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SMU Centre for AI & Data Governance Research Paper No. 2020/11

**DISRUPTIVE TECHNOLOGIES AND DIGITAL TRANSFORMATION OF THE FINANCIAL SERVICES
INDUSTRY IN SINGAPORE: REGULATORY FRAMEWORK AND CHALLENGES AHEAD**

Aurelio Gurrea-Martínez¹

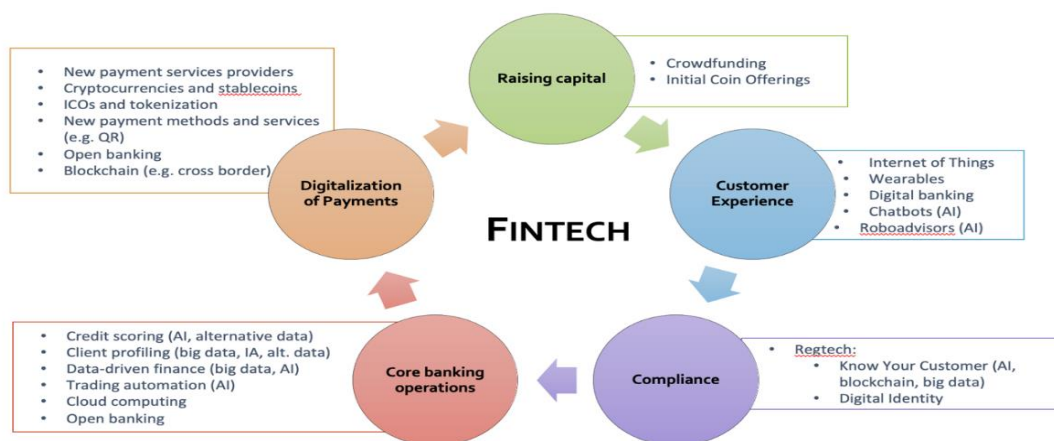
¹ Assistant Professor of Law, Singapore Management University School of Law. Email: aureliogm@smu.edu.sg This research is supported by the National Research Foundation, Singapore under its Emerging Areas Research Projects (EARP) Funding Initiative. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not reflect the views of National Research Foundation, Singapore. This paper is the preliminary version of a book chapter on financial regulation prepared for a volume on law and technology in Singapore edited by Justice Andrew Phang (Supreme Court of Singapore), Professor Goh Yinan (Singapore Management University) and Professor Simon Chesterman (National University of Singapore). For valuable comments and discussions, I would like to express my sincere gratitude to Nydia Remolina. All errors are mine.

1. Introduction

The rise of new technologies is transforming the financial services industry. Along with the traditional actors existing in the financial sector (e.g., banks, financial advisers, investment funds, etc), new participants have appeared in recent years, including large tech companies and small start-ups heavily relying on technology to provide new financial services.² Moreover, disruptive technologies accompanied by the massive use of data are changing the operation, supervision and challenges of the financial industry.³

As shown in Table 1, the use of emerging technologies in the financial sector, generally referred to as “Fintech”, has transformed the financial services industry. Among other aspects, the rise of new technologies: (i) has provided new fundraising methods for individuals and firms; (ii) has led to new forms of payments; and (iii) has helped financial institutions improve their existing processes and services, as well as their understanding of financial consumers.⁴

Table 1. Fintech ecosystem



Source: Aurelio Gurrea-Martinez and Nydia Remolina, ‘Global Challenges and Regulatory Responses to Fintech’ 36 Banking and Finance Law Review 39 (2020)

Due to a variety of factors, including an attractive regulatory framework, the existence of a sophisticated and proactive regulator, a strong financial industry, and a close collaboration between regulators and innovators, Singapore has managed to become a

² Big tech companies providing financial services are often referred to as ‘TechFins’. Start-ups heavily relying on technology to provide financial services are generally known as ‘Fintech firms’. For an analysis of these new actors of the financial sector, see Dirk A. Zetsche, Ross P. Buckley, Douglas W. Arner, and Janos Nathan Barberis, ‘From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance’ (2017), European Banking Institute Working Paper Series 2017/6, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2959925> accessed on 28 November 2020.

³ Aurelio Gurrea-Martinez and Nydia Remolina, ‘Global Challenges and Regulatory Responses to Fintech’ (2020), 36 Banking and Finance Law Review 39, pp. 40-46.

⁴ Ibid

leading fintech hub.⁵ In the first half of 2020, there was an investment of S\$462 in Singapore-based financial technology firms.⁶ In 2019, over 60,000 people from 140 countries visited Singapore to attend the world's largest fintech event – the Singapore Fintech Festival.⁷ The same year, the Monetary Authority of Singapore (“MAS”) and the Bank for International Settlements (“BIS”) launched the BIS’s Innovation Hub Centre in Singapore.⁸ Finally, it is important to note that the development of the fintech industry is part of Singapore’s Smart Nation Initiative.⁹ Therefore, even though the rise of fintech is a global phenomenon, it has been particularly relevant in Singapore. The following sections seek to explore the disruptive technologies reshaping the financial services industry in Singapore as well as the legal responses provided or potentially provided to address the new risks and challenges generated by these technologies.

2. Disruptive technologies reshaping the financial services industry in Singapore

Despite the fact that the term “fintech” became popular in recent years, the financial services industry has always heavily relied on technology.¹⁰ For instance, the appearance of ATMs in 1970 was considered one of the most important technological inventions in the financial sector.¹¹ In 1986, the London Stock Exchange went from conducting face-to-face negotiations between brokers to implementing transactions via computers thanks to the internet.¹² After the 2008 financial crisis, the use of internet-enabled platforms contributed to the development of new fundraising methods such as crowdfunding.¹³ Finally, the rise of mobile payments and online banking would not have been possible without the increasing use of smartphones and the internet.¹⁴ In the past

⁵ For a ranking of the world's leading fintech hubs, see Global FinTech Rankings, <<https://innovation.thomsonreuters.com/en/labs/portfolio/global-fintech-rankings.html/>> accessed on 29 November 2020.

⁶ See Annabeth Leow, ‘Singapore fintech sector bags S\$462m in funding in H1 2020’ (2020) Business Times <<https://www.businesstimes.com.sg/banking-finance/singapore-fintech-sector-bags-s462m-in-funding-in-h1-2020>> accessed on 30 December. Showing some data about the evolution of the fintech industry in Singapore in previous years, see Lin Lin, ‘Regulating FinTech: The Case of Singapore’ (2019) 35 Banking and Finance Law Review 94. In 2020, it should be noted that Singapore, as the rest of the world, was hit by the COVID-19 pandemic. For an analysis of the impact of COVID-19 on the fintech industry, see Nydia Remolina ‘Towards a Data-Driven Financial System: The Impact of COVID-19’ (2020) SMU Centre for AI & Data Governance Research Paper No. 08 <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3660874> accessed on 1 December 2020.

⁷ Monetary Authority of Singapore <www.mas.gov.sg/news/media-releases/2019/sff-x-switch> accessed on 29 November 2020.

⁸ Bank for International Settlements <<https://www.bis.org/press/p191113.htm>> accessed on 30 November 2020.

⁹ Singapore, Smart Nation and Digital Government Office, Smart Nation: The Way Forward (2018) <https://www.smartnation.sg/docs/default-source/default-document-library/smart-nation-strategy_nov2018.pdf> accessed on 1 December 2020.

¹⁰ Gurrea-Martinez and Remolina (n 3) p. 41-46.

¹¹ Ibid. See also Paul Volcker, “The only thing useful banks have invented in 20 years is the ATM”, New York Post (13 December 2009) <www.nypost.com/2009/12/13/the-onlything-useful-banks-have-invented-in-20-years-is-the-atm/>.

¹² Gurrea-Martinez (n 3) 43

¹³ Robert J. Shiller, ‘Capitalism and Financial Innovation’ (2018) 69 Financial Analysts Journal 1, pp. 21-25.

¹⁴ Committee on Payments and Market Infrastructures & World Bank Group, Payment aspects of financial inclusion in the fintech era (2020) <<https://www.bis.org/cpmi/publ/d191.pdf>>

years, however, new disruptive technologies are accelerating the transformation of the financial services industry.

2.1. *Distributed ledger technology*

The financial services industry has developed various use cases of distributed ledger technologies (DLT). On the one hand, by providing the technological infrastructure for cryptocurrencies, DLTs have facilitated new forms of payments. On the other hand, the use of DLTs has contributed to create new fundraising methods such as Initial Coin Offerings (ICO). Therefore, by facilitating individuals' and firms' access to finance and the development of the infrastructure for payments, DLTs are contributing to some of the primary functions that the financial system is meant to perform in the real economy.¹⁵

Cryptocurrencies can be broadly understood as a type of digital assets that can perform several functions including serving as: (i) medium of exchange; and/or (ii) unit of account; and/or store of value.¹⁶ However, cryptocurrencies do not generally have a legal tender status.¹⁷ From a private law perspective, most of the discussion on cryptocurrencies focuses on whether they are considered property. So far, most countries seem to be in favour of this position.¹⁸ Despite the importance of this discussion for a variety of areas,

¹⁵ John Armour et al, *Principles of Financial Regulation* (Oxford University Press, 2016) pp. 22-27.

¹⁶ For an analysis on the features and economic functions of cryptocurrencies, see Bank of England, 'The economics of digital currencies' (2014), Quarterly Bulletin Q3 pp. 276-286 <<https://www.bankofengland.co.uk/-/media/boe/files/digital-currencies/the-economics-of-digital-currencies>> accessed 29 November 2020; BIS, 'Cryptocurrencies: looking beyond the hype' (2018) BIS Annual Economic Report (17 June 2018) <<https://www.bis.org/publ/arpdf/ar2018e5.htm>> accessed on 29 November 2020.

¹⁷ BIS, 'Central Bank Digital Currencies' (2018) <<https://www.bis.org/cpmi/publ/d174.pdf>> accessed on 1 December 2020.

¹⁸ In Singapore, see *B2C2 Ltd v Quoine Pte Ltd [2019] SGHC*. In this case, it was argued that cryptocurrencies have the fundamental characteristic of intangible property as being an identifiable thing of value. Also, the court was satisfied that cryptocurrencies met all the requirements of the classic definition of a property right set down by the House of Lords in *National Provincial Bank v Ainsworth*: "definable, identifiable by third parties, capable in its nature of assumption by third parties, and having some degree of permanence or stability." However, the court did not consider the precise nature of the property right (as that point was not in dispute), although it noted that it was the subject of academic debate. In New Zealand, see *Ruscoe v Cryptopia Ltd (in Liquidation) [2020] NZHC 728*. In this case, the New Zealand High Court held that cryptocurrencies are a form of property that are capable of being held on trust. The decision addresses the difference between "pure information", on the one hand, and "digital assets", on the other, in terms of characterisation as property (this is an issue of significance in areas going beyond the realm of cryptocurrencies and DDLT – for example, in relation to ownership of machine-generated data created by Artificial Intelligence and the Internet of Things). In the United Kingdom, the UK Jurisdiction Taskforce of the LawTech Delivery Panel, led by the Chancellor of the English High Court, Sir Geoffrey Vos, understood that cryptocurrencies are property. Still, there are some countries more reluctant to recognize cryptocurrencies as property. For example, a Japanese court held that Bitcoin is not an object of ownership. However, there was no judicial discussion of whether, if it were possible for bitcoin to be the object of ownership, the customers had a proprietary claim to the bitcoin or merely a personal claim against the exchange. See Tokyo District Court, 5 August 2015, 2015WLJPCA08058001, LEX/DB25541521. In the academic literature, see Kelvin Low and Ernie Teo, 'Bitcoins and Other Cryptocurrencies as Property' (2017) 9 *Law, Innovation and Technology* 235; Paul T. Babie, David Brown, Ryan Catterwell, Mark Giancaspro, 'Cryptocurrencies as Property: Ruscoe and Moore v Cryptopia Limited (In Liquidation) [2020] NZHC 728' (2020) University of Adelaide Law Research Paper No. 2020-33 <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3578264> accessed on 2 December 2020; Hin Liu, Henry Chong and Louise Gullifer, 'Client-Intermediary Relations in the Crypto-Asset World' (2020) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3697946> accessed on 2 December 2020.

including tax law, property law, insolvency law and trust law,¹⁹ since this paper focuses on financial regulation, the legal analysis of cryptocurrencies will be focused on whether they qualify as ‘capital market products’ and ‘digital payment tokens’. If so, they will be subject to the Securities and Futures Act or the Payment Services Act, respectively.²⁰

Bitcoin was the first cryptocurrency widely operating in the market. This cryptocurrency was launched in 2008 by ‘Satoshi Nakamoto’ –a pseudonym used by the person or group of people behind Bitcoin. The rise of Bitcoin was associated with the disappointment of many people with the financial services industry after the 2008 financial crisis.²¹ Thus, by using a form of DLT fully decentralized such as blockchain,²² and particularly a public blockchain, people could exchange Bitcoins without using any types of intermediaries. In other words, Satoshi Nakamoto proposed a system for electronic transactions without relying on trust.²³ For that purpose, users just need to have both Bitcoins in an electronic wallet, and a counterparty willing to accept such Bitcoins as a means of payment. If so, the Bitcoin can travel from one wallet to another after a third party (“miners”) creates a block with a certain number of transactions.²⁴ The miners are responsible for linking the blocks to each other in a chronological order, with every block containing the hash of the previous block to create a blockchain.²⁵ Thus, the blockchain structure contains a registry of all transactions.²⁶

The popularity gained by Bitcoin led to the creation of many other cryptocurrencies. These other cryptocurrencies are often referred to as *altcoins*, and they include the rest of cryptocurrencies existing in the market, including Ether, Litecoin, Bitcoin Cash, and XRP, among others.²⁷

Since Bitcoin and other cryptocurrencies are highly volatile, there was a followed generation of cryptocurrencies known as *stablecoins*. The primary difference between stablecoins and the first generation of cryptocurrencies is that the former provides a stable value relative to another asset (typically a unit of currency or commodity) or a

¹⁹ For an overview of the legal implications of cryptocurrencies and other emerging technologies from the perspective of several areas of law, see Andrew Phang, Simon Chesterman and Yihan Goh (ed), *Law and Technology in Singapore* (Academic Publishing, Forthcoming, 2021).

²⁰ This legal analysis will be conducted in section 3.

²¹ Gurrea-Martinez and Remolina (n 3) pp. 40.

²² Some authors have challenged this theoretical feature of blockchain. See Nouriel Roubini, Testimony for the Hearing of the US Senate Committee on Banking, Housing and Community Affairs On “Exploring the Cryptocurrency and Blockchain Ecosystem” (2018) <<https://www.banking.senate.gov/download/roubini-testimony-10-11-18>> accessed on 29 November 2020. See also Angela Walch, ‘Deconstructing ‘Decentralization’: Exploring the Core Claim of Crypto Systems’, in Chris Brummer (ed), *Cryptoassets: Legal, Regulatory and Monetary Perspectives* (OUP, 2019) pp. 39-68.

²³ Satoshi Nakamoto, ‘Bitcoin: A Peer-to-Peer Electronic Cash System’ (2008) <<https://bitcoin.org/bitcoin.pdf>>

²⁴ That number changes depending in the protocol of each blockchain. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction* (Princeton University Press, 2016) pp. 41.

²⁵ Fran Casino, Thomas K.Dasaklis & Constantinos Patsakisa, ‘A systematic literature review of blockchain-based applications: Current status, classification and open issues’ (2019), 36 *Telematics and Informatics*, pp. 55-81.

²⁶ Michael Crosby, Pradan Pattanayak, Sanjeev Verma, Vignesh Kalyanaraman, ‘Blockchain technology: beyond bitcoin’ (2016), 2 *Applied Innovation Review* 6, pp. 6-10 <<http://scet.berkeley.edu/wp-content/uploads/AIR-2016-Blockchain.pdf>> accessed on 2 December 2020.

²⁷ As of November 2020, there are more than 2,600 cryptocurrencies worldwide. See coinmarketcap.com/all/views/all/ accessed on 30 November 2020.

basket of assets.²⁸ Therefore, it addresses the volatility problem found in other cryptocurrencies.²⁹ One of the most popular stablecoins has been Libra (recently renamed “Diem”), the cryptocurrency launched by a consortium co-founded by Facebook.³⁰ Apart from the lower volatility associated with stablecoins, Diem is also differs from other cryptocurrencies in other operational aspects. For instance, instead of using a decentralised DLT such as blockchain,³¹ Diem’s network will be managed by the founding members and uses a permissioned system that incorporates a due diligence of members and validators.³² Also, there is an identified promotor and wallet provider (Facebook, through Novi and its social media platforms) and issuer (the Diem Association) behind this particular stablecoin.³³

Probably as a response to the challenges that Diem may bring to the global financial system, many countries around the world started to explore the idea of launching their own digital currency. This situation led to the rise of *central bank digital currencies* (CBDC), a type of cryptocurrency generally providing the benefits associated with stablecoins (e.g., low volatile and use of DLT) although with the particular feature that it is backed by a country’s central bank.³⁴ Therefore, unlike general cryptocurrencies, CBDCs would consist of actual fiat currency.

Finally, DLTs have also provided the technological infrastructure needed for a new fundraising method such as *Initial Coin Offerings*. Through an ICO, an individual or entity issues some types of digital assets (“digital tokens”) receiving cryptocurrencies generally accepted by the public in exchange.³⁵ Then, these cryptocurrencies can be used, or converted into cash, to pursue the investment projects potentially desired by the issuer.³⁶ The digital tokens issued in an ICO generally represent some rights over the issuer or

²⁸ Financial Stability Board, ‘Regulatory issues of stablecoins’ (18 October 2019) <<https://www.fsb.org/wp-content/uploads/P181019.pdf>> accessed on 28 November 2020.

²⁹ Douglas Arner, Raphael Auer and Jon Frost, ‘Stablecoins: risks, potential and regulation’ (2020), BIS Working Papers No 905 <<https://www.bis.org/publ/work905.pdf>> accessed on 1 December 2020.

³⁰ The whitepaper of Libra was published by Facebook on 18 June 2019. For an analysis of the regulatory challenges of Libra, see Dirk A. Zetsche, Ross P. Buckley, and Douglas W. Arner, ‘Regulating Libra: The Transformative Potential of Facebook’s Cryptocurrency and Possible Regulatory Responses’ (2019), European Banking Institute Working Paper Series 2019/44, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3414401> accessed on 29 November 2020. On 1 December 2020, the Libra Association was renamed to Diem Association, and the cryptocurrency launched by this consortium is no longer “Libra” but “Diem”. See <https://www.diem.com/en-us/white-paper/#cover-letter>

³¹ Some authors have challenged this theoretical feature of blockchain. See *supra* note 22.

³² See *supra* note 30.

³³ *Ibid*

³⁴ For an overview of the primary features of CBDC, see Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors of the Federal Reserve and Bank for International Settlement, ‘Central bank digital currencies: foundational principles and core features’ (2020) <<https://www.bis.org/publ/othp33.htm>> accessed on 29 November 2020. For an analysis of their legal, regulatory and monetary aspects, see Bank for International Settlements, Central Bank Digital Currencies (March 2018) <<https://www.bis.org/cpmi/publ/d174.pdf>> accessed on 29 November 2020. See also Wouter Bossu, Masaru Itatani, Catalina Margulis, Arthur D. P. Rossi, Hans Weenink, and Akihiro Yoshinaga, ‘Legal Aspects of Central Bank Digital Currency: Central Bank and Monetary Law Considerations’ (2020) IMF Working Paper 2020/254, <<https://www.imf.org/en/Publications/WP/Issues/2020/11/20/Legal-Aspects-of-Central-Bank-Digital-Currency-Central-Bank-and-Monetary-Law-Considerations-49827>> accessed on 29 November 2020.

³⁵ Aurelio Gurrea-Martinez and Nydia Remolina, ‘The Law and Finance of Initial Coin Offerings’, in Chris Brummer (ed), *Cryptoassets: Legal, Regulatory, and Monetary Perspectives* (Oxford University Press, 2019) pp. 117-156.

³⁶ *Ibid*.

the issuer's assets, including cash-flow rights or a right to have access to a future product or technology developed by the promoter.³⁷ From the perspective of the functionality of the tokens, these digital assets can be classified into asset tokens, utility tokens, payment tokens and hybrid tokens.³⁸ A *payment token* is generally defined as being synonymous with cryptocurrencies.³⁹ Therefore, these tokens are only used as a means of payment. A *utility token* refers to the type of digital assets that generally provides access to a product, technology or service offered by the issuer.⁴⁰ The term *asset token* is used for those tokens representing assets enabling tokenholders to be part of the company or to enjoy any types of dividends or interest generated by the company's assets.⁴¹ Finally, a *hybrid token* exists when it has elements of the other types of tokens.⁴²

The issuance of digital tokens through ICOs allows individuals and firms to have access to financial resources that might not be obtained through other fundraising methods such as venture capital, capital markets and the banking sector, especially if the entrepreneur is a small firm without any type of reputation, connections and assets potentially offered as a collateral. Therefore, by allowing the issuance of digital assets that can serve as a fundraising method for firms, the rise of DLT is also contributing to the primary functions performed by the financial system, especially in terms of facilitating the transfer of resources that can ultimately generate jobs, wealth and growth.⁴³

2.2. Artificial Intelligence

The use of artificial intelligence (AI) is disrupting many industries, and the financial sector is not an exception. Indeed, AI and particularly some subcategories of AI such as machine learning (ML) and deep learning (DP), is being used to provide different financial services. For example, banks are starting to use AI to assess the creditworthiness of their clients through a statistical analysis known as *credit scoring*. Thus, the bank is able to know if, based on a variety of factors included in the algorithm making this assessment, a particular client is eligible for a loan and, if so, under which conditions. Similarly, banks and other actors in the financial sector are using AI to provide *financial advice* ("robo-advice") to clients potentially interested in investing in capital markets.⁴⁴ This advice is also provided using an algorithm that takes into account a variety of factors, including

³⁷ Ibid.

³⁸ It should be noted, however, that the Monetary Authority of Singapore has not established a formal classification of tokens based on their functionality. Instead, the classifications of tokens suggested by MAS is exclusively based on whether they meet the definition of capital markets products or not. In any case, since the functional classification is generally used in the industry and it is very useful for the understanding of the different tokens existing in the market, this paper will also provide a classification of tokens based on their functionality. For that purpose, it will adopt the classification established by the Swiss Financial Market Regulator (FINMA), since it is a classification that captures reasonably well all the types of tokens existing in the market. See FINMA, 'FINMA publishes ICO guidelines' (Press Release, 16 February 2018) <<https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/>> accessed on 29 November 2020.

³⁹ FINMA, 'FINMA publishes ICO guidelines' (Press Release, 16 February 2018) <<https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/>> accessed on 29 November 2020.

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Ibid.

⁴³ Ross Levine, 'Financial Development and Economic Growth: Views and Agenda' (1997) 35 Journal of Economic Literature 688.

⁴⁴ Ibid

the preferences and level of risk desired by a particular investor. Additionally, financial institutions are using AI to facilitate compliance with the existing regulatory framework. Therefore, AI is becoming an important tool to promote the use of technologies for regulatory compliance (“RegTech”). As a result of these use cases, the rise of AI in the financial services industry is reducing significant costs for financial firms, what it can be translated into more affordable financial services. Moreover, in countries where many individuals are unbanked and it people and firms face trouble having access to finance, as it generally occurs in emerging economies, AI can also become a powerful allied to promote financial inclusion.

Finally, financial authorities are also relying on new technologies to facilitate the supervision of financial markets (“SupTech”).⁴⁵ One of the technologies that it is currently used for financial supervision is AI. For instance, regulators are starting to use AI to conduct stress testing – that is, a test seeking to analyse how banks and other financial institutions would be affected under adverse scenarios.⁴⁶ Likewise, financial regulators are using ML to predict market misconduct such as insider trading and market manipulation.⁴⁷ Hence, the rise of SupTech will lead to a better supervision and enforcement in financial markets, facilitating market integrity and the building of trust needed to make the financial system a more powerful vehicle to foster growth.

2.3. Cloud computing

Many companies and individuals are starting to use cloud computing to store their data and to demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or interaction from the service provider.⁴⁸ In the financial industry, the use of cloud services by financial institutions can create several benefits such as cost reduction,⁴⁹ flexibility,⁵⁰ scalability,⁵¹ and security.⁵² Since this new technology reduces operating costs for traditional financial institutions, and it also reduces barriers to entry to fintech firms,⁵³ cloud computing can facilitate

⁴⁵ Gurrea-Martinez and Remolina (n 3) p. 72.

⁴⁶ Bank of England, ‘Stress Testing’ <<https://www.bankofengland.co.uk/stress-testing>> accessed on 1 December 2020.

⁴⁷ Dirk Broeders and Jermy Prenio, ‘Innovative technology in financial supervision (suptech): The experience of early users’ (2018), FSI Insights on policy implementation No 9 <<https://www.bis.org/fsi/publ/insights9.pdf>> accessed on 1 December 2020.

⁴⁸ For a definition of cloud computing, see also Peter Mell and Timothy Grance, ‘The NIST Definition of Cloud Computing NIST’ (2011) Special Publication 800-145, <<https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>> accessed on 1 December 2020.

⁴⁹ For example, cloud computing reduces the initial capital expenditure investment required for traditional IT infrastructure. See KPMG, ‘Cloud Economics: Making the Business Case for Cloud: An Economic Framework for Decision Making’ (2014) <<https://assets.kpmg/content/dam/kpmg/pdf/2015/11/cloud-economics.pdf>> accessed on 1 December 2020.

⁵⁰ Broeders and Prenio (n 47)

⁵¹ Ibid

⁵² Most security analysis suggests that mainstream cloud computing is more secure than on-premises IT. See David Mitchell Smith (ed), ‘Cloud Strategy Leadership’ (2017) <https://www.gartner.com/imagesrv/books/cloud/cloud_strategy_leadership.pdf> accessed on 1 December 2020.

⁵³ Broeders and Prenio (n 47)

competition and more affordable financial services, also leading to higher levels of financial inclusion.

2.4. *Application programme interfaces*

The rise of a data-driven economy has facilitated the appearance of new services potentially offered by financial institutions. The use of Application Programming Interfaces (APIs) has enabled third parties to build applications and services using the data and/or infrastructure that financial institutions store and control.⁵⁴ While this business model is not unique of the financial services industry – in fact, it is also used by many tech companies such as Amazon and Facebook– it has become very popular in the financial sector. This phenomenon, generally known as ‘open banking’, represents a new form of interaction between financial institutions and third party service providers that is changing the way traditional products, services and customer experience traditionally work in the financial sector.⁵⁵ Therefore, it can promote competition in the financial services industry, in addition to providing consumers with more products and services.

3. Current regulatory framework

3.1. *Introduction*

Financial regulation seeks to reduce a variety of market failures, including: (i) asymmetries of information between financial institutions/issuers and consumers/investors; (ii) the existence of a situation of market power by certain actors (especially large financial institutions); and (iii) the negative externalities potentially created by the operation and failure of financial institutions (particularly in terms of systemic risk).⁵⁶ By reducing these market failures, financial regulation has the ability to protect consumers and investors, reduce financial crime and promote competition, market integrity, and the stability of the financial system.⁵⁷ More importantly, it can enhance confidence in financial markets, facilitating the channelling of resources from savers to borrowers and therefore making the financial system a more powerful tool to promote economic growth.⁵⁸

In some countries, these goals of financial regulation are pursued by different regulatory authorities. In Singapore, the regulation and supervision of financial markets relies on a single financial market authority: the Monetary Authority of Singapore (“MAS”). Namely, MAS has the mission to develop a sound and progressive financial sector.⁵⁹ For that

⁵⁴ Nydia Remolina, ‘Open Banking: Regulatory Challenges for a New Form of Financial Intermediation in a Data-Driven World’ (2019) SMU Centre for AI & Data Governance Research Paper No. 2019/05 <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3475019> accessed on 30 November 2020.

⁵⁵ *Ibid*

⁵⁶ Armour et al (n 15) pp. 55-61.

⁵⁷ *Ibid* pp. 61-72.

⁵⁸ Levine (n 37).

⁵⁹ In addition to being Singapore’s single financial market regulator, MAS is also a central bank. Therefore, it performs a variety of functions that includes both financial regulation and monetary policy. See MAS, ‘Objectives and Principles of Financial Supervision in Singapore’ (2015) <<https://www.mas.gov.sg/-/media/MAS/News%20and%20Publications/Monographs%20and%20Informati>

purpose, MAS has the mandate to promote: (i) a stable financial system; (ii) safe and sound intermediaries; (iii) a safe and efficient infrastructure; (iv) fair, efficient and transparent markets; (v) transparent and fair-dealing intermediaries and offerors; and (vi) well-informed and empowered consumers.⁶⁰

The rise of new technologies has generated new risks and challenges for financial regulators. For example, cryptocurrencies can be used for illegal activities associated with money laundering, tax evasion, and financing of terrorism. Additionally, as they can serve as a means of payment, cryptocurrencies also raise several concerns from the perspective of consumer protection. The issuance of digital tokens for fundraising can also harm consumers and investors, especially taking into account that 80% of ICOs are scams.⁶¹ The rise of open banking raises some concerns for consumers. The increasing use of AI for credit scoring and robo-advice has also led to new challenges, including ethical and discrimination issues. Finally, a failure of the cloud increasingly used by financial institutions may hamper the ability of banks to provide financial services. Therefore, this situation may lead to a lack of confidence that can ultimately jeopardize the stability of the financial system. Hence, these new risks have led to a variety of changes in the regulatory framework of financial markets in Singapore.

3.2. *Regulatory framework of cryptocurrencies and digital tokens in Singapore*

From the perspective of financial regulation, the rise of cryptocurrencies has led to several challenges and regulatory responses. First, cryptocurrencies are often used as a means of payments. Since providing an efficient and reliable infrastructure of payments is one of the primary functions of the financial system,⁶² MAS decided to regulate cryptocurrencies serving as a means of payments (“digital payment tokens”) under the Payment Services Act 2019 (PSA). For the purpose of the PSA, a Digital Payment Token (“DPT”) means any digital representation of value (other than an excluded digital representation of value) that: (a) is expressed as a unit; (b) is not denominated in any currency, and is not pegged by its issuer to any currency; (c) is, or is intended to be, a medium of exchange accepted by the public, or a section of the public, as payment for goods or services or for the discharge of a debt; (d) can be transferred, stored or traded electronically; and (e) satisfies such other characteristics as the Authority may prescribe.⁶³ A person carrying on a business related to any of the payment services provided under the PSA needs to get a license.⁶⁴ Namely, among the three licenses provided by the PSA (money-changing licence, standard payment institution licence, and major payment institution licence)⁶⁵, actors facilitating the purchase, sale or exchange of DPTs should apply for a standard payment institution license unless they exceed the

on%20Papers/Objectives%20and%20Principles%20of%20Financial%20Supervision%20in%20Singapore.pdf> accessed on 29 November 2020.

⁶⁰ Ibid

⁶¹ See Ana Alexandre, ‘New Study Says 80 Percent of ICOs Conducted in 2017 Were Scams’ *Cointelegraph* (Web Page, 13 July 2018) <<https://cointelegraph.com/news/new-study-says-80-percent-of-icos-conducted-in-2017-were-scams>> accessed on 29 November 2020.

⁶² Armour et al (n 15) p. 22

⁶³ See section 2 of the PSA.

⁶⁴ Other actors required to obtain a license are providing any of the following payment services established in the PSA: (i) account issuance; (ii) domestic money transfers; (iii) cross border money transfers; (iv) merchant acquisition; (iv) e-money issuance; and (v) money-changing. See section 6(4) of the PSA.

⁶⁵ Section 6(2) of the PSA.

threshold established for this type of license.⁶⁶ If so, they will be required to apply for a major payment Institution license.⁶⁷

Second, as cryptocurrencies can be used for illegal activities, including money laundering and financing of terrorism, MAS and various international organizations such as the Financial Action Task Force (“FATF”) have imposed various anti-money laundering and countering the financing of terrorism (“AML/CFT”) obligations to actors, platforms and intermediaries dealing with cryptocurrencies. Namely, these obligations are imposed to intermediaries of digital tokens involving capital markets products (“security tokens”),⁶⁸ as well as providers of DPT services.⁶⁹

Third, certain digital tokens issued by a promoter in an ICO may meet the definition of capital market products under Singapore law. These security tokens will exist in digital assets representing shares, debenture, units in business trusts, securities-based derivative contracts, and units in collective schemes.⁷⁰ If a digital token falls under any of these categories of capital markets products, as it may occur if a company issues ‘tokenized shares’ or when the promoter issues any other capital market products represented in a digital asset, the ICO will be subject to the Securities and Futures Act.⁷¹ Thus, among other implications, the issuer will be supervised by MAS and it will be required to prepare a prospectus for the issuance of tokens unless one of the exemptions provided in the SFA applies.⁷² Therefore, in a variety of offerings, including those made to a restricted group of investors (private placement), small (personal) offering, and offerings to accredited investors and institutional investors, issuers of security tokens do not need to prepare a prospectus.⁷³

Even though the Guide on Digital Token Offerings issued by MAS clarifies the treatment of ICOs, it is important to emphasise that Singapore does not have any *special* regulatory framework for ICOs.⁷⁴ If the digital token issued by the promoter meets the definition of capital market product, the ICO will be subject to the ordinary framework provided for the issuance of securities – that is, the SFA.⁷⁵ Moreover, the financial advisor and any intermediaries involved in the purchase, exchange or sale of these security tokens will be required to obtain a capital market license under the SFA.⁷⁶ If, nonetheless, the token does not meet the definition of capital market product under Singapore law, securities law will not apply. As a result, the actors involved in the issuance, trading, advice, and

⁶⁶ The thresholds, set out in section 6(5) of the PSA, are as follows: S\$3 million monthly transactions for any payment service (other than e-money account issuance and money-changing services); S\$6 million monthly transactions for two or more payment services (other than e-money account issuance and money-changing services); S\$5 million of daily outstanding e-money.

⁶⁷ Ibid

⁶⁸ MAS, ‘A Guide on Digital Token Offerings’ (2017) (Last updated May 2020) <<https://www.mas.gov.sg/regulation/explainers/a-guide-to-digital-token-offerings>> accessed on 1 December 2020.

⁶⁹ MAS, ‘Notice PSN02 Prevention of Money Laundering and Countering the Financing of Terrorism – Digital Payment Token Service’ <<https://www.mas.gov.sg/regulation/notices/psn02-aml-cft-notice---digital-payment-token-service>> accessed on 1 December 2020.

⁷⁰ See *supra* note 68.

⁷¹ Ibid

⁷² Ibid

⁷³ Ibid

⁷⁴ This is consistent with the regulatory approach adopted in most countries around the world. See Gurrea-Martinez and Remolina (n 35) pp. 132-134.

⁷⁵ See *supra* note 68.

⁷⁶ Ibid

sale of these tokens will not be subject to the SFA. If so, they will be subject to the PSA (if the digital token can be classified as DPT) and, under the new Omnibus Act for the Financial Sector, they will also be subject to a comprehensive body of AML/CFT obligations.

Fourth, stablecoins started to get more attention in the academic and policy debate after Libra (Diem) was launched.⁷⁷ Therefore, since the PSA was drafted before this particular stablecoin was launched, it is not clear whether the PSA provides an adequate response to these new cryptocurrencies. By exhibiting characteristics of money, stablecoins blur the line between two payment services established in the PSA: e-money and DPT.⁷⁸ Therefore, as they do not clearly fall into the definition of any of them, and some stablecoins may also be deemed securities, it is not clear: (i) how these cryptocurrencies would be treated under the regulatory framework existing in Singapore; and (ii) whether the existing framework properly addresses all the risks and challenges associated with stablecoins. For this reason, MAS has proposed various amendment to the PSA that, among many other aspects, seek to address this issue. These amendments are discussed in section 4.

Finally, it is worth mentioning that, as part of the Project Ubin,⁷⁹ MAS issued a digital representation of the Singapore Dollar – a central bank digital currency – and placed it on the distributed ledger for domestic inter-bank settlement.⁸⁰ At the moment, however, Singapore does not have a specific regulatory framework for CBDC. Whether a particular framework should be adopted will also be discussed in section 4.

3.3. *The regulatory framework of AI in the financial sector in Singapore*

Singapore has adopted different strategies to deal with the challenges of AI in the financial sector. First, MAS enacted a Guide on principles to promote fairness, ethics, accountability and transparency in the use of artificial intelligence in the financial sector.⁸¹ This document provides financial firms with a set of foundational principles on the responsible use of artificial intelligence and data analytics, especially in terms of fairness, ethics, accountability and transparency.⁸² Second, in the specific context of robo-advisors, the legal strategy adopted by Singapore encompasses a mix of guidelines and legislation. On the one hand, financial institutions offering robo-advice services should

⁷⁷ For an analysis of the risks, potential and regulatory challenges of stablecoins, see Arner et al (n 22).

⁷⁸ MAS, 'Consultation on the Payment Services Act 2019: Scope of E-money and Digital Payment Tokens' (2019) <https://www.mas.gov.sg/-/media/MAS/resource/publications/consult_papers/2019/Consultation-on-the-Payment-Services-Act-2019---Scope-of-E-money-and-Digital-Payment-Tokens/Consultation-on-the-Payment-Services-Act-2019---Scope-of-Emoney-and-Digital-Payment-Tokens-MAS.pdf> accessed on 29 November 2020.

⁷⁹ Project Ubin is a collaborative effort among MAS, the Singapore Exchange, ten banks, eight technology companies, and six academic institutions seeking to explore the use of Blockchain and DLT for clearing and settlement of payments and securities. The project aims to help MAS and the industry better understand the potential of this technology. The details of the project can be found at <https://www.mas.gov.sg/schemes-and-initiatives/project-ubin>

⁸⁰ Ravi Menon, 'Is the Block Chain a Solution Looking for a Problem?' (2019) <<https://www.mas.gov.sg/news/speeches/2019/is-the-block-chain-a-solution-looking-for-a-problem>>

⁸¹ MAS, 'Guide on Principles to Promote Fairness, Ethics, Accountability and Transparency in the Use of Artificial Intelligence and Data Analytics in Singapore's Financial Sector' (2018) <<https://www.mas.gov.sg/-/media/MAS/News%20and%20Publications/Monographs%20and%20Information%20Papers/FEAT%20Principles%20Final.pdf>> accessed on 29 November 2020.

⁸² Ibid

comply with the Guidelines on Provision of Digital Advisory Services issued by MAS.⁸³ On the other hand, institutions providing financial advice are subject to the licensing regime established in the Financial Advisers Act (FAA) and the Securities and Futures Act (SFA). Therefore: (i) robo-advisors providing financial advisory services must hold a financial adviser license; (ii) robo-advisors offering a platform for executing capital markets products must hold a capital markets services license; and (iii) robo-advisors having discretion in managing investment portfolios must hold a CMS license in fund management.⁸⁴

3.4. *Regulatory framework of other emerging technologies used in the financial sector*

As it has been mentioned, other emerging technologies reshaping the financial services industry in Singapore –and internationally– include APIs and cloud computing. With regards to cloud computing, MAS considers cloud services operated by service providers as a form of outsourcing.⁸⁵ Therefore, the MAS Guidelines on Outsourcing should be observed.⁸⁶ The Guidelines on Technology Risk Management issued by MAS also cover certain aspects of cloud computing adoption in the financial sector and it highlights the cloud computing's unique attributes and risks.⁸⁷ Some international trends and potential regulatory responses to the increasing use of cloud computing in the financial services industry are discussed in section 4.

Regarding APIs, MAS has highlighted that they are crucial enablers that facilitate financial institutions' push towards customer-focused initiatives by allowing applications to be developed quickly and responsively.⁸⁸ Unlike other jurisdictions, however, including the United Kingdom and the European Union, Singapore has not implemented a formal regulatory framework for open banking.⁸⁹ Instead, it has adopted an organic approach facilitated by a non-binding document, the “API Playbook”, published by MAS and the Association of Banks of Singapore.⁹⁰ Some authors have argued that the non-compulsory approach adopted by Singapore facilitates competition, financial innovation and market development without undermining consumer protection.⁹¹ In fact, a local financial institution –DBS Bank– has managed to become the world's largest banking

⁸³ MAS, Guidelines on Provision of Digital Advisory Services (2018) <<https://www.mas.gov.sg/regulation/guidelines/guidelines-on-provision-of-digital-advisory-services>> accessed on 1 December 2020.

⁸⁴ Ibid

⁸⁵ MAS, 'Cloud' <<https://www.mas.gov.sg/development/fintech/technologies---cloud>> accessed on 1 December 2020.

⁸⁶ MAS, Guidelines on Outsourcing (2016) (Last update in October 2018) <https://www.mas.gov.sg/-/media/MAS/Regulations-and-Financial-Stability/Regulatory-and-Supervisory-Framework/Risk-Management/Outsourcing-Guidelines_Jul-2016-revised-on-5-Oct-2018.pdf> accessed on 1 December 2020.

⁸⁷ MAS, Technology Risk Management Guidelines (2013) <<https://www.mas.gov.sg/-/media/MAS/Regulations-and-Financial-Stability/Regulatory-and-Supervisory-Framework/Risk-Management/TRM-Guidelines--21-June-2013.pdf>> accessed on 1 December 2020.

⁸⁸ MAS, 'Application Programming Interfaces (APIs)', <<https://www.mas.gov.sg/development/fintech/technologies---apis>> accessed on 1 December 2020.

⁸⁹ For an analysis of the different regulatory approaches to open banking adopted internationally, see Remolina (n 54).

⁹⁰ Association of Banks of Singapore & Monetary Authority of Singapore, 'Finance-as-a-Service: API Playbook' <<https://www.mas.gov.sg/-/media/MAS/Smart-Financial-Centre/API/ABSMASAPIPlaybook.pdf>> accessed on 1 December 2020.

⁹¹ Remolina (n 54)

API developer platform with 155 APIs.⁹² Additionally, the Financial Industry API Register, managed by MAS, lists 517 open APIs offered by financial institutions in Singapore.⁹³ As a result, the organic approach to open banking adopted by Singapore could actually be more desirable than other regulatory models requiring financial institutions to give free access to their data and infrastructure to third party developers, as it is imposed under the regulatory framework existing in the United Kingdom and the European Union.⁹⁴

Even though it is not an 'emerging' technology, it is also important to emphasize new challenges associated with the use of the *internet* and internet-enabled platforms in the financial sector. For example, in the past decade, many companies have used internet-enabled platforms to raise funds from the general public. This practice, generally known 'crowdfunding', has also been subject to many debates from a financial regulation perspective. In general, there are four forms of crowdfunding: (i) equity crowdfunding, when firms raise funds by issuing shares; (ii) crowdlending, when firms borrow financial resources from the general public in the form of loans or debentures; (iii) reward crowdfunding, when firms raise funds by offering current or future units of their products or services; and (iv) donation crowdfunding, when the financial resources provided by the general public are provided without expecting any consideration in return.⁹⁵ As it happens in other jurisdictions, Singapore only subject to securities regulation those forms of crowdfunding involving a type of capital markets products.⁹⁶ Thus, only equity crowdfunding and crowdlending are subject to securities regulation. Therefore, the issuers, financial advisors and intermediaries (e.g., platforms) involved in these activities will need to comply with the provisions of the SFA.

Second, the increasing use and importance of data and new technologies in the financial services industry has exposed financial institutions to a higher risk of being subject to cyber attacks. For this reason, MAS has adopted various strategies, including the enactment of Guidelines on Technology Risk Management,⁹⁷ Notices on Technology Risk Management,⁹⁸ and Notices on Cyber Hygiene ("Tech-Risk Notices") which set out requirements on resilience of critical systems, incident reporting and cyber hygiene.⁹⁹

4. Future regulatory challenges

⁹² Ibid

⁹³ Ibid

⁹⁴ Ibid

⁹⁵ John Armour and Luca Enriques, 'The Promise and Perils of Crowdfunding: Between Corporate Finance and Consumer Contracts' (2018) 81 *Modern Law Review* 51.

⁹⁶ In Singapore, see Christian Hofmann, 'An Easy Start for Start-ups: Crowdfunding Regulation in Singapore' (2018) 15 *Berkeley Business Law Journal* 219. From a comparative perspective, see Alexander Loke, 'The Surprising Liberality of Securities Crowdfunding Regulation in Hong Kong: Insights From a Comparative Analysis' (2020) *Singapore Journal of Legal Studies* 242; Steve Kourabas and Ian Ramsay 'Facilitating Equity Crowdfunding in the ASEAN Region' (2017), Association of Southeast Asian Nations (ASEAN) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3126652> accessed on 30 November 2020.

⁹⁷ See *supra* note 87.

⁹⁸ MAS, Notice on Technology Risk Management (2013) (Last update in 2018) <<https://www.mas.gov.sg/-/media/MAS/Regulations-and-Financial-Stability/Regulations-Guidance-and-Licensing/Securities-Futures-and-Fund-Management/Regulations-Guidance-and-Licensing/Notices/Notice-on-Technology-Risk-Management-CMGN02.pdf>> accessed on 1 December 2020.

⁹⁹ MAS, Notice CMG –N03 Cyber Hygiene (2019) <<https://www.mas.gov.sg/regulation/notices/notice-cmg-n03>> accessed on 1 December 2020.

Singapore has been able to implement one of the most attractive and comprehensive regulatory frameworks for fintech probably observed internationally. This fact, along with the existence of a sophisticated regulator, a very active policy debate, and a close collaboration between innovators and regulators, have made Singapore one of the world's leading fintech hubs.¹⁰⁰

Nonetheless, technological developments and the increasing use of data in the financial services industry make the fintech ecosystem be constantly evolving. Therefore, some future reforms might be needed to respond to new risks and challenges. In fact, various legislative proposals currently discussed in Singapore seek to address some of them. For instance, the Omnibus Act for the Financial Sector is expected to provide a more comprehensive response to the AML/CFT risks associated with cryptocurrencies, since it covers all types of digital assets – including those that do not qualify as DPT or capital market products.¹⁰¹

In November 2020, it was introduced to Parliament an amendment to the PSA (“the Amendment Bill”) suggesting various changes to keep adapting the regulatory framework of payments to the new risks and challenges raised by recent developments in the fintech industry.¹⁰² First, the Amendment Bill seeks to improve and clarify the regulatory framework of DPT services.¹⁰³ Namely, the PSA currently regulates the service of dealing in DPTs and facilitating the exchange of DPTs where the DPT service provider comes into possession of moneys or DPTs. The Amendment Bill seeks to include, in the scope of the PSA, services that facilitate the exchange of DPTs without possession of moneys or DPTs by the DPT service provider, in accordance with the international recommendations of the Financial Action Task Force (FATF).¹⁰⁴ Second, the Amendment Bill allows MAS to prescribe additional licensees or classes of licensees in respect of certain payment services that must safeguard customer money, and it also imposes new conditions to safeguard the interests of users from the opportunism or insolvency of the payment services provider. Finally, this amendment to the PSA provides MAS with greater powers to impose new measures on DPT service providers whenever it might be needed to protect users, monetary policy and the stability of the financial system. Therefore, these greater powers will allow MAS to quickly respond to the new risk and challenges potentially raised by stablecoins and new fintech developments, including decentralised finance (DeFi).¹⁰⁵

Likewise, the use of AI in the financial sector is also being subject to further regulation. In 2019, MAS announced that it was working with industry partners to create a framework

¹⁰⁰ See *supra* note 5.

¹⁰¹ The consultation paper of the new Omnibus Act for the Financial Sector was published on July 2020. See MAS, ‘Consultation Paper on a New Omnibus Act for the Financial Sector’, Consultation Paper 02/2020 <<https://www.mas.gov.sg/-/media/MAS/News-and-Publications/Consultation-Papers/2020-July-Consultation-on-FSMA/Consultation-Paper-on-a-New-Omnibus-Act-for-the-Financial-Sector.pdf>> accessed on 1 December 2020.

¹⁰² The Amendment Bill can be found at <https://sso.agc.gov.sg/Bills-Supp/41-2020/2020/20201102?DocDate=20201102>

¹⁰³ *Ibis*

¹⁰⁴ FATF, ‘Virtual Assets and Virtual Asset Service providers’ (2019) <<https://www.fatf-gafi.org/media/fatf/documents/recommendations/RBA-VA-VASPs.pdf>> accessed on 1 December 2020.

¹⁰⁵ For an analysis of the concept and challenges of this new trend in the fintech industry, see Dirk A Zetsche, Douglas W Arner, Ross P Buckley, ‘Decentralized Finance’ (2020) 6(2) *Journal of Financial Regulation*.

for financial institutions to promote the responsible adoption of Artificial Intelligence and Data Analytics (AIDA).¹⁰⁶ This framework, known as Veritas, will enable financial institutions to evaluate their AIDA-driven solutions against the principles of fairness, ethics, accountability and transparency published by MAS in 2018.¹⁰⁷ On 28 May 2020, it was announced that the first phase of Veritas will commence with the development of fairness metrics in credit risk scoring and customer marketing.¹⁰⁸

Apart from these legislative and regulatory initiatives currently taking place in Singapore, other disruptive technologies and fintech developments might deserve future legislation. First, the increasing use of cloud computing in the financial services industry may bring some risks to the stability of the financial system.¹⁰⁹ Namely, a failure in the cloud, or the collapse of one of the cloud providers, can create a situation of panic that can ultimately jeopardize the stability of the financial institutions. For this reason, it would be useful to assess whether cloud providers should be regulated by MAS, or whether financial institutions should adopt additional measures to prevent any situation of systemic risk potentially created by a failure in the cloud or the collapse of the cloud provider.¹¹⁰

Second, if a CBDB is launched, new legislation will be needed not only to respond to the risks and challenges of using CBDBs as a means of payment but also to those associated with including a new form of fiat currency in Singapore. Therefore, a future reform in this direction would involve aspects of financial regulation and monetary policy.¹¹¹

Third, many digital tokens –especially those that, from the perspective of their functionality, are classified as utility tokens– do not meet the definition of capital market products or DPT. Under the Omnibus Act for the Financial Sector, the issuers, exchanges and intermediaries dealing with these tokens –and with any other digital asset– will be subject to AML/CFT obligations. Still, there are additional risks and challenges that need to be addressed. For example, as the FSA and the PSA will not apply to the issuance of these tokens, the buyers of these digital assets will be virtually unprotected.¹¹² They will only be protected by consumer protection laws and the conditions established in the White Paper prepared by the issuer. Unfortunately, these mechanisms do not seem to provide an adequate protection to tokenholders. First, the

¹⁰⁶ Monetary Authority of Singapore, 'MAS Partners Financial Industry to Create Framework for Responsible Use of AI' (13 November 2019) <<https://www.mas.gov.sg/news/media-releases/2019/mas-partners-financial-industry-to-create-framework-for-responsible-use-of-ai>> accessed on 1 December 2020.

¹⁰⁷ Ibid

¹⁰⁸ Monetary Authority of Singapore, 'Fairness Metrics to Aid Responsible AI Adoption in Financial Services' (28 May 2020) <<https://www.mas.gov.sg/news/media-releases/2020/fairness-metrics-to-aid-responsible-ai-adoption-in-financial-services>> accessed on 1 December 2020.

¹⁰⁹ Financial Stability Board, 'Third-party dependencies in cloud services: Considerations on financial stability implication' (9 December 2019) <<https://www.fsb.org/wp-content/uploads/P091219-2.pdf>> accessed on 1 December 2020.; David Fratto and Lee Reiners, 'A New Source of Systemic Risk: Cloud Service Providers' (2019).

<<https://sites.law.duke.edu/thefinregblog/2019/08/08/a-new-source-of-systemic-risk-cloud-service-providers/>> accessed on 29 November 2020; Nydia Remolina, 'Reshaping interconnectedness and systemic risk in the fintech era: the case of Cloud Computing' (2020) SMU Centre for AI and Data Governance Working Paper Series.

¹¹⁰ Ibid

¹¹¹ For an analysis of the legal and monetary challenges of CBDB, see *supra* note 27.

¹¹² Gurrea-Martinez and Remolina (n 35) pp. 135-136, 143-145.

promoter of the ICO might not be easily found and sued.¹¹³ Second, even if tokenholders enjoy certain contractual rights according to the White Paper, these rights might not be easily enforced.¹¹⁴ In practice, since a White Paper may just consist on a PDF document uploaded to a website that can quickly disappear, and the people behind the ICO might not even be known, tokenholders will not have the ability to sue the issuer for a breach of the conditions established in the White Paper.¹¹⁵ As a result, the holders of these tokens might need further protections.

For that purpose, various proposals have been suggested in the academic literature,¹¹⁶ and some of them have been recently adopted or suggested in some jurisdictions.¹¹⁷ First, it has been argued that any issuance of tokens, regardless of the legal nature of the token, should be disclosed to the financial regulator or any other public agency.¹¹⁸ This can be conducted through a simple, harmonized electronic form providing some basic information about the promoter, the tokens, the risks, the applicable law, and the advisors involved in the ICO.¹¹⁹ In fact, issuers might even be required to register the ICO using their national identify – in the context of Singapore, even SingPass. This solution would not be very costly for regulators and entrepreneurs and it would significantly reduce the number of scams by facilitating investigations, identification of issuers, public scrutiny and the creation of a registry of ICOs.¹²⁰ Moreover, by providing more protection to the buyers of tokens (especially the buyers of tokens that do not meet the definition of capital markets products or DPT), more people would be willing to participate in the ICO market. Therefore, ICOs would also become a more powerful fundraising method for *bona fide* entrepreneurs needed to raise funds.¹²¹

Second, regulators and policymakers may consider the possibility of implementing some of the mechanisms adopted in the past decades to enhance the protection of consumers.

¹¹³ Aurelio Gurrea-Martinez and Nydia Remolina, 'Corporate Governance Challenges in Initial Coin Offerings' in Andrew Godwin, Rosemary Langford, and Pey Woan Lee (eds), *Technology and Corporate Law: How Innovation Shapes Corporate Activity* (Edward Elgar Publishing, 2021), a<https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3697099> accessed on 29 November 2020.

¹¹⁴ Ibid

¹¹⁵ Ibid

¹¹⁶ Advocating for a variety of reforms to enhance the protection of tokenholders, including the imposition of an obligation to notify regulators the issuance of non-security tokens, the use of cooling off periods, and the imposition of conduct obligations and product regulation, see Gurrea-Martinez and Remolina (n 35). Proposing the regulation of white papers, as the European Union has also suggested, see Chris Brummer, Trevor I. Kiviat and Jai Massari, 'What Should be Disclosed in an Initial Coin Offering?' in Chris Brummer (ed), *Cryptoassets: Legal, Regulatory, and Monetary Perspectives* (Oxford University Press, 2019), pp. 157-202.

¹¹⁷ For instance, France requires the registration of ICOs involving the issuance of non-security tokens to the general public. It also allows the registration of ICOs involving non-security tokens even they are not addressed to the general public. See AMF, 'Obtaining approval for an initial coin offering' (2019) Autorite Des Marches Financiers (AMF) <<https://www.amf-france.org/en/professionals/fintech/my-relations-amf/obtaining-approval-ico/prepare-ico>> accessed on 29 November 2020. A more ambitious plan to regulate non-security tokens has recently been suggested in the European Union. See <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12089-Directive-regulation-establishing-a-European-framework-for-markets-in-crypto-assets/public-consultation> Among other regulatory developments, the European Union suggests the imposition of an obligation to notify regulators about the issuance of non-security tokens, the use of cooling off periods, the imposition of conduct obligations and product regulation, and the regulation of white papers.

¹¹⁸ See Gurrea-Martinez and Remolina (n 35).

¹¹⁹ Ibid

¹²⁰ Ibid

¹²¹ Suggesting this proposal in the academic literature, see Gurrea-Martinez and Remolina (n 35). A reform in this direction has been adopted in France and suggested in the European Union. See *supra* note 117.

For example, regulators can shift the burden of proof in case of any legal disputes onto the issuer of digital tokens.¹²² Thus, by putting the burden of proof on the promoter, it would be easier for the tokenholders to sue, leading to better behaviour *ex ante* by the promoter. Another measure to protect tokenholders may consist of imposing ‘cooling off’ periods that would allow tokenholders to return tokens within a given period without incurring any costs.¹²³ In fact, the return of the token can be implemented automatically through a smart contract.¹²⁴ Thus, unless tokenholders ‘ratify’ their purchase within a few days, the token would be automatically returned to the issuer. Additionally, issuers of digital tokens can be subject to stricter obligations in terms of conduct.¹²⁵ For example, they should be required to act in the interest of the buyers of the tokens.¹²⁶

5. Conclusion

This paper has sought to provide a general overview of the impact of new technologies in the financial services industry in Singapore. For that purpose, it has started by emphasizing that technology has always played an important role in the financial industry. However, new disruptive technologies, as well as the increasing use of data in the financial services industry, have created new challenges and opportunities for the financial sector. While Singapore has managed to address these challenges by adopting one of the quickest and most innovative and comprehensive responses probably observed internationally, financial markets –and particularly the fintech industry– are constantly evolving. For that reason, this paper has concluded by highlighting various challenges and reforms potentially considered in the future.

¹²² Gurrea-Martinez and Remolina (n 113).

¹²³ Ibid

¹²⁴ Ibid

¹²⁵ Ibid

¹²⁶ Ibid