

Shadow Banking, Financial Technology (FinTech), and Financial Inclusion – Three Pathways of Rapid Change in the Financial Services Industry

Summarized by **Glenn Tasky**

Executive Summary

2017 and 2018 were years of rapid transformation in the financial services industry. In most parts of the world, ten years after the start of the Great Financial Crisis (GFC), financial institutions (FIs) were better capitalized and had more stable funding and assets with a higher degree of liquidity than had been true for many years. They were more resilient than before to the types of shocks that had rocked the world in the previous decade.

However, traditional FIs could not sit back complacently. Since the GFC, customers – both households and firms -- had changed. They were no longer content with costly, slow service delivery in traditional banking areas such as payments, deposits, and loans. Governments demanded more action from FIs in extending formal financial services to excluded populations. Innovations in financial technology (FinTech) brought new players, such as e-commerce, gaming, and messaging service giants, into the financial services industry, threatening to erode margins. New, more widely available sources of customer and firm data cast doubt on banks' comparative information advantage. Disintermediation became more of a possibility, as borrowers and lenders started dealing directly with each other, even in fairly small transactions. As the pressure to satisfy investors intensified in an era of low interest rates, misconduct intensified, resulting in large fines, costs of stepping up compliance activities, and further customer alienation.

The SEACEN Centre responded to these fast-paced developments by offering several new and restyled courses in 2017 and 2018, among them two offerings of the SEACEN-MAS FinTech Seminar (together with the Monetary Authority of Singapore), two offerings of the SEACEN Course on ICT Risks in Banks (with emphasis on cyber risks), the SEACEN Course on Anti-Money Laundering and Combating the Financing of Terrorism, and reconfiguring the three Payment Systems courses to emphasize 1) operations, 2) oversight and regulation, and 3) technology and emerging issues.

Two events, in particular, reflected on these fast-paced developments. In September 2017 SEACEN hosted two major events covering the financial sector in the Asia-Pacific region: the SEACEN High-Level Seminar for Deputy Governors of Financial Stability and Supervision (6-7 September) and the SEACEN Policy Summit on Shadow Banking (8 September). This overview summarizes selected presentations from these two events, which covered a wide range of topics including

financial inclusion, misconduct, problem bank recovery and resolution, proportional regulation, artificial intelligence and machine learning in banking and banking supervision, the incentives for the rise of shadow banking, and online marketplace lending.

**The Relationship Between Financial Inclusion and Financial Stability:
Presented by Dr. Atiur Rahman, Professor, Department of Development
Studies, Dhaka University; Chairman of Unnayan Shamannay Research
Organization, and Former Governor, Bangladesh Bank**

Dr. Rahman began by illustrating the virtuous circle between financial stability and financial inclusion. Financial inclusion, he emphasized, supports financial stability by providing banks with a more diversified funding and loan base. Individual financial institutions, in other words, are more resilient when they draw their funds from myriad small savers rather than just a few big firms or entities, and when they lend to a multiplicity of small borrowers rather than just a few big corporate clients.

In addition, the availability of formal financial services diminishes the appeal of unreliable savings channels such as local moneylenders and the Ponzi schemes that inevitably crop up in less-regulated markets with less-sophisticated and experienced investors. Finally, a more inclusive financial system has more political legitimacy, and can then avoid harmful and destabilizing interference from the public sector (such as punitive taxes or audits).

Even more profoundly, financial inclusion can promote stability and income equality at the household level, lessening the likelihood of systemwide consumption drops that could cause unexpected withdrawals from bank accounts or increased incidence of non-performing bank loans. And the effectiveness of monetary policy is enhanced when a large group of potential small borrowers is enticed to take out loans in response to a policy rate cut, rather than depending on the investment whims of a small group of large borrowers.

Financial stability, in its turn, can lead to greater financial inclusion. Profitable, liquid, and well-capitalized banks are better equipped than weak banks to shoulder the upfront costs of reaching out to previously-underserved markets, taking chances with new products and services to grow new clienteles. These new customers, for their part, are more attracted to stable financial institutions in which to save and from which to borrow. Stable financial institutions with healthy net interest margins are also better equipped to serve new customers with lower fees, fostering financial inclusion.

Dr. Rahman continued by describing some of the recent financial inclusion initiatives and accomplishments in Bangladesh. Among these initiatives are: support to the agricultural sector (including loans to tenant farmers and low-cost deposit accounts for all farmers), priority financing for small and medium enterprises (SMEs), promoting women entrepreneurs, allowing (and carefully regulating) agent banking, expanding mobile financial services, introducing a refinancing scheme for “green” products and services, and making low-cost accounts available for schoolchildren and street children.

Over the past few years, the Bangladesh economy has shown significant progress in maintaining steady economic growth with moderating inflation and exchange rate stability, reducing poverty, and widening and deepening the reach of financial services. While noting these accomplishments, Dr. Rahman concluded on a cautionary note: by its very nature, financial inclusion brings in people with no track record in the use of formal services, with no formal credit history, and with little financial literacy or experience in a formal setting. Such persons may be sold unsuitable or overpriced products and services, which would expose the entire system to reputational risk. In these settings, prudent regulation, including enforcement of consumer rights and a method of customer redress, is paramount.

The presentation was followed by a lively discussion of the relative challenges involved in supervising microfinance institutions (MFIs) vs. state-owned banks. Dr. Rahman pointed out that it was not necessary to license “microfinance banks,” *per se*; similar results could be achieved by encouraging commercial banks to lend to MFIs, and state-owned banks, even those tasked with microfinance and other financial inclusion mandates, could still end up with high stocks of non-performing loans due to unavoidable and unstoppable political influence.

“Regtech and Suptech”: Using Data Analytics and Technology to Streamline the Compliance and Regulatory/Supervisory Functions, Presented by Dr. David Roi Hardoon, Chief Data Officer & Head of Data Analytics Group, Monetary Authority of Singapore (MAS)

Dr. Hardoon noted that the Data Analytics Group at MAS was only established six months prior to his address to the delegates. According to Dr. Hardoon, the interest around data and analytics was more than a hype. He shared multiple examples of how much data and information we are creating and how we are consuming data. Using Twitter and Facebook as examples, he pointed out that Twitter users tweet about 277,000 times per minute, and Facebook users share about 2,460,000 pieces of content per minute.

In financial services the breath of data is wide. From the regulator's point of view, data includes but is not limited to transactional data, exposure/risk data, trading market data, financial statement data, macroeconomic data, news and reports, and complaints and misconduct reports. A key part of data analytics is looking beyond aggregates using the building block of data science.

In order to help participants understand the meaning of machine learning and artificial intelligence, Dr. Hardoon quoted Herbert Alexander Simon, the winner of the 1975 Turing Award and the 1978 Nobel Prize in Economic Science, who said "Learning is any process by which a system improves performance over experience".

The Meaning of Machine Learning (ML) and Artificial Intelligence (AI)

ML refers to computer programmes that automatically improve their performance through experience (data). AI is a subfield of machine learning. Dr. Hardoon cited dynamic rules for AML/KYC as an example where machines using natural language processing (NLP) can be useful for named entity recognition without the power of the eye. This can be done through syntactic parsing which is the process of finding the immediate constituents of a sentence that is a sequence of words. Syntactic parsing is an important part of the field of natural language processing and it is useful for supporting a number of large-scale applications including information extraction, information retrieval, named entity identification, and a variety of text mining applications. Part of Speech (POS) Tagging is also a very basic and well-known NLP problem which consists of assigning to each word of a text the proper morphosyntactic tag in its context of appearance. It is very useful for a number of NLP applications: as a preprocessing step to syntactic parsing, in information extraction and retrieval (e.g. document classification in internet searchers), text-to speech-systems, corpus linguistics, etc. The base of POS tagging is that many words being ambiguous regarding their POS, in most cases they can be completely disambiguated by taking into account an adequate context.

Noting that very rarely there are enough supervisors at any regulatory authority, he stated that ML and AI can be an enormous benefit to supervisors. For example, given that regulators typically receive a great many questions, chatbots can be used to automate responses. ML and AI can also be useful for sentiment analysis ("opinion-mining"). The machine translation can be accomplished using syntactic parsing and tagging to provide automatic question answering that is automatically adapted and customized to individual users. Other benefits and advantages of ML and AI include:

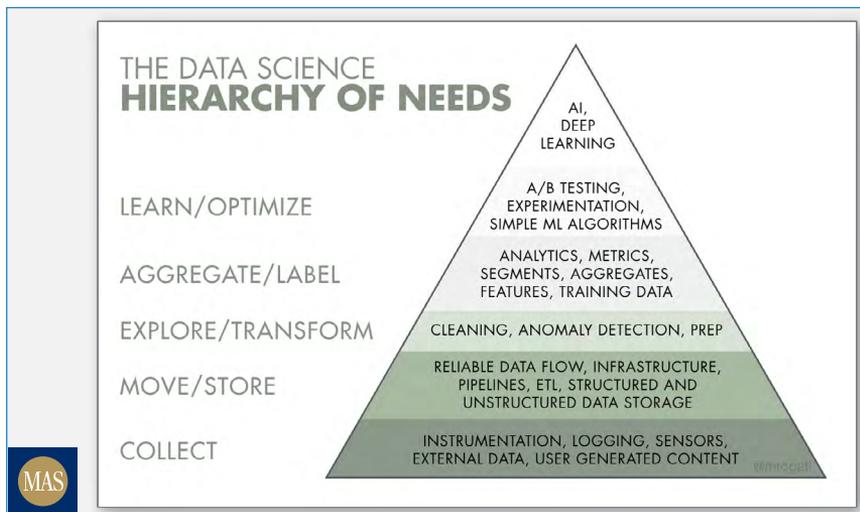
- Discovering new knowledge from large datasets
- Mimicking humans to replace certain monotonous tasks
- Developing systems that are too difficult or expensive to construct manually

The Meaning of Supervisory Technology (SupTech)

Dr. Haroon then made the distinction between regulatory technology (RegTech) and supervisory technology (SupTech). He noted that in the case of RegTech, the primary users are banks and other financial institutions, whereas with SupTech, the users are supervisors in regulatory authorities, such as central banks and monetary authorities. The main purpose banks and other financial institutions are driven towards RegTech is for regulatory compliance and reporting; for example, compliance with Basel III/IV and new AML/CFT regulations. Regulatory authorities are interested in SupTech to improve and create efficiencies for supervision and surveillance purposes.

Both RegTech and SupTech require great collaboration between regulators and financial institutions with the objective being managing and mitigating risks. It is critical to have a clear picture of where to start in the development/problem solving stage. Quoting Anthony Scriffignano, Chief Data Scientist, Dun & Bradstreet, the speaker told the audience that “You never lead with the data, and you never lead with the technology. You lead with the problem”. The Data Science Hierarchy of Needs provides a good foundation of where to start.

Begin with the Right Foundation



A key question is analytics linear or non-linear? There are four important pillars as shown below:

The Data Value Chain



Examples of use cases relating to RegTech include the following:

- Capital optimization
- Portfolio management
- Credit scoring
- Client-facing chatbots
- Trading execution

Dr. Hardoon shared an example of MAS' Capital Markets Intermediaries Department researching text analytics on misconduct reports. The key objective for MAS is to leverage text analytics to distill insights and trends on misconduct modus operandi, and guide supervisory resources, for example to prioritise reports for review. He also shared an example of MAS' Enforcement Department researching syndicated trading detection. In the problem statement MAS seeks to expand from event-driven alerting to algorithm-driven detection of collusive manipulation typified by certain behaviours e.g. pump-and-dump, layering, and circular trading.

Ongoing Data Governance

The speaker stressed the importance of ongoing data governance. A Data Governance Framework is a logical structure for classifying, organizing, and communicating complex activities involved in making decisions about and taking action on enterprise data. All organizations need to be able to make decisions about how to manage data, realize value from it, minimize cost and complexity, manage risk, and ensure compliance with ever-growing legal, regulatory, and other

requirements. Management and staff need to make good decisions – decisions that stick. They need to reach consensus on how to “decide how to decide.” They need to create rules, ensure that the rules are being followed, and to deal with noncompliance, ambiguities, and issues.

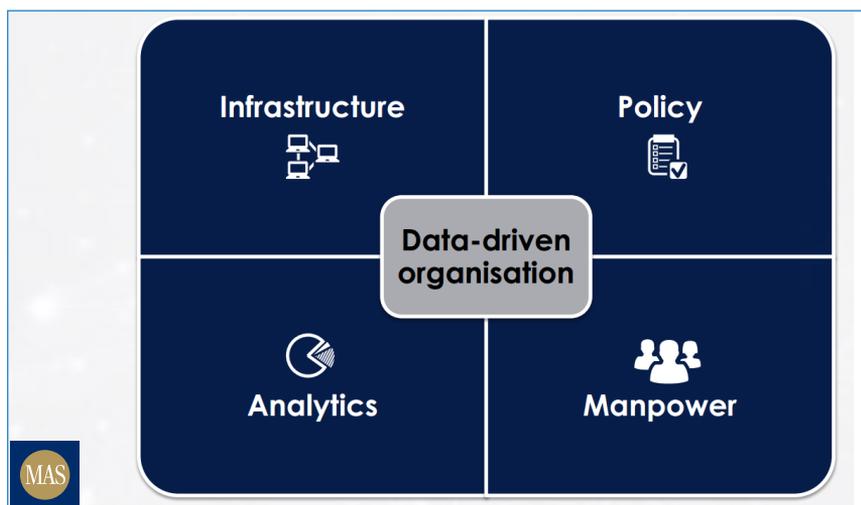
MAS’ ongoing data governance efforts include:

- MAS Data Catalogue
- Data collection platforms
- Digitization initiatives

Dr. Hardoon also made the audience aware of MAS’ upcoming data initiatives, including

- MAS private cloud
- Review of data classification
- Data cleaning framework

For MAS the core capability requirements to becoming a data-driven organisation are:



It is also important for MAS to have the right mindset -- including to empower the workforce, embrace experimentation and infrastructure, and engineer change. Management should also ask the right questions:

1. Does the project align with strategic objectives?
2. What are the dependencies and risks?
3. Has bias in the data been addressed?
4. Are the algorithms appropriate and the results robust?
5. Are the results interpretable and generalisable?

The Journey Ahead...



Dr. Hardoon ended his presentation with a quote from Jim Barksdale, former Netscape Communications Corporation CEO “If we have the data let’s look at the data. If all we have are opinions, let’s look at mine.”

Challenges in Supervisory Assessments of Banks’ Values and Conduct: Control Frauds, Misconduct Risk, and Whistleblowing; Presented by Richard M. Bowen, Senior Lecturer in Accounting, Jindal School of Management, University of Texas at Dallas, and Founder of Bank Whistleblowers United

Mr. Bowen, who previously had a long career as a senior mortgage officer at a large American bank (“the Bank”), warned about regulatory laxity and the reluctance of bank regulators to make criminal referrals to law enforcement bodies. External auditors, as well, often do not catch fraud and insider abuse until it is too late, and many bank failures could have been prevented with more diligent external auditing and more intensive supervision.

In introducing the topic of values and conduct, Mr. Bowen emphasized that watching for and reporting illegal or unethical conduct in banks is the responsibility of every bank employee. If unethical behaviour is tolerated at any level, it will tend to spread throughout the bank, and codes of ethics are necessary, but not sufficient, to reduce the risk of misconduct.

These observations come from Mr. Bowen’s own experience as a business chief underwriter for the Bank in the mid-2000s, when he observed that low-quality mortgages that the Bank would not keep in its own portfolio were being originated and bought by the Bank and sold to the United States mortgage giants Fannie Mae and Freddie Mac, and other investors, as if they were high-quality mortgages. He warned the Bank’s Board and senior management repeatedly that this practice was ongoing and was not only fraudulent, but also in violation of shareholder disclosure laws. Mr. Bowen recommended that the Board engage a third party to conduct an investigation of these fraudulent practices.

Instead of rewarding him for pointing out this misconduct, the Bank relieved Mr. Bowen of his responsibilities. The Bank also fired another whistleblower, who informed the U.S. government of the fraudulent activity. Ultimately, the government reached a settlement with the Bank, wherein the Bank paid a \$158 million fine (of which \$31 million was granted to the whistleblower). The Bank, however, continued to originate low-quality mortgages even after paying the fine.

Mr. Bowen was not as well-treated financially as the other whistleblower. He was invited to testify before the Financial Crisis Inquiry Commission (FCIC) in 2010, but parts of his testimony were scrubbed from the official record. The U.S. government put a 5-year embargo on these suppressed portions of testimony, exactly the same as the statute of limitations for fraud. Even so, Mr. Bowen's testimony did have some impact: the FCIC made 11 criminal referrals against nine individuals based on his testimony to the Department of Justice. The Department, however, refused to prosecute any of the individuals cited.

Mr. Bowen concluded with a brief discussion and warning of “control fraud,” the uncommon, but devastating, situation where bank Board directors and senior management orchestrate massive frauds that ultimately cause the bank to fail. He explained that owners and managers can, by engineering supranormal shareholder returns (with concomitant bonuses and share buybacks) for a short period of time, reap huge rewards from a bank that eventually fails with zero shareholder value. The main tools of control fraud, accounting fraud and appraisal fraud, allow high-yielding but inherently problematic (and even fictitious) loans to be made and sometimes sold, with loan-loss provisions underreported and default probabilities understated. Impressive earnings now make the directors and senior management wealthy, with large losses coming later, largely borne by the taxpayer as resolution costs.

Key in the control fraud strategy is training employees not to ask the right questions and not to speak up. Senior management often sets overly ambitious targets and punishes employees who fail to meet the targets. Retaliation against internal and external whistleblowers helps spread the message that going along with the illegal or unethical practices is the key to surviving and thriving in the organization.

Shadow Banking Typology and Links Between Shadow Banking Entities and the Banking Sector, Presented by Neill Killeen, Member of the European Systemic Risk Board (ESRB) Secretariat

Mr. Killeen focused on the setting up of the EU Shadow Banking Monitor by the ESRB, to aid its objective to prevent and mitigate systemic risk to financial stability.

The ESRB's methodology for monitoring shadow banking activity applies entity-based and activity-based approaches, which map broad shadow banking system in the EU.

1. **Entity-based mapping:** Examines investment funds, financial vehicle corporations, non-securitisation special purpose entities, security and derivative dealers, and financial companies engaged in lending.
2. **Activity-based mapping:** Focuses on horizontal shadow banking risks from financial markets which cut across entities (securities financing transactions and derivatives).

The Monitor focuses on the extent of liquidity and maturity transformation, leverage, interconnectedness with the regular banking system and credit intermediation.

The ESRB's May 2017 Shadow Banking Monitor¹ showed that the EU's shadow banking exposure stood at an estimated EUR 40 trillion, or 28% of the EU's financial sector. It grew by 2.6% in 2016, and had grown by 30% from 2012-16. EU banks in total have exposures of EUR 559 billion to shadow banking entities – approximately 4.3% of EU GDP. “Financial Vehicle Corporations” (FVCs) are securitization entities which are an important and growing component of the shadow banking market, and have close relationships with banks.

Shadow banking in Asia is still estimated to be fairly small, but growing faster than in any other area of the world. Mr. Killeen emphasized that there are no observable links yet between shadow banks in Asia and either commercial banks or shadow banks in Europe.

The key risks and vulnerabilities identified in the EU shadow banking system were:

- **Liquidity risk and risks associated with leverage** among some types of investment funds (e.g. investment funds which invest in less liquid markets while offering daily redeemable shares or are highly leveraged).
- **Interconnectedness and contagion risk** across sectors and within the shadow banking system, domestic and cross-border linkages.
- **Procyclicality, leverage, and liquidity risk** created through the use of derivatives and securities financing transactions.
- **Significant data gaps** for some types of other financial institutions.

1. <https://www.esrb.europa.eu/pub/reports/html/index.en.html>

Going forward, the ESRB will focus on the following areas:

- Employing EU wide regulatory data to monitor developments within the EU shadow banking system and monitoring other shadow banking developments globally.
- Make use of micro-data to complement sectoral data, e.g. new regulatory data such as the Alternative Investment Fund Managers Directive 2011/61/EU (AIFMD) data on alternative investment funds, European Market Infrastructure Regulation (EMIR) data on derivative transactions, and Securities Financing Transaction Regulation (SFTR) data on securities financing transactions to further develop the monitoring framework.
- Risk monitoring: Extend breadth and depth of risk indicators and metrics.
- Improve coverage and meta-data (e.g. consolidation of entities).
- Assess the geography of risk (e.g. interconnectedness, cross-border issues).

Online Marketplace Lending / Peer-To-Peer (P2P) Lending: Business Models, Risks, and Regulation, Presented by Kieran Garvey, Head of Regulation and Policy, Cambridge Centre for Alternative Finance

Mr. Garvey began with a taxonomy of the “alternative finance landscape,” consisting of non-bank, generally technology-focused firms engaging in equity finance (primarily SMEs and real estate crowdfunding), virtual currencies (initial coin offerings and cryptocurrencies), and, most important for shadow banking, lending (peer-to-peer business, peer-to-peer consumer, and peer-to-peer property). He pointed out that all of these types of alternative finance are much more common in China than in the United States or United Kingdom, but that in China, there is much less institutional funding and much more household funding for alternative finance, raising issues of consumer protection. Indeed, China’s total stock of alternative finance is estimated to have reached nearly USD 250 billion, vastly dwarfing the other regions of the world, collectively estimated at less than USD 50 billion. And, of all these types of alternative finance, P2P lending is the most dominant.

Globally, the potential market is much greater – the sum of potential unsecured personal loans, small business loans, student loans, and mortgages – has been estimated at USD 4.6 trillion. While this estimated worldwide market for P2P lending looks promising for financial inclusion, low-income countries have been slow in embracing the new technology.

Many countries are embracing P2P lending. In Southeast Asia, Singapore and Indonesia are the most active, while there is an emerging market in Malaysia, Thailand, and Vietnam. East Asian activity is dominated, of course, by China, whose total lending activity in 2015 (flow, not stock) exceeded USD 50 billion. However, South Korea and Japan have also shown significant activity. In South Asia, only India shows any activity, while in Oceania, New Zealand's P2P market has taken off rapidly, while Australia is also booming. Outside of Asia, the U.S., and the U.K., the most active countries are Germany, France, Finland, Estonia, and Canada.

Mr. Garvey explained that in the subset of P2P consumer loans, at least for the U.K., the top uses are for buying vehicles, consolidating debt, and undertaking home improvements. For P2P business lending, the most important categories are borrowing for expansion and growth, for working capital purposes, and for covering legal costs.

The risks and challenges of this growing form of shadow banking, Mr. Garvey explained, can be categorized as risks and challenges to regulators, risks and challenges to investors, and risks and challenges to platforms. For regulators, it is not a simple task even to identify and monitor all new and existing platforms, which currently number over 4,000. Many have already failed.

Regulators are also concerned about whether the P2P lenders have used appropriate judgment and credit risk analysis in making loans, and whether “adverse selection” is at play – borrowers going to P2P lenders who have been rejected by banks. In addition, Mr. Garvey cited problems with data transparency, reporting performance of loans, and the inappropriate segregation of client moneys (using client moneys for hedging, speculating, covering operational expenses, etc.). And, because the activity is growing fast, there are many opinions, but little consensus, on whether P2P lending poses systemic risk.

Mr. Garvey continued by discussing several risks to investors, many of whom are individuals and households. Notably, if investors are not financially literate, they may not properly diversify, and place a disproportionate amount of their assets with one P2P platform or even with one borrower. Moreover, investors may not fully understand the risks, which could include loss of the entire investment. There is always also the possibility of platform or borrower fraud and malpractice. Loans to certain borrowers may be in an amount, or with an interest rate, that is unaffordable to the borrower, leading to defaults and losses of investor funds.

Risks to P2P lending platforms must also be taken into account, Mr. Garvey argued. First of all, P2P borrower assessment by means of a credit score has not yet been rigorously tested. Next, there is a lack of regulatory clarity, as jurisdictions around the world are considering various regulatory approaches. Cybersecurity is a

primary concern, as it is with all FinTech platforms. And in the “rush to market,” many platforms may suffer from insufficient due diligence, incompetence, or mismanagement.

Mr. Garvey concluded by announcing the launch of the World Bank – Cambridge Global Alternative Finance Regulator Survey, which will canvass over 100 regulators, both central banks and securities commissions, to do a stocktaking of existing frameworks, specific regulatory requirements, and types of data and data-sharing that exist throughout the world.

Financial Inclusion and Proportionate Regulation: Does Regulation Help or Hinder Financial Inclusion? Presented by Dr. Atiur Rahman, Professor, Department of Development Studies, Dhaka University; Chairman of Unnayan Shamannay Research Organization, and Former Governor, Bangladesh Bank

Dr. Rahman began by outlining the dilemma: the absence of adequate regulation may allow a credit bubble to develop, causing a generalized financial crisis, but if regulation is too stringent, many creditworthy people will be denied access to all financial services, including loans. Moreover, excessive regulation of financial intermediaries can cause investment to stagnate, and foster the development of questionable “shadow banking” activities that may also lead to instability. And, if financial inclusion is not pursued as a goal in building a regulatory regime, banks will be too dependent on their large, corporate borrowers, whose dominance not only among bank customers but in the overall economy is also a potential source of instability.

While regulation is often viewed as stifling economic activity, Dr. Rahman pointed out that well-tailored regulation can actually enhance financial inclusion. For example, requiring interoperability among mobile network operators (MNOs) encourages far more people to utilize mobile financial services than if each MNO ran its own self-contained system. “Know-your-customer” (KYC) or “customer due diligence” requirements to prevent money laundering and to combat the financing of terrorism can seem to inhibit financial inclusion of clients who do not possess adequate documentation, but they can be made less onerous by allowing the opening of a restricted account pending submission of the full set of documents. Technology, as well, can assist in speeding up the required identification of customers.

As for mobile financial services, Dr. Rahman indicated that Bangladesh chose a “bank-led” model from the beginning, eliminating the need for the financial sector regulatory authority to supervise the collection of customers’ funds by the MNOs. Customers of mobile financial services increased in number from practically zero in 2012 to more than 40 million in 2017. Mobile financial services

are used by the Bangladesh government for social security payments, including to 40 million mothers. Dr. Rahman also encouraged the audience, many of whom were bankers or bank regulators, to explore partnerships between non-governmental organizations and banks, because NGOs can assist in the all-important tasks of identifying suitable borrowers, thereby meeting credit risk management guidelines while pursuing inclusion at the same time. This approach has proven successful in increasing loans to tenant farmers in Bangladesh. “Agent banking” can also foster financial inclusion, while delegating to the banks that use agents the responsibility of proper risk management in the selection of agents.

Regulation that requires customers to be better informed about the terms and conditions of banking products, together with a mandatory redress of customer complaints, can also promote financial inclusion. More knowledgeable customers of any product or service tend to use more of that product or service, especially if they know that their rights are protected if providers engage in deception or other misconduct.

Above all, Dr. Rahman stressed, it must be recognized that global financial regulatory standards are set with the largest banks in mind, and may not always fit smaller banks or those in less-developed banking markets. It is encouraging, he said, that standard-setters are now beginning to recognize this possible drawback, and more fully embracing the idea of proportional regulation with the assistance of technology.

Financial Inclusion and Proportionate Regulation: Does Regulation Help or Hinder Financial Inclusion? Presented by Dr. David Mayes, Professor of Banking and Finance, University of Auckland Business School

In his presentation, Dr. Mayes reviewed various regulatory approaches to so-called “digital currencies,” (DCs), also called “virtual currencies” or “cryptocurrencies.” Distinguishing between privately-issued DCs, such as bitcoin, and central bank-issued DCs, he noted that the proliferation of privately-issued DCs and their volatility reduced the likelihood that any one of them would gain a foothold, either as a medium of exchange or a store of value.

As for central bank-issued DCs, he saw a brighter picture. These official DCs could be exchanged between financial institutions, could be exchanged between individuals through mobile financial services (fostering financial inclusion), and could be used whenever a central bank wished to stimulate the economy through dropping “helicopter money.” Ultimately, central bank-issued DCs could replace banknotes and coins on the liability side of central bank balance sheets, providing a safer (and more easily traceable) means of payment in all transactions for which cash is normally used today.