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Towards a data-driven financial system: the impact of COVID-19¹

Nydia Remolina²

SMU Centre for AI & Data Governance Research Paper No. 2020/08

Abstract

The COVID-19 outbreak has a growing impact on the global economy and the financial sector, which plays a critical role in mitigating the unprecedented macroeconomic and financial shock caused by the pandemic. Given the unprecedented nature of the current crisis, financial regulators and supervisors, central banks, along with governments and legislatures face challenges to maintain financial stability, preserve the well-functioning core markets, and ensure the flow of credit to the real economy. Even though the COVID-19 has slowed down our daily lives and stopped the operation of many industries, it did not have the same effect in the data-driven finance world. The digital transformation of the financial services industry and financial technologies (fintech) have contributed to face some of the challenges of the pandemic. This paper explains the ongoing data revolution in the financial services industry and how traditional financial institutions and fintechs are trying to leverage on data-driven solutions to respond to the challenges associated with the economic crisis derived from the pandemic. The paper also argues that despite the potential benefits of this transformation, the future of data-driven finance in a post-pandemic world looks challenging and generates many risks for consumers and the stability of the financial sector that regulators need to address. An adequate balance of different regulatory objectives will be crucial for a sustainable recovery in a post-pandemic financial industry.

¹ This research is supported by the National Research Foundation, Singapore under its Emerging Areas Research Projects (EARP) Funding Initiative. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not reflect the views of National Research Foundation, Singapore.

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Introduction

The COVID-19 outbreak has a growing impact on the global economy and the financial sector, which plays a critical role in mitigating the unprecedented macroeconomic and financial shock caused by the pandemic. Given the unprecedented nature of the current crisis, financial regulators and supervisors, central banks, along with governments and legislatures face challenges to maintain financial stability, preserve the well-functioning core markets, and ensure the flow of credit to the real economy. The financial sector has not only implemented these regulatory measures but has also adapted to the new circumstances derived from the pandemic. In this process, the ongoing digital transformation of the financial industry helped to address some of the emerging challenges.³ The first section of the paper describes the data-driven transformation of the financial services industry, a growing phenom within the fintech space.

Even though the COVID-19 has slowed down our daily lives and stopped the operation of many industries, it did not have the same effect in the data-driven finance world. Traditional financial institutions and fintechs are trying to leverage on data-driven solutions to respond to the challenges associated with the pandemic. For instance, data-driven financial companies are participating in the lending programmes launched by several governments for small businesses whereas in previous crisis – such as the global financial crisis – only traditional institutions with traditional credit risk models participated in these programmes. This response has not unique to the financial sector. Health authorities are also leveraging data use for controlling the spread of the virus.⁴ The second section of the paper will present an overview of these data-driven finance initiatives that have been accelerated because of the pandemic.

³ For more about how the digital financial infrastructure that emerged in the wake of the 2008 Global Financial Crisis is being, and can be, leveraged to overcome the immediate challenges presented by the pandemic and manage the impending economic fallout, see Douglas W. Arner, Janos Nathan Barberis, Julia Walker, Ross P. Buckley, Andrew M. Dahdal & Dirk A. Zetsche, *Digital Finance & The COVID-19 Crisis*, UNIVERSITY OF HONG KONG FACULTY OF LAW RESEARCH PAPER NO. 2020/017 (2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3558889

⁴ For more about data-use in COVID-19 control see Mark Findlay & Nydia Remolina, *Regulating Personal Data Usage in COVID-19 Control Conditions*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER NO. 2020/04 (2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3607706

The third section of the paper offers a speculative view of the future of data-driven finance in a post-pandemic world and how despite it can contribute to the recovery of the economy, it also generates risks or consumer protection and financial stability. An adequate balance of different regulatory objectives will be crucial for a sustainable recovery in a post-pandemic financial industry.

1. The data revolution in the financial services industry

Data has taken immense importance in the last years. Consider the amount of data that is being collected worldwide every day⁵, industries are reshaping their activities into a data driven business. The *datafication* of almost any aspect of human social, political and economic activity as a result of the information generated by the numerous daily routines of digitally connected individuals and technology. The financial services industry is not isolated from this trend. This vast sea of data, that can now be stored, organised and made sense of for the industry, and a set of emerging tools and approaches could broadly be called as data-driven finance and is already driving the next wave of innovation and optimisation in the financial sector.⁶ Embracing technology and data use allows incumbent financial institutions to disrupt their own business model making the most out of the digital transformation.

Financial institutions have access to enormous amounts of data, but due to multiple constraints this data is not yet sufficiently converted into useful insights.⁷ Financial

⁵ By 2020, about 1.7 megabytes a second of new information will be created for every human being on the planet. Thus, Data is set to rise steeply to 44 zettabytes by 2020. To put that in perspective, if each Gigabyte in a Zettabyte were a brick, 258 Great Walls of China (made of 3,873,000,000 bricks) could be built. There are 931322574615.48 gigabytes in a zettabyte. See Amit Garg, Davide Grande, Gloria Macías-Lizaso Miranda, Christoph Sporleder, and Eckart Windhagen, *Analytics in Banking: Time to realize the value*, MCKINSEY & COMPANY FINANCIAL SERVICES REPORT 2017, available at: <https://www.mckinsey.com/industries/financial-services/our-insights/analytics-in-banking-time-to-realize-the-value>; Thomas Barnett, Jr., *The Zettabyte Era Officially Begins (How Much is That?)*, CISCO BLOGS 2016, available at: <https://blogs.cisco.com/sp/the-zettabyte-era-officially-begins-how-much-is-that>.

⁶ See Amit Garg, Davide Grande, Gloria Macías-Lizaso Miranda, Christoph Sporleder, and Eckart Windhagen, *Analytics in banking: Time to realize the value*, MCKINSEY & COMPANY (2017), available at: <https://www.mckinsey.com/industries/financial-services/our-insights/analytics-in-banking-time-to-realize-the-value>

⁷ Joris Lochy, *Big Data in the Financial Services Industry - From data to insights*, FINEXTRA (9 Sept 2019), available at: <https://www.finextra.com/blogposting/17847/big-data-in-the-financial-services-industry---from-data-to-insights>

institutions are not native to the digital landscape and have had to undergo a long process of conversion that has required behavioural and technological change. Thus, the financial sector is still on the path towards becoming a data-driven type of business. Financial institutions are on the road to adopt a data-driven approach to become more efficient.⁸

We are also starting to see fully digital financial services providers.⁹ Financial companies and challengers are establishing a new data operating model focused on the role of data in the decision-making process. This new operating model relies on the use of Internet of Things,¹⁰ Artificial Intelligence,¹¹ Machine Learning,¹² Cloud Computing¹³, Quantum

⁸ Nearly all (97 percent) of financial services firms are making some sort of inroads on digital transformation—whether they’re in the process of developing a strategy or already implementing one. More than a fifth (21 percent) list developing a digital transformation strategy as their top digital priority. See *Digital Transformation in Financial Services*, BDO (2019), available at: <https://www.bdo.com/insights/industries/financial-services/digital-transformation-in-financial-services> Almost half of global financial services organizations are still in a very early or even immature stage of their digital transformation journey. Only 12% of financial services organizations are mature in their digital transformations and fall into the digital transformer cluster. Their top driver is disrupting the industry to unlock new areas for growth, enter new markets or create new revenue streams (like via data monetization). In this cluster, companies are more than doubling the rate of using data-driven technologies such as AI, or augmented analytics. See *The 5 Digital Transformation Identities of Financial Services Organizations*, GARTNER (2019), available at: <https://www.gartner.com/smarterwithgartner/the-5-digital-transformation-identities-of-financial-services-organizations/>

⁹ Neobanks are financial technology firms that offer internet-only financial services and lack physical branches. See Margarida Matos Rosa, *Achieving Competition in the Financial Sector*, 9.7 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE 421 (2018).

¹⁰ The internet of things (IoT) is a catch-all term for the growing number of electronics that aren't traditional computing devices, but are connected to the internet to send data, receive instructions or both. The IoT brings the power of the internet, data processing and analytics to the real world of physical objects. See Josh Fruhlinger, *What is IoT? The internet of things explained*, NETWORKWORLD (2020) available at: <https://www.networkworld.com/article/3207535/what-is-iot-the-internet-of-things-explained.html>

¹¹ The term “artificial intelligence” was coined in 1956 by John McCarthy. The Oxford English Dictionary defines AI as the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making and translation between languages. The Financial Stability Board defines AI as, the theory and development of computer systems able to perform tasks that have traditionally required human intelligence. AI applications in the financial sector include algorithmic trading, portfolio composition and optimisation, model validation, back testing, robo-advising, virtual customer assistants, market impact analysis, regulatory compliance and stress testing. See Bonnie G. Buchanan, *Artificial intelligence in finance*, THE ALAN TURING INSTITUTE (2019), available at: https://www.turing.ac.uk/sites/default/files/2019-04/artificial_intelligence_in_finance_-_turing_report_0.pdf

¹² Machine learning methods’ goal is trying to learn from data. However, these methods are not guided by economic theory and are more about algorithms, rather than about asymptotic statistical processes. . Traditional statistics highlights hypothesis testing and inference, whereas ML methods emphasise obtaining the best prediction. ML algorithms are categorised as either supervised learning or unsupervised learning.

¹³ Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. See Stephen Orban, Andy Jassy, Adrian Cockcroft and Mark Schwartz, *AHEAD IN THE CLOUD: BEST PRACTICES FOR NAVIGATING THE FUTURE OF ENTERPRISE IT* (Amazon Digital Services LLC, 2018); Thomas Erl, Ricardo Puttini, Zaigham Mahmood, *CLOUD COMPUTING: CONCEPTS, TECHNOLOGY & ARCHITECTURE* (Prentice Hall, 1 edition,

Computing¹⁴ and open architectures such as Open Banking¹⁵ to meet the demands of digital transformation.

A broad range of applications in the financial system use these technologies. Indeed, they are impacting the banking services,¹⁶ capital markets operations and products,¹⁷

2015); Andy Kirk, DATA VISUALISATION: A HANDBOOK FOR DATA DRIVEN DESIGN (SAGE Publications Ltd; 1 edition, 2016)

¹⁴ Quantum computing is a relatively new field of research that studies the algorithms and systems that apply quantum phenomena to complex problems. It can potentially process data at speeds that are impossible for traditional computers. Looking ahead, ML is expected to have a far more powerful impact if it is

combined with QC capabilities. See Bonnie G. Buchanan, *Artificial intelligence in finance*, THE ALAN TURING INSTITUTE (2019), available at: https://www.turing.ac.uk/sites/default/files/2019-04/artificial_intelligence_in_finance_-_turing_report_0.pdf; Marcos Lopez de Prado, *Financial Quantum Computing*, CORNELL UNIVERSITY - OPERATIONS RESEARCH & INDUSTRIAL ENGINEERING (2016), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2848632

¹⁵ Open banking is not a technology-based concept. involves opening up banking systems (functionality and customer data) to third parties to allow them to provide services directly to customers. In other words, open banking facilitates for customer data and functionality to be accessed by financial institutions and other third-party providers, transforming the relationship between traditional entities and customers. This access to data and functionality gives challenger banks, neobanks, fintechs and bigtechs the opportunity to develop new innovative financial products and services. It also provides traditional banks an ideal opportunity to improve their customer experience through the vast amounts of data they hold and/or the infrastructure they already built. See Nydia Remolina, *Open Banking: Regulatory Challenges for a New Form of Financial Intermediation in a Data-Driven World*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER NO. 2019/05 (2019), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3475019

¹⁶ Among the use cases of data-driven technologies are credit scoring models using Artificial Intelligence or Machine Learning, Artificial Intelligence for stress testing, data analytics for marketing, open banking for integrating in the chain value payment services, chatbots and capital optimization models. See Samantha Barnes, *Banking and Big Data: the perfect match?*, INTERNATIONAL BANKER (14 October 2019), available at: <https://internationalbanker.com/banking/banking-and-big-data-the-perfect-match/>; Carlos Fernandez Naveira, Imke Jacob, Khaled Rifai, Pamela Simon, and Eckart Windhagen, *Smarter analytics for banks*, McKinsey & Company (2018), available at: <https://www.mckinsey.com/industries/financial-services/our-insights/smarter-analytics-for-banks>; Nydia Remolina, *Open Banking: Regulatory Challenges for a New Form of Financial Intermediation in a Data-Driven World*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER NO. 2019/05 (2019), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3475019

¹⁷ Examples of data-driven tech solutions in the capital markets are roboadvisors, portfolio management, market impact analysis and modelling of trading out of big positions, algorithmic trading. See European Securities Market Authority, *New technologies within and beyond capital markets* (2018), available at: https://www.esma.europa.eu/sites/default/files/library/esma71-99-1036_steven_maijoor_keynote_new_technologies_within_and_beyond_capital_markets.pdf; See Financial Stability Board, *Artificial intelligence and machine learning in financial services. Market developments and financial stability implications* (2017), available at: <https://www.fsb.org/wp-content/uploads/P011117.pdf>; Financial Stability Board, *BigTech in finance Market developments and potential financial stability implications* (2019), available at: <https://www.fsb.org/wp-content/uploads/P091219-1.pdf>;

insurance,¹⁸ fraud detection and compliance,¹⁹ marketing, and even the supervisory processes run by regulatory agencies.²⁰

This intersection of finance and data generates benefits for the financial sector. It brings more competition that will ultimately benefit consumers, makes the system more efficient in terms of operation costs, might help financial services providers to meet their customers' needs better and enhance their risk management.²¹ However, it also raises challenges and risks that regulators should adequately address²². These risks and challenges are not minor. They mostly relate to financial stability due to new systemically important players that could fall outside the regulatory perimeter,²³ cybersecurity, investor protection, consumer protection, competition, fairness, new and unexpected new forms

¹⁸ The insurance industry is using machine learning for pricing, marketing and managing insurance policies. See Jim Struntz, *AI on the insurance frontline*, ACCENTURE INSURANCE BLOG (2017), available at: <https://insuranceblog.accenture.com/ai-on-the-insurance-frontline>

¹⁹ This is also known as Regtech. For instance, AI and machine learning are used to improve the Know your Customer process, which is often costly, laborious, and highly duplicative across many services and industries. See Financial Stability Board, *BigTech in finance Market developments and potential financial stability implications* (2019), available at: <https://www.fsb.org/wp-content/uploads/P091219-1.pdf>;

²⁰ Supervisory technology (suptech) is the use of innovative technology by supervisory agencies to support supervision. Suptech is currently found in two areas of applications: data collection and data analytics. Within data collection, applications are used for supervisory reporting, data management and virtual assistance. Examples include the ability to pull data directly from banks' IT systems, automated data validation and consolidation, and chatbots to answer consumer complaints while collecting information that could signal potential areas of concern. Within data analytics, applications are used for market surveillance, misconduct analysis as well as microprudential and macroprudential supervision. Examples include detecting insider trading activities, money laundering identification, monitoring supervised entities' liquidity risks and forecasting housing market conditions. See Dirk Broeders and Jermy Prenio, *Innovative technology in financial supervision (suptech) – the experience of early users*, FINANCIAL STABILITY INSTITUTE. INSIGHTS ON POLICY IMPLEMENTATION NO 9 (2018), available at: <https://www.bis.org/fsi/publ/insights9.pdf>; Aurelio Gurrea-Martinez & Nydia Remolina, *Global Challenges and Regulatory Strategies to Fintech*, 36.1 BANKING & FINANCE LAW REVIEW (Forthcoming, 2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3576506

²¹ See Dirk A. Zetsche, Ross P. Buckley, Douglas W. Arner, Janos Nathan Barberis, *From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance*, 14.2 NEW YORK UNIVERSITY JOURNAL OF LAW AND BUSINESS 393 (2017)

²² See Financial Stability Board, *Artificial intelligence and machine learning in financial services. Market developments and financial stability implications* (2017), available at: <https://www.fsb.org/wp-content/uploads/P011117.pdf>; Financial Stability Board, *BigTech in finance Market developments and potential financial stability implications* (2019), available at: <https://www.fsb.org/wp-content/uploads/P091219-1.pdf>; Financial Stability Board, *Financial Stability Implications from FinTech. Supervisory and Regulatory Issues that Merit Authorities' Attention* (2017), available at: <https://www.fsb.org/wp-content/uploads/R270617.pdf>; Basel Committee on Banking Supervision, *Sound Practices. Implications of fintech developments for banks and bank supervisors*, BANK FOR INTERNATIONAL SETTLEMENTS (2018), available at: <https://www.bis.org/bcbs/publ/d431.pdf>

²³ For example, cloud services providers. See Nydia Remolina, *Cloud Computing in financial services: Redefining Systemic Risk*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER (forthcoming).

of interconnectedness. The lack of interpretability or auditability of AI and machine learning methods could also become a macro-level risk for the financial sector. Similarly, a widespread use of opaque AI models may result in unintended consequences.²⁴ The challenges related to how to translate the discussion about high level principles of AI Governance is also important to mitigate some of these risks.²⁵

Currently, regulators around the world, international setting bodies and academics discuss how to address those challenges what is the appropriate regulatory architecture to help shape the data revolution.²⁶ However, it is not an easy task for regulators to address all these challenges and promote financial innovation. While trying to strike the right balance, regulators face unavoidable conflicts between policy objectives.²⁷ Moreover, the data revolution of the financial services industry, as well as other innovations, exacerbate the trade-offs between different regulatory objectives. Financial services are unbundled because of these innovations, supply chains and financial intermediation are changing traditional forms and creating new levels of interconnectedness.²⁸

²⁴ Financial Stability Board, *BigTech in finance Market developments and potential financial stability implications* (2019), available at: <https://www.fsb.org/wp-content/uploads/P091219-1.pdf>

²⁵ Some financial regulators are debating how to approach this discussion. For instance, the Monetary Authority of Singapore issued a set of principles to promote Fairness, Ethics, Accountability and Transparency (FEAT) in the Use of Artificial Intelligence and Data Analytics in Singapore's Financial Sector. Now the regulatory authority is working closely with the tech and financial industries to translate these high level principles into specific recommendations applicable to some use data-driven applications in the financial sector. This initiative is called Veritas. The first phase will commence with the development of fairness metrics in credit risk scoring and customer marketing. See 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* (2018), available at: <https://www.mas.gov.sg/~media/MAS/News%20and%20Publications/Monographs%20and%20Information%20Papers/FEAT%20Principles%20Final.pdf>; Monetary Authority of Singapore, *MAS Partners Financial Industry to Create Framework for Responsible Use of AI* (2019), available at: <https://www.mas.gov.sg/news/media-releases/2019/mas-partners-financial-industry-to-create-framework-for-responsible-use-of-ai>

²⁶ See Johannes Ehrentraud, Denise Garcia Ocampo, Lorena Garzoni, Mateo Piccolo, Policy responses to fintech: a cross-country overview, Financial Stability Institute on policy implementation No 23 (2020), available at: <https://www.bis.org/fsi/publ/insights23.pdf>

²⁷ See Chris Brummer & Yesha Yadav, *Fintech and the Innovation Trilemma*, 107 GEORGETOWN LAW JOURNAL 235 (2019).

²⁸ See Chris Brummer & Yesha Yadav, *Fintech and the Innovation Trilemma*, 107 GEORGETOWN LAW JOURNAL 235 (2019); Nydia Remolina, Cloud Computing in financial services: Redefining Systemic Risk, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER (forthcoming); Nydia Remolina, *Open Banking: Regulatory Challenges for a New Form of Financial Intermediation in a Data-Driven World*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER NO. 2019/05 (2019), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3475019

2. The evolution of data-driven finance during the pandemic

Even though the COVID-19 has slowed our daily lives and stopped the operation of many industries, it did not have the same effect in the data-driven finance world. Not on health authorities in many jurisdictions leveraged the control of the pandemic with data-driven initiatives,²⁹ but also the financial sector and fintech companies are finding ways to use data to respond to the demands of the economy in these uncertain times. This section shows how some use cases of data-driven fintech accelerated because of the pandemic.

2.1. Data-driven lending to help Small and Medium Enterprises (SMEs)

Small and Medium Enterprises (SMEs) play a major role in most economies, particularly in developing countries. SMEs account for the majority of businesses worldwide and are important contributors to job creation and global economic development. They represent about 90% of businesses and more than 50% of employment worldwide.³⁰ Formal SMEs contribute up to 40% of national income (GDP) in emerging economies.³¹ In emerging markets, most formal jobs are generated by SMEs, which create 7 out of 10 jobs.³² However, access to finance is a key constraint to SME growth. The International Finance Corporation (IFC) estimates that 65 million firms, or 40% of formal micro, small and medium enterprises (MSMEs) in developing countries, have an unmet financing need of \$5.2 trillion every year, which is equivalent to 1.4 times the current level of the global MSME lending. East Asia And Pacific accounts for the largest share (46%) of the total global finance gap and is followed by Latin America and the Caribbean (23%) and Europe and Central Asia (15%).³³

²⁹ see Mark Findlay & Nydia Remolina, *Regulating Personal Data Usage in COVID-19 Control Conditions*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER NO. 2020/04 (2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3607706

³⁰ See The World Bank, *Small And Medium Enterprises (SMEs) Finance Improving SMEs' access to finance and finding innovative solutions to unlock sources of capital*, available at: <https://www.worldbank.org/en/topic/sme/finance> (Last visit: 20 July 2020)

³¹ These numbers are significantly higher when informal SMEs are included. See *Ibid.*

³² *Ibid.*

³³ *Ibid.*

Additionally, the pandemic has severely impacted small businesses around the world. Businesses are facing unprecedented economic disruption, losses, and are compelled to adapt to new ways of working.³⁴ With these unforeseen challenges, governments are offering financial assistance in the form of relief loan packages, designed to help small businesses navigate the crisis.³⁵ Most of these packages are allocated through banks around the world. Regulators have also decided to allow banks to use their capital buffers to provide more liquidity to the economy in forms of loans.³⁶

Consequently, banks getting inundated with a massive volume of loan application requests from small businesses, all of which must be reviewed and approved in a short time. Processing of loan application requests involves multiple steps, from loan underwriting to verification checks and approvals.³⁷ There also needs to be a mechanism to authenticate the small business enterprises applying for the loan, by extracting critical data needed for approving the loan application. The failure to process loan application requests on time leads to a huge backlog, customer dissatisfaction and a negative impact in the recovery of economies. In some countries, traditional banks have been criticized because their slow response to COVID-19, particularly in relation to lending issues.³⁸

To address this issue, some jurisdictions³⁹ allowed non-bank online lenders that use Artificial Intelligence and Machine Learning models for lending and credit scoring – to

³⁴ See OECD Centre for Entrepreneurship, SMEs, Regions and Cities, Coronavirus (COVID-19): SME policy responses (2020), available at: <http://www.oecd.org/coronavirus/policy-responses/coronavirus-covid-19-sme-policy-responses-04440101/> (Last Visit: 20 July 2020)

³⁵ *Ibid.*

³⁶ See Nydia Remolina, *Financial Regulators' Responses to COVID-19*, IBEROAMERICAN INSTITUTE FOR LAW AND FINANCE WORKING PAPER SERIES 1/2020 (2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3554557

³⁷ some media outlet reported that some banks could take two hours to collect this information and sometimes weeks to verify the information of applicants who were not existing lending customers. See Donna Fuscaldo, *As COVID-19 Lenders, PayPal, Square, Other Fintechs Get To Prove They Can Do It Better Than Banks*, FORBES (15 April 2020) available at: <https://www.forbes.com/sites/donnafuscaldo/2020/04/15/as-covid-19-lenders-paypal-square-other-fintechs-get-to-prove-they-can-do-it-better-than-banks/#8dd1202587a4>

³⁸ For example, China's traditional banking sector. See Douglas W. Arner, Janos Nathan Barberis, Julia Walker, Ross P. Buckley, Andrew M. Dahdal & Dirk A. Zetsche, *Digital Finance & The COVID-19 Crisis*, UNIVERSITY OF HONG KONG FACULTY OF LAW RESEARCH PAPER NO. 2020/017 (2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3558889

³⁹ For instance, United States with the creation of the Paycheck Protection Program, which which helps businesses secure forgivable loans and keep workers employed. See Small Business Administration, *Paycheck Protection Program* (2020), available at: <https://www.sba.gov/funding-programs/loans/coronavirus-relief-options/paycheck-protection-program> (Last visit: 20 July 2020)

participate in these programs. For the first time in this type of programs, regulators in the United States approved some fintech companies to have a role to play in the program by helping small businesses that may not have an established lending relationship with a large bank, community bank or credit union. Additionally, the fintech firms through automation and technology believe they will be able to process applications much more quickly.

This puts fintech firms, and particularly data-driven lenders in a spot they did not have before. This is the first economic crisis in which they will be able to demonstrate how beneficial these new business models can be for the economic recovery.

In Asia, even though some young SMEs use crowdlending platforms and other types of online lenders to access finance. They have become the main source of credit for many, highly vulnerable small businesses. Asian online lenders raised more than US\$4 billion in 2017 and 2018, with Indian and Indonesian companies most prominent. However, the pandemic has drastically changed the landscape for the online lending industry. Alternative lending companies and platforms across Asia are scrambling to raise funds and stave off bankruptcy as they face a wave of bad loans.⁴⁰ Online lenders that fall outside the traditional bank regulations have fewer requirements in many markets about how much capital they must have on hand. That makes them more vulnerable to a wave of defaults. Asia-focused banks including, as well as most banks in jurisdictions that follow Basel Committee recommendations, have taken greater provisions against non-performing loans since the global financial crisis, but alternative online lenders are worse off than their traditional competitors.

Another consequence of the pandemic that has accelerated data-driven lending impact, are the creation of new partnerships between banks and fintech companies. Indeed, models are being re-evaluated to make them more flexible and more adaptive to the businesses. For example, some companies are working to promote their QR code contactless payment services, which allow SMEs to conduct sales while mitigating health

⁴⁰ See *Covid-19 brings Asia's booming online lending sector to juddering halt*, MALAYMAIL (june 2020), available at: <https://www.malaymail.com/news/money/2020/06/03/covid-19-brings-asias-booming-online-lending-sector-to-juddering-halt/1871920>

risks due to COVID-19.⁴¹ This transactional data will allow fintechs and other institutions with access to that transactional data to enrich their credit risk models, especially in a sector that lacks of traditional finance information to apply for a loan. Particularly in Mexico, fintechs are becoming a leading growth partner to SMEs through transactional data which helps understand the needs and demands of clients.⁴² Data is key because it also helps understand which sector and clients will recover the fastest. This in return, is important for fintech to prioritize loans provision.⁴³

Finally, the data-driven finance evolution of the lending landscape is not only related to fintechs. Banks are also playing an important role. Through partnerships with associations that represent specific industry segments, banks in Asia, are understanding the the particular problems and needs of that sector and to identify innovative products and services where they could play a meaningful role.⁴⁴ Through this partnerships banks and fintechs are offering payment solutions for businesses that were not using e-commerce platforms.⁴⁵

2.2. Financial inclusion

⁴¹ See Celine Bteish & Marie-Sarah Chatain, COVID-19: Digital Finance Models to the Rescue of SMES in Latin America, SME FINANCE FORUM BLOG (04 June 2020), available at: <https://www.smefinanceforum.org/post/covid-19-digital-finance-models-to-the-rescue-of-smes-in-latin-america>

⁴² *Ibid.*

⁴³ Even though, it is important to note that not all jurisdictions have implemented this type of prudential regulatory requirements for fintechs.

⁴⁴ For example, DBS working with the Restaurant Association of Singapore, as the Food and Beverage (F&B) industry was losing 30-80% of revenues due to quarantine restrictions - yet their operating costs remained the same. Compounding those problems was the fact that established food delivery platforms were charging restaurants 30-33% commission on the total bill, thereby significantly narrowing profit margins for restaurants. To address this issue, DBS partnered with the government of Singapore and two homegrown fintech companies, Oddle and FirstCom, to roll out a Digital Relief Package for the F&B industry. Specifically, they enabled F&B businesses to set up an online food ordering site in just three days with much-reduced delivery rates. As a result, DBS enabled SMEs to quickly create additional online channels in order to increase revenue. See Jade Hachem & Gillette Conner, *COVID-19 - A Catalyst for Digital Transformation in the SME Lending Ecosystem*, SME FINANCE FORUM BLOG (23 April 2020), available at: <https://www.smefinanceforum.org/post/covid-19-a-catalyst-for-digital-transformation-in-the-sme-lending-ecosystem>

⁴⁵ See Shivraj Rajendran, *Bank aims to help F&B clients draw online customers*, The Straits Times (26 March 2020), available at: <https://www.straitstimes.com/business/bank-aims-to-help-fb-clients-draw-online-customers>

Lockdowns and social distancing are accelerating the digitalization of many sectors, including financial services. Just as the SARS epidemic in 2003 expedited China's path in launching digital payments and e-commerce in the country,⁴⁶ some countries are taking steps to facilitate the massive use of digital financial services, especially, digital payments. Digital payments are now a backbone to China's vibrant digital economy and its development highly influences data-driven initiatives.⁴⁷ Contactless payments to taxi drivers, vendors and even temples and beggars are possible through scanning a QR code. Payments for daily essentials, such as mobile phone bills, utilities, rent or internet fees, can all be made through mobile payments or online banking in China. Governments at all levels there also accept mobile payments as a payment method. Digital payments, in China, have almost become a public good and are definitely a key factor in data-driven finance.⁴⁸ Data and analytics is becoming the foundation of effective business decision making. In most countries digital payments services are evolving into digital lending, as companies accumulate users' data and develop new ways to use it for credit worthiness analysis.⁴⁹

Many countries⁵⁰ are replicating this model in similar ways and supporting this shift with measures such as lowering fees and increasing limits on mobile money transactions.⁵¹ During the COVID-19 lockdowns, digital financial services are enabling governments to provide quick and secure financial support to people and businesses,⁵² as demonstrated

⁴⁶ See Yan Xiao & Martin Chorzempa, *How digital payments can help countries cope with COVID-19, other pandemics: Lessons from China*, WORLD ECONOMIC FORUM (06 May 2020), available at: <https://www.weforum.org/agenda/2020/05/digital-payments-cash-and-covid-19-pandemics/>

⁴⁷ See *Bigtech in Finance, opportunities and risks*, BANK FOR INTERNATIONAL SETTLEMENTS ANNUAL ECONOMIC REPORT (2019), available at: BIS Annual Economic Report

⁴⁸ See Pricewaterhouse Coopers, *How Fintech is Shaping China's Financial Services?* (2018), available at: <https://www.pwccn.com/en/research-and-insights/how-fintech-is-shaping-china-financial-services.pdf>

⁴⁹ See Ulric Eriksson von Allmen, Purva Khera, Sumiko Ogawa, and Ratna Sahay, *Digital Financial Inclusion in the Times of COVID-19*, INTERNATIONAL MONETARY FUND BLOG (1 July 2020), available at: <https://blogs.imf.org/2020/07/01/digital-financial-inclusion-in-the-times-of-covid-19/>

⁵⁰ Mostly located in Africa, Asia and Latin America. See Ulric Eriksson von Allmen, Purva Khera, Sumiko Ogawa, and Ratna Sahay, *Digital Financial Inclusion in the Times of COVID-19*, INTERNATIONAL MONETARY FUND BLOG (1 July 2020), available at: <https://blogs.imf.org/2020/07/01/digital-financial-inclusion-in-the-times-of-covid-19/>

⁵¹ *Ibid.*

⁵² See Nana Yaa Boakye-Adjei, *Covid-19: Boon and bane for digital payments and financial inclusion*, FINANCIAL STABILITY INSTITUTE BRIEFS NO. 9. (2020), available at: <https://www.bis.org/fsi/fsibriefs9.pdf>

in Namibia, Peru, Colombia, Zambia, and Uganda.⁵³ In many of these jurisdictions, payment service providers were used to disburse government subsidies to people that did not use a digital financial channel before.⁵⁴

This is expected to help mitigate the economic fallout and potentially strengthen the recovery. The pandemic shows that the trend towards greater digitalization of financial services is here to stay.

2.3. Going digital and customer experience

The pandemic has pushed financial institutions to significantly go digital. However, this transition to be a fully digital company, in most cases requires regulatory changes. Accordingly, the Financial Action Task Force (the FATF), issued a set of measures to combat illicit financing, and encouraged the use of the flexibility built into the FATF's risk-based approach to address some COVID-19 related challenges such as digital onboarding and simplified due diligence for Know Your Customer processes.⁵⁵ Regulation plays a critical role in enabling the transition to a digital environment. As mentioned, some countries have maintained more restrictive regulations on consumer data protection, especially when it comes to cloud acceptance and e-Know Your Customer and Anti-money Laundering practices. Dissimilar regulatory regimes have been extremely challenging for digital lenders which have tried to promptly implement a uniform action plan across various markets. The pandemic is driven regulators to re-think their approaches to facilitate even more the change into a digital experience.

Additionally, due to mobility restrictions of quarantines and lockdowns, financial institutions have been challenged to help address customer concerns in multiple channels

⁵³ See Ulric Eriksson von Allmen, Purva Khera, Sumiko Ogawa, and Ratna Sahay, *Digital Financial Inclusion in the Times of COVID-19*, INTERNATIONAL MONETARY FUND BLOG (1 July 2020), available at: <https://blogs.imf.org/2020/07/01/digital-financial-inclusion-in-the-times-of-covid-19/>

⁵⁴ See Nitish Narain, Abhishek Anand, Surbhi Sood & Shobhit Mishra, *CICO Agents: The under-valued "first responders"*, MICROSAVE CONSULTING (2020), available at: <https://www.microsave.net/2020/04/15/cico-agents-the-under-valued-first-responders/>

⁵⁵ See Financial Action Task Force, *Statement by the FATF President: COVID-19 and measures to combat illicit financing* (1 April 2020), available at: <https://www.fatf-gafi.org/publications/fatfgeneral/documents/statement-covid-19.html> (Last Visit: 20 July 2020)

such as online chats. Hence, digital banking, specifically “conversational banking” seems to have permanent uptrend in this period. Conversational platforms powered by Artificial Intelligence are increasing. The rise in the number of users and the dialogues in live chatbots have been reported by some technology companies. A company that partners with financial institutions to develop chatbots in Turkey and the United States, reported that the number of users and messages has increased 5,4 and 3,9 times respectively in the banking chatbots since the outbreak of COVID-19.⁵⁶ The top asked topics have been loan application, credit payment delay, online banking password setting and request.

As more financial institutions turn to data-driven solutions to manage credit risk, they must not forget that numbers alone would not help their most important stakeholders – their customers – to be at peace. By being data-driven while putting human connection at the centre, banks can better live their commitment of helping the whole economy rise from this historic challenge.

2.4. Central Bank Digital Currencies

The debate around the creation of Central Bank Digital Currencies was surprisingly accelerated by the pandemic in some jurisdictions, such as United States and China. Millions of U.S. taxpayers have waited for weeks for promised stimulus payments of up to \$1,200 per person as a result of one of the measures taken to help people to navigate the COVID-19 crisis. While some received direct deposits in mid-April, those without bank accounts or a bank account on file with the Internal Revenue Service, who have not received a tax refund in recent years or who are married to an immigrant are still expecting that a check will arrive.

⁵⁶ See CBOT, *Covid-19 and Rise of Conversational Banking* (2020), available at: <https://www.cbot.ai/covid-19-and-conversational-banking/> (Last Visit: 20 July 2020)

Supporters of digital dollars and central bank digital currencies say a digitized monetary system could solve the logistical question of how to quickly disburse large sums to many individuals with varying access to banking services.⁵⁷

The Bank of China has recently completed the basic function development of a digital Yuan and it has moved one step closer to launch its CBDC during a middle of global recession. A number of Shenzhen-based private companies including Alibaba, Tencent, Huawei and China Merchants Bank have participated in the development of the digital currency. As central banks around the world are cutting interest rates to zero and taking aggressive action against the economic recession due to the coronavirus pandemic, China's central bank is accelerating its central bank digital currency plan and for some, turning these challenging times into an opportunity given that the digital asset is seen as the most convenient tool to translate a central bank's zero and negative interest rate policy into commercial banks.⁵⁸

According to the Bank for International Settlements (BIS), irrespective of whether health concerns are justified or not, perceptions that cash could spread pathogens may change payment behaviour by users and firms.⁵⁹ In any case, and regardless of the motive behind it, digital payments are trending in the pandemic. However, the BIS raised some concerns about the distributional consequences of any move away from cash. If cash is not generally accepted as a means of payment, this could open a 'payments divide' between those with access to digital payments and those without. This in turn could have an especially severe impact on unbanked and non-digital consumers (generally the most vulnerable: with no access to digital infrastructure and elderly). Thus, resilient and accessible central bank operated payment infrastructures could quickly become more prominent, including retail central bank digital currencies.⁶⁰

⁵⁷ See Meena Thiruvengadam, *How the COVID-19 Crisis Revived the Digital Dollar Debate*, COINBASE (8 May 2020), available at: <https://www.coindesk.com/coronavirus-what-is-digital-dollar-cbdc-explainer>

⁵⁸ See Ting Peng, *Turning a Crisis Into an Opportunity, China Gets One Step Closer to CBDC*, COINTELEGRAPH, available at: <https://cointelegraph.com/news/turning-a-crisis-into-an-opportunity-china-getting-one-step-closer-to-cbdc>

⁵⁹ See Raphael Auer, Giulio Cornelli and Jon Frost, *Covid-19, cash, and the future of Payments*, BANK FOR INTERNATIONAL SETTLEMENTS BULLETIN NO. 3 (2020), available at: <https://www.bis.org/publ/bisbull03.pdf>

⁶⁰ *Ibid.*

3. The Challenging, yet promising, future of data-driven finance in a post-pandemic world

3.1. An inclusive recovery through data analytics and artificial intelligence

Policymakers must promote an inclusive recovery, one that benefits all segments of society. governments around the world have deployed extraordinary policy measures to save lives and protect livelihoods. These include extra efforts to protect the poor, with many countries stepping up food aid and targeted cash transfers. Globally, fiscal actions so far amount to about \$10 trillion.⁶¹

But given the severity of the crisis, significant further efforts are essential. This includes taking the measures needed to avoid a scarring of the economy, including from job losses and higher inequality. It is clear that increasing access to opportunities is now more critical than ever if we are to avoid persistent increases in inequality.

The data-driven finance, if adequately deployed, can contribute to this inclusive recovery. A key priority must be to broaden the access of low-income households and small businesses to financial products. However, reaching the most vulnerable can be challenging in developing economies, where nearly 70 percent of employment is informal.⁶² But this is where data-driven finance might help.

Traditional lending has not solved the problem of lack of access to credit for SMEs and does not fit with the reality of today's SMEs. In Nigeria, for example, fewer than 7% of SMEs have ever taken out a formal loan, and SME loan requests under \$50,000 are rarely approved.⁶³ The traditional lending model is based on financial systems in which lenders

⁶¹ See Kristalina Georgieva, *The Global Economic Reset—Promoting a More Inclusive Recovery*, INTERNATIONAL MONETARY FUND BLOG (11 June 2020), available at: <https://blogs.imf.org/2020/06/11/the-global-economic-reset-promoting-a-more-inclusive-recovery/>

⁶² *Ibid.*

⁶³ See Tunde Kehinde & Ercin Eksin, *How fintech can help SMEs recover from the impact of COVID-19*, WORLD ECONOMIC FORUM (12 May 2020), available at: <https://www.weforum.org/agenda/2020/05/fintech-can-help-smes-recover-covid-19/>

have access to a host of positive and negative data on a credit report – and although the situation is improving, credit scoring is hard to find for some markets and potential debtors. Even if an SME can produce audited financial statements, tax returns and five-year projections, the chance of a traditional loan in some jurisdictions remains low.⁶⁴

As we mentioned, COVID-19 affected SMEs around the world and governments, financial institutions and fintech, are joining efforts help in this situation. Enhancing credit risk management through data initiatives will be crucial in the post-pandemic. In the post-pandemic, the lending ecosystem will have to work towards 4 goals that might help enhance credit risk management effectively.

First, building a dynamic credit decisioning framework and credit scores that incorporate the potential impact of the pandemic is key. The traditional credit scoring may need to be remodelled to take into account the potential impacts of pandemic and to include additional information about those potential lenders that are not yet included in traditional databases, for example by using alternative data. This approach will help artificial intelligence and machine learning to score more adequately the credit risks of borrowers.

Second, banks and digital lenders will have to deal with the fact that the crisis will dramatically increase non-performing loans, although with temporary relief from strict regulations and with massive liquidity help from central banks. Restructuring in the sector will accelerate. An open question is whether surviving incumbents will move ahead or if powerful new players - such as Big Tech - will enter the sector with force, transforming the incumbents.

Third, a targeted approach in redesigning loan terms or products for existing borrowers. The potential impact of the pandemic would not only be different among sectors but even among borrowers within sectors. In redesigning the terms for existing borrowers, the intervention can be targeted to individual accounts by considering borrower-specific characteristics and circumstances such as age, employment status, industry employed in, credit history, COVID-19 cases in their province/city, among others. A similar approach

⁶⁴ *Ibid.*

can be done to corporate clients. For example, a borrower owning a restaurant is different than a borrower that is a bank. Even borrowers in the same sector might differ a lot considering factors such as the location of the business. Machine learning models used for clustering debtors may enable this targeted approach in redesigning terms.

However, it is important to address the potential challenges that this theoretical benefits of enhancing credit risk management effectively through data analytics and artificial intelligence represent. The use of Artificial Intelligence and Machine Learning for credit scoring and credit risk management comes with critical challenges associated with fairness and discrimination in credit lending practices that regulators need to rapidly address. These policy conversations are much needed for the post-pandemic, especially taking into consideration that outside of the technology sector, the financial services industry is the biggest spender on Artificial Intelligence services and is experiencing very fast growth. This trend has not changed with the COVID-19 crisis.⁶⁵

Up to date, we are starting to witness the first cases of discrimination and unfair lending practices that can even not only affect borrowers directly, but can also create negative externality and even compromise the stability of the financial system. For instance, the Australian Securities and Investments Commission decided in July 2020 that it will not appeal the dismissal of its case against a fintech called Westpac. Instead, it will review its existing guidance on responsible lending and recommend legislative reforms. Westpac was charged in 2017 for having improperly assessed whether loans were suitable for customers (between 2011 and 2015). The Federal Court ruled that Westpac's use of the Household Expenditure Measure benchmark was compliant with responsible lending laws, despite it representing a low-end estimate of the spending habits of Australian families.⁶⁶ This could be a good opportunity for Australian regulators to review how they

⁶⁵ See Bonnie G. Buchanan, *Artificial intelligence in finance*, THE ALAN TURING INSTITUTE (2019), available at: https://www.turing.ac.uk/sites/default/files/2019-04/artificial_intelligence_in_finance_-_turing_report_0.pdf

⁶⁶ See Australian Securities and Investments Commission, 20-166MR ASIC will not appeal Federal Court decision on Westpac's 'responsible lending' obligations (22 July 2020), available at: <https://asic.gov.au/about-asic/news-centre/find-a-media-release/2020-releases/20-166mr-asic-will-not-appeal-federal-court-decision-on-westpac-s-responsible-lending-obligations/>

should target fair lending practices and the use of data and Artificial Intelligence in lending. It is a much needed policy discussion in all jurisdiction though.

3.2. Online lenders and digital payments vulnerability

On the one hand, online small-business lenders have become the main source of credit for many companies, especially for SMEs and highly vulnerable small businesses. However, currently online lenders are paralyzed because they cannot access funding on which their business depends. As a result, they are scaling back – just when their services are most needed.⁶⁷ An online lender is no different than a finance company that needs to borrow in the capital markets and lend that money to customers. When funding in the capital markets is unavailable or very expensive, a finance company quickly hits the wall and will not be able to provide new credit to its customers.⁶⁸ The marketplace lending business model of many online lenders only exacerbates the crisis funding problem. That means online small-business lenders need governments' help, in the short and medium-term, rescue their customers and then to play a meaningful role in any small business credit and economic recovery.⁶⁹ This is something to take into account in the post-pandemic world: recognize the different approaches that digital lending – specially provided by small lenders – needs in order to achieve the complicated balance between innovation, financial system stability and access to finance.

On the other hand, regarding payment services providers, regulators need to think about that in most jurisdictions they are not regulated under the same rules than traditional financial institutions, and accordingly, they do not have access to liquidity management support. In India, for example, service providers are incurring in additional cost related to liquidity management due to the upsurge in cash-out transactions in rural areas. Several factors have made rebalancing cash difficult. These include the sudden demand for cash, restrictions on movement and long distances to cover. The distance to bank branches that are often as far as 10-12 kilometers, and shutting down of public transport, and lack of

⁶⁷ See Todd H. Baker & Kathryn Judge, *How to Help Small Businesses Survive COVID-19*, COLUMBIA LAW AND ECONOMICS WORKING PAPER NO. 620 (2020), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3571460

⁶⁸ *Ibid.*

⁶⁹ *Ibid.*

personal transport options for agents make things even harder. Agents have even reported reducing their investment in liquidity to use the money and feed their families.⁷⁰

3.3. New-gen loan sharks?

Digital lending platforms could help a lot in the post-pandemic world. However, evidence and recent experiences in some jurisdictions such as India, Philippines, and some African countries, show that desperate times make people vulnerable. In some countries, digital lenders are characterised for doing very quick disbursement of loans.⁷¹ However, are changing high interest rates and performing practices that make people dependent on these platforms. In the post-pandemic, regulators need to diligently deter these practices. There are thousands of customers worldwide who have fallen prey to such lending platforms which are misusing data, overcharging customers and taking advantage of the digital illiteracy.⁷² If not adequately address, financial inclusion can have a dark side.

3.4. From open Banking to open data

As mentioned, COVID-19 pandemic has impacted SMEs more than the 2008 financial crisis. Open banking initiatives the use of Application Programming Interface (API) for data sharing in the post-pandemic world can be crucial to boost lending to the real economy. However, the current regulatory models that target open banking might fall short to address the post-pandemic challenges. Hence, moving the conversation from open banking to *open data* and use open APIs not only to expose data collected by banks, but also data from other data sources (contextual accounting data, supply chain data and transactional data), will facilitate sound lending decisions to help the real economy by

⁷⁰ See Nitish Narain, Abhishek Anand, Surbhi Sood & Shobhit Mishra, CICO Agents: The under-valued “first responders”, MICROSAVE CONSULTING (2020), available at: <https://www.microsave.net/2020/04/15/cico-agents-the-under-valued-first-responders/>

⁷¹ Prabhu Mallikarjunan, *How app-based lenders are harassing, sucking borrowers dry*, THE FEDERAL (11 June 2020), available at: <https://thefederal.com/the-eighth-column/how-app-based-lenders-are-harassing-sucking-borrowers-dry/>

⁷² *Ibid.*

developing new products driven by data and built around the SME's dynamic credit requirements after COVID-19.⁷³

3.5. Data challenges for regulatory agencies

As fintech transforms the financial sector, it also opens up data gaps in central bank statistics. It does so by introducing new financial products, and bringing existing services to a larger market. Data gaps are currently prevalent as (internationally comparable) information on fintech is lacking in official statistics. To understand innovation, qualitative information, information on evolving structures, and harmonised time series are needed.⁷⁴

In the post-pandemic world, central banks and financial regulators will need to close this gap and develop a comprehensive process to continuously monitor the situation and address fintech-related data issues that may arise.

3.6. The role of standard setting bodies

Fintech and, therefore, data-driven innovations in the financial sector exacerbate the difficulties of standard setting in international financial regulation.⁷⁵ Reliance on automation and artificial intelligence, novel types of big data, as well as the use of disintermediating financial supply chains, the interconnectedness with technology companies and third party services providers, complicates the balancing of different regulatory objectives.⁷⁶

⁷³ For more about the concepts of open banking and open data see See Nydia Remolina, *Open Banking: Regulatory Challenges for a New Form of Financial Intermediation in a Data-Driven World*, SMU CENTRE FOR AI & DATA GOVERNANCE RESEARCH PAPER NO. 2019/05 (2019), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3475019

⁷⁴ See IFC Working Group on Fintech Data Issues, *Towards monitoring financial innovation in central bank statistics*, IRVING FISHER COMMITTEE ON CENTRAL BANK STATISTICS (2020), available at: https://www.bis.org/ifc/publ/ifc_report_monitoring_financial_innovation.pdf

⁷⁵ See Yesha Yadav, *Fintech and International Financial Regulation*, 53 VALDERBILT JOURNAL OF TRANSNATIONAL LAW 1110 (2020)

⁷⁶ See Chris Brummer & Yesha Yadav, *Fintech and the Innovation Trilemma*, 107 GEORGETOWN LAW JOURNAL 235 (2019).

In the post-pandemic world, this challenge might be exacerbated. Innovative algorithms will introduce informational uncertainties and complex risks for market integrity. Further, regulation's ability to impose compliance costs on firms in response to these risks is limited when a preference for innovation favors smaller upstarts and non-traditional players.⁷⁷ International debate is much needed in this space in order to prevent a financial crisis derived from exacerbated risks, especially considering that in the post-pandemic data-driven finance will no longer be an innovation, but a mainstream development.

Conclusion

The COVID-19 outbreak has a growing impact on the global economy and the financial sector, which plays a critical role in mitigating the unprecedented macroeconomic and financial shock caused by the pandemic. Given the unprecedented nature of the current crisis, financial regulators and supervisors, central banks, along with governments and legislatures face challenges to maintain financial stability, preserve the well-functioning core markets, and ensure the flow of credit to the real economy. Even though the COVID-19 has slowed down our daily lives and stopped the operation of many industries, it did not have the same effect in the data-driven finance world. The digital transformation of the financial services industry and financial technologies (fintech) have contributed to face some of the challenges of the pandemic. Traditional financial institutions and fintechs are trying to leverage on data-driven solutions to respond to the challenges associated with the economic crisis derived from the pandemic. Despite the potential benefits of this transformation, the future of data-driven finance in a post-pandemic world looks challenging. An adequate balance of different regulatory objectives will be crucial for a sustainable recovery in a post-pandemic financial industry.

⁷⁷ See Yesha Yadav, *Fintech and International Financial Regulation*, 53 VALDERBILT JOURNAL OF TRANSNATIONAL LAW 1110 (2020)