



# Designing a prudential treatment for crypto-assets

03/13/2020

# Executive Summary

Crypto-assets are getting a lot of attention these days, fueled by new private entrants as well as interest from central banks, excitement surrounding the underlying technology used to create and track crypto-assets, and reported thefts and breaches of crypto-asset exchanges. The news is full of stories that suggest crypto-assets are the wild west of finance. This atmosphere has the potential to fuel overly prescriptive regulatory oversight without understanding the true risks related to the myriad of crypto-asset classes that are emerging.

The aim of this paper is to highlight important issues that must be considered when establishing any new regulatory framework for crypto-assets. The cornerstone of any new approach should be driven by the need to provide regulatory clarity and promote confidence and stability in financial markets while also enabling innovation. To this end, the banking industry supports a holistic, risk-based approach that considers other important factors beyond prudential treatment. We believe the following principles are important in meeting these objectives:

- Regulators should take a slow and measured approach to any possible regulatory treatment, as the crypto-asset market is new and rapidly evolving and bank exposures are limited to-date.
- Any oversight and regulatory treatment should be commensurate with the underlying risks, and should consider the different types and uses of crypto-assets in the market.
- A principles-based approach is needed that strikes a balance between the goals of effective oversight and fostering innovation, thereby allowing the market to continue to grow and evolve.
- Regulatory authorities should work together in a coordinated manner and engage in ongoing dialogue with key stakeholders.

## Introduction

Banks in Canada have a long history of supporting innovation and using technology to deepen relationships with their customers, deliver new products and services, and improve their operations. They also have a long history of ensuring that innovation is applied thoughtfully, and that new or emerging risks are managed appropriately to ensure trust in the financial system is maintained with Canadians. The pace of this technological change is accelerating, bringing new opportunities as well as new challenges to the global financial system. Within this context, banks consider trust to be at the core of their business and the most important currency in the digital age. Trust will continue to be a hallmark that distinguishes banks from other industries and service providers.

Crypto-assets and their underlying technologies have been identified as offering benefits in facilitating peer-to-peer interactions and promoting efficiencies due to their characteristic as tokenized, digital representations of assets. While banks' exposures to crypto-assets are currently limited and the size of this market is small relative to the global financial system, the ongoing evolution of these assets requires that both market participants and regulators adapt and evolve together. As international standard-setters such as the Basel Committee on Banking Supervision (BCBS) begin to study the market and explore possible regulatory and supervisory responses, the Canadian banking industry<sup>1</sup> believes that care must be taken to understand the risks as well as the benefits that crypto-assets afford. A conceptual approach is required that considers the underlying uses of crypto-asset instruments and the purposes they are fulfilling versus the risks each use entails.

In the sections that follow, we will first consider how different regulators around the world have defined crypto-assets and discuss what we believe is relevant for the BCBS's consideration. We then consider the different channels through which banks could be exposed to crypto-assets and how these may be relevant to prudential treatment. From our perspective, a key principle is that any prudential treatment established should be commensurate with the riskiness of the underlying crypto-assets. In this regard, balance is needed to avoid dampening economic growth and innovation while also maintaining the stability of the financial system and the broader economy.

## Prudential Treatment of Crypto-Assets

### Definitions and categories of crypto-assets

As the BCBS has observed, no single or generally recognized definition of crypto-assets currently exists.

Instead, regulators often highlight different categories of crypto-assets and the different purposes that they serve. In a Staff Discussion Paper, the Bank of Canada notes that authorities now tend to distinguish between the following large classes of crypto-assets:

- Cryptocurrencies – Generally intended to fill the role of a currency and designed to be used for the purchases of goods and services;
- Security tokens – Allow buyers to take some form of position in a firm;
- Utility tokens – Enable the user to consume some good or service specific to the platform.

The Bank of Canada notes, however, that there is still much debate on the exact definition and boundaries between these categories. A further complication is that some crypto-assets may change classes over the lifecycle of a project (e.g. they may start off primarily as a fundraising tool in the form of a security token but eventually become either a currency or utility token).<sup>2</sup>

The UK's Financial Conduct Authority (FCA) has gone a step further by identifying where different categories of crypto-asset tokens fall in relation to their regulatory perimeter:

- Security tokens – Would be subject to regulation and provide rights and obligations akin to specified investments. Include tokens that grant holders some, or all, of the rights conferred on shareholders or debt-holders and tokens that give rights to other tokens that are specified investments;
- E-money tokens – Would be subject to regulation and include tokens that meet the definition of e-money under related regulations;
- Unregulated tokens - Do not provide rights or obligations akin to specified investments.<sup>3</sup>

The accounting standard setters have also started to weigh in with the International Financial Reporting Standards (IFRS) Interpretations Committee recently concluding that crypto-currencies should be considered inventories when they are held for sale in the ordinary course of business. Otherwise, they should be treated as intangible assets.<sup>4</sup> This decision highlights the importance of considering different uses of crypto-currencies in this case. As banks need to reconcile between their accounting and regulatory balance sheets, we also recommend that the BCBS work with the accounting standard setters to consider different types and uses of crypto-assets in the banking sector for classification purposes.

While some categorization of crypto-assets may be helpful for purposes of regulation, we believe that a strict definition is not essential for any possible prudential treatment. Moreover, we recommend that the BCBS first consider whether crypto-assets are deserving of their own separate asset class for capital or liquidity treatment. As noted, such assets are not currently material to banks. Other forms of prudential

treatment are also available through Pillar 2 supervisory review and Pillar 3 disclosure. We also recommend that the Committee consider how crypto-assets are used by banks and ensure that any potential treatment is commensurate with the underlying risks.

We also recommend distinguishing between the technology supporting crypto-assets and the crypto-assets themselves. While the BCBS has adequately captured the key features of crypto-assets from a technology and design standpoint, there needs to be further consideration of different types of crypto-assets and their related risks. At a very high level, Central Bank Digital Currencies (CBDCs), private stablecoins, and other types of private crypto-assets may present very different levels of risk. For example, the risk may depend on the nature/stability of the issuing entity, whether and how the entity is regulated, and whether the value of the crypto-asset is tied to an asset or pool of assets. We are pleased to learn that the Financial Stability Board (FSB) will be consulting on regulatory issues and possible responses to stablecoins<sup>5</sup> and that the Bank of Canada is joining with other peer institutions in studying CBDC.<sup>6</sup> We believe that a holistic but risk-based approach that considers all types of crypto-assets would be most effective in assessing any possible prudential treatment.

## **Potential use cases and prudential treatment**

We appreciate the BCBS's efforts in highlighting different channels by which banks may be directly or indirectly exposed to crypto-assets. We underscore that each of these use cases should be considered separately as they involve very different bank activities that present different types and levels of risk. In fact, many of the use cases do not involve banks owning crypto-assets directly or indirectly or having any material risk exposure to these assets, which means they should be excluded from any specific prudential treatment. Overall, it would be helpful if the BCBS could share any initial research on each of the different use cases and the risks observed. We question whether the risk would necessarily be different compared to the risk associated with traditional assets. To this end we concur with the BCBS's view that a crypto-asset and traditional asset that are otherwise equivalent in their economic functions and the risks they pose, should not be treated differently for prudential purposes.

Further instruction would also be helpful regarding the category of high-risk crypto-assets identified in the BCBS discussion paper. While the BCBS includes its own features of high-risk crypto-assets, we believe that further refinement is needed to ensure greater flexibility and relatability to specific use cases. In our view, many of the high-risk features described in the paper are simply descriptive of crypto-assets (e.g. digital assets that are recorded on a distributed ledger technology platform and are secured cryptographically) rather than indicative of risk. Further analysis and guidance are required on the

characteristics of low- and medium-risk crypto-assets to provide some point of comparison. Specific examples would also be helpful in relation to each category. This would allow stakeholders to better evaluate the BCBS's illustrative capital and liquidity requirements for high-risk crypto-assets.

The discussion paper refers to the supervisory review process and Pillar 3 disclosure requirements as part of the scope of prudential treatment. Subject to materiality considerations, we agree that banks should have a rigorous process in place for assessing the risk profile of its crypto-asset exposures. However, we express some caution with certain wording such as the need for “comprehensive” due diligence and the “active involvement” of a bank’s board and senior management. Once again, there is a need to differentiate between different types and uses of crypto-assets by banks and the nature and degree of oversight that would be appropriate. Pillar 2 supervisory review does offer an alternative to Pillar 1 capital and liquidity treatment, where banks are involved in using crypto-assets without directly owning them. We therefore support consideration of all forms of prudential treatment in relation to crypto-assets.

On Pillar 3 disclosure, we appreciate the BCBS's focus on material crypto-asset holdings, but we are concerned with the amount of granular information that may be required. Any disclosure needs to be flexible in nature and fit for purpose to banks' use of crypto-assets. We also question whether each of the different exposure channels warrant separate disclosure as some of the use cases relate to service-type activities that banks may perform (e.g. validating crypto-asset block transactions, underwriting initial coin offerings). Pillar 3 disclosure should focus on material high-risk crypto-asset exposures. We also believe that qualitative disclosure should be an option as this can provide greater insight into how crypto-assets are being used by banks and how the risks are being managed.

## **Outside the scope of prudential treatment**

### ***Custody Arrangements***

We strongly believe that crypto-assets held in custody by banks should be outside the scope of prudential treatment. Custodial services are already subject to different regulations and new regulations and protections are already emerging in relation to crypto-assets. Subjecting banks to prudential treatment for this activity would impair their ability to compete effectively with non-bank participants. In Canada, the Canadian Securities Administrators (CSA) issued a staff notice earlier this year highlighting that securities legislation will apply to entities that facilitate the buying and selling of crypto-assets where such entities retain ownership, possession, and control of the crypto-assets.<sup>7</sup> In New York, where trust companies

operate the major crypto-asset trading platforms, the State's Department of Financial Services has established a BitLicense that is required for any person to engage in any virtual currency business activity.<sup>8</sup> This includes storing, holding, or maintaining custody or control of virtual currency on behalf of others. In Wyoming, the state has enacted a total of 13 blockchain enabling laws including authorizing banks as the first true "qualified custodian" for digital assets. Investors will still directly own their digital assets under custody as a bailment, which means they retain direct ownership without giving up control.<sup>9</sup> This is similar to a safety deposit box where the banks do not own the customer's assets and the assets are therefore not subject to any prudential treatment.

### ***Clearing and Settlement***

Some banks have also been experimenting with blockchain technology and the use of crypto-assets to facilitate the real-time movement of funds across their global network. Most of these use cases involve stablecoins that are issued as tokens in exchange for fiat currency, which are then exchanged over the bank's digital ledger. These stablecoins have shown the potential to increase efficiency in cross-border payments and reduce costs for banks and their customers, and do not generate any form of digital asset that is owned by the bank. Such crypto-assets are not currently subject to prudential treatment and this should not change simply because a different technology is now being used to clear and settle the payments. Moreover, there is already existing oversight of clearing and settlement systems involving banks and other institutions. Under the Payment Clearing and Settlement Act in Canada, the Bank of Canada is responsible for the oversight of financial market infrastructure including payments systems, central counterparties, and securities settlement systems.<sup>10</sup>

We are concerned that the cost of prudential regulation may not only hinder innovation in regulated financial institutions but could also make the provision of intra- or inter-bank clearing and settlement services economically unviable. Consequently, we believe that crypto-assets that function as payment tokens should also remain outside the scope of prudential treatment.

## **Holistic Approach to Regulating Crypto-Assets**

### **Supporting Innovation Requires Flexible, Principles-based Regulation**

When considering the appropriate prudential regulatory framework for crypto-assets, care must be taken in the kind of standards that are adopted so that the market can continue to grow, evolve, and support

innovation. A principles-based approach strikes a balance between the goals of effective oversight and fostering innovation. Effective oversight means that any supervisory framework or standards established should be proportional to the risks that have been identified, and should be guided by necessity. It also means standards should be targeted to respond to, and manage, specific risks.

Generally, we concur with the set of high-level principles put forward in the BCBS's discussion paper regarding the design of a prudential regulatory framework. As noted earlier, we support the premise that financial systems or technologies should not be treated differently for prudential purposes unless there is a new risk resulting from the specific features of crypto-assets relative to traditional assets. Where a crypto-asset falls within an existing regulated asset-class (i.e. a currency, commodity, equity, etc.), regulations should be consistently applied to the traditional and digital assets.

Establishing new prudential standards for crypto-assets therefore implies the need to distinguish between the activity or service delivered, and the underlying assets used to facilitate that activity. In the UK, for example, the FCA has taken the position that exchange tokens fall outside the regulatory perimeter for specified investment assets, since the activity being performed is otherwise subject to regulations governing payment services.<sup>11</sup> This reinforces our argument that regulators need to be targeted and selective in the types of market activities being controlled, and that oversight be proportional to the risks that need to be managed.

Determining the appropriate level and scope of prudential treatment will require a deep understanding of a complex and rapidly-evolving market. As discussed above, crypto-assets are not easily defined or categorized, and may demonstrate characteristics of a currency, security or commodity - characteristics that can change depending on the context in which a crypto-asset is used. In addition, the crypto-assets space is particularly ripe for innovation and is evolving rapidly, and therefore we believe it would be premature to lock down a specific regulatory treatment at this early stage. Given the speed with which the use of crypto-assets is evolving, the framework will need to be flexible and nimble to remain relevant and current. Standards that are overly prescriptive have a greater tendency to quickly become outdated and impede innovation.

## **Promoting Confidence and Stability in Financial Markets**

The other priority in designing a prudential regulatory framework for crypto-assets is to balance the goal of innovation and competition with the need to promote the safety and soundness of the economy and manage macro prudential risk. A carefully designed supervisory framework should aim to increase

confidence in the market, thereby encouraging businesses to research, invest and innovate. For example, in Canada, there is the suggestion that the recent guidance on crypto-assets<sup>12</sup> from the CSA would help bring legitimacy to participants not previously regulated.<sup>13</sup> Moreover, an important component of stabilizing markets is minimizing the potential for avoidance schemes (e.g. the use of techniques to avoid the application of the regulatory framework to a particular technological representation of a crypto-asset), or forcing crypto-asset activities into markets that are not subject to high standards of regulation and supervision.

In the context of managing exposures to crypto-assets and promoting market stability, we share the BCBS's view that crypto-assets have the potential to introduce new types of risks that need to be considered and appropriately addressed. These include the following:

1. Money laundering/terrorist financing: Crypto-assets that are exchanged for fiat currency or that are issued as a token for payment transactions allow for greater anonymity than traditional payment methods given transactions cannot be traced back to a person's or organization's identity. This anonymity enables users to conceal the origin and destination of funds and to use these tokens to carry out money laundering and terrorist financing.
2. Cyber security: The nature of the crypto assets makes both the tokens and any associated services vulnerable to a variety of traditional cyber attacks, such as a phishing or malware attack.<sup>14</sup> If not properly managed, cyber criminals will exploit weak cyber risk management practices which can result in significant losses for both the consumers and the exchanges holding the crypto-assets.
3. Operational Risk: If a consumer holds fiat currency in an account held by a crypto-asset exchange, exchange providers have minimal obligations in safeguarding funds or establishing controls to prevent operational failures. These providers are not subject to any operational requirements, capital or financial resiliency rules.
4. Consumer/investor protection: Unlike deposits with a traditional bank that are covered by deposit insurance schemes, consumers that hold crypto-assets can suffer financial loss if their account or digital wallet is hacked, and in many cases have no recourse to any party to claim compensation. Consumers may be unaware whether their assets are subject to any regulatory protection and insufficient information regarding the risks of buying and selling crypto-assets.

5. Market risk: The value of many crypto-assets can fluctuate significantly and cause substantial losses to consumers and investors. Such a scenario can undermine consumer confidence and stability in financial markets, especially in situations where individuals hold currency to hedge their financial risk.

It is important to underscore that the presence and materiality of these risks depends on the use and economic function of the crypto-asset. A risk-based regulatory response therefore needs to consider how the technology is being deployed and whether there are fundamental implications for investor confidence or the safety and stability of the financial system. In situations where crypto-assets are being purchased directly and held by end users, they should be provided with the disclosures and information needed to understand the risks of purchasing and holding crypto-assets so end users are able to make informed decisions.

## **Additional Considerations**

### ***Central Bank Digital Currency***

The BCBS acknowledges that the growth of crypto-assets and potential future evolutions in the industry raise several policy questions that are beyond its purview and outside its focus on managing bank exposures to crypto-assets. It also acknowledges that coordination is needed with other international bodies to develop a holistic approach to the regulatory treatment of crypto-assets, crypto-asset exchanges and platforms. We share the Committee's perspective on the need for a holistic approach and consideration of other initiatives that have implications for crypto-assets and digital currencies.

The concept of a CBDC is increasingly gaining the attention of central banks across the globe, with close to seventy percent of central banks now conducting research into CBDCs.<sup>15</sup> While research appears to be ongoing among the Bank of Canada and other central banks<sup>16</sup>, the Bank of Canada recently concluded there is not a compelling case to issue its own cryptocurrency at this time. However, the Bank of Canada suggests that the widespread use of private crypto currencies could change its decision.<sup>17</sup> As such, it is important to consider that the introduction of a CBDC could potentially displace the demand for some crypto-assets<sup>18</sup> and reduce banks' direct and indirect exposures. CBDCs, which would effectively be fiat currency, may provide greater stability compared to privately issued crypto-currencies that are often volatile. CBDCs may also offer the comfort of a more stable, regulated framework compared to private crypto currencies or stablecoins, thus providing the element of trust necessary for a stable financial

market.

With the real possibility of CBDCs disrupting the crypto-asset market, we reiterate the need for the Committee to proceed slowly in considering any prudential treatment. The crypto-asset market is rapidly changing and evolving, and the full implications of CBDCs need to be better understood before imposing any new standards or regulatory framework on the banking system.

### ***Developing a coordinated regulatory approach***

We support the Committee's broader work plan on crypto-assets including monitoring of market and regulatory developments and quantifying banks' exposures to crypto-assets through periodic data collection exercises. We also appreciate that regulators have expressed challenges with respect to collecting reliable data, particularly as it relates to collecting data on financial institutions' exposures.<sup>19</sup> Not only are regulators challenged to find a common definition, they also need to develop agility in order to increase their understanding and assessment of crypto-assets.

To facilitate a coordinated regulatory approach, we support ongoing dialogue with key stakeholders as this market evolves and matures. Standardization, consistent taxonomy and regulatory clarity would help create trust amongst all participants in the crypto-asset market and minimize confusion for regulators and oversight bodies as well. For example, consider the challenges with respect to enforcement on the International Monetary Fund's (IMF) Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) obligation. The IMF has highlighted this issue and points out that "when transaction verification is decentralized, and the number of entities involved (such as crypto-exchanges, governance bodies, wallet providers, client fund managers, and market makers) are very large and fragmented across firms, sectors and countries, enforcement of AML/CFT obligations becomes difficult. If anything, international cooperation will become all the more relevant to avoid regulatory arbitrage and a dilution of regulation."<sup>20</sup> To this end, we support participation in joint working groups or outreach sessions organized at an international level to facilitate cooperation. This would help clarify expectations at an early stage and allow for an open exchange of ideas. Such an approach may also be helpful in relation to other emerging fintech developments.

## **Conclusion**

The crypto-asset market is nascent relative to other markets and continues to evolve. While banks'

exposures and size of the market is limited, the ongoing evolution of these assets require that both market participants and regulators evolve as well. With a constantly evolving market, undertaking a holistic approach would be most effective in assessing any possible prudential treatment. We strongly support a principles-based, technology-neutral, approach to the regulatory treatment of crypto-assets to provide market participants with the flexibility to adapt to an evolving market while providing the stability of a regulatory framework.

Should BCBS decide to propose specific measures governing the prudential treatment of crypto-assets, it will be critical to ensure such measures are proportional to the risk of the underlying assets so as not to restrict economic growth and innovation. We urge regulators to pursue a measured approach to fully assess the different levels of risks a crypto-asset may pose, and to ensure measures put forward differentiate between the different types and uses, and the underlying function of the crypto-assets. A pragmatic approach will ensure that services and activities such as custody arrangements, or clearing and settlement solutions like payment tokens, are appropriately excluded from prudential treatment.

Effective regulatory oversight requires a holistic approach that takes into account and balances banks' exposure to risks, the need to enable innovation, and the possible introduction of CBDCs. We firmly believe ongoing collaboration and coordination amongst key stakeholders will be necessary to provide meaningful guidance and clarity in a rapidly evolving market. Regulators and the financial services sector must work together to foster confidence and trust in the digital era while promoting stability, innovation and economic growth.

---

<sup>1</sup> The Canadian Bankers Association is the voice of more than 60 domestic and foreign banks that help drive Canada's economic growth and prosperity. The CBA advocates for public policies that contribute to a sound, thriving banking system to ensure Canadians can succeed in their financial goals. [www.cba.ca](http://www.cba.ca).

<sup>2</sup> Chapman, James & Carolyn A. Wilkins. Bank of Canada Staff Discussion Paper 2019-1 Crypto "Money": Perspective of a Couple of Canadian Central Bankers <https://www.bankofcanada.ca/wp-content/uploads/2019/02/sdp2019-1.pdf>

<sup>3</sup> UK FCA Guidance on Cryptoassets Policy Statement PS19/22 (July 2019) <https://www.fca.org.uk/publication/policy/ps19-22.pdf>

<sup>4</sup> IFRIC Update June 2019. Holdings of Cryptocurrencies – Agenda Paper 12 <https://www.ifrs.org/news-and-events/updates/ifric-updates/june-2019/#8>

<sup>5</sup> FSB Chair's letter to G20 Finance Ministers and Central Bank Governors: February 2020: <https://www.fsb.org/2020/02/fsb-chairs-letter-to-g20-finance-ministers-and-central-bank-governors-february-2020/>

<sup>6</sup> Bank of Canada announcement (January 21, 2020): Central bank group to assess potential cases for central bank digital currencies: <https://www.bankofcanada.ca/2020/01/central-bank-working-group-cbdc/>

<sup>7</sup> Canadian Securities Administrators. CSA Staff Notice 21-327 Guidance on the Application of Securities Legislation to Entities Facilitating the Trading of Crypto Assets [https://www.osc.gov.on.ca/documents/en/Securities-Category2/csa\\_20200116\\_21-327\\_trading-crypto-assets.pdf](https://www.osc.gov.on.ca/documents/en/Securities-Category2/csa_20200116_21-327_trading-crypto-assets.pdf)

<sup>8</sup> New York State Department of Financial Services website: [https://www.dfs.ny.gov/apps\\_and\\_licensing/virtual\\_currency\\_businesses](https://www.dfs.ny.gov/apps_and_licensing/virtual_currency_businesses)

<sup>9</sup> Long, Caitlin (March 4, 2019). "What Do Wyoming's 13 New Blockchain Laws Mean?"

<https://www.forbes.com/sites/caitlinlong/2019/03/04/what-do-wyomings-new-blockchain-laws-mean/#23b0308e5fde>

<sup>10</sup> Bank of Canada Regulatory Oversight of Designated Clearing and Settlement Systems <https://www.bankofcanada.ca/core-functions/financial-system/oversight-designated-clearing-settlement-systems/>

<sup>11</sup> PS19/22, Financial Conduct Authority Guidance on Crypto-assets, July 2019, paragraph 60. <https://www.fca.org.uk/publication/policy/ps19-22.pdf>

<sup>12</sup> [https://www.osc.gov.on.ca/documents/en/Securities-Category2/csa\\_20200116\\_21-327\\_trading-crypto-assets.pdf](https://www.osc.gov.on.ca/documents/en/Securities-Category2/csa_20200116_21-327_trading-crypto-assets.pdf)

<sup>13</sup> <https://www.theglobeandmail.com/business/article-csa-outlines-regulatory-framework-for-cryptocurrency-exchanges/>

- 
- <sup>14</sup> KPMG: Securing Cryptoassets, October 29<sup>th</sup>, 2018. <https://home.kpmg/us/en/home/insights/2018/11/securing-cryptoassets.html>
- <sup>15</sup> Baraontini, Christian and Henry Holden, BIS Papers, “Proceeding with caution – a survey on central bank digital currency”, January 2019. <https://www.bis.org/publ/bppdf/bispap101.pdf>
- <sup>16</sup> The Bank of Canada and five other central banks created a group to jointly research CBDCs. These countries include Canada, United Kingdom, Japan, European Union, Sweden and Switzerland. Accessed from Press Release: <https://www.bankofcanada.ca/2020/01/central-bank-working-group-cbdc/>
- <sup>17</sup> Lane, Timothy, Bank of Canada, “Money and Payments in the Digital Age”, February 2020. Accessed from: <https://www.bankofcanada.ca/2020/02/money-payments-digital-age/?#GATop>
- <sup>18</sup> Roubini, Nouriel. (2018, November 19) Why Central Bank Digital Currencies will destroy bitcoin, Retrieved from <https://www.theguardian.com/business/2018/nov/19/why-central-bank-digital-currencies-will-destroy-bitcoin>
- <sup>19</sup> Chimienti, Maria Teresa, Urzula Kochanska and Andrea Pinna. “Understanding the crypto-asset phenomenon, its risks and measurement issues”. ECB Economic Bulletin, Issue 5/2019 [https://www.ecb.europa.eu/pub/economic-bulletin/articles/2019/html/ecb.ebart201905\\_03~c83aeaa44c.en.html#toc2](https://www.ecb.europa.eu/pub/economic-bulletin/articles/2019/html/ecb.ebart201905_03~c83aeaa44c.en.html#toc2)
- <sup>20</sup> Adrian, Tobias and Tommaso Mancini Griffoli, “The Rise of Digital Money”; IMF FinTech Note No. 19/01, July 15, 2019.