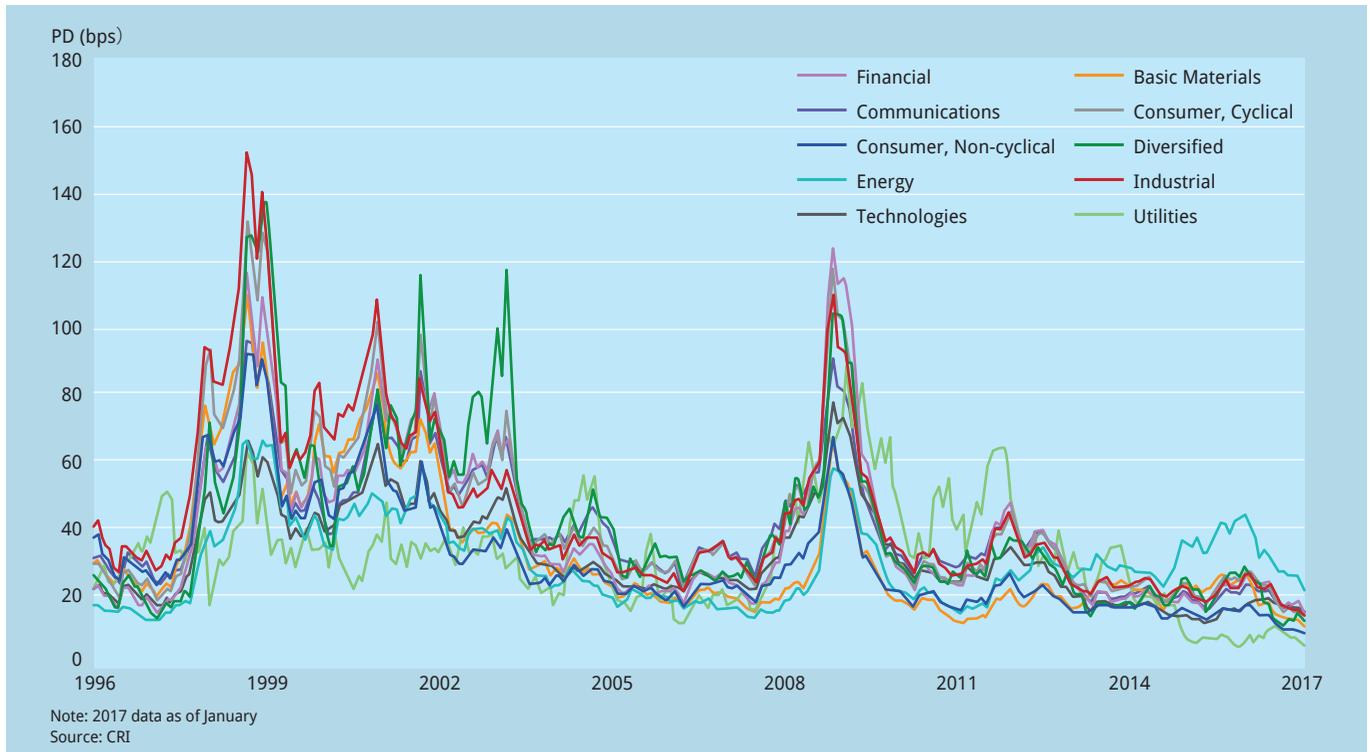


Figure 2: Sample of Industry Level 1-Year PDs, 1996-2017



CRI also provides industry level PDs (Figure 2) using information from companies of similar characteristics to those in the SME portfolio. Creditors have long recognized the importance of industry factors in examining a company's credit quality as firms of different sizes and industries are likely to have different credit profiles. Information on credit cycles and industry-specific trends is reflected in industry level PDs, which provide an overview of the aggregate credit risk for the SMEs, aiding P2B lenders like Validus in identifying high risk companies by comparing its PDs over time and across categories. By downloading a monthly data file through the CRI's portal, lenders can explore the PD term structure over different periods and horizons.

Conclusion

FinTech has already exerted tremendous influence on the financial industry and

its fast-paced developments are naturally drawing attention from all sectors in the economy. Venture capital has been actively financing FinTech startups since 2012. In 2015, total global investment in FinTech companies peaked at USD 46.7 billion but has since dropped to USD 24.7 billion in 2016.*⁹ Some FinTech companies have already collapsed due to low barriers to entry when the FinTech transaction technologies deployed by them are commoditized. FinTech companies that are likely to succeed in the long run need to develop advanced and sustainable technologies as a differentiator, and there is no doubt some will do so.

Business analytics as a product of the big data era is becoming increasingly indispensable today because when properly developed, it serves as a differentiator and the driver for long run success. There is a huge potential for the FinTech industry to explore deep business analytics and subsequently to capitalize on the information. The CRI's deep credit analytics effort is used as an example to showcase how it can be applied by FinTech firms, and we expect to see more business analytics development along the lines of the CRI.

Notes

- *1 <https://www.imf.org/external/pubs/ft/sdn/2012/sdn1211.pdf>
- *2 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/413095/gs-15-3-fintech-futures.pdf
- *3 <https://www-01.ibm.com/software/data/bigdata/what-is-big-data.html>
- *4 <http://www.economist.com/node/15557443>
- *5 <http://www.mckinsey.com/industries/retail/our-insights/how-retailers-can-keep-up-with-consumers>
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THE CREDIT RESEARCH INITIATIVE, NATIONAL UNIVERSITY OF SINGAPORE

The Credit Research Initiative (CRI), founded in July 2009 at the National University of Singapore, offers credit risk measures (ratings, etc.) for exchange-listed firms worldwide as a "public-good" which are based on scientific models developed in-house and with contributions from researchers and practitioners globally.

CRI constructs high quality credit measures with transparent methodologies and free of human bias. It is widely used by international banks, asset management firms, insurance companies, international organizations (e.g. IMF, World Bank) as well as academic researchers.

The CRI produces Probability of Default (PD), and Actuarial Spread (AS) with term structure from 1-month to 5-year horizons for over 65,000 exchange-listed firms in 121 economies that are updated daily. CRI also provides Corporate Vulnerability Index (CVI), which can be viewed as stress indicators, measuring credit risk in specified economies/industries. In 2017, CRI released the Systemically Important Financial Institution (CriSIFI), which assesses and ranks the systemic importance of listed banks and insurers.

These credit measures are available for free download on the CRI website. The CVI data are also available through Bloomberg and CBonds which offer their users free access. The comprehensive CRI data are recently made available through Thomson Reuters at a cost. Additionally, CRI provides customized delivery of credit risk data and analytical risk solutions for credit portfolio monitoring, validation, benchmarking, and stress testing upon client's requests.



Introducing Nomura Foundation

Nomura Foundation is pleased to offer this new publication on capital markets in Asia, sharing the perspectives of scholars and practitioners from throughout the region.

Nomura Foundation is a public interest incorporated foundation formed in 2010 from the combined resources of three existing foundations established by Nomura Group, Japan's largest securities company. The foundation aims to contribute private sector resources to support a dynamic and sustainable economy and society in Japan and the world by promoting the social science disciplines, enhancing international understanding, and fostering the next generation of academic and artistic talent.

The foundation's programs focus on four areas: Social Sciences, Foreign Student Scholarships, Arts and Culture, and World Economy. The Social Sciences program

provides grants for academic research in economics, law, politics, and other social sciences, particularly research involving international and interdisciplinary approaches. Our Foreign Student Scholarship Program provides two-year scholarships to foreign students working toward advanced degrees in the social sciences or humanities at leading Japanese universities.

The Arts and Culture program provides grants to up-and-coming talent, international cultural exchanges, exhibitions, performances, and other individual and group artistic endeavors. The foundation supports the Nomura Art Prize, which aims to promote the fine arts in Japan and support young artists by collecting and preserving their works, and the work of Dunhuang Academy to preserve the Silk Road frescoes in the Mogao Caves of western China.

The World Economy program carries on the work of the former Tokyo Club Foundation for Global Studies in funding research, conferences, and publications on the global macro economy and capital market development.



Panel Discussion at the 2015 Forum



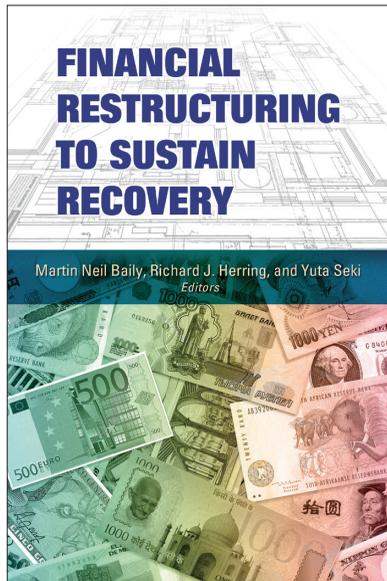
Lord Mervyn King at the 2015 Forum

Since 2010 the World Economy Program has organized eight conferences on the global macro economy in partnership with the Brookings Institution (US), Chatham House (UK), the Development Research Center of the State Council (China), Nomura Securities, Nomura Institute of Capital Markets Research, and other organizations. Issues addressed included “Productivity, Technology, and Growth” and “The Evolving Global Financial Order.” Together with the Development Research Center and Nomura Institute of Capital Markets Research the foundation has organized seven conferences bringing together experts from China and Japan to discuss capital market development in China and the lessons from Japan’s experience. These conferences have covered such topics as “Capital Markets and Development through Innovation” and “Capital Market Development under the New Normal.” (A complete list of conference titles and programs can be found on the foundation’s website <http://www.nomurafoundation.or.jp/en/>.)

In order to inform the general public, the foundation’s website archives all of the research papers and presentations

prepared for its World Economy conferences. In addition, Nomura Foundation has provided financial backing for a number of print publications including several conference volumes published by the Brookings Institution, *Capital Markets in India* published by Sage, Inc., the quarterly Japanese-language journal *Chinese Capital Markets Research*, and the semi-annual *Nomura Journal of Asian Capital Markets*. All the contents of *Chinese Capital Markets Research* and *Nomura Journal of Asian Capital Markets* can be found on the foundation’s website.

With the publication of *Nomura Journal of Asian Capital Markets* the foundation continues its support of research on capital market development and extends its scope beyond China, India, and Japan to cover the emerging economies of Asia.



Cover of *Financial Restructuring to Sustain Recovery*



Cover of *Chinese Capital Markets Research*

Introducing Nomura Institute of Capital Markets Research

Established in April 2004 as a subsidiary of Nomura Holdings, Nomura Institute of Capital Markets Research (NICMR) builds on a tradition begun in 1965 of studying financial and capital markets as well as financial systems, structures, and trends. NICMR offers original research and policy proposals by specialists based upon its knowledge of actual business practices.

NICMR publishes some of its research output in Japanese in the magazine *Nomura Capital Markets Quarterly*, and it posts some items in Japanese, English and Chinese on its website.

In Japan, structural changes in the economy and society have rapidly progressed. Population aging is in progress and is having a major impact on economic and social systems. Japan faces a number of challenges, including the need to reform its social security, tax, and public finance systems. As a front-runner of aging society, Japan has to overcome these challenges to develop further.

As a mature economy, one of Japan's most valuable resources is its JPY 1,800 trillion household financial assets. Whether this is used effectively will be critical to the country's future. We recognize that Japan must establish a market mechanism-driven money-flow in order for its economy to further progress. Our core mission is to contribute to financial system and securities market reforms in order to help establish such a market-structured financial system.

NICMR research encompasses not only Japanese issues, but also covers timely issues concerning international capital markets. In addition to research offices in New York, London and Beijing, NICMR established a research office in Singapore in 2015 to strengthen its Asian research platform.

The continuous growth of China and the other Asian countries is generating huge funding needs for their infrastructure and it means that this region requires not only indirect financing systems but also robust capital markets. There is an urgent need to promote development of Asian capital markets, which are a key for the future of Asian financial systems and their economies.

Since the global financial crisis, people have become increasingly aware of problems that spread beyond national boundaries. As financial regulators around the world cooperate more closely, there is a greater need for recognition of regional differences. The role of Asia from the perspective of rulemaking and global standards is also increasingly important.

Our mission includes generating financial and capital market-related policy recommendations for Asian countries based upon fundamental analysis and comparative studies of experiences in Japan and other developed countries. We believe that there are lessons to be learned from Japan's experience when it comes to issues such as the need to increase the availability of direct finance and the need to increase the availability of investment services to cater to the growing number of middle-income households.

We will continue to review such developments and strive to be even more timely in our studies and proposals. As a member of the Nomura Group, a global financial group based in Asia, we hope to continue to contribute to the development of financial markets in both Japan and the rest of Asia.



Cover of *Nomura Capital Markets Quarterly*

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