



Key Aspects around Central Bank Digital Currencies Policy report

Central Bank Digital Currencies
Working Group (CBDC WG)

May 2019

CEMLA FINTECH FORUM

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Executive Summary

With the digital world changing today faster than ever before, money and payments are undoubtedly one of the areas most challenged by new technologies. Financial innovation enabled by said technologies has introduced new ways of processing, delivering and using payments and financial services, challenging central banks to consider whether they might widen their own portfolio of financial services, including the issuance of a digital currency.

From a conceptual point of view, issuing digital fiat money may result in significant efficiency gains (by reducing the costs associated with cash management), support financial inclusion efforts (especially in emerging economies), foster contestability in transactional financial services (including retail payments), and potentially allowing authorities to trace transactional information for policy purposes. Notwithstanding, central banks must undertake a thorough cost/benefit analysis and assess the possible effects of issuing a CBDC on the financial system and on the economy (including the impact on funding costs for traditional financial institutions and the risk of disintermediation as part of their traditional depositors moves funds to a CBDC, potential operational challenges for the central bank, and larger risk factors like cyber-attacks, to name a few).

Whereas the above considerations cannot be fully assessed at this stage due to ongoing research and slight experience on the topic, Latin American and Caribbean central banks are devoting efforts to get a better understanding of the implications and impact of digitizing fiat money. In a number of cases the need to address not only financial inclusion but also other industry shortcomings, have motivated regional authorities to engage in more formal CBDC experimentation, including The Bahamas, the Eastern Caribbean Currency Union, Ecuador and Uruguay.

The Working Group on Central Bank Digital Currencies (CBDC WG) was established by the CEMLA Fintech Forum, mustering the experience of a task force that has studied both existing literature, researches and recent experience of CBDC projects. The ultimate goal of the CBDC WG is to identify the main conceptual and practical aspects regarding CBDC¹ useful for central banks when evaluating the issuance of a digital form of currency as legal tender. A report addressing the above considerations with annexes as supporting material can be found attached to this Executive Summary.

The CBDC WG has found that central banks projects to test or evaluate the feasibility of issuing digital fiat money share the following common aspects:

- a. From the public policy perspective, the projects have focused on providing a public supplementary alternative means of payment similar to cash but in digital form that is free of risk and that aims to be widely accessible with the ultimate goal of enhancing financial inclusion.

¹ A possible longer-term goal is to develop a policy framework and assessment approach for CBDC.

- b. The projects have been designed in such a way that the digital currency is for general purpose use and available 24x7, with the potential to improve interoperability in retail payments market. The involvement of private third parties as well as the freedom for the central bank to adjust CBDC features in the initial stages are all relevant features.
- c. From the implementation perspective, the projects have shown that technology allows – at a small scale given the nature of the pilots– issuing, circulating and using money in digital form and in coexistence with traditional physical cash. Leadership from the management of central banks is crucial to devote the necessary efforts to analyze, design and properly engage in the implementation of a CBDC project. Other issues like cooperation with relevant stakeholders and the technical capacity and expertise of staff involved in the CBDC project implementation were found as very relevant factors.

The key considerations that the CBDC WG wishes to convey to the Latin American and Caribbean Central Banks Governors are the following:

- There is no one-size-fits-all solution; every case deserves a profound study of the motives, possible solutions and implications. The case for introducing a CBDC must be preceded by an in-depth analysis of the implications and design issues that must better serve for each central bank, with special focus on the potential operational and reputational risks stemming from the issuance of a nationwide large-scale digital currency. Central banks should ensure that each policy and practical issue is translated into specific measures, including: risk mitigating controls, scalability and outreach strategies (including citizens’ technological literacy and telecommunications geographical coverage), IT- and cyber-related features, AML compliance and controls, operational arrangements and schemes, among other important implementation factors. Moreover, central banks may wish to reflect on the convenience of digitizing fiat money against promoting (or regulating) other private-owned options including fast payments, e-money and similar industry solutions since CBDC raises important policy and practical questions that need to be addressed.
- Central banks, especially in emerging economies, may find it motivating (or even necessary) to test CBDC as a gateway to foster financial inclusion or as an avenue to ensure the existence of public alternative solution(s) in the national money and payment system. Given the acceptance and use –as well as market presence– of mobile and digital technologies in most Latin American and Caribbean countries, it may be probable that a digital fiat money solution could result in: a) greater efficiency and competition in the provision of transactional financial services; b) a channel to formalize the shadow economy and reduce tax evasion. It could also help contribute to the public policy objective of ensuring sufficient and efficient supply of means of payment where market failures persist. Some of these considerations are valid for more advanced economies, but are particularly relevant for emerging economies where financial inclusion efforts have recently gained attention.
- New technologies support CBDC, however experimentation have occurred on a limited scale. From the operational point of view, deploying a CBDC system would move central banks into uncharted territory and encumber them with additional responsibilities, which

would inevitably expose them to greater operational and reputational risks. Some of the most significant ones are those related with the large technological effort and costs as well as the imminent exposure to cyber risk. For such reasons, testing further aspects such as data management, continuity and resilience, as well as interoperability, anonymity and traceability, deserve special attention looking forward. From the implementation viewpoint, coordination and leadership are also noteworthy elements, with the central bank leading the design and implementation of a CBDC and comprising the engagement and support of public and the private relevant actors.

- For the time being, CBDC could be a supplementary alternative to cash. It is probable that pioneer central banks would initially experiment with CBDC designs such that they keep the main attributes of cash to ensure that adoption follows a growing and sustainable tendency. And it is also very likely that, at least initially, central banks continue providing a proper supply of banknotes and coins. In the mid-term, information resulting from CBDC usage could shed light on how to improve the cash management process and reduce its use.
- Neither the costs nor subsequent effects or impacts are readily quantifiable, due to lack of experience. Further experimentation (on scale and timing) is necessary to validate the effects. This is the case for a significant number of payment issues, such as the interoperability and communication between existing infrastructures and platforms, its effects on the usage of other cashless payment instruments and the potential use of traceable data of CBDC for various policy purposes (e.g. cash management, fiscal, AML). In terms of monetary issues, the effect that are more difficult to estimate has to do with the degree of substitution of cash and sight deposits for CBDC. With regard to financial intermediation, it is not possible to foresee if the landscape for financial services provision –once CBDC is deployed– will affect traditional banking business models and products. On financial inclusion matters, there might be a case for emerging economies to use CBDC as a gateway to formal financial services for underserved or unserved population. But its impact on financial intermediaries' efforts on inclusion matters, also deserves to be considered.

Introducing a CBDC system should thus be a gradual and cautious process. In fact, it has been recognized that implementing a CBDC is not without risks, significant challenges and costs. Therefore, it is imperative for central banks to carefully assess its benefits and costs and its implications and impact, before deciding to introduce a CBDC.

1. Introduction

The pervasive digitization of society and economic and financial activity, the growing demand for real-time financial services, recent developments in financial innovations enabled by new technologies (e.g. crypto-assets and related applications), and the increasing consolidation of different financial services providers (banks, fintechs and new non-bank entrants), among other developments, have prompted a number of central banks to consider whether they might widen their own portfolio of financial services.

On these grounds, the international community² has been debating in recent times³ whether central banks (CB) should digitize fiat money either for general purposes or for limited uses. Factors motivating this debate range from:

- Interest in testing new technologies, with the aim of gaining efficiency, fostering competition in financial services provision, including payments. In particular, the potential to enhance contestability and efficiency in the payments market, dominated by private /commercial players for account-based payments and transfers, by offering a public (central bank) alternative to private money;
- In emerging economies, the opportunity to broaden financial access and inclusion by leveraging new technologies;⁴
- The need to provide adequate fiat money solutions where use of cash is declining, and with that ensuring the public provision of goods such as money and payments against a full private system;
- Potential to reduce the cost of cash management, especially in emerging economies, (estimated in around 1.5% of GDP worldwide⁵);
- Also, in emerging economies, the potential to formalize the shadow economy, or to mitigate tax evasion and financial crime;
- Potential to foster financial stability by offering alternative and risk-free options to commercial bank deposits; and

² CPMI-MC, 2018; Engert and Fung, 2017; Bascand, 2018; Riksbank, 2018 and Norges Bank, 2018.

³ Providing general public access to forms of central bank money is not entirely a new idea since in fact it was advanced by Tobin in 1985.

⁴ Emerging economies in general have been recently fostering financial inclusion and access, and while this is not a strong motivation in advanced economies that are already testing CBDC projects, it may constitute a case for Latin American and Caribbean economies to analyze such developments with the aim of broadening the access channels to formal financial services in digital forms. (CEMLA, 2018).

⁵ Estimated figures from MasterCard, 2013. Physical cash is not only costly to produce and to keep in circulation but it is also environmentally harmful. Consequently, reducing its use can contribute to a “greener economy”.

- Potential to strengthen the speed, efficiency and control of the monetary policy transmission mechanisms.

This new development has interesting attributes that could firm up many central banks' policy goals in a number of fields. But its implementation is also very challenging and poses a number of significant risks. Therefore, before considering the possible launch of a Central Bank Digital Currency (CBDC) for the general public, central banks should first identify which issues they would like to address (payments systems efficiency and payments market contestability, financial inclusion, monetary policy transmission efficiency and financial stability, among others) and then carefully undertake a thorough benefit/cost analysis and assess its possible effects on the financial system and the economy, which would also depend on the technical implementation chosen as each different option brings different considerations. Analyzing whether the intended goals could also be achieved by other public policy instruments is advisable.

The CBDC WG⁶ was mandated to identify practical and policy implications of CBDC, highlighting the various economic and financial considerations that emerging economies must consider when approaching this issue, with the ultimate goal of reporting to Latin America and the Caribbean Central Banks' Governors in the CVII Meeting of CEMLA Governors in the Spring of 2019.

The following sections of the report present a conceptual and analytical framework for CBDC, including potential implications to be considered by central banks, and key findings on the assessment of projects of digital sovereign currency that have gone live⁷ in the region and abroad. Section II outlines the dimensions and key concepts about money and CBDC, including policy considerations and implementation issues, as well as a balance englobing potential benefits and implications that are relevant for central banks. Section III summarizes the main findings of the CBDC WG after analyzing selected projects testing and implementing digital fiat money in Ecuador, Uruguay and Sweden, focusing on four areas: motivation, design, implementation and expected results. Section IV concludes with a short list of messages that point out the lessons and considerations the CBDC WG deems more relevant for the attention of the Latin American and Caribbean Central Banks' Governors.

⁶ CEMLA Fintech Forum started in May 2017 with the first meeting of experts in Madrid, Spain. Then it continued in March 2018 in Buenos Aires, Argentina, where two working groups were defined: Regulation of Fintech and CBDC. Subsequently, there was a meeting in Lima, Peru as part of the Seminar "Virtual Currencies and the Role of Central Banks" (October 2018).

⁷ See section III.c.iii

2. Policy and implementation issues

2.1 Money and CBDC

Given its nature as a ‘promise to pay’, support for a given form of fiat money is fundamentally the result of trust; i.e. the belief by the members of a given community that such type of money will, subsequently, be accepted by a third party in a trade. Confidence in central bank money rests on the ability of its issuer to maintain the value of the stock of currency as a whole. This is at the core of any central bank’s mandate and it is enhanced by its degree of independence. Thus, once established, a central bank’s reputation in achieving this goal remains fairly unchallenged over time. At the same time, the effectiveness of financial regulations is what broadly underpins confidence in private bank money. Yet in times of financial unease, fiat money ultimately relies on the conviction by economic agents that it can be converted on demand into a secure asset issued by a central bank (Tobin, 1985; CPMI, 2018). In absence of cash, CBDC could play this role.

Existing forms of central bank money are cash (physical and broadly accessible to the public at large for general purposes) and reserves/settlement balances (mainly available in CB accounts to banks and other financial intermediaries). Usually, the general public and most non-bank economic agents have no access to central bank accounts. New technological developments allow for alternative forms of central bank money, specifically to issue a CBDC, either for wholesale or for general purposes. A wholesale CBDC would limit access to a predefined group of users, while the general purpose one would be widely accessible. The latter in turn could be either account based (allowing for the identification of the money holder) or token (value) based (allowing for a major degree of anonymity).⁸ Additionally, a general purpose CBDC also represents the extension of the provision of reserves to the general public for different purposes (that is, not restricted to financial institutions for large-value payment systems or monetary policy purposes⁹) but without implications on the extension of credit facilities to the new holders of the CBDC.

⁸ Bech and Garrat, 2018; CPMI-MC, 2018; Engert and Fung, 2017

⁹ Others like Y. Mersch, Member of the Executive Board of the BCE, referred to CBDC as “digital base money” (quoted by Meaning et.al., 2018). When non-interest bearing, i.e. similar to bank notes, many referred to it as “e-cash” or “d-cash”. It does not need to be “crypto” or distributed ledger based (DLT) to be a CBDC as there are other technologies that allow for the same uses and policy goals.

Box 1. Central Bank Digital Currency for wholesale purposes

The main focus of research and testing related to wholesale CBDC has been the use of consensus protocols and distributed ledger technologies in areas such as registry, trading and settlement of large-value transactions involving securities, derivatives and other financial assets.

Most of the experience has been related to projects in countries with highly sophisticated financial markets looking for alternatives to enhance efficiency. In particular, it is worth mentioning the initiatives in Canada (Jasper), Singapore (Ubin), the Bank of England, the European Central Bank and the Bank of Japan, which explore applications of DLT and similar technologies to existing market infrastructures, either with token-based or account-based central bank money.

According to the CPMI-MC Report (2018), these developments do not represent any particular novelty from the public policy perspective and, for the time being, do not look clearly superior to existing infrastructures (even though they could be promising in many respects).

Source: Own elaboration based on CPMI-MC, 2018.

CBDC can be broadly defined as an electronic central bank liability, denominated in an existing (legally recognized) unit of account, which serves both as a means of payment and as a store of value (CPMI-MC, 2018), namely digital money of legal tender that is available for the general public.

The design and related attributes of a CBDC compared to existing forms of cash are one of the most relevant issues under debate by the international community. According to CPMI-MC, the most salient attributes to be defined are: availability (ranging from normal business hours to 24 hours a day and seven days a week), anonymity (ranging from complete to none), transfer mechanism (account-based vs token-based), interest-bearing (if desirable) and limits/caps (value- or volume-based), among others.

This report mainly focuses on the dimensions and implications of a general purpose CBDC that is: i) available to the general public in digital forms (either accounts- or token-based) and ii) issued in parallel to banknotes and coins -physical cash- and central bank reserves (i.e. not intended to become a replacement for cash).¹⁰

To frame the analysis of such specific CBDC, the CBDC WG has selected a set (see chart below) of benchmark design features it may have as a possible starting point for discussing its attributes before a central bank considers digitizing fiat money.¹¹

¹⁰ The focus is placed on domestic issuance for CB since those related with cross-border payments using CBDC are still an open discussion little explored in the academic and practical references available on the subject.

¹¹ CPMI-MC, 2017; Engert and Fung, 2017; Bascand, 2018; Coeuré, 2018, Meaning at.al., 2018.

Key design features of CBDC against other forms of money

Features	Existing central bank money		Central bank digital currencies		
	Cash	Reserves and settlements balances	General purpose		Wholesale
			Token-based	Account-based	Token-based
24/7 availability	✓	X	✓	(✓)	(✓)
Anonymity vis-à-vis central bank	✓	X	(✓)	X	(✓)
Peer-to-Peer transfer	✓	X	(✓)	(✓)	(✓)
Interest-bearing	X	(✓)	(✓)	(✓)	(✓)
Limits or caps	X	X	(✓)	(✓)	(✓)

Note: ✓=existing or likely feature, (✓) = possible feature, X = not typical or possible feature

Source: CPMI-MC, 2018.

It should be underlined that alternative choices would generate different trade-offs along several dimensions.¹² Based on this, the following subsections elaborate on the features and related implications that policymakers must consider when performing a CBDC analysis or implementation.

2.2 Dimensioning a general purpose CBDC

Ingves (2018) highlights the fact that money, payment systems and the overall sovereign monetary system can be seen as a public good. Economic theory establishes that such goods that cannot be offered to a sufficient extent or in an efficient manner by the private market may require government intervention. On the other hand, the mandates of central banks encompass the provision of an efficient payments system and ensuring monetary and financial stability, all of which provides room for central banks to be an active part of a public monetary and payments systems, by means of digital forms of cash. In other words, CBDC can be seen as a response of central banks to assume a task which in principle may exceed its mandate (Jordan, 2018) but that could be justified by market failures, even in spite of the unnecessary burden of responsibility on the central bank and the potential disempowerment of the private sector.

¹² Developments in technology, such as cryptography, facilitate control of counterfeiting and no double-spending. It also helps CB to monitor how CBDC circulates and even to target or restrict its use according to public policy objectives.

From the fact that CBDC can be part of said sovereign monetary and payments system, there are a number of aspects that deserve special attention by policymakers with regard to central banks (traditional) mandates:

- Payments aspects: CBDC may provide the public with the choice to hold digital sovereign money as an alternative to cash and to sight deposits at commercial banks so that payments and transfers can take place directly in risk-free central bank money, and in real time, to businesses, individuals and the government. Accordingly, this could help strengthen financial inclusion efforts, enhance market contestability and efficiency in the payments market and ensure fast settlement of retail transactions. These are particularly relevant considerations for emerging economies. It is worth saying that, for this to be the case, CBDC should have competitive user costs as compared to cash and also to alternative commercial electronic payment methods.

Furthermore, a CBDC may cover the need for central bank money by the general public in extreme cases where a successful transition to a world of digital payments ends up in a predominantly private provision of payment services (through financial institutions) so that access to traditional public alternatives representing central bank liabilities may no longer exist (Ingves, 2018).

However, several issues from the payment's perspective arise regarding cybersecurity, data storage, consumer protection, and other areas that are discussed in section II.c.ii. below.

- Monetary policy aspects: Recent implementation of non-conventional monetary policy in advanced economies has provided room to consider the potential of (an interest-bearing) CBDC that would furnish central banks with an appropriate degree of monetary accommodation without resorting to measures aimed at modifying the size or composition of its balance sheet, often referred to as quantitative easing. Having a CBDC may, in fact, make more systematic and transparent monetary policy actions, thereby facilitating the effectiveness of transmission mechanisms and at the same time granting the central bank greater control over the general financial conditions in the economy and, therefore, over aggregate demand.¹³ It could also help to limit the range of short-term rates more closely to the central bank policy stance, mainly by relieving downward pressure on the “scarcity premium” of some safe assets. Yet, the actual impact of such a tool largely depends on preexisting conditions in a given market (e.g. degree of interconnection between deposit and lending markets, previous pass-through rates as well as the ease of cross-border capital flows) so that real improvements can prove to be rather limited (Armelius, Boel, Clausen and Nessén, 2018). Other issues also arise from CBDC with regards to the central bank's legal mandate, targets and objectives, instruments options, among other conceptual aspects

¹³ Bordo and Levine, 2017; Meaning et.al., 2018; Nuño 2018. Supporters of this approach have maintained that CB's ability to cut rates further remains constrained by the de facto zero interest rate on paper currency since cash can be held by depositors and investors as an alternative to interest-bearing financial instruments. Therefore, if cash were abolished or at least no longer acted as an effective competitor for large value transactions, with an interest-bearing digital currency, policymakers would be able to push market interest rates below zero in response to a severe adverse shock.

(definition of monetary aggregates, velocity of money, zero lower bound, seigniorage revenue, etc.).

In addition to that, a CBDC could also contribute to preserve seigniorage revenue in the face of the declining use of cash in some countries under certain conditions (Engert and Fung, 2017). More specifically, the impact on seigniorage could be positive or negative depending on: a) the interest rate paid on CBDC (if any) and, b) the relative cost of producing CBDC versus the costs of producing the equivalent amount of cash (Meaning et.al., 2018).

- Financial intermediation aspects: With a universally-accessible CBDC, central banks would be making available to the public and firms an outside, competitive option of a risk-free liability that could be used as a means of payment, unit of account and a store of value, in the form of digital money. As the introduction of a CBDC may cause households and firms to decide between banking sight deposits or digital money holdings at the central bank, it could therefore potentially reduce the need of “state guarantees” that apply to bank liabilities, either explicitly by means of a deposit insurance arrangement or otherwise implicit (as illustrated by the international financial crises). This could influence discipline across banks and financial entities to show themselves as safe to compete with a risk-free central bank liability.

In any case there is a potential group of people who will prefer CBDC which in turn would foster competition and cause a potential impact on financial intermediation.

In spite of its numerous and valuable attributes, a CBDC implies several issues and risks, including a wider role for central banks in financial systems, and the need to allocate economic resources to deploy digital fiat money –as further elaborated in the following subsection. It is therefore critical that policymakers are aware of the (major) implications central banks should consider to properly assess the case for a CBDC.

2.3 Implications and potential challenges of a general purpose CBDC

2.3.1 Relevant policy implications

The international community is converging on the idea that introducing a CBDC should be (if at all) a gradual and cautious process. In fact, it has been recognized that implementing a general purpose CBDC is not without risks, significant challenges and costs. Therefore, it is critical to explore relevant policy implications central banks must consider in approaching this development.

- Payment system implications. It is likely that an efficient design of a CBDC is one where central banks are able to distribute it on a wholesale basis through commercial banks and payment services providers (PSP) while the latter distribute it to end-users through their retail channels in order to increase operational resilience and robustness of payment systems at a larger scale. Central banks would more likely need to rely on banks and PSP for the effective performance of functions, such as clients’ compliance with public regulation on the use of money, namely, know-your-customer requirements. Ultimately, a CBDC model can be designed in such a way that banks and PSP perform critical complementary functions

instead of attempting to replace them and misplace their expertise and long-established capacity.

In any case, both central banks and commercial banks and other payment services providers would have to make considerable investments to set up a suitable infrastructure for this new product, redesign networks and integrate it with current existing technologies and services. Issues such as how to remunerate private intermediaries for performing those functions will require a thorough analysis. It would also be expected that the banking sector and other financial entities, with the capacity and expertise to intermediate, would continue to offer value-added services, such as overdrafts and loans and mortgages, while competing against CBDC for transactional services.

- Financial intermediation implications. Probably one of the most challenging implications of the introduction of a CBDC at a significant scale is its potential effects on the traditional structure of the banks' business and financial intermediation model, given their recourse to leverage from demand deposits to provide the wider economy with credit. A general purpose CBDC could compete with guaranteed bank deposits, with implications for the pricing (interest and non-interest), stability and composition of banks' funding. Besides this, the probability of a flight to quality towards the central bank money that could impact commercial banks sight deposits should also be considered, particularly in times of stress.¹⁴ Furthermore, due to the strong competition on retail transactional services, banks and other financial entities would be pushed to increasingly rely on wholesale or even overseas funding which is likely to be expensive and more unstable. This would constitute a large structural change for the banking sector which could see their intermediation margins eroded and have consequences for credit provision, thereby posing a significant challenge to the sustainability of current bank business models. This could result in unknown scenarios for banks to continue to comply with capital and prudential requirements, while assuming novel (e.g. riskier) intermediation initiatives that alter their business models.

As a result, central banks should be mindful of the convenience of deploying a CBDC that while enhance contestability and efficiency in the payments market by offering a public alternative to private money, also prevent large-scale runs from demand deposits to CBDC or cash holdings. This is a design issue that can take several forms, including restricting the CBDC supply to a given amount such that it complements but not completely "crowds out" private money, in an attempt to moderate the unintended effects on the banking sector's business models; establishing a notice period for large CBDC withdrawals and/or convertibility caps; limiting CBDC usage -only for small amount transactions-, or setting daily transfer limits on CBDC accounts. Such design features are within the control of the central bank and would affect the attractiveness of CBDC, limiting the extent to which it can be a substitute for bank deposits (Meaning et.al, 2018), thus enabling the banking sector to adapt their business models to be more competitive over time.

¹⁴ CPMI-MC, 2018; Bascand, 2018; Coeuré, 2018, Nuño, 2018; Engert and Fung, 2018.

- Monetary policy implications. Introducing a CBDC may imply a new thinking for monetary policy, especially in a hypothetical scenario where CBDC replaces cash to a large extent. For instance, being a liquid and creditworthy asset, a CBDC could function as a risk-free asset comparable in nature to short maturity government bills, with potentially unintended effects on the public debt market and government financing (CPMI-MC, 2018). With respect to the extreme scenario of abolishing cash to circumvent the zero-lower bound, it may not be necessary but it would rather be sufficient to eliminate large-denomination bank notes so that they no longer act as an effective asset to avoid negative interest rates.
- Other implications. Concerning other policy implications, it should be noted that privacy considerations are one of the top concerns in case a CBDC is deployed. Indeed, anonymity may be controversial or undesirable for many central banks but there are also possible designs allowing for secrecy in retail transactions among households and firms while allowing for the identification of the end-users in a central database (either operated by the central bank itself or outsourced).¹⁵ This latter alternative can allow for digital records and traces thus improving the application of rules aimed at anti-money laundering and countering the financing of terrorism (AML/CFT), as well as satisfying the public policy requirements of other supervisory and tax regulations. That may even help reduce economic informality by introducing friendly CBDC features for segments of the population that have been self-excluded from formal financial services given their aversion to be traced.

An important conclusion that stems from the various policy implications of introducing a digital currency is that central banks should be able to take control over the design of CBDC, and thus be able to seek a proper balance of the features and needs that a digital currency should have and meet. All things considered, the ultimate goal for central banks by issuing CBDC might be to address unmet population needs with regard to money (and payments), but at the same time mitigating any potential unintended implication that may hamper either financial intermediation models, or monetary policy transmission mechanisms, as well as payment systems functioning, by means of a suitable and appropriate CBDC design.

2.3.2 Central banks deploying digital currencies: issues and challenges

It is not clear that central banks have a technical comparative advantage in issuing a digital currency given the lack of market and technical expertise with regards to this new development. Technological developments on the one hand are evidencing that digitizing fiat money is plausible for wholesale and for general purposes. On the other hand, policy implications require that central banks carefully analyze the design features in consideration of its potential effects in monetary, financial and payments dimensions.

¹⁵ There are, however, significant operational, legal and reputational risks that can arise from central banks holding such a sizeable amount of personal information. They stem from the need to comply with general data protection requirements that these institutions have so far only been partly bound by.

In view that the measurable and non-tangible costs associated with the launching of a CBDC are complex to estimate due to the specific design features as selected by each central bank, it is recommended to adhere to a minimum set of considerations to ensure a robust design and management of the system. These considerations may include the following:

- The complete elimination of banknotes is unlikely to be feasible, given users' preferences or geographical, emergency planning, economic, political or idiosyncratic reasons. Given this, central banks should bear in mind the importance of CBDC as a complementary system, allowing off-line payments to still take place in physical format, i.e. paying with coins and banknotes.
- A CBDC system will be highly demanding in terms of telecommunications, software, authentication, cybersecurity, operational risk mitigation and other technical capacities. The adequate management of these factors will represent costs that the central bank must absorb, directly or indirectly.¹⁶ A CBDC system might be vulnerable to outages in electricity and internet connections, to weaknesses in geographical coverage of these critical infrastructures as well as to risks of failures of their services or to anti-competitive strategies by these commercial firms (even more so if they are monopolies or oligopolies), making it necessary for central banks to master the technical and technological know-how to deal with day-to-day and contingency situations.
- The technological means to issue and transfer CBDC –e.g. a digital wallet and the distribution technology– should be feasible and acceptable to the central bank, to the general public and to other relevant parties including commercial banks and third-parties (Engert and Fung, 2018). Central banks might consider to “outsource” any related information processing and client identification and control functions that could play a new role on a larger scale, which may represent additional or unexpected associated costs, to alleviate the possible lack of experience or capacity to deal with users, intermediaries and other parties included in the CBDC system.
- Certain groups in society, for instance those with lower levels of financial education, or vulnerable ones (e.g. late adopters) and others (e.g. the shadow economy), may find challenging to use digital solutions also because they do not have the purchasing capacity to buy smartphones or the technical literacy to use them adequately. Central banks should ensure that the general public is ready and prepared to use digital forms of cash, by promoting adoption and training campaigns, as well as by developing easy-to-use technical interphases and involving relevant stakeholders of the CBDC system that could foster outreach and scalability (e.g. in terms of nation-wide identification mechanisms or IT infrastructure).
- In cases where central banks decide to concentrate most or all transactional aspects, the operational risks will exacerbate as it may become a “single-point-of-failure” of the whole

¹⁶ Alternatives for recovering costs are technically possible but highly controversial or politically non-viable since cash is considered virtually cost-free for end-users.

economic system (CPMI-MC, 2018). Central banks should be prepared to face challenging scenarios related to technical and technological aspects of a CBDC system with proper communication and continuity strategies, including the immediate wide-supply of physical cash in cases of emergency (natural disaster, major cyber-attacks, etc.)

- The complexity and uncertainty associated with introducing a CBDC may carry legal and reputational risks for central banks. For instance, central banks could be called upon to provide CBDC users' data to tax and other authorities (e.g. for judicial matters). Moreover, they would have to manage privacy and anonymity issues stemming from the insights obtained from private transactions. This may require reflecting on its effect on economic freedom as a state entity concentrates digital records and traces of a great deal of economic transactions from the public (Jordan, 2018).

In summary, it is difficult to quantify the effects and costs of deploying a CBDC system, as there is no previous experience. Analyzing whether the intended goals of a CBDC could also be achieved by other means is required, since CBDCs raise important questions and challenges that need to be addressed. A CBDC would move central banks into uncharted territory and encumber them with added responsibilities and costs, which would inevitably expose them to greater risks and political interference. A cautious and incremental approach might therefore be always preferred. Also, while situations differ, central banks should also be aware of assessing a widely accessible CBDC system against existing or potential schemes of fast (even instant), efficient, properly regulated and competitive private retail payment products.¹⁷

2.4 A first balance of CBDC key aspects, issues and implications

All in all, central banks, especially in emerging economies, may be attracted to the role a CBDC could play to foster financial inclusion, greater efficiency and competition, as well as to promote the formalization of the economy, reduce tax evasion, among others possible advantages. It could also help contribute to the public policy objective of ensuring an efficient supply of means of payment, where the private sector fails to do so due to market failures. Some of these considerations are also valid for more advanced economies, but are particularly extremely relevant for emerging countries.

However, the implementation of a general purpose CBDC also brings substantial implications and challenges that deserve careful assessment. Some of the most significant ones are those related with the large technological effort and cost derived from the provision of a CBDC on a national scale: In particular, the challenge to effectively include certain groups in society with lower levels of financial education, and to manage the operational risks of a systemically important payments system of such magnitude whose failure might cause considerable harm to the economy as a whole. Furthermore, the new CBDC related functions may also test the traditional boundaries of central banks' jurisdictions and responsibilities, which would affect the private sector.

¹⁷ (CPMI-MC, 2018).

3. Assessing CBDC projects: lessons learnt and key considerations

3.1 Introduction

The goal of this section is to analyze the main design features of selected CBDC projects that could shed light for Latin American and Caribbean central banks about the opportuneness of a CBDC and the way forward. To achieve this, the CBDC WG selected CBDC projects in an effort to provide relevant insights related to conceptual and practical aspects implied by the suggested benchmark and features identified above in section II.a.

In the following subsections, three projects are being presented which exhibit different features. The initiatives of Ecuador (BCE) and Uruguay (BCU) show varying degrees of reach and scale in practical terms. The one undertaken by the central bank of Sweden (Riksbank) remains so far as a useful prototype for analyzing the implications of different options when issuing a CBDC.

From a general perspective, it can be said that the BCE project is one of the first cases of a CBDC implementation with a global reach. In 2014, the BCE launched the “Dinero Electrónico” as a centralized model of digital currency (US dollar-based) accessible by the public at large.¹⁸ It was later handed over to the banking sector to become a fast payments scheme. In the case of the BCU, the so-called e-Peso Project was launched as a six-months public-private partnership pilot starting in late 2017, and currently the Board of the BCU is assessing the main findings of the pilot phase. Concerning the Riksbank, the e-Krona is an on-going project whose feasibility is being analyzed since early 2017, and a decision on whether to recommend the issuance of its own digital currency will depend on the further stages of the project which are to be reviewed in 2019.

3.2 Methodology

The CBDC WG elaborated an assessment document made of a standardized matrix for evaluation and a related methodological note, both used in conjunction to explore four strategic aspects of selected CBDC cases.¹⁹ This package together with the analytical framework provided by the CPMI-MC Report and the benchmark defined in section II.a of this report, were the basis for the CBDC WG to survey the practical aspects of the Riksbank, the BCE and the BCU. The following subsections summarize the main findings of the assessment, considering: 1) motivation (main reasons considered for the implementation); 2) design features (specific aspects of the product); 3) practical implementation aspects (timeline of implementation and stages); and 4) the expected

¹⁸ The initial project only considered the citizens opening accounts directly in the BCE. Since 2017 agreements with banks and other private payment services providers were incorporated to outsource some functions with them.

¹⁹ The CBDC WG assessment package is found as an annex of this report. Each selected case was assessed against the CBDC WG methodology and was complemented with interviews and documents reviewed directly by Group members.

effects of issuing a CBDC (potential effects on monetary policy, financial intermediation and payment systems).

3.3 Main findings

3.3.1 Motivation

The WG inquired about the reasons that led central banks to consider issuing a CBDC, whether they were based on legal, institutional or policy considerations. Likewise, specific goals were considered as motivational aspects, including: reducing cash in circulation or promoting electronic payments, increasing payments market competition, fostering financial inclusion, reducing informality, or fighting tax evasion and financial crime, among others.

One of the lessons that can be learnt from the assessed cases is that some of the main reasons for central banks aiming to supplement banknotes and coins in circulation with a CBDC include a strong trend already in place to use less cash in society –as in the case of Sweden– or the exactly opposite reason: the desire to reduce the use of cash to broaden financial inclusion –as in the case of BCU– or to favor less shadow economic activity –as in the case of BCE–. It should be noted that, in all cases, there is the legal mandate for the central bank to provide fiat currency to the economy.

The issuance of a CBDC as a complement to banknotes and coins in circulation is of special relevance in Sweden because of the continuous reduction in the use of cash, and also in Ecuador which, by being a dollarized economy, decided to implement the project as a mechanism to reduce the high costs of keeping foreign physical cash in circulation. In Ecuador, there was also an interest in expanding financial inclusion and increasing access to financial services to the underserved population. In Uruguay, an important motivation was the interest in being part of the global digitalization trend.

It should be noted that the legal framework of each country facilitated the initiation of the aforementioned projects, among other considerations because regulation does not specify standards or formats (paper, plastic, electronic, etc.), for the issuance of the legal currency.

Additionally, central banks indicated that another reason to initiate the projects was to improve the country's payment infrastructure and to foster research. Regarding payments, the introduction of a CBDC would test the current infrastructures, particularly in the retail sphere; and regarding research, central banks highlighted the importance of studying the effects on monetary policy and financial stability. It should be also emphasized that none of these projects were designed to improve the effectiveness of monetary instruments or to create a new financial ecosystem.

All projects show that their central banks had a mandate to increase the use of electronic means of payments in society. Other objectives, like enhancing competition or reducing informality and tax evasion, as well as fighting against corruption, were not a priority for the projects. However, it was pointed out that there may be some favorable secondary effects from reducing said idiosyncratic features. It is worth mentioning that the Riksbank emphasized that financial entities were likely to react to the CBDC with strategies to keep clients, services or products.

Regarding the scope covered by each CBDC project, it was found that central banks not only worked on developing a research concept note, but also on the possibility of implementing a pilot. Uruguay finished it in 2018, Ecuador went on to a production phase between 2014 and 2015, while Sweden will decide on the implementation in 2019.

The BCU noted that no regulatory adjustments would be necessary to fully implement a CBDC, while the BCE indicated that it will be necessary to enact regulations for the CBDC to become a universally accessible means of payment, and the Riksbank points out that legal modifications include the adjustment of its Act in order to consider CBDC as legal tender.

The results also highlight the importance of coordination and participation of both the public and the private sector to cooperate in the design and implementation of the project, even though it was the initiative of the central bank to engage in the CBDC project. Another common issue for BCU and BCE were the technological requirements for the decision to issue a CBDC.

The last aspect under assessment as regards the scope of CBDC relates to improving the efficiency of cross-border transfers. Yet again, the responses reflect the different realities of each country. In Ecuador, the issue is relevant due to the significant migration of its population, but it was not envisioned, while in Uruguay the project was limited to a domestic scope, and in Sweden it was not considered in the initial phase of the project.

Besides this, it is noteworthy to point out that within the international central bank community there is no clear agreement on whether the potential benefits of issuing CBDC are large enough to offset the challenges and risks it entails, as it has been concluded in reports published by Denmark, Israel, the IMF (2018) and the BIS (Barontini and Holden, 2019).

Box 2. Central Bank Digital Currency in the Marshall Islands

The Republic of the Marshall Islands (RMI) issued a declaration on February 2018 announcing the issuance of a new legal tender, named “Sovereign” or “SOV”, which will circulate in addition to USD, as the unique legal tender for the time being in that country. The SOV will be a decentralized currency, based on blockchain technology -on an open distributed ledger- that records transactions in a verifiable and permanent manner. By this declaration, the new digital currency is declared legal tender for all obligations, public charges, taxes and dues. It will not be anonymous or redeemable.

The RMI Government has appointed a corporation to be in charge of the arrangement required for the issuance of the SOV. The number of units at issuance shall be fixed at 24.000.000, and each SOV unit will be divided into 100 sub-units. The supply of SOV units shall only grow in a predefined yearly rate of 4%. All users of the SOV will be required to undergo standard Know-Your-Customer procedures and requirements. Digital Currency Exchanges in the RMI will be licensed and regulated to follow anti-money laundering requirements.

The International Monetary Fund (IMF) has expressed concerns about these developments, noting that the potential benefits from related revenue gains could be considerably smaller than the potential costs arising from economic, reputational, and governance risks. In addition, the IMF emphasized the need for additional steps to strengthen the AML/CFT framework in RMI.

Source: Own elaboration based on IMF statement, 2018.

3.3.2 Design

With respect to the design aspects, projects were analyzed from different perspectives such as the type of currency to be issued, the target users, the availability of the product, the type of issuance that would be implemented, the degree of accessibility to the product; as well as operational aspects (dispersion, monitoring, validation, storage of data, etc.) and other factors related to CBDC supply.

With regard to the type of currency to be issued, the BCE and the BCU adopted a general-purpose CBDC. In the case of Ecuador, it was highlighted that issuance would be supported or based on US dollars because of its particular condition of being a dollarized economy. The Riksbank is evaluating the option between an account-based or a value-based model (e.g. a CBDC bearing interest would demand an account-based model while if anonymity is a requested feature, a value-based model would be preferable instead).²⁰ Likewise, all countries agreed in considering that an important aspect of the design of their own CBDC is the 24x7 availability.

Even though BCE, BCU and Riksbank agreed that the issuance of a CBDC is a central bank's responsibility, the access to accounts provided by the central bank through a mobile wallet-type device is treated differently in each case. In the case of the Riksbank, the wallet would be provided by the central bank and would be available to the general public (more likely interoperating with accounts of private entities); meanwhile, in the case of Ecuador, accounts had to be opened by the BCE and users had to load their wallets directly at authorized outlets and directly with the central bank (the possibility of interoperating with private wallets was not indicated). In the case of Uruguay, there are two components in the design of the pilot e-Peso: The issuance provided by BCU, and the wallet and transaction validation provided by third-parties (the type of access to accounts is subject to evaluation).

In terms of operational aspects such as dispersal of CBDC holdings, an important lesson learnt from the projects is that third-parties participation to promote interaction with users of all wallets and infrastructures that are developed is of utmost relevance, even though different approaches may be adopted. BCE allowed financial entities to interact with electronic wallets providers; BCU issued e-Peso but the storage, dispersal and operational aspect were in charge of third-parties (IBM, Roberto Gori Company, RedPagos, etc.). In Sweden, it is still under evaluation how to link up private sector entities in the operation of e-Krona. These approaches reflect the importance of ensuring interoperability of CBDC products with other retail payment and financial services to build upon existing infrastructure.

The monitoring and transaction validation were realized differently by each central bank. While the BCE took full responsibility of these tasks by mandate and by regulation, the BCU entrusted a third-party (IBM) with the monitoring and validation of e-Peso transactional aspects during the pilot. The Riksbank noted that these functions will directly depend on the model to be selected (account-based or token-based).

²⁰ In a register-based model (account based) the balance will be stored in a central database (as a central bank database) and in a value-based model (token-based), the value will be stored in an App or other instruments such as cards.

With respect to the storage of transaction information, the BCE kept it internal by legal mandate, the BCU through a third-party at the initial design but considering a direct supervision; while for the Riksbank it will depend on the model to be chosen. Another important similarity between the projects is that the primary issuance of a CBDC is exclusively a central bank task. Lessons learnt from these operational aspects relate to data management, operational resilience, and expertise related to CBDC deployment and the importance for the central bank to ensure that selected features are both robust and efficient, whether provided by third-parties or internally.

Technological aspects, such as the degree of interoperability, anonymity and traceability, conversion rate to the fiat currency in circulation, risk management, among others, also deserve attention. The three projects diverged in terms of solution systems and software. In Ecuador, a proprietary BCE platform was developed, while in Uruguay the e-Peso pilot was made with proprietary third-party provider software. The Riksbank has not yet defined which technology will be used, stating that this decision is still subject to evaluation.

Regarding the degree of interoperability, all the projects agreed that the platforms must be interoperable. However, while the BCE used its own standard solution, the BCU has not decided yet and the Riksbank is evaluating the option to invite external actors to propose interoperable solutions.

In relation to operations like cash-in, cash-out, interest bearing (if any) and level of anonymity, there are also important lessons. While cash-in should be carried out at the central bank (if accounts are opened in the central bank), cash-out operations would depend on the interaction between CBDC accountholders and wallet solutions (mostly through a network of affiliated third parties like banks and payments service providers, etc.). In relation to interest bearing for CBDC holdings, all central banks agree that no interests will be paid or charged, on the one hand because rewarding CBDC holdings could provoke flight towards central bank money, and on the other, because imposing fees to CBDC holdings would discourage its use as a means of payment.

Regarding anonymity, the three central banks agreed in selecting a CBDC design that provides the public with a degree of anonymity to preserve cash features untouched, yet each project could define its own level of anonymity and traceability of data. Riksbank stated that the degree of anonymity could have a limit of up to 250 Euros, in line with the AML European standards.

A number of lessons can be drawn from the abovementioned attributes of the CBDC projects. One key lesson is that central banks, in their attempt to make the CBDC attractive for the public, have considered cash-like attributes in CBDC. Another lesson is that CBDC design merit special and deep study to properly deal with financial intermediation and monetary policy considerations. The issue of whether bearing interest for CBDC holdings or not also has to be carefully analyzed in order to prevent unintended implications.

Finally, in terms of risk management, it can be seen that BCE -as the only case that went live- had covered operational risk, liquidity, information and cybersecurity considerations in the design of its CBDC. In the case of the BCU, as the project is still under a pilot phase, risk management considerations were limited to the design of the tests and may require further adjustments in the event the central bank decides to move ahead with full implementation. Lastly, in the case of the Riksbank, it will be necessary to wait for real-life testing in order to understand how risks would be

managed by stakeholders and authorities. While there are policy issues that may not necessarily be decided beforehand, aspects such as cyber and operational risks should be a top-priority for central banks, given the reputational hazard that may arise from providing the general public with a brand-new digital currency, even in situations where physical cash is suitably available.

3.3.3 Implementation and testing

Implementation aspects that were assessed for each of the selected cases include the following: decision making, internal and external coordination, staffing, timetable, deliverables, incentive schema, etc.

The three central banks indicated that it was an autonomous decision to issue CBDC, that it was approved by the Board, and that it took at least a year to prepare the feasibility project. In all cases, a special team was formed comprising professionals from various areas such as payment systems, treasury, technology and information, legal, monetary policy, among others. This reflects the importance of ensuring high-level commitment for allocating institutional resources, and the need for a multidisciplinary team to be the foundation for the project.

Central banks also agreed that coordination efforts were needed at various levels and with several stakeholders, including other relevant authorities, telecom operators and financial entities, etc., for the sake of the operational aspects of the project and because awareness among authorities and private sector becomes relevant once the project is tested and decision on further implementation must be taken. In this vein, it is imperative that the central bank work together with key stakeholders and –most likely– act as the project leader.

It was challenging to obtain information on project costs, due to confidentiality concerns. Additionally, the BCU carried out a project totally financed by a private company²¹ and the Riksbank indicated that the cost will depend on decisions to be made when issuing the e-Krona. In general, it can be said that implementation costs could vary considerably from one case to another given the specific design features each model may have, including third party involvement.

The incentive schema for the introduction of CBDC was another aspect assessed. The BCE and the BCU indicated a special incentive scheme, the first one based on the return of 4% of VAT and the second on granting a UYU500 credit in the digital wallet for the first 1,000 users who perform cash-in transactions. The Riksbank indicated that it has not yet designed an incentive scheme and that this issue will be evaluated before the potential launch of the e-Krona.

In summary, the various projects show the following differences:

- a. The BCE had (2) two stages of implementation that were clearly distinguished: The first stage begun with the issuance in 2014 of digital money as a means of payment (opening of US dollars accounts -replacing physical banknotes- at the BCE) with very limited number of users and transactions, and a second stage, starting in 2017, when the central bank gave consent to some

²¹ Roberto Giori Company

private financial institutions to take the lead in reorienting the scope and nature of the project into a fast payments scheme.

- b. The Riksbank pointed out that the e-Krona project has three defined phases of development: The first one is the theoretical proposal (2017), the second is related to the assessment of regulatory and operational issues (2018), and the third phase is related to the possible development and implementation of e-Krona (2019).
- c. The e-Peso project had two phases. The evaluation (2014-2017) considered the analysis of legal, technological and safety issues and a 6-month pilot, starting on November 2017, with 3 stages:
 - i) BCU issued (UYU20 millions) e-Pesos and transferred an amount (UYU7 millions) to a third party for dispersal and transactional purposes; ii) the wallet app, the cash-in facilities, and the transactionality available for users with the support of additional third parties, including a telecom company and a specialized payment service provider; and iii) the pilot finalized with cash-out for all the existing CBDC accounts through the specialized provider. The BCU will assess next steps to be taken.

Concerning the risk management during the implementation process, the three central banks are reported to have adequate risk management frameworks to deal with various aspects of the project. The BCE paid special attention to transaction safety, errors in collection and transfers as well as communication failures. The BCU included analysis on legal, informational, financial and even reputational risks. They also tested the technological components of the system (production, wallet, transactional system, etc.) and concluded that these were adequate.

Box 3. Update of the Riksbank's e-Krona Project

In October 2018, the Riksbank published its second Report of the e-Krona Project highlighting the relevance of going further and decide about issuing a CBDC.

-There is a need to adapt Riksbank's Act: The project proposes a consultation for amendments to the Act. A widely-accessible value-based e-krona would be compatible, however the Act will need to be amended if the Riksbank opt for an account-based e-krona design, given that opening deposit accounts for the public is out of the scope of the central bank. Furthermore, such amendments have to be submitted to the Swedish Parliament.

-Develop a value-based e-krona: The project proposes that the Riksbank build a technical solution for a value-based e-krona (a pilot without interest rate but with traceable transactions), considering this design as a prepaid value (electronic money) and taking into account the Electronic Money Act (legal base).

-Further assessment of an account-based e-krona: Given the legal modifications and an interinstitutional coordination in the design of an account-based e-krona, the project would be exploring agreements for such coordination.

However, the Riksbank has not decided yet whether to issue an e-krona or not. The final decision depends on several future steps like the conceptual test, the pilot, the legal inquiry, the dialogue with society, results of experimental environments and in existing infrastructures, among others. The following timetable has been proposed for the project:

1. Investigation of the need of legislative amendments (2019)
2. Technical support for an e-krona pilot (2019)
3. Technical solution draft, test and evaluation (2019-2020)
4. Parliament has the option for adopting new legislation (2020-2021)
5. Riksbank prepares implementation in a specific project with markets agents and society (2021-).

Source: Own elaboration based on Riksbank, 2018.

The review of these issues illustrates that a CBDC implementation should be an extremely well-designed process, as it can provide central banks with the opportunity to adapt and react properly to unexpected events as well as to establish an adequate and properly introduced CBDC. The analyzed cases proved that the technical implementation of CBDC is feasible, but since their scope is rather limited, there are open questions, for instance those related to the scalability of the system. In addition, there was not sufficient comparable information from the central banks at present on other aspects such as the deliverables of the project, strategy of CBDC introduction to the market and educational training.

3.3.4 Expected effects

Three areas were considered in relation to expected effects:

- a) Payment systems (interoperability, clearing and settlement, risk management, supervisory role of the central bank, etc.),
- b) Monetary policy (transmission channels, policy objective, confidence in the currency, supply and demand of money, etc.), and
- c) Financial stability (business model, assets and liabilities of financial institutions, regulatory compliance, etc.).

One important lesson that the CBDC WG wishes to underscore is that all three projects were (or are) differently structured. On the one hand, the Riksbank is currently evaluating implications and alternative designs in order to undertake a real-life implementation. The BCE ran a large-scale project between 2014 and 2017, but the issuance of digital money was shut down after negligible scalability and adoption. The BCU launched a short-term experiment between 2017 and 2018 and is currently analyzing subsequent test phases. From these experiences, it can be concluded that further experimentation (on scale and timing) will be necessary to validate the expected results in the abovementioned aspects. Yet, there are some key insights that could be extracted from these cases.

- Payment systems. In general terms, only the BCU has determined that the e-Peso implementation needs a new payment infrastructure (to process mobile payments), which should be integrated with existing platforms to create an ecosystem that is modern and inclusive. The BCE and Riksbank anticipated minimal impact on their existing payment systems infrastructure. In addition, the Riksbank mentioned that the impact on other

payment services providers is expected to be small. The Riksbank indicated that the project related to e-Krona is likely to be a means of payment to complement cash (for retail transactions).

Central banks agree that technology is a crucial factor in the implementation of a CBDC. The BCU concluded that the implementation of CBDC will require the development of technological resources to complement the current payment infrastructure. The BCE mentioned that technological changes were already implemented in the payment systems and the Riksbank said that an open access to central bank money with individual accounts, managed by Riksbank, would present a technological challenge to be addressed.

Concerning interoperability and standardization issues, there were differences between the BCU, the BCE and the Riksbank on this matter. The BCU pointed out that the business model is under evaluation. Hence, the scope for interoperability with banks and other payments and market infrastructure is also under analysis. In the case of the BCE, there was only one platform and there was interoperability between mobile telephone platforms only, but further consideration about CBDC and other payments and financial infrastructures was not provided. Meanwhile, this effect has not yet been assessed in detail in the case of the Riksbank.

With respect to clearing and settlement, one of the key aspects that BCE and the Riksbank have in common is the likelihood of a null effect since the former will continue settling in real time and the latter points out that the settlement will continue being in central bank money. Meanwhile, the BCU indicated that the effect would depend on roles assignments; a new clearing and settlement arrangement may be necessary to process mobile payments and interconnection with existing infrastructures and bank accounts.

Regarding the legal framework, the BCU is evaluating possible changes and the Riksbank is exploring adjustments to its legal framework, including mandates, faculties and legal tender features associated with CBDC. As a complement, the payment system oversight role is expected to include CBDC, but will depend in the end on the design of the CBDC.

Another important aspect to highlight is the potential impact on the use of cash. The three central banks agreed that a CBDC will affect the use of cash, given the shift of preferences in the various groups of users. This aspect is crucial in Sweden because of the continuously declining trend in the use of cash by the public.

On financial inclusion matters, the BCE emphasized that the CBDC was designed with the main goal to promote financial inclusion, enhance bank intermediation, and reduce the use of cash. The BCU noted that the e-Peso could help financially excluded people who have access to mobile phones to use e-Peso and other (new) related financial products. The Riksbank emphasized that an open access to the risk-free central bank money will open the possibility to include underserved people into the financial system.

- Monetary policy. In general terms, BCU pointed out that the e-Peso has potential to substitute other payment methods supported by banking deposits with eventual effects on

the money multiplier, depending on the degree of substitution between deposits and traditional currency, and the amount of CBDC issued. The Riksbank found that the size of the demand for e-Krona will be the main factor determining what the consequences will be for monetary policy. The BCE did not report any expected effect (mainly because there is no independent monetary policy in Ecuador since it is a dollarized economy).

Regarding the effect on the transmission channels, the BCU and the Riksbank indicated that it depends basically on the decision of having interest-bearing CBDC holdings. If it is designed as an interest-free means of payments (like cash), then there is no direct effect over the interest rate determination (BCU), but if it is designed to earn interest, then it has to be incorporated into monetary policy implementation (Riksbank).

Concerning the determination of the policy interest rate, the BCU considers that monitoring CBDC transactions will be relevant for its monetary programming which is based on monetary aggregates. In other words, should CBDC be incorporated into money demand estimations, the physical money supplied would be managed according to the policy announcement. The Riksbank also indicates that the effect would be unknown, depending on if it accrues a positive, zero or negative interest rate. In addition, it could have effects over the zero-lower bound of the policy interest rate. The BCE, Riksbank and the BCU reported no effects. Indeed, the BCU and Riksbank emphasized that the inflation targeting regime and price stability is not likely to be affected in anyway. In fact, Riksbank says that the initial assessment of the e-Krona project is that any design would not affect their policy objective on price stability.

The expected effects of CBDC on currency confidence are expected to be positive. The BCU underlined that, considering that the central bank will issue its own CBDC, it is expected that this will generate confidence among the general public. In addition, the Riksbank indicated that because cash is the money form of legal tender, a new government-guaranteed means of payment without credit risk will increase the confidence in the currency.

Another interesting aspect is the potential effect of CBDC on the demand and supply of money. BCU pointed out that the demand for CBDC will be estimated, along with its impact on traditional currency and deposits. The Riksbank mentioned an unknown effect, depending on various factors such the design of the e-Krona, interrelationship with financial entities, payment infrastructures, etc.

In relation to aspects like seigniorage, exchange rate movements or informality of the economy, the central banks mentioned that they do not expect significant impacts, or these were not initially considered or defined in the CBDC projects. Concerning of seigniorage, the case of BCE is particularly relevant, but available information did not allow this issue to be explored.

- Financial stability. The BCU foresees no major effects on financial stability for its pilot, given the small amount of e-Pesos in circulation; meanwhile the BCE expected a decrease in financial services costs. The Riksbank mentioned that the effect will depend on the design of the new e-Krona (whether interests are paid-off or not), the size of demand, measures

implemented by financial entities (to revert outflows of money), and the macroeconomic environment (internal and external conditions).

Regarding the effects on the financial business model, the BCU pointed out that financial entities are continuously adjusting their business models to take advantage of innovation; the BCE mentioned that the private sector reacted by developing its own mobile wallet; and the Riksbank stated that this also would depend on the demand for CBDC but that reduced intermediation is likely, at least in terms of the provision of payments.

Regarding the impact on financial entities' balances, including assets and liabilities, the three central banks agreed on a minimal effect. The Riksbank mentioned that the effect on the banks' balance sheet is related to the demand for e-Krona as well as the amount of reserves at the Riksbank.

Finally, no major effects on regulatory compliance are expected for any of the three central banks.

- Risks management. The three central banks agreed that the expected effect will be subject to the design of the CBDC model. However, the Riksbank noted that because the CBDC will be designed and managed by the central bank, the effects will probably be limited.

4. Final remarks

The international central banking community is extensively analyzing -and, in some cases, testing- CBDC as an opportunity to improve existing money and payment systems. Related opportunities may be more evident in cases where financial inclusion levels could be enhanced with a digital and widely accessible central bank money solution that supplements existing forms of money and payments means, including cash and cashless payment instruments.

The case for introducing a CBDC system must be preceded by an in-depth analysis of the implications and design issues that are appropriate to each case, with special focus on the potential risks stemming from the operational and reputational features of deploying a large-scale digital currency, and the potential effects on the existing money and payments systems, including the traditional financial business models. Moreover, central banks may wish to reflect on the convenience of digitizing fiat money against promoting (or regulating) other privately-owned options including fast payments, e-money and similar industry solutions.²² In this vein, the international experience, especially in advanced economies, shed light on the fact that motivations must be properly understood before deciding to embark on this new territory. Central banks from Denmark, Hong Kong, Israel, Japan and the European Central Bank have explicitly stated that after analyzing the opportunity of issuing a general-purpose digital currency of legal tender, there is not a strong case in the short-term.

The CBDC WG has surveyed conceptual and practical aspects of central bank digital currency developments from the perspective of Latin American and Caribbean central banking. In particular, the CBDC WG has based its own analysis on an extensive literature review and a methodology of its own to assess several features of selected CBDC projects, focusing on four dimensions (motivation, design, launching and expected effects) of this novel and under-tested form of money.

The CBDC WG have found that central banks projects to test or evaluate the feasibility of issuing digital fiat money share the following common aspects:

- a. From the public policy perspective, the projects have focused on providing a public supplementary alternative means of payment similar to cash but in digital form that is free of risk and that aims to be widely accessible with the ultimate goal of enhancing financial inclusion. The Riksbank is the only case with a goal centered in providing the general public with a publicly-owned alternative to money in light of the dominance of private money, while other cases –representing emerging economies– established a strong motivation for financial inclusion.
- b. The projects have been designed in such a way that the digital currency is for general purpose use and available 24x7, with the potential to improve interoperability in the retail payments market. The involvement of private third parties and the existence of incentive schemes for early adoption, as well as the freedom for the central bank to adjust CBDC features in the

²² IMF (2018).

initial stages, are all relevant features. The BCE case proved that the lack of involvement of the private sector –as part of the CBDC system– may endanger the successful functioning of the CBDC project, being that one of the reasons for the project to be terminated.

- c. From the implementation perspective, the projects have shown that technology allows –at a small scale given the nature of the pilots– issuing, circulating and using money in digital form and in coexistence with traditional physical cash. Leadership from the management of central banks is crucial to devote the necessary efforts to analyze, design and properly engage in the implementation of a CBDC project. Other issues like cooperation with relevant stakeholders and the technical capacity and expertise of staff involved in the CBDC project implementation were found as very relevant factors. The BCU is the only case where implementation (pilot phase) has confirmed the feasibility of a CBDC going live, with design and implementation aspects properly managed, cooperative arrangements in place, and the technology smooth and effective functioning.

The above results of the CBDC WG help to better understand the various implications of a digital currency, including the need for the central bank to determine if there is a clear case to deploy such an alternative form of money in terms of the costs-benefits (at the policy-, operational-, and commercial-levels). In those cases where pilots or a decision to implement a CBDC has already been taken, there is a need for the design and implementation aspects to be led by the central bank, in coordination with and careful scrutiny by relevant private and public stakeholders for adequate functioning of the money, payment and financial systems. As part of this watchful analysis, central banks should ensure that each conceptual and practical issue is translated into specific measures, namely risk mitigating controls, scalability and outreach strategies, IT- and cyber-related features and controls, operational arrangements and schema, among other important implementation factors.

Overall the CBDC WG review established that the case for CBDC will be unique on a country by country²³ basis, depending on the economic, financial and idiosyncratic, cultural and regional circumstances prevailing in each case.

Finally, it is important to continue monitoring experiences in the region and abroad, with the aim of learning from analyses and tests of digital forms of money in different countries.²⁴ Likewise, in light of the growing innovation in financial technologies, Latin American and Caribbean central banks are advised to keep informed about relevant developments directly related to CBDC, and for that the CBDC WG could be a purposeful vehicle.

²³ Regional deployment of CBDC is a matter going beyond the CBDC WG analysis. Notwithstanding, the Working Group acknowledges the importance of studying further the feasibility and implications of cross-border features for digital currencies.

²⁴ The CBDC WG is aware of retail CBDC experiments under way, including Bahamas, China, the Eastern Caribbean Currency Union, India, Marshall Islands and West Africa, that will shed light on practical aspects of digital currency pilots going live. References to these experiments were not included in this report given the status of each project and the timetable of the CBDC WG.

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Annex 1. Assessment Matrix (MAX), Practical Issues of Implementing a Central Bank Digital Currency

In order to assess the CBDC projects the CBDC WG design an Assessment Matrix (MAX) and a Methodology Annex (MA) aiming to create a standardized overview of each project, with particular emphasis in practical issues of their implementation.

The Assessment Matrix is presented below

MAX structure:

The matrix is composed by four sections:

Section 1. Motivation: This section seeks to determine why a central bank could spend resources to consider of issuance its own digital currency (central bank digital currency, CBDC). Issues related to feasibility and desirability, as well as institutional aspects are covered in this section.

Section 2. Design: This section seeks to identify all technical aspects and product features of the CBDC. It is important to provide a complete description of all design characteristics considered in this section.

Section 3. Launching: This section is focused on gathering details (and the time frame) of the launching of the CBDC project, including hierarchical level of decision making, responsibility levels, inter-institutional coordination and the main milestones or phases of the project.

Section 4. Expected effects: This section is focused on exploring potential effects of introducing a CBDC in the economy. In particular, to understand if monetary, financial or payments implications are (or were) expected to happen.

I. Motivation

Why a digital currency issued by a Central Bank?		
General objective: This section seeks to determine why a central bank could spend resources to consider of issuance its own digital currency (central bank digital currency, CBDC). Issues related to feasibility and desirability, as well as institutional aspects are covered in this section.		
a) Reasons		
Instructions: Please indicate the reason(s) -and select its importance (in a scale of: Low, Medium, High, No applicable)- behind the CBDC project; describing the context and the reason itself.		
Reason	Importance	Description
Legal mandate or Central Bank Board decision		
Need of an institutional change		
Issues to overcome		
Issues to overcome	Payments infrastructure improvement	
	Effectiveness of monetary policy instruments	
	A new financial ecosystem	
	Financial Inclusion	
	Research	

Institutional vision		
Other reasons		

b) Specific goals		
Instructions: Indicate is the following goals were considered or not in the CBDC project objective.		
Goals	Yes/No	Description
Reduce cost of cash		
Development and use of electronic payments		
Competition in financial markets		
Reduce the economic informality and tax evasion		
Tackle corruption, money laundering, terrorist financing		
Other objectives		
c) Scope		
Instructions: Indicate is the following aspects were considered or not in the CBDC project scope.		
Aspects	Yes/No	Description
Conceptual note		
Pilot implementation		
Legal framework change		
Assessment of central bank technical and legal conditions		
Efficiency at international transfers		
Reduce or eliminate the use of cash		
Other goals		
Other issues		
Instructions: Indicate is the following issues were considered or not in the CBDC project.		
Issues	Yes/No	Description
Solve only one problem or several problems at a time (transverse solution in the economy)		
Focus on a single market or several markets		
Involvement: only public sector or private sector as well		
Internal (jurisdiction) considerations and international integration		
Government or State policy		

II. Design

CBDC - Product Design	
This section seeks to identify all technical aspects and product features of the CBDC. It is important to provide a complete description of all design characteristics considered in this section.	
Instructions: Indicate and explain briefly on each field.	
Feature	Description
CBDC type	
Target users	
Availability and business continuity	
Issuance	
Access to the central bank accounts (wallet type)	
Operation dispersion	
Operation monitoring	
Operation validation	
Data storage and taxonomy	
CBDC supply	
Underlying technology	
Interoperability	
Cash-in, cash-out	
Feature	Description

CBDC remuneration	
Transaction limits	
Level of anonymity	
Traceability and other policy purposes	
Business model	
Foreign exchange rate	
Risk management	
Other product design aspects	

III. Launching

CBDC - Launching
This section is focused on gathering details (and the time frame) of the launching of the CBDC project, including hierarchical level of decision making, responsibility levels, inter-institutional coordination and the main milestones or phases of the project.

Instructions: Describe each aspect and, when necessary, select the period of time invested/to invest in one of them (options: 3 months, 6 months, 1 year, >1 year, To be determined, Not applicable). If needed, please feel free to add rows to cover different topics (details, subsections, issues) at one aspect.		
Aspect	Time span	Description
Authorization		
Coordination		
Team(s)		
Cost and financing		
Project phases and timetable		
Deliverables		
Implementation risks		
Market introduction		
Incentives and transactions scheme		
Education and training		
Other aspects of the launching project		

IV. Expected effects

CBDC - Expected effects
This section is focused on explore the potential effect of introduce a CBDC in the economy. In particular, know the impact on monetary policy, financial stability and payment systems, in order to identify in which areas, the central banks must implement complementary measures to not affect their powers, their policy objectives and their legal mandates.

Monetary policy			
Instructions: Select the degree of impact and described each topic.			
	Aspects	Effect	Description
General assessment of implications	Transmission channels		
	Determination of policy interest rates		
	Change in the policy objective		
	Price stability		
	Seigniorage		
Confidence in fiat money			
	Aspects	Effect	Description

Money demand and supply		
Cash usage		
Foreign exchange rate		
Informal economy		
Other		

Financial stability		
Instructions: Mark the degree of impact and described each topic.		
Aspects	Effect	Description
General assessment of implications		
General assessment of implications	Financial entities business model	
	Financial entities balance	
	Liabilities	
	Assets	
Bank multiplier		
Regulatory compliance		
Financial inclusion		
Other		

Payment systems		
Instructions: Mark the degree of impact and described each topic.		
Aspects	Effect	Description
General assessment of implications		
General assessment of implications	Technology	
	Interoperability and standardization	
	Clearing and settlement	
Legal framework		
Risk management		
Risk management	Operational continuity	
	Financial risks	
Payment systems oversight role		
Other		

Annex 2. Methodological Annex (MA), Practical Issues of Implementing a Central Bank Digital Currency

As mentioned before, the Methodology Annex (MA) was created as a support document for the CBDC projects assessments. The methodology is presented entirely, below.

I. Objectives

This document provides a methodology for assessing practical issues regarding the projects of central bank digital currencies (CBDC) already implemented or ongoing. This MA was developed in parallel with and as an adjunct to the Assessment Matrix (MAX). Accordingly, the MA and MAX should be taken together as closely related and supporting documents. The MA elaborates on the expectations related to aspects to be covered ideally in the assessment of CBDC projects.

II. Use of the MA

This MA is primarily intended for setting a baseline for assessors to identify key practical considerations about the lessons or expected outcomes of the implementation of CBDC.

The MA seeks to ensure standardized assessments; therefore, assessors may be able to communicate the outcome of their assessments in the MAX similarly and according to the availability of information and elaborated comments. It is worth underlining that the assessment does not imply formal rating of the various aspects to be assessed.

III. Practical considerations in conducting an assessment

The following practical matters should be taken into account when conducting an assessment:

- Access to information – when conducting an assessment, assessors should be able to analyze all relevant information available on the CBDC project. In particular, assessors will be given with access to contact point person in the respective institution leading the CBDC project. For all assessments, relevant information may include public information, such as official reports and statements, news and articles, and -when possible- also non-public information, such as internal self-assessments, white-papers, and others.
- Assessment of actual results – strong emphasis should be placed on the actual results, especially in those cases of pilot phases already conducted. In the case of assessment of early phased CBDC projects, emphasis should be placed in expected outcomes and initial baseline, i.e. main assumptions of the project.
- Assessment obstacles – assessors should note any factors that may impair the assessment, with particular reference to the degree of cooperation encountered in carrying out the analysis and should communicate those issues to the Fintech Forum Secretariat and the CBDC WG in order to identify additional measures to fulfill the assessment.

IV. Instructions to assess a CBDC project (completion of the MAX)

Section 1: Motivation	
This section seeks to determine why a central bank could spend resources to consider of issuance its own digital currency (central bank digital currency, CBDC). Issues related to feasibility and desirability, as well as institutional aspects are covered in this section.	
a) Reasons	
Legal mandate or Central Bank Board decision	Explain if the CBDC project is developed due to an ad-hoc direct decision of the Board or based on a legal mandate.
Need of an institutional change	Overview related to the decision behind the project. Explain if an institutional change is pursued and provide further elements of the main aspirations (cash management, technological attest, financial inclusion, etc.)
Issues to overcome	Explain if, and how, the CBDC project is aimed at addressing existing problem(s). Specify if the issue(s) are related to the industry, the economy, the central bank, etc. For instance, reducing cash and ensuring the provision of a reliable legal tender, or to promote new technologies to broaden economic activity.
Payments infrastructure improvement	Explain if, and how, the CBDC project will imply technological improvement in the existing central bank payments infrastructure. If changes are expected in other private-owned infrastructures, please explain briefly.
Effectiveness of monetary policy instruments	Explain if, and how, the CBDC project will provide the possibility to improve the effectiveness of the monetary policy tools/instruments currently used by the central bank to fulfil its mandate.
A new financial ecosystem	Explain if, and how, the CBDC project will address issues related to the new financial ecosystem, e.g. new players, product offerings, competition, etc.
Financial Inclusion	Explain if, and how, the CBDC project is part of the financial inclusion strategy and explain the main aspirations around. Describe specifically the possible perspectives of the strategy, such as payments, financial literacy, etc.
Research	Explain if, and how, the CBDC project relates to research and scientific motivations.
Institutional vision	Explain if, and how, the CBDC project responds to the interest of the central bank strategy to be at the forefront of recent technological developments or if there are other institutional reasons, such as reputational, among others.
b) Specific goals	
Reduce cost of cash	Explain if, and how, the CBDC project is seeking to decrease of the cost related to cash management; aspects as: issuing, storage, security, transportation, among others.
Development and use of electronic payments	Explain if, and how, the CBDC project is seen as a tool to promote development and use of electronic payments.

Competition in financial markets	Explain if, and how, the CBDC project will enhance competition in financial markets.
Reduce the economic informality and tax evasion	Explain if, and how, the CBDC project will promote the formalization of the economy and reduce tax evasion.
Tackle corruption, money laundering, terrorist financing	Explain if, and how, the CBDC project is part of an integral strategy to tackle corruption, money laundering, terrorist financing, and other financial crimes.
c) Scope	
Conceptual note	Explain if the CBDC project will result, or has produced, a conceptual note (academic paper, internal report, etc.) without additional implementation actions to be taken.
Pilot implementation	Explain if the CBDC project will serve, or already served, to decide on the implementation of a digital currency.
Legal framework change	Explain if the CBDC project will help, or helped, to assess the need for regulatory change(s) related to fintech.
Assessment of central bank technical and legal conditions	Explain if the CBDC project will be used, or was used, to determine the technical and operational conditions of the central bank to attest new financial technologies.
Efficiency at international transfers	Explain if the CBDC project will illustrate, or shown, its usefulness for cross border payments and other non-domestic transactions.
Reduce or eliminate the use of cash	Explain if the CBDC project will help, or helped, to understand its complementarity with physical cash.
d) Other issues	
Solve only one problem or several problems at a time (transverse solution in the economy)	Explain if the CBDC project is designed to solve a single problem (describe it) or if it is being developed to address different problems and with that offer a transverse solution in the economy.
Focus on a single market or several markets	Explain how the approach of the CDBC project regarding it develop will be. It will only be focused on the financial system or will take into account other markets such as telecommunication and, in that sense, how the project will address relevant players of those markets.
Involvement: only public sector or private sector as well	Explain who is part of the CDBC project. It is a public-sector project or will had private sector involvement too. In both cases describe the scope.
Internal (jurisdiction) considerations and international integration	Explain how the CBDC project will be part or how will be the approach to fulfil and complemented the internal jurisdiction -if possible, describe the implications-. Likewise, how the CBDC project will be integrate and complement the current international financial system.
Government or State policy	Explain if the CBDC project is been developed as a government policy or has a state policy status.

Section 2: Design	
This section seeks to identify all technical aspects and product features of the CBDC. It is important to provide a complete description of all design characteristics considered in this section.	
Feature	
CBDC type	Type of digital currency: wholesale, general purpose, other.
Target users	Describe who will be able to open wallets, and what are the main uses envisioned for the CBDC. For instance, only individuals for P2P, or only banks for interbank fund transfers, etc.
Availability and business continuity	Describe the availability scheme of the CBDC product, 24x7? 5x8? Explain what are the main contingency and business continuity measures to deal with pitfalls, unexpected failures and other important likely scenarios.
Issuance	Describe if the process of issuing the CBDC considers a direct provision from the central bank or a third party will provide this service.
Access to the central bank accounts (wallet type)	Explain if holders of digital wallets will have access to central bank accounts. In case that accounts are not directly managed by central bank, explain how the wallets will be debited/credited and which type of entity will provide this service, and finally, describe how will be the communication between central bank and those third-party service providers.
Operations dispersal	Describe if all financial entities will be able to operate with CBDC. Explain if non-financial entities will be allowed operate with CBDC.
Operation monitoring	Describe whether, and how, the central bank will monitor CBDC transactions. Explain if there will be monitoring at individual or at an aggregated level. In case of an outsourced service, explain the role of the third party in charge of this task.
Operation validation	Describe the process of validation of the transactions and specify if it is related to consensus protocols, centralized or decentralized operational process, etc.
Data storage and taxonomy	Describe how the data storage related to CBDC transactions occur, emphasizing business continuity and cybersecurity protocols. Explain how the database (structural framework) will be managed. In case of an outsourced service, explain the responsibilities between the third-party provider and the central bank.
CBDC supply	Describe how will the CBDC supply, underlining what will be the parameters to set the level of CBDC to be deployed. If possible, describe the implications for money supply and monetary policy goals.
Underlying technology	Provide a detail explanation of the type of technology underpinning the CBDC project and codification type ((DLT own code, blockchain, open- or closed-loop, a centralized system or other).
Interoperability	Explain if -and how- there will be interoperability between the CBDC platform(s) and other payments and market infrastructures including cross border payments.

Cash-in, cash-out	Describe how will the CBDC will be converted into physical cash and commercial bank money and vice versa. Explain if the central bank seeks perfect complementarity/convertibility between CBDC and cash and commercial bank money.
CBDC remuneration	Describe if there will be remuneration to CBDC (digital wallets and related accountholders). Explain if it would be possible to pay an interest rate or a penalty rate (negative interest rate).
Transaction limits	Explain if there will be limits for digital wallets (balance, transfers, deposits thresholds, depending on transaction type, etc.). In case some limits will apply, explain if they will be applied in any state or they are contingent to some circumstances (stress situation) or to some holders' characteristics (children restrictions)
Level of anonymity	Describe if there will be total or partial anonymity of transactions and of accountholders information. Describe the level of privacy on the transactions and specify under which circumstances could be disclosed the participants in a transaction.
Traceability and other policy purposes	Explain if there will be any potential or expected use of the CBDC data with policy purposes (AML, taxes, cash dispersion, etc.).
Business model	Explain what will be the business model (associated costs to the central bank or accountholders, profitability sources, etc.). Describe the fee or pricing policy, and if there will be specific transactions cost? Zero, fix, variable, "two parts", ad valorem, etc.
Foreign exchange rate	Describe how will the CBDC could be used by foreign potential users, including temporary visitors or other interested parties in holding a digital wallet. Explain if there will be a process to convert foreign currency into CBDC.
Risk management	Describe the risk management framework to be set for the CBDC functioning, in terms of financial risk, market risk, legal risk, operational and cyber risk, etc.

Section 3: Launching	
This section is focused on gathering details (and the time frame) of the launching of the CBDC project, including hierarchical level of decision making, responsibility levels, inter-institutional coordination and the main milestones or phases of the project.	
Aspect	
Authorization	Describe the necessary authorizations for the launching of the CBDC project. Explain if the decision is given the central bank autonomy or if other regulatory authorities must grant authorization.
Coordination	Describe the process of coordination with the private sector and other public administration entities. Specify if the coordination with public entities relates to regulatory and/or operational matters.

Team(s)	Describe how the CBDC implementation process can be translated into work teams at the central bank. Explain what areas, and leading actors are involved, and provide information about pre-project aspects in which work teams were (will be) needed/required.
Cost and financing	Explain the main aspects related to the project costs, emphasizing if such costs will be borne or share by private entities. Describe the financial plan in case the project contemplates a final implementation.
Project phases and timetable	Describe the main phases and timetable of the project and specify the contingent or exceptional aspects during the implementation.
Deliverables	Describe what will be the project milestone and potential follow-up actions after the execution. Explain the main results of the evaluation project, for ongoing projects, enlist the aspects to be evaluated after the execution of the project.
Implementation risks	Describe the foreseen risks and mitigation tasks for the CBDC project implementation.
Market introduction	Describe how will be (or was) the CBDC introduction to the market. Explain if it was a controlled sample and environment, if the introduction was (or will be) progressive, partial, total and what are the main design aspects to determine how the CBDC should be introduced. If there are (or were expected) concerns related to the market introduction, please describe them.
Incentives and transactions scheme	Describe if the CBDC main design aspects considered an incentive scheme or other transactions-related conditions to influence the market response.
Education and training	Describe if at the end-user level, there will be (or were) educational or training facilities about the use of CBDC. At the implementation- and operational-level, describe if the involved work teams were taught for the proper functioning of the project.

Section 4: Expected effects

This section is focused on exploring potential effects of introducing a CBDC in the economy. In particular, to understand if monetary, financial or payments implications are (or were) expected to happen.

a) Monetary policy

General assessment of implications	Describe if it is expected that the CBDC project will be a cost-effective alternative from a monetary policy point of view. For instance, in case the CBDC project aims at enhancing monetary policy actions, explain if the central bank assessed if there would be a speed up in the transmission of monetary policy signals, or if there will be room to mitigate eventual volatility in short-term interest rates and to remove the "effective lower bound" restriction, among other related issues.
Transmission channels	Describe if it is expected an impact related to transmission channels and to what extent the current monetary policy regime will be impacted. Explain if the central

	bank has specific (expected or tested) concerns regarding the effectiveness of the monetary policy with a CBDC.
Determination of policy interest rates	Explain how the monetary policy instruments will be affected by the CBDC, including interest rates for OMO, reserve requirements, etc., and the related implications for the pass through to money markets, etc.
Change in the policy objective	Describe if, as a result of the CBDC project, it will be required or pursued a policy objective change and what will be the conditions for this change to take place.
Price stability	Explain if it has been studied (or at least considered) issues related to price stability with the CBDC implementation, and in particular if this an aspect that can be controlled through a specific policy action.
Seigniorage	Explain if, facing the reduce use of cash, CBDC project would contribute to ensure adequate central bank money for the public and preserve seigniorage revenue.
Confidence in fiat money	Describe if it will be possible to sterilize the CBDC issuance, and if there are expected effect in the public confidence against currency of legal tender.
Monetary aggregates	Explain if the central bank has considered to redefine the concepts and measures (policy and management) about monetary aggregates with the implementation of a CBDC.
Money demand and supply	Describe if the central bank has studied the potential effects in the money demand and supply with a CBDC. Explain which will be the main effects.
Cash usage	Describe if the central bank has identified potential implications for cash usage and the expected symbiosis of physical and digital cash.
Foreign exchange rate	Explain if the central bank has identified the implications of CDBC implementation in terms of determination of the exchange rate and other related aspects including the transmission channel, the intertemporal preferences, and which policies will be required to address sudden shocks to the exchange rate due to CBDC or external shocks affecting both variables.
Informal economy	Describe what effects could be anticipated in the case of major changes in the user base of formal financial services given the CBDC implementation. In special, explain if it is foreseeable to have a decrease on the levels of informal economy and a broadening of the tax base and major scope of transmission channels.
b) Financial stability	
General assessment of implications	Describe if it is expected that the CBDC project will be a cost-effective alternative from a financial stability point of view. For instance, explain what the main expected changes in the current state of financial intermediation after a CBDC are to be deployed. In special, provide an explanation of whether a disintermediation process is expected, or a financial services mispricing could be expected, as well as “fly-to-quality” effect from banking deposits to central bank accounts, among other potential effects.

Financial entities business model	Explain if the central bank has identified the impact on the financial entities business model with the implementation of a CBDC. Provide further explanations on the costs and revenue sources for traditional financial intermediaries
Financial entities balance	Describe what are the main effects for financial intermediaries' balance sheets that the central bank has detected (or assumed) once a CBDC is fully implemented. Explain whether the CBDC project bears to mitigate a potential "crowding out" effect from central bank to the commercial bank deposits.
Liabilities	Explain what will be the expected effects over demand for deposits and cash.
Assets	Explain what will be the expected effects over credit allocation. In special, describe how the central bank would address an eventual rise in financial services price (e.g. retail and government banking).
Bank multiplier	Describe if the central bank has considered (or assumed) the impact on the banking multiplier and the CBDC issuance.
Regulatory compliance	Explain if the central bank has anticipated the implications for regulatory compliance rules (AML/CFT, KYC, etc.) in case a CBDC is deployed. In particular, explain what authority will be in charge of following up on these compliance rules.
Financial inclusion	Describe if the central bank identified possible effects on financial inclusion and access levels given the implementation of a CBDC.
c) Payment systems	
General assessment of implications	Describe if it is expected that the CBDC project will be a cost-effective alternative from a financial stability point of view. For instance, if the central bank has assessed (or considered) the impact on the development or functioning of current payments infrastructure due to CBDC launching. In special, explain if it has been considered to create a new payment infrastructure or if it is possible the carry out the implementation through the existing platforms.
Technology	Describe the main implications for the use of technology in payments infrastructure with the implementation of a CBDC, for instance, if it is expected a major change by replacing current technological resources.
Interoperability and standardization	Describe if the central bank has identified the expected role of CBDC related to promoting the interoperability and interconnection of existing infrastructures and platforms, as well as the implications for standards and operating rules.
Clearing and settlement	Describe if the central bank has identified the new clearing and settlement arrangements of payments infrastructures that will be affected by the functioning of a CBDC. In special, if the CBDC will be operated throughout existing infrastructure, provide an explanation of how this will work.
Legal framework	Explain if the central bank considers (or could anticipate) important legal changes for payment infrastructures to deal with CBDC deployment.

Risk management	Explain if the central bank has identified a significant change in current risk management framework for existing payments infrastructure given the implementation of a CBDC.
Operational continuity	Describe if the central bank considers important changes in the management of operational risk (data protection, business continuity plan, contingency actions) of payment systems due to the introduction of a CBDC.
Financial risks	Describe if the central bank considers important changes in the management of financial risk (liquidity, solvency, credit -if any, and others) of payment systems due to the introduction of a CBDC.
Payment systems oversight role	Describe if the central bank expects or have defined important changes for the payment systems oversight and what additional measures could be expected to ensure the proper operation of the current payment infrastructures.

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