Fintech Toolkit: Smart Regulatory and Market Approaches to Financial Technology Innovation

Electronic copy available at: https://ssrn.com/abstract=3598142
As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn
Germany
T +49 61 96 79-0
F +49 61 96 79-11 15
E Atilla.yuecel@giz.de
I www.giz.de

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

Authors:
Dirk A. Zetzsche, Professor of Law, ADA Chair in Financial Law, University of Luxembourg
Douglas W. Arner, Kerry Holdings Professor in Law, University of Hong Kong
Ross P. Buckley, KPMG Law – King & Wood Mallesons Professor of Innovative Disruption, UNSW Sydney

The report benefitted from the inputs of Atilla Kaiser-Yücel and the commentary by Sofia Bublatzky and the Financial Systems Development MENA Working Group.

GIZ would like to thank the regulatory and supervisory authorities from Arab countries engaged in the process for participating in the interviews and surveys.

Design:
sweetwater visuelle kommunikation, Darmstadt

Photo credits:
Adobe Stock, Paul Hageman/GIZ

URL links:
This publication contains links to external websites. Responsibility for the content of the listed external sites always lies with their respective publishers. When the links to these sites were first posted, GIZ checked the third-party content to establish whether it could give rise to civil or criminal liability. However, the constant review of the links to external sites cannot reasonably be expected without concrete indication of a violation of rights. If GIZ itself becomes aware or is notified by a third party that an external site it has provided a link to gives rise to civil or criminal liability, it will remove the link to this site immediately. GIZ expressly dissociates itself from such content.

GIZ is responsible for the content of this publication.

Frankfurt, April 1, 2020.
## Contents

| Section                                                                 | Page |
|------------------------------------------------------------------------|------|
| EXECUTIVE SUMMARY                                                      | 5    |
| 1 INTRODUCTION                                                         | 6    |
| 2 FINTECH: TAXONOMY AND FRAMEWORK                                      | 8    |
| 2.1 ABCD Technology Archetypes                                          | 9    |
| 2.2 Fintech Provider Types                                              | 10   |
| 2.3 Fintech Markets                                                    | 12   |
| 3 CONTEXT AND POLICY OBJECTIVES OF SMART REGULATORY AND MARKET APPROACHES TO FINTECH | 13   |
| 3.1 Fundamental Trends in Fintech and Financial Regulation             | 14   |
| 3.2 Overarching Policy Objectives: The ISIP Framework                  | 14   |
| 3.3 Fintech Disrupting the Financial Systems in the MENA Region         | 16   |
| 4 COMMON REGULATORY CHALLENGES AND RISKS WITH FINTECH                  | 18   |
| 4.1 Inclusion                                                          | 19   |
| 4.2 Stability                                                          | 19   |
| 4.3 Integrity                                                          | 19   |
| 4.4 Client Protection                                                  | 20   |
| 5 LAYING THE FOUNDATIONS FOR REFORM                                    | 21   |
| 5.1 Principles for Smart Regulatory and Market Approaches              | 22   |
| 5.2 Principles for Financial Systems Development Cooperation            | 24   |
| 6 RECOMMENDATIONS FOR THE DESIGN AND IMPLEMENTATION OF SMART REGULATORY AND MARKET APPROACHES TO FINTECH INNOVATION | 26   |
| 6.1 Preconditions                                                      | 27   |
| 6.2 Smart Regulatory Approaches to Fintech Innovation                 | 29   |
| 6.3 Market Approaches to Fintech Innovation                            | 35   |
| 6.4 Furthering Digital Finance by Other Means                          | 35   |
| 7 CONCLUSIONS                                                          | 37   |
| ANNEX 1: FINTECH-RELATED FINANCIAL STABILITY ISSUES AND POTENTIAL POLICY RESPONSES | 39   |
| ANNEX 2: INSIGHTS FROM THE MENA REGION                                  | 43   |
| ANNEX 3: USEFUL RESOURCES                                              | 48   |

Electronic copy available at: https://ssrn.com/abstract=3598142
### List of Abbreviations

| Abbreviation | Description |
|--------------|-------------|
| ABCD         | Artificial Intelligence, Big Data, Cloud Services, Distributed Ledger Technology / Blockchain |
| AFI          | Alliance for Financial Inclusion |
| AI           | Artificial Intelligence |
| AML          | Anti-Money Laundering |
| ASIC         | Australian Securities and Investments Commission |
| B2B          | Business-to-business |
| B2C          | Business-to-consumer |
| B2G          | Business-to-Government |
| BIS          | Bank for International Settlement |
| CAGR         | Compound Annual Growth Rate |
| CCP          | Central Counterparty |
| CDD          | Customer Due Diligence |
| CERT         | Computer Emergency Response Team |
| CFT          | Combating the Financing of Terrorism |
| CGAP         | Consultative Group to Assist the Poor |
| CLASSIC      | Customer-centric, Legacy-free, Asset-light, Scalable, Simple, Innovative, Compliance-light |
| CTRO         | Chief Technology Risk Officer |
| DLT          | Distributed Ledger Technology |
| DNA          | Data, Network Externalities, Adjacent Financial Services |
| eKYC         | Electronic Know-your-customer |
| FMI          | Financial Market Infrastructure |
| FSB          | Financial Stability Board |
| G20          | Group of Twenty |
| G2P          | Government-to-person |
| GDPR         | General Data Protection Regulation |
| GIZ          | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| HKU          | University of Hong Kong |
| ICT          | Information and Communication Technology |
| IMF          | International Monetary Fund |
| IOSCO        | International Organization of Securities Commissions |
| IoT          | Internet of Things |
| ISIP         | Inclusion, Stability, Integrity, Protection |
| IT           | Information Technology |
| KYC          | Know-your-customer |
| MAS          | Monetary Authority of Singapore |
| MENA         | Middle East and North Africa |
| MSME         | Micro, Small, and Medium-sized Enterprise |
| NCP          | National Contact Point |
| NFTS         | National Fintech Strategy |
| R&D          | Research and Development |
| SDG          | Sustainable Development Goal |
| SEC          | Securities Exchange Commission |
| STEM         | Science, Technology, Engineering, and Mathematics |
| TBTF         | Too-big-to-fail |
| TCTF         | Too-connected-to-fail |
| UNSW         | University of New South Wales |
Executive Summary

Finance has been transformed by digitalization and datafication over the past five decades. The latest wave of technology in finance (Fintech) is re-shaping the sector at an unprecedented pace. This digital financial transformation brings about structural changes, with positive and negative effects, likely even more in the high-potential markets of the Middle East and North Africa.

Fintech can stimulate competition and product variety with positive outcomes for societies and economies. The fundamental changes taking place in the financial system, however, call for the design of adequate approaches to Fintech innovation. An ecosystem is required that allows innovation balanced with financial inclusion, financial stability, market integrity and consumer protection. This toolkit presents novel regulatory and market approaches policymakers, regulators, and development professionals can adopt to enable safe Fintech innovation.

Regulatory frameworks will determine the future of Fintech. Following principles from global good practice (mainly activity-based, proportional, and technology-neutral regulation), regulatory approaches in sequenced stages help to create pathways for innovative Fintech firms.

First, regulators ought to identify and modernize unsuitable regulation based on a regulatory impact assessment that determines whether legacy rules remain useful.

Second, proportional regulation, reflected in provisions for market stability and integrity depending on the extent of risks underlying the regulated activity, create supportive pathways for new, particularly inclusive non-bank financial services.

Third, an Innovation Hub with experts of the regulatory authority is best suited to guide Fintech firms through the regulatory maze, yield valuable insights into market innovations, and assess possibilities of dispensation.

Fourth, testing and piloting regimes allow to apply leniency in a wait-and-see or test-and-learn approach to assist innovative firms. Authorities can further decide to tolerate innovations by licensed institutions and possibly by start-ups by extending on a case-by-case basis waivers or no-action-letters which declare certain activities as permissible or suspend certain rules.

Fifth, a regulatory sandbox, which standardizes the scope of testing and piloting, allows regulators to create a tightly defined safe space for granting dispensation from specific regulatory requirements for innovative firms that qualify.

Sixth, restricted licences allow feasible innovative firms to further develop their client base and financial and operational resources in a controlled manner.

Seventh, a full licence is essential for innovative firms as size requires and permits. Over these stages, as regulatory rigour and costs increase so tend to do Fintech firms’ maturity and ability to cope with risks and compliance, while maintaining a level playing field for licensed entities.

Demand and supply side factors will eventually propel innovative entrepreneurship and Fintech growth. Market approaches to Fintech innovation combine the support of financial and digital literacy in the population, cybersecurity capacities in the sector, acceleration programmes and investor-friendliness in the business environment, and technology clusters or digital centres in public-private-academic partnerships.

Sequenced reforms that are informed by global good practice, responsive to the local context and that contribute to regionally consistent frameworks, are policymakers best pick in support of an enabling ecosystem for Fintech. Concerted efforts will enable innovative financial service providers to tap the market and scale as well as Fintech to be beneficial for financial inclusion, competition and economic development across the region.
INTRODUCTION
Finance has been transformed by digitization and datafication over the past five decades. The progress and global reach of technology – particularly information and communication technology – is re-shaping financial services at an unprecedented pace, with incumbents being subject to pressure to change or being disrupted by new entrants or financial institutions that can innovate faster.

Technology-driven financial innovation (Fintech) is grounded in the use of Artificial Intelligence (AI), Big Data, Cloud Services, and Distributed Ledger Technology and Blockchain (ABCD for short). Fintech enables business model, channel and product innovations in finance, and transforms risks.

Finance is the most globalized segment of the world economy and among its most digitalized and data-heavy sectors. This can be seen across four major axes: the emergence of global wholesale markets, an explosion in the number of Fintech start-ups since 2008, fast-paced digital financial transformation in emerging markets and developing economies (e.g. China), and the increasing role of big technology companies (Bigtech) and technology firms (Techfin) in financial services as well as an enhanced interconnectivity of systems.

Digital financial transformation brings about structural changes, with positive and negative effects. While finance and technology have always interacted, the recent speed of change is unique and arises from the co-evolution of financial services, ABCD technologies, internet of things (IoT) and new entrants since the 2008 Global Financial Crisis.

While offering enormous potential, Fintech innovation challenges regulators asked to balance financial inclusion, financial stability, market integrity and consumer protection (commonly referred to as the ISIP framework).

Innovative regulatory frameworks are needed to meet these challenges: regulations that ensure openness to business model, channel and product innovation while addressing risks to society, the financial system, and the economy; and allow experimentation and formal pathways for the entry of Fintech start-ups and other new competitors. This includes proportional (or tiered) regulations for the benefit of a wider range of low-risk, low-cost and low-value financial services.

Regulation is a perennial challenge. Regulatory reform,¹ in times of rapid change, is not evidence of mistake or failure, but quite the opposite, of an active hunt for the best compromise given the (at times strongly diverging) local preconditions. This means the design and degree of regulatory reform will vary among jurisdictions. This toolkit thus serves as a baseline starting point for thorough discussion, rather than presenting ready-made solutions.

Building on desk research and stakeholder interviews, this toolkit presents regulatory and other approaches to enabling safe Fintech innovation. This report seeks to inform the debate around emerging issues and to support financial policymakers and regulators as well as development practitioners in identifying, formulating, and implementing policy responses, with a focus on the high potential markets of the Middle East and North Africa (MENA) region. The toolkit can be used a) to support the development of an entirely new regularity framework for specific innovations (e.g. in markets with little experience); or b) to enhance existing frameworks to address a range of financial policy objectives in the context of digital financial transformation.

Part 2 presents the taxonomy and framework, Part 3 sets the context and policy objectives of smart regulatory and market approaches to Fintech, and Part 4 introduces the common Fintech challenges and risks against regulatory objectives. Part 5 lays out the foundations for reform, and Part 6 discusses the regulatory tools available for furthering innovation. Part 7 concludes.

---

¹ In this toolkit, we use ‘regulatory reform’ to denote all changes necessary to existing formal laws and regulatory instruments and such new laws and instruments needed to establish an appropriate holistic regulatory framework to respond to innovation.
FINTECH: TAXONOMY AND FRAMEWORK
2.1 ABDC Technology Archetypes

2.1.1 Artificial Intelligence and Machine Learning

AI is a very broad umbrella term which refers to systems that perceive their environment and act to maximize their chances of successfully achieving their task. Base line AI is software that mimics human cognitive functions, such as 'learning' and 'problem solving.'

Machine learning is a subset of AI that uses statistical, data-based methods to progressively improve performance on a given task, without humans reprogramming the system to achieve enhanced performance. In practice, learning is achieved through extensive 'practice' with multiple feedback rounds through which the machine is told whether it has passed or failed a task.

AI and machine learning have the potential to develop independently after initial design and creation. It is not necessarily intelligent in the human sense, since it is mostly routine applied repeatedly to generate and structure knowledge regarding the order and correlation of datapoints in a given, potentially very big, dataset. In this sense, AI puts the mass of data gathered by Big Data applications to good use. Such 'narrow' forms of AI have the potential to develop into 'general' forms of AI, potentially exceeding human capabilities in the not distant future.

Prominent use cases of AI and machine learning in financial services include:

- Crowdfunding, including crowd-lending and crowd-investing (where AI assists in allocating liquidity and identifying new funding opportunities)
- Robo advice/asset and wealth managers (where AI assists in finding new profit opportunities and tailoring advice to customers)
- Risk management systems (where AI assists in revealing hidden risk correlations)
- Compliance systems (where AI assists in detecting fraud patterns).

For supervisors, AI may underpin Regtech solutions, which utilize submitted datasets.

2.1.2 Big Data

Big data is separate from but closely connected to AI. Big data analytics refers to the processing of data sets that are either too large or complex for traditional data processing applications. Big data applications apply advanced data analytics methods such as predictive or behavioural data analysis. Big data analytics can be used to detect unexpected correlations in large data pools, test expected correlations for causation, or determine the probability of events.

Big data analytics has received attention from various policy angles, notably the enhancement of potential biases implicit in the data, and the impact of the analytics on privacy and data protection. With advances in computer vision, speech, analytics, and mobile robotics, we can reasonably expect more and more data to be generated.

2.1.3 Cloud Solutions

Cloud services are available to users on demand over the internet from a provider’s servers. Such systems may be distributed or centralized. They often provide data storage and access (e.g. Apple iCloud) to a range of software and other services provided by IT and related companies (e.g. Microsoft, Amazon, Alibaba). The major cloud services providers include Amazon, Microsoft, Alibaba, Apple and IBM. Cloud service providers generally begin with storage, computing and analytics services; and, increasingly, are providing a range of related services. Cloud services are often seen as particularly efficient and secure, yet they raise a range of potential issues discussed in more detail below.

Start-ups today are frequently cloud-natives, meaning that from inception their data storage and processing are provided via cloud systems from major providers. Incumbent financial institutions are increasingly using cloud services. Financial services cloud providers such as Amazon, IBM and Microsoft provide traditional software via cloud services (software as a service) and an increasing range of standardised and bespoke cloud-based compliance and data management services.

Regulators too are increasingly looking at cloud solutions for data storage and management. The SEC-sponsored EDGAR disclosure repository website is hosted by cloud service providers including Amazon. The Monetary Authority of Singapore (MAS) has created its own private cloud.
2.1.4 Distributed Ledger Technology, Blockchain and Smart Contracts

A distributed ledger is ‘a database that is consensually shared and synchronised across networks spread across multiple sites … allowing a transaction to have [multiple private or] public “witnesses”’. This sharing results in a sequential database distributed across a network of servers all of which together function as a ledger. Distributed ledgers are best understood by considering traditional ledgers in which a centralized register administered by a single entity, like a bank, contains the relevant data. That arrangement entails several risks. If the hardware housing the register is destroyed, the information content may be lost. Second, disloyal employees of the bank may manipulate the information. Third, manipulations and losses may arise from a cyber-attack. While not every server will be cyberattacked, any server can be manipulated with sufficient computing power and time (even if no other encryption weaknesses are known to the attackers). Distributed ledger technology (DLT) addresses these problems by raising the barrier for manipulation. The technology requires consensus of many data storage points (nodes) rather than the approval of one administrator.

Blockchain: Distributed ledgers can be paired with a block-chain protocol. Blockchain refers to the storage of data in bundles (‘blocks’) in a strict time-related series which links each block to the previous and subsequent blocks. The chronology of storage is revealed through a time stamp imprinted on each of the blocks. The blockchain renders data corruption even harder, because a successful cyberattack requires corrupting not just one block of data, but multiple data sets (i.e. the whole blockchain after the alteration) as well as the time stamps.

Smart Contracts: Distributed ledgers have provided fertile ground for the application of another innovation that may solve the problem of trust in human interactions. While neither smart, nor contracts, and thus not well named, they are self-executing software protocols that reflect parts of an agreement between two parties. The relevant terms are written directly into lines of code. Smart contracts permit the execution of transactions between disparate, anonymous parties without the need for an external enforcement mechanism (such as a court, an arbitrator, or a central clearing facility). They render transactions traceable, transparent, and irreversible (from a technological, though not necessarily a legal, standpoint).

Although distributed ledgers and blockchains are information storage devices, and smart contracts are information processing tools, the latter can ‘run’ on distributed ledgers. For this reason, we refer to these three technologies collectively as DLTs.

Prominent use cases of DLT include:
- Cryptocurrencies such as Bitcoin, ETH and Libra
- Recordkeeping systems such as share registries and property registries
- Clearing and settlement systems
- Initial Coin Offerings and other forms of token-based finance
- Shareholder and client identification systems (shared registers, eKYC registers, KYC utilities)

2.2 Fintech Provider Types

Providers of Fintech services include start-ups, Techfins and Bigtech, financial institutions, and authorities.

2.2.1 Start-Ups

Start-ups are early-stage firms, typically characterised by a small number of highly motivated employees. Start-ups are often, but not always, funded by venture capital.

The typical Fintech is a start-up that identifies a ‘pain point’ in financial services (something incumbents do poorly or not at all) and seeks to provide a remedy. The usual goal is either to sell the solution service directly to customers or to sell the service or itself to an incumbent financial services firm.

Common Fintech start-up characteristics are expressed in the CLASSIC framework (see figure below).

For example, Fintech companies tend to have a laser-like focus on specific customer propositions (often one that is poorly served, if at all, by traditional FS companies) and offer seamless and intuitive user experience. Fintechs are able to scale, typically balance sheet light, and free from the burdens of legacy systems and platforms. Fintechs also tend to have smart, unbundled business models often designed to avoid the need for authorisation.
2.2.2 Bigtech and Techfin

Bigtechs are existing technology and e-commerce companies (including Alibaba, Amazon, Google, Facebook, Tencent, Apple, etc). These companies often play an important role as cloud service and/or technology service providers to incumbent banks.

Techfins are Bigtechs that enter the financial services market utilising their typically large pre-existing non-financial services customer bases. In contrast to Fintechs, Techfins start with technology and data and then add financial services. Techfins' primary relationships with customers are in other fields such as e-commerce, social networks, entertainment, and telecommunications. They collect massive amounts of data from those relationships, and then seek to use that data to deliver more efficient financial services to their existing customers. Initially, a Techfin may sell data to financial services providers or leverage its customer relationships by serving as a conduit through which its customers can access financial services provided by a separate institution. Later, the Techfin may provide the financial services directly itself. Techfins can assemble much of the information the customer’s bank or asset manager possesses, and supplement it with very detailed knowledge of many other aspects of customer choices and preferences. These preferences can then be processed by algorithms that have established correlations between certain preferences and creditworthiness to provide a much more nuanced assessment of creditworthiness than a bank.

The BIS summarizes these key characteristics of Bigtechs evolving into Techfins under the acronym DNA: data, network externalities, adjacent financial services.6

Techfins pose major regulatory challenges for competition, data privacy and cyber security. From a regulatory perspective, they need to be approached differently than Fintechs. The provider with the best information about a customer is best placed to price credit and insurance services for that customer. Traditionally that has been the customer’s bank. However, banks may no longer enjoy this advantage or at least not for long.

5 Diagram adapted from EY (n 4) 22.
6 BIS, Annual Economic Report 2019 (Report, 2019) 62 <https://www.bis.org/publ/arpdf/ar2019e.htm>.
The data to which Techfins have access is typically expansive, covers much of the people in a market, and deep in terms of the number of data points that can be gathered for an individual. Techfins can readily expand into offering financial services. Facebook, Amazon and Alibaba are doing so in payments in India — a competition which is likely to be played out in an increasing range of markets around the world as Alibaba has shown with its expansion of financial services offerings in China, particularly in lending and investment management.

2.2.3 Financial Institutions

Financial institutions can use Fintech from the ground up sparing legacy systems and legacy processes, such as digital (or challenger) banks, that harness digital technology to provide more client-oriented, convenient and cheaper branchless banking services. Alternatively, traditional commercial banks leverage the latest wave of technology such as big data analytics in risk management or, in other cases, non-bank financial institutions digitally transform their operations and client relationships.

2.2.4 Authorities: Regtech / Suptech

Regtech is the use of technologies for compliance and reporting as well as regulation and monitoring. It thus includes Suptech as one component. Regtech systems are used to enhance operations (Operations Regtech) and compliance controls within the providers (Compliancetech) as well as supervision (Suptech) processes.

Regtech is thus an umbrella that covers private sector applications in which regulatory compliance, monitoring, and analytics are digitalized and automated for efficiency gains. From the regulatory and supervisory standpoint, it includes use of technology to facilitate oversight by financial supervisors mostly using big data analytics and, increasingly, AI. Regtech tends to enable more efficient compliance with regulation and Suptech more efficient supervision.

Regtech includes electronic know-your-customer (eKYC) systems which facilitate client on-boarding by financial intermediaries and can enhance market integrity, automated compliance monitoring and reporting. Regtech also brings new challenges, including the need for qualified supervisory staff, adaptations in internal governance and new cybersecurity risks.

2.3 Fintech Markets

2.3.1 G2P – Government-to-Person

Fintech markets emerge among a range of parties including government, businesses and retail clients. Government-to-private markets include, for example, official identity schemes, such as Aadhar in India or the European eIDASR, the scheme for cross-border digital identity, and electronic systems for payment of government salaries and benefits.

2.3.2 B2B – Business-to-Business

B2B markets include, for example,
- data service providers such as Refinitiv, Thompson-Reuters and Bloomberg
- AI-driven risk analytics, including Blackrock’s Aladdin
- business-oriented mobile payment services
- most blockchain-as-a-service offerings, for instance by IBM and Microsoft
- enterprise cloud services

2.3.3 B2C – Business-to-Consumer

B2C markets include, for example, remittance services for migrants, mobile payment services for consumers, and robo-advice and wealth technology solutions.

2.3.4 B2G – Business-to-Government

B2G markets include, for example, cloud storage for government entities, outsourced development of risk analytics and supervision tools, and electronic payment systems (e.g. public-private real time gross settlement (RTGS) systems).

---

7 Luca Enriques and Dirk A Zetzsche, ‘Corporate Technologies and the Tech Nirvana Fallacy’ (Law Working Paper No 457/2019, European Corporate Governance Institute, 25 June 2019) 4 https://ssrn.com/abstract=3392221, Douglas Arner, Janos Barberis and Ross Buckley, ‘FinTech, RegTech and the Reconceptualization of Financial Regulation’ 37 Northwestern Journal of International Law and Business 371, 371-414 (2017) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2847806
8 Janos Barberis, Douglas Arner and Ross Buckley (eds), The RegTech Book The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries in Regulation (J. Wiley 2019)
CONTEXT AND POLICY
OBJECTIVES OF SMART
REGULATORY AND MARKET
APPROACHES TO FINTECH
**3.1 Fundamental Trends in Fintech and Financial Regulation**

Fintech is transforming financial systems and challenging existing approaches of financial policymakers and regulators. Overall, four fundamental trends can be observed.

**3.1.1 The Type of Players in Financial Services Are Changing**

This change calls for regulatory and supervisory responses to safeguard financial integrity, protection, and stability. As start-ups, Bigtechs and/or Techfins enter markets, regulators need to be nimble and adaptive. Start-ups and Techfins benefit from different unit economics: start-ups from asset-light, less regulated, partly outsourced business models, and Techfins from economies of scale (platforms) and network effects. The range of business model, channel, and product innovations typically challenges regulators in terms of regulatory scope, frameworks, skillsets and approaches.

**3.1.2 Traditionally Segregated Sectors Are Converging**

This change triggers more inter-institutional coordination among regulators and requires more regulatory resources at least in the short-term. Policymaking and regulation for Fintech needs to be coordinated across jurisdictions, including prudential and non-prudential financial supervision, competition policy, ICT, and cybersecurity.

**3.1.3 The Rate of Innovation and the Amounts of Data Are Changing**

This change requires more active regulators. Fintech innovations are emerging ever faster, increasing the volume, velocity, and variety of data. Risks often increase alongside increasing reliance on technology, interconnectedness in the financial system, and concentration of data. The rise of data can challenge market competition (e.g. platform economies) and cybersecurity (e.g. open data and outsourcing), among other factors. So, an abundance of data tends to challenge regulatory resources. Regulators need to respond with their own Regtech and Suptech data-driven tools.

**3.1.4 The Objectives for Regulators and Their Tools Are Changing**

Many financial systems are insufficiently competitive and do a poor job of serving certain market segments, especially small business and consumers. Policymakers consequently often welcome Fintech and task their regulators with its encouragement to promote competition. This calls for new approaches by regulators which may include more frequent consultation with providers, innovation hubs, regulatory sandboxes and Regtech, as they seek to fulfill a market facilitator role.

**3.2 Overarching Policy Objectives: The ISIP Framework**

Fintech innovation has the potential to stimulate competition and product variety in terms of quantity (financial sector broadening) and quality (financial sector deepening and market efficiency). Financial regulation is required to ensure this innovative technological progress has positive outcomes for the society and economy. Regulatory approaches need to ensure that Fintech innovation contributes to overarching financial policy objectives such as inclusion, stability and integrity of the system, and client protection (ISIP).

---

9 Some differ between different types of innovation such as adjacent, disruptive, or breakthrough innovation. The boundaries of these expressions are hard to define. From our perspective all innovation shares the joint feature to drive efficiencies, either by assisting incumbents to perform services better or less expensively (collaborative approach) or by replacing incumbents altogether (disruptive approach).
Financial inclusion: all people and firms have access to, and are able to use, affordable, responsible and sustainable financial services.

Financial stability: a multidimensional concept, of which one aspect is a robust and smooth functioning financial system.\(^\text{11}\)

Market integrity: illicit financial transaction and market participants in the financial system are controlled with AML/CTF risks as prime examples.

Client protection: clients’ funds are protected from non-compensated financial and operational risks such as moral hazard, fraud, deficient operations, and data protection.

Some frameworks mention competition as a separate policy objective – a goal which typically requires regulators to rethink their role.

---

10 Figure reproduced from UNGSSA FinTech Working Group and CCAF, Early Lessons on Regulatory Innovations to Enable Inclusive FinTech: Innovation Offices, Regulatory Sandboxes, and RegTech (Report, 2019) 16.

11 See Serge Jeanneau, Financial Stability Objectives and Arrangements – What’s New? (BIS Papers No 76) <https://www.bis.org/publ/bispap76e_rh.pdf>.
3.3 Fintech Disrupting the Financial Systems in the MENA Region

By global standards, financial sectors in the MENA region are moderately developed in terms of depth and market composition. They are dominated by banks with non-bank financial services emerging. The countries of the Gulf region have larger and deeper financial systems than the more diverse group of non-Gulf countries. Hence, oversight in these bank-dominated markets is pre-dominantly characterised by a traditional focus on prudential supervision led by institutional regulations.

All together the financial inclusion levels in the MENA is 63% of adults. Micro, small and medium-sized enterprises (MSME), particularly informal ones, make up the largest share of the private sector but are severely constrained due to generally low bank competition paired with regulatory gaps for alternative financial services and a fairly stagnant financial infrastructure (including digital or faster payments, effective credit bureaus, collateral and movable asset registries). The informality and limited capacities of these businesses impede financing by incumbents given their attitudes to risk and the relatively high costs of servicing such businesses.

Fintech offers to spur competition and promote financial inclusion (or deepening) and economic development. The use of Fintech in identification and KYC procedures, payments and money transfers, lending, investments and savings, insurance, and public administration as well as in supervisory and regulatory practices offers a great deal to the MENA region.

ICT, financial services, and their convergence in Fintech are widely considered growth sectors and enablers of new jobs and structural diversification in these countries on their path to digital economies: e.g. in Egypt every new ICT job created 2.8 indirect jobs between 2008 and 2011; and M-pesa in Kenya directly generates income for more than 80,000 agents in addition to the effects of increased levels of financial inclusion.

---

12 Asli Demirgüç-Kunt et al, The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution (The World Bank Report, 2018).
13 Douglas W Arner, Ross P Buckley and Dirk A Zetzsche, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation (AFI Report, September 2018) https://www.af-institute.org/sites/default/files/publications/2018-09/AFI_FinTech_Special%20Report_FINAL.pdf; Douglas W Arner, János Barberis and Ross P Buckley, ‘Fintech, RegTech and the Reconceptualization of Financial Regulation’ (2017) 37(3) Northwestern Journal of International Law and Business 371; Dirk A Zetzsche et al, ‘Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation’ (2017) 23 Fordham Journal of Corporate and Financial Law 31; Douglas W Arner et al, ‘Fintech and RegTech: Enabling Innovation While Preserving Stability’ (2017) 18(3) Georgetown Journal of International Affairs 47; Dirk A Zetzsche et al, ‘From Fintech to TechFin: The Regulatory Challenge of Data-Driven Finance’ (2018) 14(2) NYU Journal of Law and Business 393.
14 World Bank, Iraq Systematic Country Diagnostic (Report, February 2017) https://elibrary.worldbank.org/doi/abs/10.1596/26237; World Bank, A New Economy for the Middle East and North Africa (MENA Economic Monitor Report, October 2018) https://openknowledge.worldbank.org/bitstream/handle/10986/30436/9781464813672.pdf?sequence=11&isAllowed=y.
Fintech in the MENA region is driven by an increasingly well-educated and tech-savvy young population and by the scale of opportunity. Record remittance flows that move on legacy rails, the numbers of unbanked people and the massive funding gap for millions of businesses across the region incentivise Fintech start-ups, Bigtech or Techfins, and innovative financial institutions to harness the possibilities of Fintech. The number of Fintech start-ups has grown rapidly over the past years, at a CAGR of 39% since 2012, with more than 300 Fintech start-ups present across the MENA region (see figure).16

15 Magnitt, 2019 MENA Fintech Venture Report (Report, October 2019) - https://magnitt.com/research/50675/2019-mena-fintech-venture-reports
16 Wamda, Fintech in MENA: Unbundling the Financial Services Industry (Report, 16 March 2017) - http://backend.wamda.com/api/v1/downloads/publications/fintech-mena-unbundling-financial-services-industry, Magnitt (n 16)
COMMON REGULATORY CHALLENGES AND RISKS WITH FINTECH
4.1 Inclusion

4.1.1 Fintech-Related Inclusion Issues

Remarkably, since 2010, over 1.2 billion people globally have opened their first ever financial or mobile money account. Yet a lot still needs to be done, with 1.7 billion adults lacking formal access to a financial or mobile money account as of 2018, and in turn to other types of financial services. One must furthermore look beyond technical inclusion: such an account is a precondition to participation in the financial system, not an end in itself. Such participation is about improving people’s lives and supporting sustainable development in the context of the UN Sustainable Development Goals (SDGs). The account is a means to an end which will be enabled by more efficient everyday living, investments in education, health and retirement, and greater resilience against economic shocks. Account holders who lack the knowledge to use financial services effectively can face new types of financial difficulties, such as over-indebtedness or insolvency. A broad concept of financial inclusion is thus necessary: in addition to formal access, true financial inclusion requires financial and technological literacy, technological infrastructure, trust in financial firms and regulators, competitive choice, etc.

Fintech-driven products and services, if appropriate, accessible and affordable, can do much to promote financial inclusion.

4.1.2 Inclusion-Related Policy Tools

Realizing the potential of Fintech for financial inclusion calls for a strategic framework for an enabling environment of policies, regulations, and infrastructure. The Alliance for Financial Inclusion (AFI) draws from experience in EMDEs and suggests a progressive approach in four staged phases to building a Fintech ecosystem for financial inclusion:17

- Digital identification and simplified account opening
- Open access interoperable electronic payment systems
- Government provision of services including salary and benefit payments through the ID, account and payment infrastructure
- Development of digital financial infrastructure such as clearing and settlement systems.

These pillars work best in a well-designed proportional regulatory system that supports financial inclusion, other financial policy objectives (stability, market integrity, consumer protection) and sustainable development aligned with the SDGs.

4.2 Stability

The global financial crisis of 2008 ushered in a new era in financial stability regulation. Before 2008 our system focussed on the stability of individual financial firms. The crisis shone a spotlight on the potential of linkages among firms to be a source of systemic risk and so post-crisis regulation has focused far more on interdependencies in markets.

We address the full range of Fintech-related financial stability issues in Annex I. These issues include cybersecurity, market structure, data protection, and financial infrastructure (particularly, the rapidly growing role of cloud services).

We then consider in the Annex seven stability-related policy tools available to regulators to respond to the risks associated with the instability inducing aspects that may arise from the growth of Fintech. The first of such responses is to prioritise tech risk. Tech risk is a new form of risk, and thus not yet prominent in most financial regulators thinking – and it needs to be. The next steps for regulators are to strengthen their in-house tech expertise and enhance reporting requirements about firms’ tech risk management strategies. Further strategies are also considered. We then conclude by analysing why regulators themselves need to start employing Regtech solutions in supervision.

4.3 Integrity

4.3.1 Fintech-Related Integrity Issues

Financial market integrity focuses on preventing the criminal and terrorist use of the financial system, with fraud and theft the most common examples. These activities undermine social acceptance and trust in financial services. Illegal conduct can

17 Arner, Buckley and Zetzsche, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation (n 13).
be profitable to financial firms. For instance, firms that support money laundering and tax evasion may well charge unusually high fees. This increases risks for society, and for legitimate clients of such firms.

Much financial regulation and financially related law enforcement activities relate to the intersection between criminal activities – especially fraud and theft – and the use of the financial system to support criminal or other prohibited activities such as terrorism. Fintech offers a range of new tools to potentially combat such activities (frequently in the form of Regtech). However, Fintech can also offer new scope and means for such criminal activity.

From the standpoint of criminal activity relating to finance, digital crime is the most rapidly growing area of crime in recent years, as a range of crimes (such as fraud) move into the digital environment. High profile examples include digital frauds, cyber thefts and identity and data thefts. Technology has enabled much wider access through social media and into bank accounts and other electronic stores of financial and data resources. In this respect, a focus is the development of cryptocurrencies and other forms of digital assets, that offer new opportunities for fraud and money laundering.

### 4.3.2 Integrity-Related Policy Tools

Integrity-related policy tools include:

- **eKYC and digital due diligence** -- given the pro-concentration forces of technology, we expect the former will, in time, lead to a series of eKYC utilities covering whole financial markets,
- **Electronic compliance and risk management applications** detecting criminal activity (insider trading, fraud, money laundering etc.) by looking for unusual data patterns,
- **Automatic tax information exchange** among public authorities, and in certain cases private entities,
- **Further cooperation among public and private entities** to implement and enforce uniform standards across market participants,
- **Enforcement action and sanctions.**

### 4.4 Client Protection

#### 4.4.1 Fintech-Related Client Protection Issues

Client protection covers mainly transparency, fair treatment, data privacy and confidentiality, and complaints handling. Issues for clients of Fintech firms may include:

- fraudulent or criminal activity or malfunctions,
- implicit discrimination in big data analytics,
- data privacy infringement, data security issues with the provider or in outsourcing arrangements,
- profiling of clients using multiple layers of data from different sources and providers

#### 4.4.2 Client Protection-Related Policy Tools

Policy tools aiming at client protection include:

- **mandatory disclosure of key facts and statements**,
- **product governance and target market rules**,
- **mandatory training and licensing of client advisors**,
- **testing algorithms for undisclosed or unexpected side effects**,
- **clear data privacy and security legislative frameworks including consent, right to be forgotten, limitation of data storage**,
- **allocation of liability with a potentially reversed burden of proof for complex algorithms and other non-transparent infrastructure.**
LAYING THE FOUNDATIONS FOR REFORM
5.1 Principles for Smart Regulatory and Market Approaches

The fundamental changes taking place in the financial system globally and in the MENA region call for the design of adequate regulatory approaches to Fintech innovation. As innovation usually requires an enabling environment, regulatory frameworks will determine the future of Fintech. Basic principles for financial policymaking and regulatory reform in the MENA countries can be borrowed from global good practice and include: 1) activity-based regulation, 2) proportional regulation, 3) globally consistent regulation, 4) regulation that lowers barriers to entry, and 5) technology-neutral regulation.

5.1.1 Activity-Based Regulation

Financial regulation should be based on activities, on the functions, being performed, instead of the type of organisation or firm that performs them. The same activity with the same risk should attract the same regulatory treatment.18

Effective regulation of fintech has to consider the nature of the financial risks and of the entities bearing the risks. Understanding who bears the financial risk is instrumental in developing appropriate and effective regulatory tools and the right place to start in developing this understanding is the nature of the activity being performed.

5.1.2 Proportional Regulation

Especially with Fintech, because so many Fintech start-ups are small, regulation needs to be proportional with lighter rules for smaller entities and more rigorous rules for the major institutions.

5.1.3 Global Fundamentals

'Smart' regulation should be built on shared fundamentals. As an example, while all agree on the importance of combating money laundering and financing of terrorism (AML/CFT) and the Financial Action Task Force sets standards, implementation of these standards varies among countries which is problematic. To resolve this tension, regulators should look to their broader mandates (i.e. consumer protection, financial stability, competition, etc) as opposed to attempting to apply overly rules-based approaches and should seek a high level of consistency with details.

5.1.4 Towards Lower Entry Barriers

Regulators should seek to promote competition in their financial markets, and if promoting competition is not an explicit part of their mandate, they should seek to have it included. Competition and innovation are two sides of the same coin in finance: innovation enables competition, and competition drives innovation as one competitor seeks to distinguish itself from the others. So, competition on the merits (i.e. where all participants follow the same rules and bear the same costs) is in general a good thing in finance. It can be difficult to determine if a new Fintech entrant is a competitor or collaborator. Some Fintechs follow disruptive strategies, while others support licensed entities in mastering the digital revolution. Both approaches are healthy and support the financial ecosystem. On balance, and certainly for all jurisdictions that wish to signal regulatory flexibility to the market, the express provision of the promotion of both competition and innovation in their mandate will be most useful.

New participants can facilitate regulatory experiments with new supervisory and reporting models. The bargaining power of start-ups with regulators is disproportionally low compared to that of large incumbent licensed enterprises. This gives regulators the opportunity to engage in a sequenced reform process and to impose new digital regulation on such new entrants from the outset, while incumbent financial institutions will only have to face more digitised monitoring and reporting over time. This allows experimentation at the margin (as supported by the low numbers of firms in sandboxes) while the bulk of the industry is gradually and more slowly brought to new standards via the digitisation of regulatory requirements themselves, in short: Regtech. Risks incurred by unregulated, yet sandboxed, firms may be accepted—for the very reason that they can kickstart innovation whereas regulation sets higher-than-desired barriers to innovation.

Overall, it is reasonable to develop smart regulatory approaches, i.e. frameworks that lower entry barriers to financial markets in so far as it is still possible to keep risks at the entry gates.

18 Robert C Merton, ‘A Functional Perspective of Financial Intermediation’ (1995) 24(2) Financial Management 23.
5.1.5 Technology-Neutral Regulation

Regulation should be 'technologically neutral’. This does not excuse regulators from the need to understand the impact of new technologies on processes (e.g. biometric identification for payments) or business models (e.g. alternative data credit scoring). Instead ‘technological neutrality’ means regulators do not seek to ‘regulate’ technological innovations, but instead focus on the financial processes and activities that technology enables and that ought to be subject to regulation (e.g. the problem is not automated investment advice but the risks of fraud and poor advice).

5.1.6 Seven Stages of Smart Regulatory Approaches

From this basis, a reasonable regulatory approach comprises sequenced stages:
1. Abolition of unsuitable regulation
2. Proportional regulation
3. An innovation hub, which does not require legislation, is staffed by regulatory experts that guide Fintech firms through the regulatory maze, discuss their innovation, and can issue waivers or other forms of dispensation
4. A testing and piloting environment
5. A regulatory sandbox, which widens the scope of testing and piloting, is transparent, and removes the regulators' disincentive to grant dispensations (and depending on the ecosystem and the importance of cross-border recognition the sandbox may take the form of a sandbox umbrella)
6. A restricted licensing / special charter scheme, under which innovative firms can further develop their client base and financial and operational resources
7. A full licence, based on a proportional structure, when size and income permits

There are a range of reason for this order of sequencing. First and foremost, regulators must identify and reduce red-tape 'formal' regulation and ensure proportionate regulation, i.e. any regulatory requirement is justified with risks (assumed or proven) relating to the very activity. Once this is ensured, an innovation hub is the most flexible approach and likely to be of most benefit to the widest number of firms. It facilitates contact for Fintech firms with the regulator and will boost regulator learning. Testing and piloting and sandbox regimes in contrast, will assist some firms, but not all, and often, not many. These initiatives are worth having but will not be of broad appeal. Finally, the restricted and full licensing regimes are desirable and essential, of course, respectively, but naturally come towards the end of the product development process.

Furthermore, from one stage to the next, regulatory rigour and fixed costs of regulation increase, as does the Fintech's operational space in terms of clients, resources, and scope. This sequence of regulatory approaches should lead to a desirable lowering of entry barriers for firms.

At each stage, of course, the Smart Regulator will consider risk considerations in the context of the firm's ability to cover costs and while seeking to maintain a similar regulatory burden for licensed entities.)
5.2 Principles for Financial Systems Development Cooperation

5.2.1 Technical Assistance and Capacity Development for Fintech Innovation

Donors, development finance institutions, and bi-/multilateral agencies just like GIZ can harness international partnerships, their long-standing bilateral cooperation relationships across the MENA region, and their experience in systemic approaches to financial systems development. Technical (and financial) assistance however will have to respond to the fundamental changes taking place on the market and regulatory levels of the financial system.

Advisory will have to go hand in hand with institutional and human capacity development to address challenges in IT and financial innovation including, but not limited to:

- the technical and vocational education, training, and recruitment of technology and financial young potentials and creation of attractive career paths in the sector;
- the promotion of institutional IT expertise as well as policies and procedures within regulatory and supervisory authorities as well as providers across functions and hierarchy levels;
- the development of capacities of staff can help to drive forward technology and innovation-related topics within the regulatory and supervisory authorities;
- the exposure of senior decision makers and young potentials to one another within organisations as well as across authorities and financial service providers.

Financial systems development initiatives, such as for digital financial inclusion, might require more than ever a cross-country, cross-sectoral, and multi-level approach. On the national level, this may entail:

- Re-visiting and re-defining stakeholder maps for any one financial system initiative so as to consider all relevant players from within the wider ecosystem, such as associations and providers from ICT sectors or authorities relevant for competition, cybersecurity, digital economy or e-government and the like;
- Establishing a dedicated unit within the Central Bank staffed with Innovation Officers in charge for Fintech and regulation-related external inquiries, in-house advisory, market monitoring, and facilitation of below mentioned measures (Innovation Hub);
- Organising Hackathons whereby competent authorities challenge teams of technology experts (Regtech), Fintech start-ups or other service providers to develop and pitch their solutions for a given problem statement against some monetary incentive;
- Organising Tech Fairs whereby public and private stakeholders invite for, exhibit and review latest technology and innovation developments;
- Organising Open Days whereby authorities invite young entrepreneurs and tech firms to inclusive visit for an open dialogue;
- Supporting co-working spaces, incubators or Digital Centres (see BMZ initiative) and the like in public-private-civil society partnerships;
- Organising a Fintech Council for regular public-private dialogue, the exchange of knowledge and consultations between policymakers, regulators, practitioners, and academia, or for joint policy or other working papers;
- Setting-up a governance framework and coordination structure with the Central Bank as lead organisation and thematic working groups with public-private players in an effort to formulate and implement national policies and strategies (e.g. national Fintech strategy), infrastructure projects (e.g. CERTs, data infrastructure, KYC utilities, payment gateways etc) and industry standards (e.g. open data and API platforms);
- Interdisciplinary training of staff of authorities in innovation, business, technology, strategy development, project management, and marketing matters;
- Enhancing national digital and financial literacy levels in collaboration with public, private, and civil society stakeholders.¹⁹

On a regional level, partner countries could join forces for:

- Providing a safe environment for regional cooperation and experimentation in innovation topics for financial regulators to strengthen their capacities and a regionally integrated framework for Fintech. Interested authorities engage in learning, supervisory exchange, joint testing, and co-licensing in Fintech and Regtech issues. They jointly work towards a regime for regulatory passporting to enable the regional expansion and growth of Fintech;
- Setting up regional Centres of Expertise in specific areas, with access to expertise and trainings in a fair and equal manner for all participating countries and stakeholders (e.g. Regional Cybersecurity Resource Centre).

¹⁹ See ‘Systemic Approach to Financial Inclusion’, CGAP (Web Page) @https://www.cgap.org/topics/collections/market-systems-approach.

Electronic copy available at: https://ssrn.com/abstract=3598142
5.2.2 Ecosystem Stakeholder Engagement and Consultation

A consultative reform process is critically important to strengthening the entire ecosystem for Fintech, including governance, demand, talent, capital-related enablers, and especially for developing an enabling regulatory framework. Implementing regulatory reform is a complex undertaking and requires the interaction of a broad array of stakeholders. The regulatory framework should aim to balance the interests of relevant stakeholders in order to achieve the desired impact for the sector, the society, and the economy.

5.2.3 Holistic, Active, Coordinated In-Country Policymaking

Ensuring a clear, long-term perspective for Fintech reform and investments is crucial for attracting and ensuring the needed contributions. That long-term perspective will require policymakers and regulators, infrastructure and market players to convene under a common theme and strategy. This requires strong leadership, hence the advice to appoint a lead agency such as the Central Bank or, if desired, as high as the Prime Minister’s or President’s Office.

Once the Fintech reform agenda is started, interventions may have to be adjusted. However, corrections should be limited to the original strategy framework. A reshuffling of priorities along the way, depending for example on political events such as elections, are likely to create confusion and deter investments.

There are no silver bullets and no one-size fits all solutions. Knowledge of the local context paired with good practice and lessons learned from other country experiences promises sustainable results. Regulatory reforms must fit the enabling environment (political, economic, social, technological, legal) of any one country and focus on achieving local optima. For example, conventional financial solutions may face difficulty with some parts of the society and hence Islamic financial principles such as risk-sharing or profit-and-loss-sharing may be relevant.

Self-confidence in learning and home-grown solutions are key. This includes preparing institutions for the reality that Fintech reform can be an ongoing, multi-year process, rather than a one-step effort that yields short-term results.
6 RECOMMENDATIONS FOR THE DESIGN AND IMPLEMENTATION OF SMART REGULATORY AND MARKET APPROACHES TO FINTECH INNOVATION
Fintech is a means to achieve ends. The ends relate to specific policy objectives. Fintech policymaking in the MENA region should, as it does in most places, seek to use innovative regulatory approaches to promote Fintech in the pursuit of greater competition in financial services and financial inclusion. Further regulatory adaptations will be needed so that the growth in Fintech does not compromise the three traditional financial regulatory aims of promoting financial stability, integrity, and consumer protection.

This chapter outlines general preconditions for reform and presents innovative regulatory and market approaches which are appropriate for MENA countries and through which financial policymakers and regulators can promote innovative Fintech businesses and the ISIP framework.

6.1 Preconditions

6.1.1 Diagnostic Studies

Diagnostic studies involve environmental assessments and market analyses to help identify the key drivers of, and challenges to, the growth of Fintech in a country. The studies seek to understand the status quo, and thereby underpin recommendations for reform. The environmental assessment typically encompasses the political, economic, social, technological, legal, capital, and human resources aspects of the Fintech ecosystem. The market analysis will address supply and demand for Fintech so as to support evidence-based policymaking and private sector investments. The data collected should help to challenge assumptions, support new policy approaches, and provide the basis for monitoring progress.

6.1.2 Definition of Fintech

Fintech is a broad term often used flexibly. A clear definition of Fintech is thus key to developing adequate regulatory frameworks. The definition does not necessarily need to be codified in law. A softer definition might be helpful as it allows flexibility for adjustments over time. Generic definitions, as listed in the introductory part, can serve as examples. Country-specific Fintech definitions, for example as part of a national strategy, may go further to refer to the relevant policy objectives as well as the relevant financial functions subject to reforms. Holistic Fintech frameworks or model taxonomies can provide a vantage point for countries to narrow the relevant scope of Fintech in a national context.

6.1.3 Vision for Fintech

Informed by diagnostic studies and motivated by overarching financial and non-financial policy objectives, a clear vision for Fintech in a country will provide the foundation for regulatory reform to support Fintech innovation. It is typically a concise, inspirational and aspirational statement that defines medium-to long-term goal(s) of the strategy [not to be confused with the overarching policy objective].

Pro-innovation regulatory approaches can promote competition in financial services. However, not all types of innovation are equally important or be in demand. Given usually limited resources, policymakers and regulators will need to answer why – besides economic growth as an overall consideration – they want certain Fintech innovations, focusing on very specific parts of the Fintech universe.

A practical approach is to develop a nationally endorsed Fintech vision shared by a broad range of stakeholders, including government, regulators, private sector actors and others, which lays out the policy objectives that guide the implementation of policies, reforms, and investments. For instance, some countries will seek to strengthen financial inclusion, while others will seek to respond to international expectations around enhancing integrity.

The vision will identify the sector or services where innovation will most likely fall on fertile ground, i.e. where a focused political and financial investment will lead to quick, and long-term, impact. For instance, in a country where formal financial inclusion is low, Fintech policy could focus on financially including people in certain regions or market segments. In contrast, where the payment sector is mature and most people have a bank account, Fintech policy can seek to promote more sophisticated services, such as unemployment insurance.

The vision for Fintech can be expressed in a National Fintech Strategy which guides stakeholders and provides a basis for monitoring progress.

20 AFI, Mobile Financial Services: Supervision and Oversight of Mobile Financial Services (MFSWG Guideline Note No 12, 14 February 2014).
21 AFI, National Financial Inclusion Strategies: Current State of Practise (FISPLG Report, June 2018) 10 (https://www.afi-global.org/sites/default/files/publications/2018-06/national%20financial%20inclusion%20strategies.pdf).
Box: National Fintech Strategy (NFTS)

Enabling Fintech innovation in the financial system in a safe and secure manner for a defined policy objective requires a deliberate and coordinated approach to identify key opportunities and challenges, strengthen linkages and coordination across financial and non-financial domains, and align the efforts of a wide range of public, private, and civil society stakeholders.

A National Fintech Strategy (NFTS) can serve as a policy instrument to actively promote Fintech innovation to support increased competition or inclusion in the financial system while putting in place the necessary safeguards to ensure financial stability, integrity, and consumer protection, i.e. to balance the range of financial (and non-financial) policy objectives.

An NFTS document is informed by evidence and prepared in consultation with stakeholders. It can be a useful tool to provide a common definition of Fintech, to chart a clear vision for Fintech, to outline strategy objectives, to identify Fintech drivers, challenges and opportunities for policies, reforms, and investments across the ecosystem. It can help to effectively coordinate actions and allocate needed resources in priority areas in view of the set policy objective(s). 22

Forthcoming Guidelines for National Fintech Strategies by the Arab Region Fintech Working Group will provide country stakeholders with specific assistance and recommendations.

6.1.4 Governance and Institutional Coordination

a) Coordination is Required Across Public, Private, and Civil Society Stakeholders

Turning vision into reality requires an appropriate, effective framework to coordinate policies, reforms, and investments.

The main participants in developing legislation include relevant regulators and government entities. The legislature will be involved where Fintech reform includes formal amendments to legislation. Promoting financial inclusion through Fintech can involve a range of departments and regulators, including ministries of economy, industry and trade, education, IT and communications, and financial, competition and telecommunications regulators. Ambiguities or overlaps in regulatory jurisdictions can result in conflicting regulation or weak enforcement. For instance, the financial regulator may identify competition or data privacy concerns with Fintech which may require action from other regulators.

Private sector participants (service providers, industry, consumer organisations and research facilities) are often important. A timely, regular, consultative process among public, private, academic and civil society players can enhance knowledge and enable technological and financial services innovation.

We recommend implementation of Principle 6 of the G20 Principles for Innovative Financial Inclusion, 26 by ensuring cross-sectoral coordination through a national governance framework with an inter-agency coordination structure (which

Suggested Resources

- AFI, Fintech for Financial Inclusion 23
- CGAP, Four basic regulatory enablers 24
- IMF, Bali Fintech Agenda 25
- G20, High Level Principles for Digital Financial Inclusion 26
- UNSW, Regulatory Handbook: The Enabling Regulation of Digital Financial Services. 27

22 AFI, National Financial Inclusion Strategies: Current State of Practise (n 22); EY (n 4); IMF and World Bank, The Bali Fintech Agenda (Chapeau Paper, 19 September 2018)محاوله Fintech للしさة المالية في نظام مالي في طريقة آمنة ونافذة، يطلب من ذلك تشريعاً معتمداً ومراعياً للاحتياجات والأعمال التجارية، الذي تجعل من الهيئات التنظيمية المالية ومؤسسات القطاع الخاص والمجتمع المدني المرتبطة بها فرصة للعمل على تحقيق الأهداف المتعددة.

23 Arner, Buckley and Zetzsche, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation (n 13).

24 Stefan Staaken and Patrick Meagher, Basic Regulatory Enablers for Digital Financial Services (CSAP Focus Note No 109, May 2018) (https://www.csap.org/sites/default/files/researches/documents/Focus-Note-Basic-Regulatory-Enablers-for-DFS-May-2018.pdf).

25 IMF, The Bali Fintech Agenda (Policy Paper, 11 October 2018) (https://www.imf.org/en/Publications/Policy-Papers/Pages/2018/10/11/pp101118-bali-fintech-agenda.aspx).

26 G20, G20 High-Level Principles for Digital Financial Inclusion (https://www.g20.org/publications/g20-high-level-principles-digital-financial-inclusion/).

27 Malady, Buckley, and Tsang, Regulatory Handbook: The Enabling Regulation of Digital Financial Services (UNSW Law Research Paper No 2016-05) (https://ssrn.com/abstract=2715350).

28 "Cooperation, Create an institutional environment with clear lines of accountability and coordination within government, and also encourage partnerships and direct consultation across government, business, and other stakeholders."
can take the form of a formal agreement or Memorandum of Understanding (MOU), and a defined lead agency. The role of each regulator and party should be clear, and the framework should evolve as the process matures.

b) Responsibility for Leading Fintech Reform Should Be Assigned to One Institution

Experience suggests strongly that an efficient reform process needs one institution to lead, drive and coordinate it. This could be the office of the President, the Ministry of Finance or the Central Bank, and is, most often, the Central Bank. This lead institution should set goals and facilitate the coordination of the range of processes required to support the growth of Fintech and financial inclusion.

c) Coordination is Required Within Authorities

Fintech is often addressed in a range of departments within one regulatory authority, including payment, securities and lending departments. Accordingly, collaboration within the authority is vital. Fintech reform is further likely to require expertise from IT, legal, research and (where they exist) non-bank financial institutions departments.

Coordination is key both for leveraging the authority’s in-house expertise, and for creating the necessary consensus across the authority. For example, while the banking supervision department might generally be in charge of licensing and approving new providers and products, the IT department may have the expertise to promote cybersecurity.

In many countries financial inclusion ‘units’ are responsible for executing the overall reform strategy. An alternative is an internal financial innovation / Fintech committee that spans departments of the financial regulator.

GIZ experience suggests that such units or internal committees that include representatives from all relevant departments are effective. The committee should have the necessary power to make recommendations on all aspects of digital financial services / Fintech, e.g. draft regulatory texts, licensing, approval, and research. This should ensure an efficient policy development and implementation process.

Suggested Resources:
- AFI, Current State of Practise in Financial Inclusion Strategies
- World Bank, Developing and Operationalizing a National Financial Inclusion Strategy
- World Bank, Coordination Structures for Financial Inclusion Strategies and Reforms

6.2 Smart Regulatory Approaches to Fintech Innovation

There are many ways a regulator can approach promoting Fintech innovation. These include supporting research and development; human capital development; marketing; investment promotion, including the establishment of investment funds; creation of incubators and accelerators; and legal and regulatory reforms. In this section we consider seven in particular: (1) abolition of unsuitable regulation, (2) proportional regulation, (3) innovation hubs, (4) testing and piloting, (5) regulatory sandboxes, (6) restricted licensing, and (7) waivers and no-action letters.
6.2.1 Abolish Regulation (Red Tape)

Abolishing regulation is often a relatively easy and inexpensive approach. However, most rules were adopted initially for a reason. So before doing so, a regulatory impact analysis should determine whether the rule in question remains useful. Rules which are often ripe for abolition include formal requirements (such as rules asking for confirmation in writing or certified copies, as such information can often be confirmed today from other data sources including corporate registers, tax information etc.).

6.2.2 Ensure Proportionality of Regulation ('Bespoke Regulation')

Proportional regulation includes stricter rules for larger firms, and more lenient rules for smaller ones. Proportionality is key, alongside competition policy considerations, when devising formal and supportive pathways for Fintech start-ups into the market. Proportionality needs to be reflected particularly in regulations concerning market stability (including capital requirements) and market integrity (tiered KYC or CDD requirements depending on transaction size) to create an enabling playing field for new non-bank financial service providers. Some rules, however, don’t lend themselves to this approach. For instance, it makes no difference to customers whether they have been defrauded by large or small firms, so fit and proper person tests for corporate officers should remain.

6.2.3 Innovation Hubs

An innovation hub is a unit within the financial regulator that serves as a portal through which industry can access regulators to discuss their Fintech innovation and obtain regulatory guidance or dispensations. An innovation hub itself does not require legislation. A hub is typically staffed by regulatory experts.

Regulators who wish to genuinely promote innovation need to make available the staff to interact with industry, where necessary, issue bespoke waivers or other forms of dispensation of some regulatory requirements and assist with advice and guidance to Fintech start-ups seeking to navigate the regulatory maze.

Innovation hubs will generally be the most efficient and effective regulatory approach to promote and facilitate innovation in financial services, while sandboxes – more expensive to set up and maintain – tend to attract the headlines and send an innovation-friendly message to the market.

6.2.4 Testing and Piloting Arrangements

Regulators can grant leniency (and exemption from licensing requirements) for testing and piloting, under a wait-and-see or test-and-learn approach.35
A wait-and-see approach is often advisable when an innovation is not a threat to retail consumers. A test-and-learn approach is defined by clear boundaries in terms of transaction volume and duration of the test – whether the activity is continued depends on the outcome of the test. In a pilot, in contrast, the intention from the outset is to continue the activity after the piloting period – which is designed to provide some data which is missing.

For testing and piloting applications regulators must define with certainty where testing and piloting ends and regular activity begins. Overall, these approaches enable innovation in the market, including in data collection, on a temporary basis within boundaries or with safeguards in place. They allow the regulator to monitor associated risks, thereby to inform policies and the decision-making for regulatory reform or to identify sectoral gaps that merit further attention. An exemption for testing and piloting is particularly useful for authorized financial institutions as they can test new technology and business models under their existing licence.

Where an activity meets the definition of a regulated activity, pursuing it cannot be justified on testing and piloting grounds unless (1) the clients are not selected on actual market criteria—we refer to this category as “fake clients”; (2) the test participants are aware of their guinea pig function; (3) the use is limited to a certain number of occasions, a specific time, or certain clients; and (4) the testing environment is insulated from the licensed entities’ or Fintechs’ “real” business activity. Where clients consent, the Fintech could justify testing and piloting for some time.

6.2.5 Regulatory Sandboxes

Regulatory sandboxes are safe spaces in which Fintech startups and other innovative enterprises can develop and test their innovations without being subject to the full extent of financial regulation. A sandbox is a tightly defined safe space which automatically grants relief from some regulatory requirements for those entities that meet its entry tests. In contrast to testing and piloting, the sandbox requires formal approval of entry by a regulator. The sandboxed firm does not, at first, get an unlimited licence. Its right to pursue the activity is conditioned upon its remaining in the sandbox, and statutes tend to limit sandbox participation to anywhere between 6 and 24 months.

One upside of both sandboxes and innovation hubs are the learning outcomes for the regulator from the close interaction with innovative firms. One downside, especially of sandboxes, are possible conflicts of interests which may arise when a supervisory agency, having ‘sandboxed’ a firm for a while, has an interest in it being a success story. Additional concerns relate to the rule of law, equal treatment of competitors, and the costs of establishing a sandbox scheme which may turn out to be incommensurate to the returns in terms of numbers of firms benefiting from a sandbox, in particular when compared to an innovation hub.

“The U.K. FCA sandbox grew out of its innovation hub, termed Project Innovate. Likewise in Australia, the Australian Securities and Investments Commission’s sandbox grew out of its innovation hub, which well preceded the sandbox. […] In cases where Fintech and innovation firms are emerging and presenting challenges to the existing regulatory regime’s approaches, a sandbox may be a useful additional element of the Fintech and innovation ecosystem.”

36 Ross P Buckley et al, ‘Building Fintech Ecosystems: Regulatory Sandboxes, Innovation Hubs and Beyond’ (Working Paper No 53, European Banking Institute, 1 November 2019) (https://ssrn.com/abstract=3455872).
Egypt has adopted a regulatory sandbox framework in June 2019. As of December 2019, 3 firms benefitted from Sandbox testing.

The Regulatory Sandbox in Egypt is a cohort-based business model: only Fintech companies and start-ups specializing in the subject announced at each cohort are accepted in the selection process. The first cohort 2019 was based on Fintechs specializing in e-KYC solutions.

The number of Fintechs accepted to the program may vary at each cohort depending on resources and capabilities. This allows keeping adequate guidance and supervision standards.

Participants need to meet six eligibility criteria: the innovation must be
1) within the Fintech scope,
2) genuinely innovative,
3) provide a benefit to customers,
4) must be in a real need for the Regulatory Sandbox,
5) be a mature solution, and ready for Sandbox testing and
6) support digital transformation & Financial Inclusion initiatives.

A separate team within CBE coordinates the Regulatory Sandbox in Egypt and it follows a defined process, which includes the following phases:
1) Application stage. Among the documents required for the application, applicants need to provide a detailed testing plan that would eventually need to be integrated and approved by CBE if successful. Testing plans include among other things, risks associated with the business, caps and floors for the number of clients as well as the value of transactions, etc.
2) Evaluation Stage.
3) Preparation stage. In this phase, the applicant must select and provide a list of customers, who need to be aware of the risks incurred by making use of the services/technology offered by the sandboxed company (formal consumer protection terms).
4) Experimentation stage. Upon selection, Fintechs are accepted to the Regulatory Sandbox for testing. Within the Regulatory Sandbox, Fintechs may operate freely, testing their technology with real clients over a period of 6 months (an extension up to 12 months is allowed). Sandboxed firms must fulfil some reporting requirements, primarily a monthly progress measured across different KPIs and optionally they can provide a report listing operational or technical incidents, audits and customers satisfaction reports. The objective of regulators is to collect, through reporting, statistically relevant parameters in order to measure the impact of the services provided by the sandboxed Fintechs in the ecosystem and to evaluate their growth.
5) Exit. In the event of success, the sandboxed firm is allowed to enter the Egyptian financial market, after obtaining a licence if required.

Even if Fintechs are not required to have their activities backed by a traditional financial institution, most of the applicants had partnerships with banks.

The regulatory Sandbox in Egypt is part of an articulated Fintech vision and strategy, which was developed after an accurate assessment of the national ecosystem aimed at identifying specific local challenges. These assessment considerations are directly translated in the selection procedures and functioning of the Regulatory Sandboxes. For instance, the assessment revealed that 99% of the ventures in Egypt are SMEs and it was reported in our survey that Fintechs that target SMEs are preferred in the selection process compared to other Fintechs targeting different client segments.37

37 https://fintech-egypt.com/sandbox/, own survey and interview.
In summary, the real work of promoting Fintech is far more likely to be done by an innovation hub than a sandbox. Sandboxes, for reasons of consumer protection, must have narrow entry criteria. Innovation hubs merely facilitate interaction with regulators for the purpose of receiving guidance and possibly dispensations. For this reason, the number of providers that typically benefit from an innovation hub far eclipse the number that qualify for a sandbox.

However, our recommendation is for regulators in the MENA region to have both a sandbox and a hub. This is because the sandbox term cuts through and having one tends to send the clear (and valuable) message that the regulator is flexible and easy to deal with. This is probably because many jurisdictions now have sandboxes and nearly all use that term in describing them. Fewer jurisdictions have innovation hubs and use a wide range of names for them. So, the term ‘sandbox’ will cut through, while the actual work of promoting innovation is far more likely to be done in the hub.

6.2.6 Restricted Licensing

Restricted licensing enables the grant of partial licences. For instance, a wealth management firm could be licensed to provide investment advice for liquid financial instruments to wholesale clients only, rather than being licensed to advise wholesale and retail clients on all asset classes. A payment institution could be licensed to provide simple retail payments only. The ASIC Fintech licence grants a licence swiftly to innovative firms which meet the criteria. The upside of restricted licensing is legal certainty and transparency and reduced costs for entrepreneurs, while downsides include that strongly growing firms may quickly outgrow the restrictions.

6.2.7 Waiver and No-Action Letters

With waivers, authorities assess conduct on a case-by-case basis and declare, at the end of a formal proceeding, whether certain conduct is deemed to comply with the law, even though it may in some respects not comply with all details of a written rule. The waiver/no-action letter approach differs from the “wait and see” approach since the supervisory authorities take an active decision to tolerate a certain conduct (i.e. they may assume liability, if the law provides for liability in cases of unlawful waivers). Waivers and no-action dispensations are most often extended to licensed institutions, but the practice can usefully be applied to Fintech start-ups.

For rule of law reasons, the procedures for waiver/no-action letters should follow certain internal guidelines, and the outcomes should be published, to ensure other firms can seek the same degree of regulatory lenience. Firms applying for no-action letters should be required to provide a factual brief and a legal assessment which discusses the rules and explains why disregard of certain aspects of the rules is in line with the ISIP taxonomy laid out above.

38 See ‘Fintech Licensing FAQs’, ASIC (Web Page, 15 January 2020):<https://asic.gov.au/for-business/innovation-hub/asic-and-fintech/fintech-licensing-faqs/>.
39 See Australian Securities and Investments Commission, Licensing: Financial Product Advice and Dealing (Regulatory Guide 36, June 2016).
Insights From the MENA Region

No-Action Letter Practice
1 out of 6 countries make use of no-action letters but does not issue no-action letters often.

Fintech Waiver Policy
6 out of 6 countries do not have a Fintech waiver policy.
3 out of 6 countries would consider changes to the law in this regard, while 3 want to retain their approach.

6.2.8 Umbrella Licence

The umbrella licence is granted to a business that meets the licensing requirements of a given country, yet performs the regulated activity by way of outsourcing. The Fintech firms are delegates of the umbrella licence holder. An umbrella licence creates economies of scale for costs of regulation and supervision since only the umbrella licence holder needs to report to supervisory authorities, pay licensing fees (if any) and ensure compliance with the regulations.

While attractive for small Fintech firms, the Umbrella licence holder also assumes liability for misconduct by the Fintech firms. This could result in a perverse incentive structure where the benefit of misconduct is allocated to the Fintech firm and the costs/liability to the Umbrella-licence holder.

A case where umbrella licences may be useful may involve tech-cluster and accelerator providers where the provider sets the conditions for and selects participants in the cluster/accelerator and subjects them to its contractual conditions. An umbrella licence could be fruitful particularly to secure proper performance of certain key compliance concerns, in particular KYC checks to control AML/CTF risks, as well as financial and operational risk management. An umbrella licence requires, on the side of the licence holder, a sophisticated control and reporting infrastructure as well as seasoned key management.

6.2.9 Voluntary Fintech Licences

Several firms that are not yet licensed in the MENA region understand a licence as a benefit when contracting with larger banks, yet licensing is restricted to firms pursuing a certain regulated activity, with the scope of regulated activity being rather traditional and limited to archetypes of financial intermediation. These firms could consider submitting themselves to a voluntary licensing process, despite the fact that they do not pursue one of the archetype financial services, in order to benefit from the positive effects that they expect from a regulatory approval in return for submitting themselves to reporting requirements and regulatory oversight. Examples could include the provision of AML/CTF checks or data analysis/scoring on behalf of regulated intermediaries.

While we note that a “voluntary” Fintech licence would be novel, in an environment like the MENA region where regulated activities are often not granularly written in the respective law a voluntary Fintech licence could yield some benefits, yet the limits and legal consequences of such a voluntary scheme would need to be clearly defined.

6.2.10 Regional Fintech Licences

For mid-size firms the small geographic scope of a banking or financial services licence is a disadvantage since these firms lack the size to establish subsidiaries, and acquire licences, in each country of the MENA region. These firms would welcome a regional licensing scheme, similar to the European Passport covering all EU and EEA countries.40

As the European experience shows, expanding a national licence into a regional licence requires a significant degree of harmonization of laws across the region in addition to close cooperation and trust among competent authorities in the region, paired with some oversight mechanism to avoid arbitrage.

40 For further information on the European passport and access requirements across regions see Dirk A Zetzsche, ‘Competitiveness of Financial Centers in Light of Financial and Tax Law Equivalence Requirements’ in Ross P Buckley, Emilioos Avgouleas and Douglas W Arner (eds), Reconceptualising Global Finance and its Regulation (Cambridge University Press, 2016) 390.
6.3 Market Approaches to Fintech Innovation

Non-legal systemic interventions for financial innovations include strengthening the demand side, strengthening the supply side, and furthering innovative entrepreneurship. These non-legal interventions also include:

1. enhancing financial and tech literacy programmes,
2. supporting cybersecurity research centres (regional or national), to address cybersecurity risks through a collaborative approach.

Jordan’s cyber security policy foresees:

- the creation of national Computer Emergency Response Teams (CERTs) to deliver continuous network monitoring and threat intelligence and incident response capability,
- a cyber-training programme to enhance the skills of NCP stakeholders and CERT staff;
- Public Key Infrastructure (PKI) to manage secure information communication, and identity authentication and digital signatures;
- an international information security co-operation programme to aid information sharing, exchange lessons learned and enhance capability development.

8. creating digital clusters (for instance, around universities) to further regional technology expertise. Similar to financial centres, these digital centres could develop services which are not available or too expensive to build, while ensure sufficient customization to the local context. The cost-benefit analysis of a digital centre strategy is particularly important to ensure wise spending of public funds.

6.4 Furthering Digital Finance by Other Means

Regulators can further tech implementation among financial services firms through rules that lead to pro-innovation investments by way of digital reporting requirements, data privacy and liability rules. The interaction of apparently separate reforms can drive the development of digital finance.

6.4.1 Reporting Tools, Tech-Based Reporting

In tandem with post-crisis international regulatory approaches, many regulators (in particular in Europe) have imposed very extensive reporting obligations on financial intermediaries in an effort to combat systemic risk as well as address a range of integrity risks emerging from money laundering, terrorism financing and competition scandals. These financial regulatory reforms have a common focus related to international financial regulatory standards; and a common imposition of extensive reporting requirements upon the financial services industry. All in all, these reforms have spurred rapid digitization of finance, financial reporting and regulatory capacity digital finance, in the following way:

When faced with a proposed regulation, the financial services industry will demand sufficient time to build the necessary IT systems to implement it. The necessity of technological implementation of regulatory reporting requirements then forces intermediaries and their service providers to continually invest in the development of their software and IT systems to ensure sufficient data are collected within their organization to meet reporting requirements, that these data are packaged and reported in the necessary structure and form. This is the process of datafication: the application of analytics tools to digital data. Once financial intermediaries have “datafied” their reporting, the regulators and supervisors are also forced

---

See http://moict.gov.jo/uploads/studies/National%20Cyber%20Security%20Strategy%202018-2023.pdf
to develop data management systems, which are capable of receiving and processing the volume of data being generated and delivered by the financial services industry. With enhanced analytics tools, supervisors can handle even more data (and in turn, tend to ask the supervised entities to collect and transmit even more of it, triggering another Regtech cycle).

6.4.2 Data Privacy Rules

Another field of legislation driving technological progress includes the imposition of enhanced data privacy rules. Legislation could require financial institutions, for instance, to reorganize their data processing as well as client data policies to meet the requirements of data privacy legislation (with the EU’s GDPR providing the most advanced example). The extensive details on personal data of individuals also require data categorization tools which allow for amendments and deletion after a given timeframe or upon the natural person’s request. Financial intermediaries have often collected large amounts of data from and about their customers, over long periods of time. However, in many cases, these data have not been used effectively, because they have been restricted to certain business units, lines, products or silos within individual firms. Under data privacy rules, financial intermediaries are obliged to build comprehensive systems for their digitized data which address the collection, storage, use and protection of the data. The process of digitization combined with systemization to meet the data privacy requirements may trigger a revolution in financial industry treatment of customer data, in the same way that data-oriented reporting requirements drive a revolution in financial industry collection and processing of business and regulatory data. However, unlike the financial regulatory reforms which drive not only digitization but also datafication, data privacy rules create barriers to centralization of individual customer data and its use, placing requirements on the financial industry to develop new systems of data management and also shifting control of many aspects of their data from financial and data intermediaries (which have collected it) to individual customers (who are its subject).

6.4.3 Allocating Responsibility

Vulnerable people tend to lack financial and tech literacy. Legal language in contracts often works against them, allocating responsibility for misuse of their password, cyber risks, or abuse of their customer data to them rather than the service providers. This undermines trust in financial services and undercuts a crucial support for ensuring financial inclusion which is that clients use the services to which they have access.

Legislation can shift responsibility in these cases to the entity with best means and resources to fend off cyberattacks and bear the risks: the financial institution. It is typically the financial service providers that can best increase security and monitor clients’ accounts and assets against attacks.

Rules promoting trust in financial services through allocating liability and responsibility to the “cheapest cost avoider” are widespread in modern financial legislation. For instance, the EU Payment Services Directive II (adopted in 2016*) allocates responsibility for regaining clients’ assets from unauthorized payments entirely to the financial institutions. However, responsibility does little if the provider lacks the means to meet its obligations, so legislation could pair with liability with the requirement to either provide additional capital reserves or liability insurance for cases of mandated liability.
CONCLUSIONS
CONCLUSIONS

We have sought in this report to provide policymakers and regulators in the MENA region with guidance and the range of options available to them to harness Fintech innovation based on global best practice. The choice of any particular regulatory approach is of course a matter of sovereign discretion informed by the local expertise of the domestic ecosystem and market.

We suggest that policymakers and regulators, however, particularly pay attention to the benefits of regionally harmonized regulatory frameworks for Fintech. The more consistent regulatory approaches are across the region, the more attractive each of the national markets will be to innovative financial service providers. This is because consistent regulation facilitates the expansion and rollout of Fintech innovation across the region, enabling providers to materialize economies of scope and scale and clients to choose from a wider set of services.

Achieving regionally integrated framework conditions as part of enabling ecosystems for Fintech may not be an easy task. Stakeholders across the region are well served by realising that a high level of effortful collaboration is their best pick to attract on the global stage the innovative sorts of financial services providers. These will further Fintech across the entire MENA region with benefits for financial inclusion, competition and economic development at large.

In pursuing this regional approach to an enabling ecosystem for Fintech, the above recommendations offer much guidance. A good starting point for nations is to identify and revamp legacy regulations by implementing proportional regulation in a tiered approach – with more lenient provisions for less risky activities such as by non-bank firms and gradually increasing, more prudential requirements for riskier services carried out by financial institutions.

We also suggest at the same time that financial regulatory authorities establish Innovation Hubs with staff that is knowledgeable of the financial licensing regime and encouraged to develop the capacities regarding Fintech developments and the local business environment. The Innovation Hub experts should be readily contactable by Fintech start-ups and financial institutions and able to provide guidance about regulatory requirements and dispensations.

Finally, subsequent reforms can include the establishment of a regulatory sandbox, as much for the message having a sandbox will send, as to the number of likely entrants into it. Global experience strongly suggests that most Fintech entrants in the MENA region will probably not qualify for a sandbox – or will decline to enter it, as their growth trajectory will take them quickly beyond the limits – but will benefit greatly from the guidance by an Innovation Hub.

Electronic copy available at: https://ssrn.com/abstract=3598142
ANNEX 1: FINTECH-RELATED FINANCIAL STABILITY ISSUES AND POTENTIAL POLICY RESPONSES

Electronic copy available at: https://ssrn.com/abstract=3598142
1 Fintech-Related Financial Stability Issues

Prior to 2008, the regulatory focus was on identifying major risks and building appropriate regulatory and supervisory frameworks, principally through the Basel II Capital Accord. Basel II and financial stability regulation in general focused on a “micro-prudential” approach prior to 2008 in which regulators focused on the safety and soundness of individual financial institutions through such prudential regulatory standards.

This approach focused on five major categories of risk: credit / counterparty risk, market risk, payment risk, operational risk, and legal risk. Basel II included capital charges and related regulatory standards for the first four of these (with little attention to legal risk).

In this framework, risks relating to technological and data issues were included in operational risk, and thus attracted a relatively small cost in capital charges and related risk management and compliance systems. Since 2008, financial stability regulation has focused far more on ‘macroprudential’ risks. These risks arise from interdependencies in markets and were at the heart of the 2008 crisis. They have thus been central to post-crisis financial regulatory reforms.

With digital financial transformation, the standard post-2008 approach no longer addresses the full range of risks faced by a financial system. The emergence of digitisation and datafication means technology risks (including risks relating to cybersecurity and data privacy) should be seen as a separate form of risk, beyond traditional operational risk. Technology risks can arise within individual institutions and in the interconnections among institutions; and, more fundamentally, have the potential to impact financial sector confidence and stability directly.

Several key areas of concern arising from digital financial transformation include cybersecurity, data security and data privacy, new forms of financial institutions and new financial market infrastructures. Accordingly, an appropriate framework of analysis encompasses: (1) new sources of traditional forms of risk; (2) new forms of risk; and (3) entirely new markets and systems (including systems for regulation such as Regtech).

a) Cybersecurity

Cybersecurity has become a strong focus of financial regulators, governments and financial and tech firms globally. Cybersecurity is a very significant source of systemic risk, and a significant national security issue. Cybersecurity risk can thus be a new source of traditional risk and a new form of risk with potentially catastrophic consequences. While the weight of the international risks is significant, addressing them at a cross-border level is particularly challenging due to both financial stability and national security issues.

While regulators – nationally, regionally and internationally – are focusing attention on related issues, the wide range of actors and motivations are a challenge. Though financial institutions and infrastructure providers must focus significant resources and efforts on cybersecurity, the role of states and state-supported actors highlights the difficulties of pushing the entire burden onto the financial sector. Furthermore, the rise of Fintech exacerbates certain cybersecurity threats that are unique to the financial system, and its stability.

As a result of the increased state presence in cyber-activities (including cyberwarfare), states have to take a leading role in building systems to monitor and support key economic sectors – such as the financial sector – in addition to private and regulatory attention to issues of cybersecurity.

b) Market Structure

Another major stability concern stems from the market structure and competitive efficiency of Fintech markets, especially the risk of market concentration. Technology is characterised by scale economies and network effects (where existing users of an application benefit from additional users). For instance, where many online traders use the same platform, all can benefit from intra-platform liquidity by cutting out third-party clearing and settlement. These effects also benefit the platform provider who thereby facilitates both trading and clearing and settlement. This highlights to real potential of technology platforms to turn into sectoral monopolists, with the finance industry becoming an oligopolistic structure with a few multi-service-platforms providing almost all services entirely inside the platform (and some external providers attached to, and entirely dependent upon, the platform). Likewise, data-driven technology industries are characterised by a lower degree of contestability. The more data necessary to compete in a Fintech submarket, the harder is entry for new firms. These market concentration and contestability issues will turn into a market composition issue over time. New entrants will be side-lined by data-rich technology firms (Bigtechs) entering finance. This will both reduce the innovative potential of Fintech markets, and enhance too-big-too-fail (TBTF) systemic risk.

In considering these issues, the Financial Stability Board (FSB) concluded in 2019, addressing Fintech and market structure:

42 FSB, Fintech and Market Structure in Financial Services: Market Developments and Potential Financial Stability Implications (Report, 14 February 2019): https://www.fsb.org/wp-content/uploads/P140219.pdf.

- To date, the relationship between incumbent financial institutions and Fintech firms appears to be largely complementary and cooperative.

Electronic copy available at: https://ssrn.com/abstract=3598142
The competitive impact of Bigtech may be greater than that of Fintech firms. Bigtechs typically have large, established customer networks and enjoy name recognition and trust.

Reliance by financial institutions on third-party data services providers (e.g., data provision, cloud storage and analytics, and physical connectivity) for core operations is low at present but warrants ongoing monitoring.

Since the time of that summary however, the rapid growth in cloud and data services raises a range of concerns.

c) Data Protection and Security

The increasingly central role of data in finance highlights a second major area of concern: data protection. Different approaches are developing in different economies, in part representative of fundamentally different societal approaches, with the US, China, and the EU exemplifying diverging legal approaches to use, ownership and protection of data. These various approaches raise major questions about the role of data in digitised and “datafied” societies and economies: who owns and controls data, and what does ownership and control entail? The EU’s General Data Protection Regulation (GDPR) is the most ambitious, harmonised legal approach and reflects concerns for individual privacy (and thus grants rights to data subjects against data controllers).

In looking at related issues, it is important to distinguish between data security or protection risks and data privacy risks (about the collection and use of personal data, particularly where there are extensive privacy protections such as GDPR). Some governments have worked of late to adopt approaches similar to GDPR; a noteworthy example is India that follows a pro-technology approach paired with EU-style individual data protection rights and a state monopoly on crucial building blocks for the financial system. Nonetheless there remains wide variations in national approaches and capacities for data protection.

d) Infrastructure

In addition to new risks from the digital environment (particularly relating to cybersecurity and data protection and privacy) and from new financial institutions (particularly scale and network effects), new risks also arise from new forms of digital financial infrastructure. Bigtech has played a particularly salient role in this development. The activities of these firms are rapidly expanding into credit provision, insurance, and investment services, creating complex interconnected webs across several sectors.

Concerns about financial infrastructure are by no means new, with financial regulation focusing on payment systems since the failure of Bankhaus Herstatt in 1974 and on securities clearing and settlement systems particularly since the failure of the Hong Kong stock and futures exchanges in 1987, with both addressed by the BIS Committee on Payment and Settlement Systems and the International Organisation of Securities Commissions (IOSCO). Since 2008, the focus on ‘financial market infrastructures’ (FMIs) has increased dramatically, with leadership by the FSB and the renamed joint BIS-IOSCO Committee on Payment and Market Infrastructures. Since 2008, there has been an ongoing debate about whether the benefits of central clearing houses in reducing counterparty risk are exceeded by new risks of concentration and systemic reliance.

Cybersecurity issues arise directly with central counterparties (CCPs) and similar infrastructures. There are also TB2F / too-connected-to-fail concerns, particularly as new entrants use new technologies like blockchain or stablecoins to disrupt existing markets and participants.

We also see the emergence of new forms of digital financial infrastructure, particularly in cloud services. Cloud services and cloud service providers are playing an increasing role in the financial sector. This is particularly so with new Fintechs which are often cloud natives, with their entire business cloud-based. Traditional financial institutions are also increasingly using cloud services to backup existing systems and build new systems (often to replace existing outdated core systems based on old mainframes running seriously out-of-date software). These third-party service providers expose the financial intermediaries using their services to operational risks, and in particular to cyber-risks. This includes services supplied by the large IT service platforms to which many financial intermediaries are outsourcing core functions.

Financial supervision typically does not apply to the Big Data providers. IT/data providers usually fall outside the scope of financial regulation and financial regulators lack information about such firms and their potential roles in interconnectivity across the financial sector as well as tools of supervision or regulation.

Financial law usually responds to risks created by non-supervised firms by imposing strict outsourcing requirements on financial firms. In particular, the financial firm needs to ensure systemic stability at all times, regardless of the outsourcing of information technology. But how should a bank (even a JP Morgan or Goldman Sachs) ensure that a major tech company (for example Amazon, Apple, Google or Microsoft) provide appropriate service? Banks may struggle to police firms whose market value is many times their own, nor can they really ensure that Bigtech’s cloud centres work.
Such issues about cloud services are leading to increasing discussion of whether such firms should be regarded as systemically important infrastructure providers and regulated accordingly, in the same way as are certain payment systems or securities/derivatives CCPs. Related discussions are also underway about whether cloud services are in fact a form of utility and need to be separated from other technology businesses.

The alternative to control of the service provider is diversification. For instance, financial law could require financial firms to have mirror cloud servers from three separate and unrelated providers. While mandatory diversification ensures some additional security and has some positive effects on market structure in the provider market, it attracts increased costs and other problems.

The first other problem is cybersecurity. The more financial data more providers hold, the greater is the risk of data corruption (stealing, manipulation or abuse) from inside or of a cyber-attack from outside. On top, digital financial services tend to use legacy or natively insecure devices, infrastructure and protocols that were originally built for communication data, not to guarantee the security of financial transaction data.

Second, mandatory diversification of data streams and server space reduces the benefits of datafication. It slows down IT processes and risks confusion: storing data on a blockchain using many different cloud-service providers costs time and resources. If a brokerage system runs on three different data systems simultaneously, which don’t correspond, which of the three datasets is correct? These risks are exacerbated by the high concentration of the market for cloud storage and analytics. Financial intermediaries will have little choice. Other examples come from reliance on a small number of data providers, which in turn raises risks due to similarities of business models (as occurred with securitisation prior to 2008) and concentration and reliance risks.

**2 Stability-Related Policy Tools**

The deficiencies in the regulatory system with regard to global technology risks are similar to those deficiencies which contributed to the 2008 Crisis. They include loopholes in regulation, lack of coordination among regulators, information asymmetry, lack of expertise on the part of financial intermediaries and regulators, and lack of awareness or investment on the side of intermediaries.

First, in implementing strategies, regulators must prioritise tech risks, both internally and externally. The result should be that tech risks are treated as being as important as financial risks. This is particularly important in monitoring these new sorts of risk and collecting non-traditional forms of information. This could be done by appointing a Chief Technology Risk Officer (CTRO) for the supervisory authority in order to emphasise the significance of these sorts of risks. Financial intermediaries should also be required to appoint CTROs or equivalent senior management officers responsible for cyber, technology and data risks, as a main contact point, with board monitoring, at the least in the context of firms’ risk committees. Further, the CTRO’s report on cyber risk should be a core agenda item at all meetings of both the authorities and of the intermediaries’ senior management.

Second, regulators need to strengthen in-house tech expertise to understand the sources of these new risk exposures of the ecosystems they monitor and supervise, and to be able to discuss tech matters with intermediaries.

Third, regulators must continue to enhance reporting requirements about the intermediaries’ tech risk management strategies and the budget and human resources devoted to systemic stability and cybersecurity. These reports should include technological details and be read by the supervisor’s tech department.

Fourth, regulators must prioritize these sorts of risks in both on- and off-site supervision to understand whether intermediaries have understood those risks and how they address them; and speak to IT staff as well as to upper management or the legal department during examinations. For the authorities both technology and regulatory experts should be present.

Fifth, regulators must strive to depoliticize cybersecurity where related to financial stability, to foster the development of intergovernmental or sectoral networks capable of preventing and defending against cyber incidents, especially considering the growing financial interconnectedness. An isolated cybersecurity island that is still connected to the “datafied” financial network poses increasing risks of contagion.

Sixth, regulators will have to make use of new technologies themselves, since only the user understands the issues with the application. This can be part of a major Regtech strategy which – in many instances – is overdue, in order to respond to the enormous data streams regulators receive in response to GFC-related additional reporting requirements. Regulators may also suffer from failures of technology, but if they do they will also learn to handle large tech projects – and know what they have to ask for from the intermediaries.

Seventh, regulators should continually seek to harmonise cyber and data policies to avoid friction and uncertainty, and not allow rules with potential impacts on financial stability to become entrenched. This may prevent races to the bottom that can intensify destabilising behaviour.

Electronic copy available at: https://ssrn.com/abstract=3598142
Insights From the MENA Region

Sample: 6 countries
Total in the sample:
3 Sandboxes (2 active and 1 proposed)
4 Innovation Hubs (2 active and 2 proposed)

Average licensing process (months) for banks: 9.7 months
Average licensing process (months) for Non-Banks: 7 months
Average licensing process (months) for Fintechs: 7.8 months

Average Licensing Process (Months)
ANNEX 2: INSIGHTS FROM THE MENA REGION

Average Licensing Process - Bank (Months)

| Process Period (Months) | Country 1 | Country 2 | Country 3 | Country 4 | Country 5 | Country 6 |
|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Mena                    | 18        | 16        | 14        | 12        | 10        | 8         |

Average Licensing Process - Fintech (Months)

| Process Period (Months) | Country 2 | Country 3 | Country 4 | Country 5 |
|-------------------------|-----------|-----------|-----------|-----------|
| Mena                    | 12        | 10        | 8         | 6         |

Average Licensing Process – Non-Bank (Months)

| Process Period (Months) | Country 2 | Country 3 | Country 4 | Country 5 |
|-------------------------|-----------|-----------|-----------|-----------|
| Mena                    | 12        | 10        | 8         | 6         |

Electronic copy available at: https://ssrn.com/abstract=3598142
The chart below shows the top Fintech Challenges in the region (score built as sum of the scores collected from all respondents: most pressing challenge=5, least pressing challenge=1). The score shows a value of importance per challenge in the MENA region. The higher the score, the more pressing is a specific challenge in the region.

Top 5 most pressing Fintech challenges in the MENA region:
1. Clarity with regulatory and licensing requirements
2. Lack of means for digital identification and onboarding of clients
3. Cost of regulatory compliance
4. Established financial institutions or service providers unwilling to cooperate (same scoring as ‘3-Cost of regulatory compliance’)
5. Social, cultural, religious

Electronic copy available at: https://ssrn.com/abstract=3598142
The chart below shows the most important benefits of Fintech for licensed financial institutions (score built as sum of the scores collected from all respondents: most important benefit=5, least important benefit=1).

MENA countries consider Fintechs beneficial for licensed financial institutions because they ease their access to tech expertise.

![Benefits of Fintech for Licensed Financial Institutions](image_url)
ANNEX 3:  
USEFUL RESOURCES

Electronic copy available at: https://ssrn.com/abstract=3598142
Fintech: Taxonomy and Framework

AI and Machine Learning: Suggested Resources

Regulatory Bodies and NGOs
- BaFin, ‘Big data meets artificial intelligence Challenges and implications for the supervision and regulation of financial services’ (July 2018) https://www.bafin.de/SharedDocs/Downloads/EN/dl_bdai_studie_en.pdf?__blob=publicationFile&v=11
- Bauggess, Scott W., ‘The Role of Big Data, Machine Learning, and AI in Assessing Risks: a Regulatory Perspective’ (21 June 2017) Acting Director and Acting Chief Economist, DERA, Champagne Keynote Address New York https://www.sec.gov/news/speech/bauggess-big-data-ai
- Bauggess, Scott W., ‘The Role of Machine Readability in an AI World’ (3 May 2018) Deputy Chief Economist and Deputy Director, Division of Economic and Risk Analysis, SEC Keynote Address: Financial Information Management (FIMA) Conference 2018, Boston, Massachusetts, https://www.sec.gov/news/speech/bauggess-big-data-ai
- BIS, The use of big data analytics and artificial intelligence in central banking (May 2019) BISIFC Bulletin No 50.
- Brainard, Lael, What Are We Learning about Artificial Intelligence in Financial Services? (13 November 2018) Board of Governors of the Federal Reserve System at Fintech and the New Financial Landscape, Hosted by the Federal Reserve Bank of Philadelphia, The Federal Deposit Corporation, University of Pennsylvania Wharton School of Business, Bank Policy Institute and Brookings Institution, Philadelphia, Pennsylvania.
- Carney, Mark, Enable, Empower, Ensure: A New Finance for the New Economy (20 June 2019) Bank of England, Speech at the Lord Mayor’s Banquet for Bankers and Merchants of the City of London at Mansion House, London.
- Cantu, Carlos, Stijn Claessens and Leonardo Gamagcorto, How do bank-specific characteristics affect lending? New evidence based on credit registry data from Latin America (July 2019) BIS Working Paper No 798.
- De Nederlandsche Bank (Dutch Central Bank), General principles for the use of Artificial Intelligence in the financial sector (2019), https://www.dnb.nl/binaries/General%20principles%20for%20the%20use%20of%20Artificial%20Intelligence%20in%20the%20financial%20sector_tcm46-385055.pdf
- European Commission, Fintech Action Plan (March 2018), http://ec.europa.eu/info/publications/180308-action-plan-fintech_en
- European Securities and Markets Authority, ‘ESMA response to the Commission Consultation Paper on Fintech: A More competitive and innovative financial sector’ (7 June 2017) https://www.esma.europa.eu/press-news/esma-news/esma-responds-commission-consultation-fintech
- Falk, Magnus, ‘Artificial Intelligence in the boardroom’ (01 August 2019) FCA Insight, https://www.fca.org.uk/insight/artificial-intelligence-boardroom
- Financial Stability Board, ‘Artificial intelligence and machine learning in financial services - Market developments and financial stability implications’ (1 November 2017) https://www.fsb.org/wp-content/uploads/P011117.pdf
- Grupetta, Rob, ‘Using artificial intelligence to keep criminal funds out of the financial system’ Head of the Financial Crime Department at the FCA, delivered to the Fintech Innovation in AML and Digital ID regional event, London (06 December 2017) https://www.fca.org.uk/news/speeches/using-artificial-intelligence-keep-criminal-funds-out-financial-system
- Hong Kong Monetary Authority, High-level Principles on Artificial Intelligence, 1 November 2019, https://www.bkma.gov.hk/media/eng/doc/key-information/guidelines-and-circular/2019/20191110c1.pdf
- Hunt, Stefan, ‘From Maps to Apps: the Power of Machine Learning and Artificial Intelligence for Regulators’ Head of Behavioural Economics and Data Science, Financial Conduct Authority, Speech at Beesley Lecture Series on regulatory economics (19 October 2017) https://fca.org.uk/publication/documents/from-maps-to-apps.pdf
- Kuroda, Haruhiko, AI and the Frontiers of Finance, (13 April 2017) Bank of Japan, Conference on “AI and the New Financial Landscape”, Tokyo
- Lagarde, Christine, ‘Central Banking and Fintech – A Brave New World?’ (29 September 2017) IMF Managing Director Bank of England conference, London
- Greg Medcraft, ‘Driving better consumer outcomes in the era of big data and artificial intelligence’ ASIC Chairman Corporate Governance Discussion Group Sydney, Australia (3 November 2016) http://download.asic.gov.au/media/4064271/greg-medcraft-speech-corp-governance-discussion-group-published-3-november-2016.pdf
- Monetary Authority of Singapore, ‘Principles to Promote Fairness, Ethics, Accountability and Transparency (FEAT) in the Use of Artificial Intelligence and Data Analytics in Singapore’s Financial Sector’ (November 2018) https://www.mas.gov.sg/-/media/MAS/News%20and%20Publications/Monographs%20and%20Information%20Papers/FEAT%20Principles%20Final.pdf
- OECD, OECD Principles on AI, (22 May 2019)

Electronic copy available at: https://ssrn.com/abstract=3598142
**ANNEX 3: USEFUL RESOURCES**

- **OECD Council,** Recommendation of the Council on Artificial Intelligence (22 May 2019)
- **G20,** G20 Ministerial Statement on Trade and Digital Economy, (9 June 2019)
- **OECD,** Artificial Intelligence in Society (11 June 2019)
- **OECD (2018),** “Private Equity Investment in Artificial Intelligence”, OECD Going Digital Policy Note, OECD, Paris, www.oecd.org/going-digital/ai/private-equity-investment-in-artificial-intelligence.pdf
- **OECD (October 2017)** “AI: Intelligent machines, smart policies”, OECD Digital Economy Papers, OECD, Paris, https://www.oecd-ilibrary.org/science-and-technology/oecd-digital-economy-outlook-2017/technology-outlook_9789264276284-en
- **OECD (19 November 2018)** ‘Artificial intelligence and machine learning in science’ and ‘Artificial intelligence and the technologies of the next production revolution’ in OECD Science, Technology and Innovation Outlook, OECD, Paris, https://www.oecd.org/sti/oecd-science-technology-and-innovation-outlook-2018-53037771/
- **Proudmam, James,** Managing machines - the governance of artificial intelligence (4 June 2019) Executive Director of UK Deposit Takers Supervision of the Bank of England, at the FCA Conference on Governance in Banking, London
- **Panetta, Fabio,** Harnessing Big Data & Machine Learning Technologies for Central Banks (26 March 2018) Banca D’Italia.
- **James Proudmam,** ‘Cyborg supervision – the application of advanced analytics in prudential supervision’ Executive Director, UK Deposit Takers, Speech given at workshop on research on bank supervision, Bank of England (19 November 2018) https://www.bankofengland.co.uk/speech/2018/2018-11-19/james-proudmam-cyborg-supervision
- **Wuermelng, Joachim,** Artificial intelligence (AI) in finance – six warnings from a central banker (27 Feb 2018) BIS.
- **World Economic Forum,** The New Physics of Financial Services - Understanding how artificial intelligence is transforming the financial ecosystem (Aug 2018), http://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf

**Private Entities**

- From Principles to Practice – Use Cases for Implementing Responsible AI in Financial Services (Nov. 2019), https://www.microsoft.com/en-us/download/confirmation.aspx?id=487
- **UK Finance,** Artificial Intelligence in Financial Services (Jun. 2019), https://www.ukfinance.org.uk/system/files/AI-2019_FINAL_ONLINE.pdf

**Academic Literature**

- **Borselli, Angelo,** Insurance by Algorithm. European Insurance Law Review, No. 2, 2018; Bocconi Legal Studies Research Paper No. 3284437. Available at SSRN: http://ssrn.com/abstract=3284437
- **Casey, Anthony J. & Niblett, Anthony,** The Death of Rules and Standards, 92 Ind. L.J. 1401, 1410-12 (2017) (arguing that technology will facilitate the emergence of individualized micro-directives in between rules and standards);
- **Casey, Anthony J. & Niblett, Anthony,** Self-driving contracts, 43 J. Corp. L. 1, 13-26 (2017) (arguing that technology will lead to subject-specific, self-completing contract law);
- **Casey, Anthony J. & Niblett, Anthony,** A Framework for the New Personalization of Law, U. Chi. L. Rev. (forthcoming 2019) (developing preconditions for AI-based reconfiguration of the law);
- **Davis, Joshua P.,** Laws without Mind: AI, Ethics, and Jurisprudence (Fall 2018) 55 California Western Law Review 1, pp. 165-220.
- **Enriques, Luca & Zettzsche, Dirk A.,** Corporate Technologies and the Tech Nirvana Fallacy, European Corporate Governance Institute (ECGI) - Law Working Paper No. 457/2019, https://ssrn.com/abstract=3392321
- **Etzioni, Amitai, & Oren Etzioni,** Keeping AI Legal (Fall 2016) 19 Vanderbilt Journal of Entertainment and Technology 1, pp. 133-146.
- **Fenwick, Mark & Vermeulen, Erik P.M.,** Technology and Corporate Governance: Blockchain, Crypto, and Artificial Intelligence (October 9, 2018), European Corporate Governance Institute (ECGI) – Law Working Paper No. 424/2018. Available at SSRN: https://ssrn.com/abstract=3263222 or http://dx.doi.org/10.2139/ssrn.3263222
- **Jackson, Brandon W.,** Artificial Intelligence and The Fog of Innovation: A Deep-dive on Governance and the Liability of Autonomous Systems (2019) 35 Santa Clara High Technology Law Journal 4.
- **Katz, Daniel M.,** Quantitative Legal Prediction – or How I Learned to Stop Worrying and Start Preparing for the Data Driven Future of the Legal Services Industry, 62 Emory L.J. 909 (2013) (highlighting the opportunities of data-driven quantitative predictions for the legal profession);
- **Lin, Tom C. W.,** The New Investor. 60 UCLA Law Review 678 (2013); 60 UCLA Law Review 678 (2013)
Big Data: Suggested Resources

Regulatory Bodies and NGOs

- **Marano, Pierpaolo**, Navigating InsurTech: The digital intermediaries of insurance products and customer protection in the EU (2019) Maastricht Journal of European and Comparative Law 1-22.

- **McPhail, Lihong and McPhail, Joseph**, Machine Learning Implications for Banking Regulation (July 20, 2019). Available at SSRN: https://ssrn.com/abstract=3423413 or http://dx.doi.org/10.2139/ssrn.3423413

- **Scherer, Matthew U.**, Regulating Artificial Intelligence Systems: Risks, Competencies, and Strategies (Spring 2016) 29 Harvard Journal of Law & Technology 2.

- **Scott, Kate**, AI and Risk for Financial Institutions (2019) International Financial Law Review 110.

- **Surden, Harry**, Machine Learning and Law, 89 U. Wash. L. Rev. 87,102–10 (2014) (discussing progress on AI research and how it may affect the practice of the law).

- **Zetzsche, Dirk A., Arner, Douglas W., Buckley, Ross P. and Tang, Brian**, Artificial Intelligence, Fintech and Regtech, Working Paper (Dec. 2019). www.ssrn.com/abstract=3531711

- **Bholat, David**, ‘Big data and central banks’ Bank of England Quarterly bulletin 2015 Q1 (9 March 2015) https://www.bankofengland.co.uk/quarterly-bulletin/2015q1/big-data-and-central-banks

- **BIS**, ‘Central banks’ use of and interest in “big data”’ (October 2015) BIS IFC Report https://www.bis.org/ifc/publ/ifc644.htm

- **BIS**, Big Data (16 September 2017) BIS IFC Bulletin No. 44 https://www.bis.org/ifc/publ/ifc644.htm

- **BIS**, The use of big data analytics and artificial intelligence in central banking (May 2019) BIS IFC Bulletin No 50.

- **BIS**, ‘Building Pathways for Policy Making with Big Data’ BI-IFC/BIS International Seminar on Big Data (26 July 2018) Bank of Indonesia and Irving Fisher Committee on Central Bank Statistics BIS https://www.bis.org/ifc/events/big_data_jul_18/ifc_big_data_jul_18_seminar.pdf

- **BIS**, Are post-crisis statistical initiatives completed? (January 2019) BIS IFC Bulletin No 49.

- **Buch, Claudia**, Digitalization, competition, and financial stability (17 August 2019) Opening remarks, Seminar – Statistics on Fintech – Bring Together Demand and Supply to Measure its Impact, Kuala Lumpur.

- **Cantu, Carlos, Stijn Claessens and Leonardo Gambacorto**, How do bank-specific characteristics affect lending? New evidence based on credit registry data from Latin America (July 2019) BIS Working Paper No 798.

- **Coeure, Benoit**, ‘Policy analysis with big data’ Member of the Executive Board of the European Central Bank, at the conference on “Economic and Financial Regulation in the Era of Big Data”, organised by the Bank of France, Paris (24 November 2017) https://www.bce.org/review/171124c.pdf

- **FCA**, ‘Feedback Statement: Cal for Inputs on Big Data in retail general insurance” (September 2016) https://www.fca.org.uk/publication/feedback/fs16-05.pdf

- **Galhau, Francois Villeroy de**, ‘Economic and financial regulation in the era of big data’ Governor of the Bank of France, at the Conference on “Economic and Financial Regulation in the Era of Big Data”, Paris, (24 November 2017) https://www.bce.org/review/171229b.pdf

- **GIZ**, Responsible Use of Personal Data and Automated Decision-making in Financial Services (Aug. 2018) https://www.gfis.org/wp-content/uploads/2018/10/2018-08-22-Responsible-use-of-personal-data-and-automated-decision-making-in-financial-services.pdf

- **Joint Committee of the European Supervisory Authorities**, ‘Joint Committee Discussion Paper on the Use of Big Data by Financial Institutions’ (July 2016) https://www.eusa.europa.eu/system/files_fore/library/jc-2016-86_discussion_paper_big_data.pdf?download=1
Kothari, S.P., ‘Policy Challenges and research Opportunities in the Era of Big Data’ (13 July 2019) Chief Economist and Director, Division of Economic and Risk Analysis, Big Data and High-Performance Computing for Financial Economics, National Bureau of Economic Research, Cambridge, MA https://www.sec.gov/news/speech/policy-challenges-research-opportunities-era-big-data

Nyand-Andersen, Per, Emmanouil Pantelidis, ‘Google econometrics: nowcasting euro area car sales and big data quality requirements’ European Central Bank Statistics Paper series (November 2018) https://www.ecb.europa.eu/pub/pdf/psdm/psnahme.pdf

OECD, ‘Data driven innovation for growth and well being’ (6 October 2015) https://read.oecd-ilibrary.org/science-and-technology/data-driven-innovation_9789264229358-en#page1

OECD, ‘Big Data: Bringing competition policy to the digital era’ (26 April 2017) https://oecd.org/document/DAF/COMP/M(2016)2/ANN4/FINAL/en/pdf

Panetta, Fabio, Harnessing Big Data & Machine Learning Technologies for Central Banks (26 March 2018) Banca D’Italia.

Rossi, Salvatore, ‘Big Data econometrics with applications’ Senior Deputy Governor of the Bank of Italy and President of the Institute for the Supervision of Insurance (IVASS), at the 29th (EC)2 Conference on "Big Data Econometrics with Applications", Rome, (13 December 2018) https://www.bsi.org/review/r181213c.pdf

Signorini, Luigi Federico, ‘Harnessing big data & machine learning technologies for central banks’ Deputy Governor of the Bank of Italy, at the workshop on “Harnessing Big Data & Machine Learning Technologies for Central Banks”, Bank of Italy (10 April 2018) https://www.bsi.org/review/r180410b.pdf

Sinha, Nitish, ‘Using big data in finance: Example of sentiment-extraction from news articles’ FEDS Notes (26 March 2014) https://www.federalreserve.gov/econresdata/notes/2014/using-big-data-in-finance-example-of-sentiment-extraction-from-news-articles-20140326.html

Stein, Kara M., ‘A Vision for Data at the SEC’ (28 October 2016) Commissioner of the SEC, Keynote address to Big Data in Finance Conference https://www.sec.gov/news/speech/speech-stein-10-28-2016.html

Stein, Kara M., ‘From the Data Rush to the Data Wars: A Data Revolution in Financial Markets’ (28 October 2016) Commissioner of the SEC, (27 September 2018) Georgia State University College of Law – Henry J. Miller Distinguished Lecture Series https://www.sec.gov/news/speech/speech-stein-092718

Thorsrud, Leif Anders, ‘Nowcasting using news topics Big Data versus big bank’ European Central Bank Working Paper (21 December 2016) https://www.ecb.europa.eu/pub/conferences/shared/pdf/20170929_advances_in_short_term_forecasting/Paper_5_Thorsrud.pdf

Tissot, Bruno, ‘Big data and central banking’ IFc Bulletin 44 (21 September 2017) https://www.bi.org/ifc/publ/ifcb44_overview_rh.pdf

UNCDF, ‘Big data4What?’ (18 December 2018) https://www.uncdf.org/article/4216/bigdata4what

Academic Literature

Arner, Douglas W., Barberis, Janos Nathan & Buckley, Ross P., The Emergence of Regtech 2.0: From Know Your Customer to Know Your Data, (2016) 44 Journal of Financial Transformation 79; UNSW Law Research Paper No. 17-63. Available at SSRN: https://ssrn.com/abstract=3044280

Arner, Douglas W., Zetzsche, Dirk A., Buckley, Ross P. & Barberis, Janos Nathan, Fintech and Regtech: Enabling Innovation While Preserving Financial Stability, (2017) 18(3) Georgetown Journal of International Affairs 47.

Barocas, Solon, & Andrew D. Selbst, Big Data’s Disparate Impact 104 Cal. L. Rev. 671 (2016) (highlighting data dependency and the risk that algorithms simply reflect existing biases in society);

Cohen, Julie E., What Privacy Is For, 126 Harv. L. Rev. 1904, 1918 (2013) (arguing that big data is an euphemism that conceals efforts to repackage pervasive surveillance as innovation and asking to balance data processing and privacy priorities);

Elvy, Stacy-Ann, Paying for Privacy and the Personal Data Economy, 117 Colum. L. Rev. 1369, 1400-28 (2017) (developing a typology of data business models and highlighting similarities and tensions between a commercial data market and consumers’ privacy interests);

Kuhn, Mckenzie L., 147 Million Social Security Numbers for Sale: Developing Data Protection Legislation After Mass Cybersecurity Breaches, 104 Iowa L. Rev. 417, 421-435 (2018) (arguing in favor of federal data protection laws);

Scott, Kate, AI and Risk for Financial Institutions (2019) International Financial Law Review 110.

Zetzsche, Dirk A., Ross P. Buckley, Douglas W. Arner & Janos N. Barberis, From Fintech to Techfin: The Regulatory Challenges of Data-Driven Finance, 14 N.Y.U. J.L. & Bus. 393, 435-443 (2018) (arguing in favor of data-specific adjustments to financial regulations). Available at SSRN: https://ssrn.com/abstract=2959925
ANNEX 3: USEFUL RESOURCES

- Zetzsche, Dirk A., Arner, Douglas W., Buckley, Ross P. & Weber, Rolf H., The Future of Data-Driven Finance and Regtech: Lessons from EU Big Bang II, European Banking Institute Working Paper Series 2019/35. Available at SSRN: https://ssrn.com/abstract=3359399 or http://dx.doi.org/10.2139/ssrn.3359399
- Zetzsche, Dirk A., Buckley, Ross P. & Arner, Douglas W., Regulating LIBRA: The Transformative Potential of Facebook's Cryptocurrency and Possible Regulatory Responses. Available at SSRN: https://ssrn.com/abstract=3414401

Cloud Solutions: Suggested Resources

Regulatory Bodies and NGOs
- APRA, ‘Information Paper Outsourceing Involving Cloud Computing Services’ (24 September 2018) https://www.apra.gov.au/sites/default/files/information_paper_-_outsourceing_involving_cloud_computing_services.pdf
- Bank of England, ‘New economy, new finance, new bank: The Bank of England’s response to the can Steenis review on the future of Finance’ (June 2019) https://www.bankofengland.co.uk/-/media/boe/files/report/2019/response-to-the-future-of-finance-report.pdf?la=en&hash=C4FAB66456F3C86029C61D423ED7B1A9#page=11
- Basel Committee on Banking Supervision, ‘Sound Practices: Implications of fintech developments for banks and bank supervisors’ (February 2018) https://www.bis.org/bcbs/publ/d431.pdf
- Brainard, Lael, ‘Where Do Consumers Fit in the Fintech Stack?’ "Fintech Risks and Opportunities: An Interdisciplinary Approach," a conference sponsored by the University of Michigan, Ann Arbor, Michigan (16 November 2017) https://www.federalreserve.gov/newsevents/speech/brainard-d20171116a.htm
- Buckley, Ross P., Arner, Douglas W., Zetzsche, Dirk A. and Selga, Eriks, ‘The Dark Side of Digital Financial Transformation: The New Risks of Fintech and the Rise of TechRisk’. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3478640

Academic Literature
- Arthur, Charles W., ‘The End of Money and the Birth of the Post-Money Economy’ (2014) Journal of Economic Issues 48:6
- Beck, Thorsten, Demirguc-Kunt, Asli, and Demirguc-Kunt, Asli, ‘Global Financial Development Report’ (2017) World Bank
- Beck, Thorsten, Demirguc-Kunt, Asli, and Demirguc-Kunt, Asli, ‘Global Financial Development Report’ (2018) World Bank
Distributed Ledgers and Blockchain

Regulatory Bodies and NGO

- **Ali, Robleh, John Barrdear, Roger Clews and James Southgate**, ‘Innovations in payment technologies and the emergence of digital currencies’ Bank of England Quarterly Bulletin 2014 Q3 (16 September 2014) [https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/innovations-in-payment-technologies-and-the-emergence-of-digital-currencies.pdf?la=en&hash=AB4d869B3E-F355A0486F7B08AF086F2EE31554D](https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/innovations-in-payment-technologies-and-the-emergence-of-digital-currencies.pdf?la=en&hash=AB4d869B3E-F355A0486F7B08AF086F2EE31554D)

- **Awazu, Luiz and Pereira da Silva**, Fintech in EMEs: blessing or curse? (5 June 2018) BIS, Panel remarks at CV Meeting of Central Bank Governors of CEMLA – Asuncion, Paraguay.

- **ASIC**, ‘Evaluating distributed ledger technology’ ASIC Information sheet 219 [https://asic.gov.au/regulatory-resources/digital-transformation/evaluating-distributed-ledger-technology/](https://asic.gov.au/regulatory-resources/digital-transformation/evaluating-distributed-ledger-technology/)

- **Athanassiou, Phoebus**, ‘Impact of digital innovation on the processing of electronic payments and contracting: an overview of legal risks’ European Central Bank Legal Working Paper Series No 16 (October 2017)

- **Bajwa, Tariq**, ‘International remittance through blockchain technology launch’ Governor of the State Bank of Pakistan, at the launching ceremony of international remittance through block chain technology, Islamabad (8 January 2019) [https://www.bis.org/review/r190115b.pdf](https://www.bis.org/review/r190115b.pdf)

- **Bardear, John, and Micheal Kumhof**, ‘The Macroeconomics of central bank issued digital currencies’ Bank of England Working Paper No. 605 (18 July 2016) [https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/the-macroeconomics-of-central-bank-issued-digital-currencies.pdf?la=en&hash=341B602838707E5D6FC26884588C912A721B1DC1](https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/the-macroeconomics-of-central-bank-issued-digital-currencies.pdf?la=en&hash=341B602838707E5D6FC26884588C912A721B1DC1)

- **Benos, Evangelos, Rodney Garratt and Pedro Gurrola-Perez**, ‘The economics of distributed ledger technology for securities settlement’ Bank of England Working Paper 670 (18 August 2017) [https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/the-economics-of-distributed-ledger-technology-for-securities-settlement.pdf?la=en&hash=17895E1C1FECC66D37E12E4BE63BA9D-9741577FE5](https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/the-economics-of-distributed-ledger-technology-for-securities-settlement.pdf?la=en&hash=17895E1C1FECC66D37E12E4BE63BA9D-9741577FE5)

- **BIS, Committee on Payments and Market Infrastructures**, ‘Distributed ledger technology in payment, clearing and settlement – an analytical framework’ CPMI Papers No 157 (27 February 2017) [https://www.bis.org/cpmi/publ/d157.pdf](https://www.bis.org/cpmi/publ/d157.pdf)

- **Brainard, Lael**, ‘Cryptocurrencies, digital currencies, and distributed ledger technologies – what are we learning?’ Member of the Board of Governors of the Federal Reserve System, at the Decoding Digital Currency Conference, sponsored by the Federal Reserve Bank of San Francisco, San Francisco, California (15 May 2018) [https://www.bis.org/review/r180516d.pdf](https://www.bis.org/review/r180516d.pdf)

- **Carstens, Agustin**, Money in a digital age: 10 thoughts (15 November 2018) BIS, Singapore, Speech.

- **Cermano, Javier Sebastian**, ‘Blockchain in financial services: Regulatory landscape and future challenges for its commercial application’ 16/20 Working Paper BBVA research (December 2016) [https://www.bbvaresearch.com/wp-content/uploads/2016/12/WP_16-20.pdf](https://www.bbvaresearch.com/wp-content/uploads/2016/12/WP_16-20.pdf)

- **ECB, STELLA – a joint research project of the European Central Bank and the Bank of Japan** ‘Securities settlement systems: delivery-versus-payment in a distributed ledger environment’ (March 2018) [https://www.ecb.europa.eu/pub/pdf/other/ecb_stella_project_report_march_2018.pdf](https://www.ecb.europa.eu/pub/pdf/other/ecb_stella_project_report_march_2018.pdf)

- **ECB, STELLA – a joint research project of the European Central Bank and the Bank of Japan**, ‘Payment systems: liquidity saving mechanisms in a distributed ledger environment’ (September 2017) [https://www.ecb.europa.eu/pub/pdf/other/ecb_stella_project_report_september_2017.pdf](https://www.ecb.europa.eu/pub/pdf/other/ecb_stella_project_report_september_2017.pdf)

- **ESMA**, ‘The Distributed Ledger Technology Applied to Securities Markets’ (7 February 2017) [https://www.esma.europa.eu/sites/default/files/library/dlt_report_-_esma50-1121423017-285.pdf](https://www.esma.europa.eu/sites/default/files/library/dlt_report_-_esma50-1121423017-285.pdf)

- **Financial Conduct Authority**, ‘Distributed Ledger Technology – Feedback Statement on Discussion Paper 17/03’ (December 2017) [https://www.fca.org.uk/publication/feedback/fs17-04.pdf](https://www.fca.org.uk/publication/feedback/fs17-04.pdf)

- **Financial Conduct Authority**, ‘Discussion Paper on distributed ledger technology’ (April 2017) [https://www.isco.org/library/isco-statements/United%20Kingdom%20-%20FCA%20-%20Discussion%20Paper%20on%20distributed-ledger%20technology.pdf](https://www.isco.org/library/isco-statements/United%20Kingdom%20-%20FCA%20-%20Discussion%20Paper%20on%20distributed-ledger%20technology.pdf)

- **Googoolye, Yandraduth**, ‘Blockchain technology’s potential to benefit society and the economy’ Governor of the Bank of Mauritius, Prelude to Banquet in the context of the ADC Global Blockchain Summit, Adelaide (27 March 2019) [https://www.bis.org/review/r190329g.pdf](https://www.bis.org/review/r190329g.pdf)

- **Institute of International Finance**, ‘Improving global AML efforts with technology and regulatory reform’ (29 November 2017) [https://www.iif.com/portal/0/files/private/32370132_iif_-_aml_regtech_and_reg_reform_nov_2017.pdf](https://www.iif.com/portal/0/files/private/32370132_iif_-_aml_regtech_and_reg_reform_nov_2017.pdf)

- **International Finance Corporation**, ‘Blockchain – Opportunities for Private Enterprises in Emerging Markets’ (January 2019) [https://www.ifc.org/wps/wcm/connect/2106d1c6-5361-41ed-86c2-f7d16c510e9f/201901-IFC-EMCompass-Blockchain-Report.pdf?MOD=AJPERES&CVID=mxYj-sA](https://www.ifc.org/wps/wcm/connect/2106d1c6-5361-41ed-86c2-f7d16c510e9f/201901-IFC-EMCompass-Blockchain-Report.pdf?MOD=AJPERES&CVID=mxYj-sA)
IOSCO, ‘IOSCO Research Report on Financial Technologies (Fintech)’ (February 2017) https://www.ioesco.org/library/pubdocs/pdf/IOSCOPD554.pdf

Knot, Klass, ‘The evolution of power of blockchain – a central banker’s balancing act’ President of the Netherlands Bank, at the EBF Conference “The Evolution of Power”, Groningen (5 October 2018) https://www.bis.org/review/r181015j.pdf

Linnenmey Bech, Morten and Rodney Garratt, ‘Central Bank Cryptocurrencies’ BIS Quarterly Review (17 September 2017) https://www.bis.org/publ/qtrpdf/r_qt1709f.pdf

Maechler, Andre M., The financial markets in changing times Changes today and tomorrow: the digital future (5 April 2018) Bank of Switzerland, Money Market Event, Speech.

Menon, Ravi, ‘Economic possibilities of blockchain technology’ Managing Director of the Monetary Authority of Singapore, at the Global Blockchain Business Conference, Singapore (9 October 2017) https://www.bis.org/review/r171010b.pdf

Mersch, Yves, ‘Distributed ledger technology – panacea or flash in the pan?’ Member of the Executive Board of the European Central Bank, at the Deutsche Bank Transaction Bankers’ Forum 2016, Frankfurt am Main (25 April 2016) https://www.bis.org/review/r160426b.pdf

Mersch, Yves, ‘Distributed ledger technology – role and relevance of the European Central Bank’ Member of the Executive Board of the European Central Bank, at the 22nd Handelsblatt Annual Conference “Banken-Technologie”, Frankfurt am Main (6 December 2016) https://www.bis.org/review/r161212c.pdf

OECD, ‘Blockchain and distributed ledger technology’ http://www.oecd.org/daf/blockchain/

Pinna, Andrea, and Wiebe Ruttenberg, ‘Distributed ledger technologies in securities post-trading – Revolution or evolution?’ European Central Bank Occasional Paper Series No 172 (April 2016) https://www.ecb.europa.eu/pub/pdf/ocpap/ocopap172_en.pdf

Starks, Mary, ‘Blockchain: considering the risks to consumers and competition’ Director of Competition, FCA, at Authority for Consumers & Markets Conference Panel, Netherlands (26 April 2018) https://www.fca.org.uk/news/speeches/blockchain-considering-risks-consumers-and-competition

Starks, Mary, ‘Disruptive innovation in financial markets’ Director of Competition, FCA, delivered at the OECD (Organisation for Economic Cooperation and Development), Paris (26 October 2015) https://www.fca.org.uk/news/speeches/disruptive-innovation-financial-markets

Tapscott, Don, and Alex Tapscott ‘Realizing the Potential of Blockchain – A Multistakeholder Approach to the Stewardship of blockchain and Cryptocurrencies’ World Economic Forum White Paper (June 2017) http://www3.weforum.org/docs/WEF_Realizing_Potential_Blockchain.pdf

Thiele, Carl-Ludwig, ‘Blockchain technology – opportunities and challenges’ Member of the Executive Board of the Deutsche Bundesbank, at the 6th Central Banking Workshop 2016, Eltville, (21 November 2016) https://www.bis.org/review/r161125b.pdf

Thiele, Carl-Ludwig, ‘Industry Dialogue on “Distributed ledger technology – potential benefits and risks” Member of the Executive Board of the Deutsche Bundesbank, at the G20 conference “Digitising finance, financial inclusion and financial literacy”, Wiesbaden (26 January 2017) https://www.bis.org/review/r170131e.pdf

Christopher Woolard, Conclusions from the Cryptoassets Taskforce’ Executive Director of Strategy and Competition at the FCA, delivered at The Regulation of Cryptocurrencies event, London (20 November 2018) https://www.fca.org.uk/news/speeches/conclusions-cryptoassets-taskforce

Academic Literature

DLT and Digital Assets

Arner, Douglas W., Buckley, Ross P., Didenko, Anton, Park, Cyn-Young, Pashoska, Emilija, Zetzsche, Dirk A. and Zhao, Bo, Distributed Ledger Technology and Digital Assets – Policy and Regulatory Challenges in Asia, Asian Development Bank Economics Working Paper Series. Available at SSRN: https://ssrn.com/abstract=3414408

Chohan, Usman W., Initial Coin Offerings (ICOs): Risks, Regulation, and Accountability (November 30, 2017). Available at SSRN: https://ssrn.com/abstract=3080098 or http://dx.doi.org/10.2139/ssrn.3080098

Donald, David C. and Miraz, Mahdi H., Multilateral Transparency for Securities Markets through DLT (July 26, 2019). The Chinese University of Hong Kong Faculty of Law Research Paper No. 2019 - 05. Available at SSRN: https://ssrn.com/abstract=3352293

Kaal, Wulf A., Initial Coin Offerings: The Top 25 Jurisdictions and Their Comparative Regulatory Responses (February 2, 2018). CodeX Stanford Journal of Blockchain Law & Policy (2018); U of St. Thomas (Minnesota) Legal Studies Research Paper No. 18-07. Available at SSRN: https://ssrn.com/abstract=3117224 or http://dx.doi.org/10.2139/ssrn.3117224

Perlman, Leon, A Model Crypto-Asset Regulatory Framework (May 16, 2019). Available at SSRN: https://ssrn.com/abstract=3370679 or http://dx.doi.org/10.2139/issn.3370679

Electronic copy available at: https://ssrn.com/abstract=3598142
Zetsche, Dirk Andreas, Ross P. Buckley and Douglas W. Arner, The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain, 2018 U. Ill. L. Rev. 1361, 1382-1402.

Zetsche, Dirk Andreas, Buckley, Ross P., Arner, Douglas W. and Föhr, Linus, The ICO Gold Rush: It’s a Scam, It’s a Bubble, It’s a Super Challenge for Regulators; 60:2 Harvard International Law Journal 321 (2019). Available at SSRN: https://ssrn.com/abstract=3072298 or http://dx.doi.org/10.2139/ssrn.3072298

Blockchain

Finck, Michèle, Blockchains and Data Protection in the European Union (November 30, 2017). Max Planck Institute for Innovation & Competition Research Paper No. 18-01. Available at SSRN: https://ssrn.com/abstract=3080322 or http://dx.doi.org/10.2139/ssrn.3080322

Primavera De Filippi and Aaron Wright, Blockchain and the Law – The Rule of Code (2018) (acknowledging the opportunities of blockchain technologies and arguing that the law needs to catch up, because blockchain could undermine the capacity of governmental authorities to supervise commercial activities and vital government-provided services);

Panisi, Federico, Buckley, Ross P. and Arner, Douglas W., Blockchain and Public Companies: A Revolution in Share Ownership Transparency, Proxy-Voting and Corporate Governance?, 2 Stanford Journal of Blockchain Law & Policy 2019. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3389045

Rodrigues, Usha, Law and the Blockchain, 104 Iowa L. Rev. 679, 708-27 (2019) (analyzing default rules from corporate, partnership and contract law that could fill the gaps in smart contracts);

Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018). Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019). Available at SSRN: https://ssrn.com/abstract=3193576 or http://dx.doi.org/10.2139/ssrn.3193576

Zetsche, Dirk A., Ross P. Buckley and Douglas W. Arner, The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain, 2018 U. Ill. L. Rev. 1361, 1382-1402 (arguing that distributed ledger and blockchain is far from an unregulated space since existing doctrines of contract, corporate and partnership law do apply and could establish a blockchain participant’s liability).

Smart Contracts

Fairfield, Joshua, Smart Contracts, Bitcoin Bots, and Consumer Protection, 71 Wash. & Lee L. Rev. Online 35, 36 (2014);

Hileman, Garrick and Rauchs, Michel, 2017 Global Blockchain Benchmarking Study (September 22, 2017). Available at SSRN: https://ssrn.com/abstract=3040224 or http://dx.doi.org/10.2139/ssrn.3040224

Kiviat, Trevor I., Note, Beyond Bitcoin: Issues in Regulating Blockchain Transactions, 65 Duke L.J. 569, 605–07 (2015) (discussing a smart contract to trade futures);

Kölvars, Merit, Margus Poola & Addi Rull, Smart Contracts, in The Future of Law and eTechnologies 133 (Tanel Kerikmäe & Addi Rull eds., 2016);

Koulu, Riikka, Blockchains and Online Dispute Resolutions: Smart Contracts as an Alternative to Enforcement, 13 Scripted 40, 43-69 (2016);

Levy, Karen E.C., Book-Smart, Not Street-Smart: Blockchain-Based Smart Contracts and The Social Workings of Law, 3 Engaging Sci., Tech. & Soc’y 1 (2017);

Sklaroff, Jeremy M., Smart Contracts and the Cost of Inflexibility, 166 U. Pa. L. Rev. 263 (2017) (arguing that human-based contracting is flexible due to inherent incompleteness while machine-based contracting creates new inefficiencies from automation, decentralization and anonymity);

Werbach, Kevin and Cornell, Nicolas, Contracts Ex Machina, 67 Duke L.J. 313, 367-81 (2017) (arguing that smart contracts, while offering novel possibilities and potential for changing the commercial world, will not displace contract law due to technical limitations and doctrinal concerns).

Fintech Provider Types

Regulatory Bodies and NGOs

Andressen, Sevin, ‘Regulatory and Supervisory Issues from Fintech’ Speech at Cambridge Centre for Alternative Finance conference on Navigating the Contours of Alternative Finance (29 June 2017) https://www.fsib.org/wp-content/uploads/Cambridge-Centre-for-Alternative-Finance-Regulatory-and-Supervisory-Issues-from-Fintech.pdf

Armstrong, Patrick, ‘Regtech and Suptech – change for markets and authorities’ ESMA Report on Trends, Risks and Vulnerabilities No.1 (2019) 42 https://www.esma.europa.eu/sites/default/files/library/esma50-report_on_trends_risks_and_vulnerabilities_no1_2019.pdf#page=42

BIS, Big tech in finance: opportunities and risks (2019) BIS Annual Economic Report.

Electronic copy available at: https://ssrn.com/abstract=3598142
ANNEX 3: USEFUL RESOURCES

- **BIS, Sound Practices – Implications of fintech developments for banks and bank supervisors** (February 2018) BIS, BCBS.
- **Bowman, Michelle W., Community Banking in the Age of Innovation** (11 April 2019) “Fed Family” Luncheon at the Federal Reserve Bank of San Francisco, San Francisco.
- **Broders, Dirk, & Jermy Prenio, Innovative technology in financial supervision (suptech) – the experience of early users** (July 2018) BIS, FSI Insights on policy implementation No 9.
- **Buch, Claudia, Digitalization, competition, and financial stability** (17 August 2019) Opening remarks, Seminar – Statistics on Fintech – Bring Together Demand and Supply to Measure its Impact, Kuala Lumpur.
- **Carstens, Agustin, Big tech in finance and new challenges for public policy** (4 December 2018) BIS, Keynote, FT Banking Summit, London.
- **Carstens, Agustin, ‘Big tech in finance and new challenges for public policy’ FT Banking Summit, London** (4 December 2018) [https://www.bis.org/speeches/sp190314.htm](https://www.bis.org/speeches/sp190314.htm)
- **Financial Stability Board, Fintech and market structure in financial services: Market developments and potential financial stability implications** (14 February 2019) [https://www.fsb.org/wp-content/uploads/P140219.pdf](https://www.fsb.org/wp-content/uploads/P140219.pdf)
- **Frost, Jon, Leonardo Gamacorta, Yi Huang, Hyun Song Shin and Pablo Zbinden, Bigtech and the changing structure of financial intermediation (April 2019) BIS Working Papers No 779.**
- **FSI Connect, Fintech developments in the insurance industry – Executive Summary** (BIS).
- **Mourmouras, John, ‘Fin-Regtech: regulatory challenges with emphasis on Europe’ Senior Deputy Governor of the Bank of Greece, at Cornell University, New York City (28 February 2019)** [https://www.bis.org/review/r190318m.htm](https://www.bis.org/review/r190318m.htm)
- **Institute of International Finance, ‘Regtech in Financial services: Technology Solutions for compliance Reporting’** (March 2016) [https://www.if.com/Portals/0/Files/private/if-regtech_in_financial_services_-_solutions_for_compliance_and_reporting.pdf?ver=2019-01-04-142943-690](https://www.if.com/Portals/0/Files/private/if-regtech_in_financial_services_-_solutions_for_compliance_and_reporting.pdf?ver=2019-01-04-142943-690)
- **Shin, Hyun Song, ‘Big Tech in Finance: opportunities and risks’ BIS Annual Economic Report (23 June 2019)** [https://www.bis.org/publications/pdf/ar2019c3.pdf](https://www.bis.org/publications/pdf/ar2019c3.pdf)
- **Toronto Centre, Suptech: Leveraging technology for better Supervision’ TC Notes (July 2018)** [http://res.torontocentre.org/guidedocs/Suptech%20-%20Leveraging%20Technology%20for%20Better%20Supervision%20FINAL.pdf](http://res.torontocentre.org/guidedocs/Suptech%20-%20Leveraging%20Technology%20for%20Better%20Supervision%20FINAL.pdf)
- **Yuen, Arthur, ‘Regtech in the smart banking era – a supervisor’s perspective’ Deputy Chief Executive of the Hong Kong Monetary Authority, at HKIB Annual Banking Conference 2018, Hong Kong (27 September 2018)** [https://www.bis.org/review/r181012g.pdf](https://www.bis.org/review/r181012g.pdf)

---

**Academic Literature**

- **Arner, Douglas W., Barberis, Janos N. and Buckley, Ross P., Fintech, Regtech and the Reconceptualization of Financial Regulation. Northwestern Journal of International Law and Business** (Oct. 2016). Available at SSRN: [https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2847806](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2847806)
- **Arner, Douglas W., Buckley, Ross P. and Zetzsche, Dirk A., Fintech for Financial Inclusion: A Framework for Digital Financial Transformation** (September 4, 2018). UNSW Law Research Paper No. 18-87; University of Hong Kong Faculty of Law Research Paper No. 2019/001; University of Luxembourg Law Working Paper No. 004-2019. Available at SSRN: [https://ssrn.com/abstract=3245287 or http://dx.doi.org/10.2139/ssrn.3245287](https://ssrn.com/abstract=3245287)
- **Arner, Douglas W., Barberis, Janos N. and Buckley, Ross P., Fintech and Regtech in a Nutshell, and the Future in a Sandbox** (July 1, 2017). CFA Institute Research Foundation Vol. 3, Issue 4, pp. 1-20, July 2017, ISBN: 978-1-944960-25-4; University of Hong Kong Faculty of Law Research Paper No. 2017/040. Available at SSRN: [http://dx.doi.org/10.2139/ssrn.3088303](http://dx.doi.org/10.2139/ssrn.3088303)
- **Buckley, Ross P. and Mas, Ignacio, The Coming of Age of Digital Payments as a Field of Expertise** (August 25, 2015). Journal of Law, Technology & Policy, Issue 1, pp 71-87, 2016. Available at SSRN: [https://ssrn.com/abstract=1552754 or http://dx.doi.org/10.2139/ssrn.1552754](https://ssrn.com/abstract=1552754)
- **Hileman, Garrick and Rauchs, Michel, 2017 Global Blockchain Benchmarking Study** (September 22, 2017). Available at SSRN: [https://ssrn.com/abstract=3040224 or http://dx.doi.org/10.2139/ssrn.3040224](https://ssrn.com/abstract=3040224)
- **Malady, Louise, Buckley, Ross P. and Tsang, Cheng-Yun, Regulatory Handbook: The Enabling Regulation of Digital Financial Services** (December 1, 2015). Regulatory Handbook: The Enabling Regulation of Digital Financial Services, December 2015; UNSW Law Research Paper No. 2016-05. Available at SSRN: [https://ssrn.com/abstract=2715350](https://ssrn.com/abstract=2715350)
- **Zetzsche, Dirk A., Buckley, Ross P. and Arner, Douglas W., Regulating LIBRA: The Transformative Potential of Facebook’s Cryptocurrency and Possible Regulatory Responses**. Available at SSRN: [https://ssrn.com/abstract=3414401](https://ssrn.com/abstract=3414401)
- **Zetzsche, Dirk A., Ross P. Buckley, Douglas W. Arner and Janos N. Barberis, From Fintech to Techfin: The Regulatory Challenges of Data-Driven Finance**, 14 N.Y.U. J.L. & Bus. 393, 435-443 (2018) (arguing in favor of data-specific adjustments to financial regulations). Available at SSRN: [https://ssrn.com/abstract=2959925](https://ssrn.com/abstract=2959925)
Zetzsche, Dirk A. and Preiner, Christina, Cross-Border Crowdfunding – Towards a Single Crowdfunding Market for Europe, European Business Organization Law Review (2019). Available at SSRN: https://ssrn.com/abstract=2991610

Zetzsche, Dirk Andreas and Dewi, Tsany Ratna, The Paradoxical Case Against Interest Rate Caps for Microfinance – And: How Fintech and Regtech Resolve the Dilemma (April 17, 2018). University of Luxembourg Law Working 2018-003. Available at SSRN: https://ssrn.com/abstract=3159202 or http://dx.doi.org/10.2139/issn.3159202

Fintech Markets

Regulatory Bodies and NGOs

Awazu, Luiz, and Pereira da Silva, Fintech in EMEs: blessing or curse? (5 June 2018) BIS, Panel remarks at CV Meeting of Central Bank Governors of CEMLA – Asuncion, Paraguay.

Broeders, Dirk and Jermy Prenio, Innovative technology in financial supervision (suptech) – the experience of early users (July 2018) BIS, FSI Insights on policy implementation No 9.

FSB, Fintech Credit, Market structure, business models and financial stability implications (22 May 2017) FSB and BIS, Report prepared by a Working Group established by the Committee on the Global Financial System (CGFS) and the Financial Stability Board (FSB).

Academic Literature

Arner, Douglas W., Buckley, Ross P. and Zetzsche, Dirk Andreas, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation. Available at SSRN: https://ssrn.com/abstract=3245287.

Buckley, Ross P., Arner, Douglas W. and Zetzsche, Dirk Andreas, Sustainability, Fintech and Financial Inclusion, European Banking Institute Working Paper Series 2019/41. Available at SSRN: https://ssrn.com/abstract=3387359.

Fenwick, Mark and Vermeulen, Erik P.M., Banking and Regulatory Responses to Fintech Revisited: Building the Sustainable Financial Service “Ecosystems” of Tomorrow (September 1, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3446273

Hileman, Garrick and Rauchs, Michel, 2017 Global Blockchain Benchmarking Study (September 22, 2017). Available at SSRN: http://dx.doi.org/10.2139/issn.3040224 or http://dx.doi.org/10.2139/issn.3040224

Kilborn, Jason J., Crowdfunding and Crowdlending in the US: Regulations, Exemptions, and Outcomes (April 1, 2019). Available at SSRN: https://ssrn.com/abstract=3362591 or http://dx.doi.org/10.2139/issn.3362591

Nemoto, Naoko, Storey, David J. and Huang, Bihong, Optimal Regulation of P2P Lending for Small and Medium-Sized Enterprises (January 2, 2019). ADBI Working Paper 912. Available at SSRN: http://ssrn.com/abstract=3313999 or http://dx.doi.org/10.2139/ssrn.3313999

Tsai, Chang-hsien, To Regulate or Not to Regulate? A Comparison of Government Responses to Peer-to-Peer Lending among the United States, China, and Taiwan (2018). University of Cincinnati Law Review, Vol. 87, No. 4, 2018, p. 1077 – 1122 . Available at SSRN: http://ssrn.com/abstract=3426015

Zetzsche, Dirk A., Buckley, Ross P., Arner, Douglas W. and Barberis, Janos N., Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation (August 14, 2017). 23 Fordham Journal of Corporate and Financial Law 31-103 (2017). Available at SSRN: https://ssrn.com/abstract=3018534.

Zetzsche, Dirk A., Arner, Douglas W., Buckley, Ross P., Decentralized Finance (DeFi), Working Paper (2020), www.ssrn.com/abstract=3539194.

Fintech: Common Policy and Regulatory Issues

Literature on Fintech for Financial Inclusion

Regulatory Bodies and NGOs

Claessens, Stijn, Frost, Jon, Turner, Grant and Feng Zhu, Fintech credit markets around the world: size, drivers and policy issues (September 2018) BIS Quarterly Review.

Brainard, Lael, Fintech and the Search for Full Stack Financial Inclusion (17 October 2018) Remarks at the Fintech, Financial Inclusion – and the Potential to Transform Financial Services, Boston.

Awara, Luiz and Pereira da Silva, Financial inclusion in the age of fintech: a paradigm shift (25 October 2018) BIS, Welcoming keynote address, Fourth FSI-GPFI conference, Switzerland.

Coeure, Benoit, Fintech for the people (31 January 2019) BIS, Keynote speech, 14th BCBS-FSI high-level meeting to Africa, Cape Town.
### Academic Literature

- **Arner, Douglas W., Zetzsche, Dirk Andreas, Buckley, Ross P. and Barberis, Janos Nathan**, The Identity Challenge in Finance: From Analogue Identity to Digitized Identification to Digital KYC Utilities, *European Business Organization Law Review* (2019). Available at SSRN: [https://ssrn.com/abstract=3224115](https://ssrn.com/abstract=3224115)
- **Arner, Douglas W., Buckley, Ross P., and Zetzsche, Dirk Andreas**, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation. Available at SSRN: [https://ssrn.com/abstract=2945287](https://ssrn.com/abstract=2945287)
- **Buckley, Ross P., Arner, Douglas W. and Zetzsche, Dirk Andreas**, Sustainability, Fintech and Financial Inclusion. Available at SSRN: [http://ssrn.com/abstract=3387359](http://ssrn.com/abstract=3387359) or [http://dx.doi.org/10.2139/ssrn.3342238](http://dx.doi.org/10.2139/ssrn.3342238)
- **Goodell, Geoffrey and Aste, Tomaso**, A Decentralised Digital Identity Architecture (February 23, 2019). Available at SSRN: [https://ssrn.com/abstract=33342238 or http://dx.doi.org/10.2139/ssrn.3342238](https://ssrn.com/abstract=33342238)
- **Hockett, Robert C.**, Money’s Past is Fintech’s Future: Wildcat Crypto, the Digital Dollar, and Citizen Central Banking (December 11, 2018). 2 Stanford Journal of Blockchain Law & Policy (2019). Available at SSRN: [http://ssrn.com/abstract=3295555](http://ssrn.com/abstract=3295555)
- **Malady, Louise, Buckley, Ross P., Didenko, Anton and Tsang, Cheng-Yun**, A Regulatory Diagnostic toolkit for Digital Financial Services in Emerging Markets (December 1, 2018). (2018) 34 Banking and Finance Law Review 1. Available at SSRN: [http://ssrn.com/abstract=3380885](http://ssrn.com/abstract=3380885)
- **Malady, Louise, Buckley, Ross P. and Tsang, Cheng-Yun**, Regulatory Handbook: The Enabling Regulation of Digital Financial Services (December 1, 2015). Available at SSRN: [https://ssrn.com/abstract=2715350](https://ssrn.com/abstract=2715350)
- **Zetzsche, Dirk A. and Dewi, Tschany Ratna**, The Paradoxical Case Against Interest Rate Caps for Microfinance – And How Fintech and Regtech Resolve the Dilemma (April 17, 2018). University of Luxembourg Law Working 2018-003. Available at SSRN: [http://ssrn.com/abstract=3159202](http://ssrn.com/abstract=3159202)

### Literature on Fintech and Financial Stability Concerns

#### Regulatory Bodies and NGOs

- **Big tech in finance: opportunities and risks (2019)** BIS Annual Economic Report.
- **Claudia Buch**, Digitalization, competition, and financial stability (17 August 2019) Opening remarks, Seminar – Statistics on Fintech – Bring Together Demand and Supply to Measure its Impact, Kuala Lumpur.
- **Fintech Credit, Market structure, business models and financial stability implications (22 May 2017)** FSB and BIS, Report prepared by a Working Group established by the Committee on the Global Financial System (CGFS) and the Financial Stability Board (FSB).
- **Luiz Awazu and Pereira da Silva**, Fintech in EMEs: blessing or curse? (5 June 2018) BIS, Panel remarks at CV Meeting of Central Bank Governors of CEMLA – Asuncion, Paraguay.
- **Luiz Awara and Pereira da Zilva**, Financial inclusion in the age of fintech: a paradigm shift (25 October 2018) BIS, Welcoming keynote address, Fourth FSI-GPFI conference, Switzerland.
- **Luiz Awara, Pereira da Zilva and Goetz von Peter**, Financial instability: can Big Data help connect the dots? (29 November 2018) BIS, Remarks, Ninth European Central Bank Statistics Conference, Frankfurt.
- **Thomas Philippon**, The Fintech Opportunity (August 2017) BIS Working Paper No 655.

#### Academic Literature

- **Buckley, Ross P., Arner, Douglas W., Zetzsche, Dirk A. and Selga, Eriks**, The Dark Side of Digital Transformation: The New Risks of Fintech and the Rise of TechRisk, *Singapore Journal of Legal Studies* (2020). Available at SSRN: [https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3478640](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3478640)

### Fintech and Market Integrity Concerns

#### Academic Literature

- **Arner, Douglas W., Zetzsche, Dirk Andreas and Buckley, Ross P. and Barberis, Janos Nathan**, The Identity Challenge in Finance: From Analogue Identity to Digitized Identification to Digital KYC Utilities, *European Business Organization Law Review* 2019. Available at SSRN: [https://ssrn.com/abstract=3224115](https://ssrn.com/abstract=3224115)
Literature on Fintech and “Protection” Concerns

Regulatory Bodies and NGOs

- Arner, Douglas W., Barberis, Janos Nathan and Buckley, Ross P., The Emergence of Regtech 2.0: From Know Your Customer to Know Your Data. (2016) 44 Journal of Financial Transformation 79. Available at SSRN: https://ssrn.com/abstract=3044280.
- Arner, Douglas W., Barberis, Janos N. and Buckley, Ross P., Fintech, Regtech and the Reconceptualization of Financial Regulation. Northwestern Journal of International Law & Business (2017). Available at SSRN: https://ssrn.com/abstract=2847806

Academic Literature

- Arner, Douglas W., Buckley, Ross P. and Zetzsche, Dirk Andreas, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation. Available at SSRN: https://ssrn.com/abstract=3245287.
- Finck, Michèle, Blockchains and Data Protection in the European Union (November 30, 2017). Max Planck Institute for Innovation & Competition Research Paper No. 18-01. Available at SSRN: https://ssrn.com/abstract=3080322 or http://dx.doi.org/10.2139/ssrn.3080322

Regulatory tools for Further Innovation

Regulatory Bodies and NGOs

- BIS, Are post-crisis statistical initiatives completed? (January 2019) BIS IFC Bulletin No 49.
- The use of big data analytics and artificial intelligence in central banking (May 2019) BISIFC Bulletin No 50.
- Sound Practices – Implications of fintech developments for banks and bank supervisors (February 2018) BIS, BCBS.
- Stijn Claessens, Jon Frost, Grant Turner and Feng Zhu, Fintech credit markets around the world: size, drivers and policy issues (September 2018) BIS Quarterly Review.
- Financial Stability Board, RSB,
- Hiroshi Nakaso, Fintech – its impacts on finance, economics and central banking (18 November 2016) Remarks at the University of Tokyo, BIS Central Bankers speeches.
- Dave Ramsden, The Bank of England – Open to Fintech (22 March 2018) HMT’s International Fintech Conference, London, remarks.
- Fabio Panetta, Fintech and banking: today and tomorrow (12 May 2018) Speech by the Deputy Governor of the Bank of Italy, Rome.
- Jacqueline Loh, E-payments in Asia – regulating innovation and innovative regulation (26 June 2018) Keynote address at the Central Bank Payments Conference, Singapore.
- Philip Lowe, A journey towards a near cashless payments system (26 November 2018) Speech, Australian Payment Summit, Sydney.
- John (Iannis) Mourmouras, Fin-Regtech: Regulatory challenges with emphasis on Europe (28 February 2019) Cornell University, New York, Keynote speech.
- Andrea M Maecler and Thomas Moser, The evolution of payment systems in the digital age: A central bank perspective (28 March 2019) Swiss National Bank, Money Market Event, Zurich, Speech.
- Tharman Shanmugaratnam, Banking liberalisation’s next chapter – digital banks (28 June 2019) Keynote Address, The Association of Banks Annual Dinner, Singapore.
- Claudia Buch, Digitalization, competition, and financial stability (17 August 2019) Opening remarks, Seminar – Statistics on Fintech – Bring Together Demand and Supply to Measure its Impact, Kuala Lumpur.

Academic Literature

- Arner, Douglas W., Barberis, Janos Nathan and Buckley, Ross P., Fintech and Regtech in a Nutshell, and the Future in a Sandbox (July 1, 2017). CFA Institute Research Foundation Vol. 3, Issue 4, pp. 1-20, July 2017, ISBN: 978-1-944960-25-4; University of Hong Kong Faculty of Law Research Paper No. 2017/040. Available at SSRN: https://ssrn.com/abstract=3088303 or http://dx.doi.org/10.2139/ssrn.3088303.
- Arner, Douglas W., Buckley, Ross P. and Zetzsche, Dirk Andreas, Fintech for Financial Inclusion: A Framework for Digital Financial Transformation (September 4, 2018). UNSW Law Research Paper No. 18-87; University of Hong Kong Faculty of Law Research Paper No. 2019/001; University of Luxembourg Law Working Paper No. 004-2019. Available at SSRN: https://ssrn.com/abstract=3245287 or http://dx.doi.org/10.2139/ssrn.3245287
Brummer, Christopher J. and Yadav, Yesha, Fintech and the Innovation Trilemma (October 17, 2017). 107 Georgetown Law Journal 235, 2019; Vanderbilt Law Research Paper No. 17-46; Georgetown Law and Economics Research Paper No. 11-23. Available at SSRN: https://ssrn.com/abstract=3054770 or http://dx.doi.org/10.2139/ssrn.3054770

Buckley, Ross P., Arner, Douglas W., Veidt, Robin and Zetzsche, Dirk Andreas, Building Fintech Ecosystems: Regulatory Sandboxes, Innovation Hubs and Beyond (November 1, 2019). University of Luxembourg Law Working Paper No. 2019-010; European Banking Institute Working Paper Series 2019 – no. 53; UNSW Law Research Paper No. 19-72. Available at SSRN: https://ssrn.com/abstract=3455872 or http://dx.doi.org/10.2139/ssrn.3455872

Chiu, Iris H-Y, A Rational Regulatory Strategy for Governing Financial Innovation (September 5, 2017). European Journal of Risk Regulation, Forthcoming. Available at SSRN: https://ssrn.com/abstract=3032712

Fenwick, Mark and Vermeulen, Erik P.M., Banking and Regulatory Responses to Fintech Revisited: Building the Sustainable Financial Service “Ecosystems” of Tomorrow (September 1, 2019). Lex Research Topics in Corporate Law & Economics Working Paper no. 2019-4. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3446273

Michele, Eva and Jiang, Johannes, Regulatory Technology - Eight Policy Recommendations (July 22, 2019). LSE Law - Policy Briefing Paper No. 37, July 2019. Available at SSRN: https://ssrn.com/abstract=3423899 or http://dx.doi.org/10.2139/ssrn.3423899

Perlman, Leon, A Model Crypto-Asset Regulatory Framework (May 16, 2019). Available at SSRN: https://ssrn.com/abstract=3370679 or http://dx.doi.org/10.2139/ssrn.3370679

Zetzsche, Dirk Andreas and Buckley, Ross P and Arner, Douglas W. and Barberis, Janos Nathan, Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation. 23 Fordham Journal of Corporate and Financial Law 31-103 (2017). Available at SSRN: https://ssrn.com/abstract=3018534

Mohr, Vivian and Garnsey, Elizabeth W., Exploring the Constituents of Growth in a Technology Cluster: Evidence from Cambridge, UK (September 1, 2010). Centre for Technology Management (CTM) Working Paper 2010/01. Available at SSRN: https://ssrn.com/abstract=1923065 or http://dx.doi.org/10.2139/ssrn.1923065

Schiavone, Francesco, The Strategic and Technological Determinants of the Structural Forms of Hi-Tech Clusters (January 22, 2009). International Journal of Technoentrepreneurship, Vol. 1, No. 3, pp. 296-312, 2008. Available at SSRN: https://ssrn.com/abstract=1331481

Zetzsche, Dirk A., Ross P. Buckley, Douglas W. Arner & Janos N. Barberis, From Fintech to Techfin: The Regulatory Challenges of Data-Driven Finance, 14 N.Y.U. J.L. & Bus. 393, 435-443 (2018) (arguing in favor of data-specific adjustments to financial regulations). Available at SSRN: http://dx.doi.org/10.2139/ssrn.2959925.

Zetzsche, Dirk Andreas and Arner, Douglas W. and Buckley, Ross P. and Weber, Rolf H., The Future of Data-Driven Finance and Regtech: Lessons from EU Big Bang II (March 27, 2019). European Banking Institute Working Paper Series 2019/35. Available at SSRN: https://ssrn.com/abstract=3359399 or http://dx.doi.org/10.2139/ssrn.3359399

Furthering Digital Finance by Other Means

Academic Literature

Athreye, Suma S., Agglomeration and Growth: A Study of the Cambridge Hi-Tech Cluster (June 2001). SIEPR Discussion paper 00-42. Available at SSRN: https://ssrn.com/abstract=302958

Maignan, Carole Juliette and Ottaviano, Gianmarco I.P. and Pinelli, Dino, ICT, Clusters and Regional Cohesion: A Summary of Theoretical and Empirical Research (June 2003). FEEM Working Paper No. 58.2003. Available at SSRN: https://ssrn.com/abstract=438507 or http://dx.doi.org/10.2139/ssrn.438507