



The Future of Central Bank Digital Currencies

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Overview

Central Bank Digital Currency (CBDC) has been the subject of many research papers published by dozens of central banks and financial institutions over the last few years. It has garnered interest almost equal to the hype over blockchain technology, largely due to the rise of cryptocurrencies. The emergence of the latter has shaken some of the most basic concepts of monetary theory, as new borderless currencies are being issued without government consent or involvement. On a fundamental level, some have broached discussion on the relevance of centralized fiat currencies in the modern world and what place they might have – if any – in the future.

Central banks are known for being conservative, and rightfully so. They carry the heavy burden of implementing a state's monetary policy. Their key asset, aside from economic competence, is their reputation. The base of any solid economy is a strong, professional and reliable central bank, that is trusted, both locally and globally, to think things through rather than making hasty moves. This requires extreme caution given the potential consequences of a given monetary policy. Attention must be paid to the timing and type of policy, and of course the benefits and drawbacks must be weighed and due diligence conducted during the entire implementation process. It is understandable then that Central Banks would be hesitant to adopt innovative advances such as cryptocurrencies.

That being said, the danger of a state ruling out cryptocurrency or blockchain technology entirely could be akin to throwing the baby out with the bathwater, were they to ignore the merits of, or delay the implementation of, CBDCs. It is clearly important for the financial arms of any state to have a commitment to efficiency and innovation, as well as a certain entrepreneurial and enterprising spirit. We see great potential in moving forward with bold new trials of this important technology that could ultimately improve central bank processes while improving core components like security. In addition, it is evident that the need for digital currencies has already been emerging from the market. The current policy of avoidance only leaves a void that is filled by private solutions that are problematic in many aspects and could ultimately force the hand of central banking systems.

In this paper, we keep our focus solely on the opportunity that issuing a CBDC could present, as well as the potential benefits to the economy if such a protocol were further developed and implemented. We argue that CBDCs are a disruptive instrument in the hands of a bold central bank that wishes to enhance its economic and financial influence. We will explain why issuing a CBDC is in the best interest of the central bank and the general public, thus attempting to progress the discussion from *if* to do so, rather to *when and how*. With every new technology, the *first mover's dilemma* is always prevalent: Should I be the first to adopt this new technology, or wait and learn the lessons of trial and error from others? CBDC represents an opportunity for bolder banks to become a beacon of innovation and lead the way towards a new global financial future.

This is not intended to be a pure academic discussion on advanced macroeconomic aspects of different monetary policies. Still, we do rely on the reader's acquaintance with these concepts, even if only on a basic level. For those who wish to dwell on that, we refer them to our additional reading list at the end.

What is a CBDC?

CBDC is a form of money¹ however, there is no consensus on its definition. It builds on concepts from several areas of research, hence the debate. Still, when reading the most cited definitions carefully, one can gather some general principles and an emerging standard. In order to find a common denominator that can serve as a foundation for discussion, we rely on two commonly accepted definitions: that of *Bech and Garrat* and that of *Berentsen and Schär*:

1. *Bech and Garrat's* “Money Flower” defines CBDCs as a form of money that is:

- a. Widely accessible – Central banks already offer settlement accounts (or balances), but they are only accessible to commercial banks. However, CBDCs would be available to the general public,
- b. Issued by a central bank – As opposed to bank deposits, other digital payment services or virtual currencies,
- c. Peer-to-peer – as opposed to bank deposits
- d. Digital – As opposed to physical cash, which satisfies only the three other aforementioned traits of this definition

2. *Berentsen and Schär* look at it differently, by examining three criteria: monopoly vs. competition, virtual vs. physical, and centralized vs. distributed. Accordingly, they see two types of CBDCs that are relevant for our discussion:

- e. Issued by a central bank – just as Bech and Garrat advocate,
- f. Virtual – similar to, if not interchangeable with, Bech and Garrat’s “digital” requirement, and
- g. Centralized or distributed – Herein lies the main divergence between the two views (and potentially two types of CBDC). If a CBDC is centralized, Bech and Garrat refer to it as “*Central Bank Electronic Money*.” If it is *distributed*, the pair call it a “*Central Bank Cryptocurrency*.”

Assuming the approaches above can be reconciled and a clear working definition of CBDCs agreed upon, there are certain design features that would still be a matter for debate. Features of one CBDC in turn might contrast with CBDCs issued by other central banks. These features are analyzed by *BIS Committee on Payments and Market Infrastructures*:

- Availability – The bank may determine any sort of limitations on using the currency, *e.g.* time, location, duration, sector, etc.
- Anonymity – User anonymity may vary, *i.e.* total anonymity to maximal identification required
- Transfer mechanism – In our view, this is the most strategic decision the central bank needs to make, as it stands that at the heart of the discussion whether a CBDC ought to be centralized or distributed. We explore this topic later in this paper
- Interest bearing – As with any form of a central bank’s liability, it may bear positive, negative, or zero interest, accordingly resulting in different consequences
- Limits or caps – Such limits may be necessary to prevent and mitigate any potential misuse of the currency, whether intentional or not

¹ There are many forms of money, but the discussion about its taxonomy is beyond the scope of this paper. We refer our readers to the papers written about it, whether by *Berentsen and Schär*, *BIS Committee on Payments and Market Infrastructures*, *Bech and Garrat* or *Meaning, Dyson, Barker and Clayton*.

The features above demonstrate the potential variations that CBDCs might have and how they satisfy each respective central bank's laws, regulations, policies, and targets. Let us now discuss the reasons for increasing interest in CBDCs.

When Finance and Technology Converge

Greater attention to the CBDC concept and its accompanying research is not coincidental. Rather, it is the direct result of recent financial and technological developments, and the convergence of the two.

Emergence of Blockchain Technology

Blockchain is a technology that combines the merits of modern cryptography with the advantages of distributed ledgers. Each ledger consists of a *chain* of data blocks, linked one to the other, sealed cryptographically and time-stamped. As no central entity is responsible for validating transactions and updating the ledger, each participant (or "node") on the network must maintain a copy of the ledger and validate new transactions independently.

Bitcoin is a decentralized digital currency. It is the most famous application of blockchain (to date) and thus is likely the reason most people still tend to confuse the two. Bitcoin came to life in 2009, but the surge in attention, and the value appreciation that followed, reached its peak in 2017.

For many, the biggest technological breakthrough with blockchain technology was inventing a mechanism for exchanging value by creating digital scarcity. The revolutionary change here for finance came in the notion that a digital currency had been created privately with decentralized software, and without the intervention or permission of a central bank. With that, one of the base assumptions of monetary theory, *i.e.* central banks control money supply, had been shattered.

It is true that blockchain technology is still premature for many of the applications some evangelists claim it will easily replace. Still, we are among those who believe that it is here to stay and indeed disrupt those industries and day-to-day activities that its biggest proponents claim the technology will supplant. This includes the banking industry, supply chain management, information verification for new technologies such as self-driving cars, and even industries as far reaching as health and fitness. However, the most obvious transformation is in the world of finance and economics, especially in asset tracking.

Global Effort to Fight Money Laundering

It seems that law enforcement agencies around the world have come to realize that the most effective way to fight crime and terrorism – whether local or global – is to target financial assets. As a result, agencies are operating both nationally and internationally and making the tracking of these assets a core focus. On the national level they are making substantial efforts to promote aggressive anti-money laundering (AML) legislation. While on the international level, they are trying to improve global cooperation. The best examples are the legislation in the US and the Financial Action Task Force (FATF).

In the US, it is the Financial Crimes Enforcement Network (FinCEN) charged with combating money laundering, terrorist financing and other financial crimes. One of the direct outcomes of the 9/11 Attacks was the Patriot Act passed in the US Congress. It consists of ten titles, one of them being *Title III: International Money Laundering Abatement and Financial Anti-Terrorism Act of 2001*.

Among its purposes was to “increase the strength of United States measures to prevent, detect, and prosecute international money laundering and the financing of terrorism;”²

On the global level, that cooperation is led by the FATF, an intergovernmental organization whose objectives are “to set standards and promote effective implementation of legal, regulatory and operational measures for combating money laundering, terrorist financing and other related threats to the integrity of the international financial system.”³ The clause about “terrorist financing” was added in 2001. The FATF currently has 37 member countries and three observer states.

Growing Use of e-Wallets

Digital payments through e-wallets have been growing significantly in the last few years and growth is expected to accelerate significantly in the future. According to the World Payment Report 2018⁴, “Global electronic wallet (e-wallet) transaction volumes are estimated to have totalled about 41.8 billion transactions in 2016, comprising almost 8.6% of all non-cash transactions.” Of this, about 71 percent (29.7 billion transactions) were conducted via payment apps or e-wallets offered by tech giants such as Amazon, Google, Apple, Facebook, Alibaba, and Tencent.

Judging by the predicted growth rates of non-cash transactions, the amount of future transactions is expected to increase, with Emerging Asian markets leading the pack at an expected CAGR of 28.8% for the next five years, passing North America by 2021. This growth is mostly driven by smartphone penetration rates, the falling cost of data, and improved security. Banks still play only a minor part in this market despite their inherent strengths, *e.g.* client trust, network, regulatory expertise, etc. However, we estimate that this will change and that banks will gain a substantial market share, especially as these markets become more regulated. It is our opinion that banks should and will eventually provide their own e-wallets as part of a larger solution that will include additional instruments and services.

While these trends have not been overlooked by central banks and financial policy makers, they are still having difficulties providing a timely response in the form of new regulation. We believe that CBDCs can assist in this process, and in essence kill two birds with a single stone. Not only can CBDC be an effective instrument in fighting money laundering, but it can also provide the public with a government-certified e-wallet.

Merits of CBDC

We believe that CBDC has many advantages, and can be one of the most effective instruments for tackling the challenges and trends discussed above.

CBDC as a Monetary Tool

Adjusting interest rates is a central bank’s most powerful instrument for carrying out monetary policy. These adjustments have a direct effect on macroeconomic factors such as the commercial bank’s liquidity and credit cost, and as a result consumer spending and borrowing. According to

² USA PATRIOT Act, Title III, Section 302(a)(1)

³ <http://www.fatf-gafi.org/about/whoweare/>

⁴ World Payments Report 2018, Capgemini & BNP Pariba, (<https://worldpaymentsreport.com/>)

conventional monetary theory, a central bank has three conventional means to affect a market's interest rate:

- Open market operations (OMO) – Buying or issuing bonds, to increase or decrease the total supply of money.
- Discount rate on banks' reserve accounts – Determining the cost of banks' credit, rolled down to their customers
- Reserve requirements – Setting the minimum cash reserve ratio of commercial banks

CBDCs could be used by central banks as part of the first of these two conventions, by issuing or absorbing issued CBDCs and by setting the discount rates on CBDC accounts, respectively. Let us further examine the implications of both:

Open Market Operations

Such operations carried out using CBDCs for Open Market Operations may be highly efficient and even improve that central bank's current arsenal. Naturally, that depends on whether the CBDC is considered a desirable asset by the economic agents, *i.e.* banks, households⁵, companies, government, etc.

A simplified scenario assumes that households are able to manage CBDC accounts in the central bank, and consider it as an adequate substitute for cash and retail bank accounts. As they increasingly use them, the central bank's liability shifts from banknotes towards CBDCs, thus reducing commercial banks' cash reserves and pushing them to increase their CBDC reserves. The outcome of this scenario is an increase in the central bank's CBDC liability and CBDC credit facilities, while its banknote liability decreases.

In the eyes of the central bank, it will be required to hold assets to back up its CBDC liabilities in the same manner it would have needed to back banknotes. In short, CBDCs could be implemented as part of a central bank's OMO strategy just like printing cash. However, as it is easier to issue a digital currency than printing new cash, the process is more efficient for the central bank.

Setting Discount Rate

Once CBDC accounts are available for everyone – not just commercial banks – setting the discount rate becomes more straightforward. Moreover, once the counterparty risk is eliminated and everyone has direct access to the central bank, CBDCs are likely to become the most secure and liquid asset in the market. The mechanism of this interest rate would be similar to that of the discount rate on banks' reserves today.

As mentioned above, the central bank may set CBDC interest rates as positive, negative or zero. Each policy would result in different outcomes depending on the central bank's intention. While a positive rate might establish the market's inflation rate or even indicate a risk-free interest rate, a zero-percent interest rate may support the notion that CBDC is electronic cash. The case for negative interest rate is more tricky as it might create two sets of currencies, *i.e.* a currency denoted by cash in circulation and another one denoted by the CBDC reserve accounts. On the face of it, this might cause instability, but might be useful in other scenarios when extreme measures are required.

Reducing the Amount of Circulated Cash

We believe that a modern economy should aspire to be as efficient as possible. One way to reach this goal is to minimize, if not outright eliminate, the use of physical cash.

⁵ Representing individuals

One might claim that there will always be a psychological demand for “physical” money. However, the history of currency challenges that presupposition. Before notes, coins were the primary form of payment, backed by the metal’s intrinsic value.⁶ However, since carrying a single note that guarantees 100 coins is more convenient than carrying 100 heavy coins, notes gained popularity. The leap of faith was on the receiving side, acknowledging that notes had no intrinsic value and were bonded to some reserve that backed its declared value. Therefore, they had to be confident that the third party who guaranteed the note’s written value, if required.⁷ For many years, countries backed the money they issued with gold reserves and other valuable metals, or issued money back in the foreign currencies of other countries who did so. Only in 1971, as part of the *Nixon Shock*, did the United States abolish direct convertibility of USD to gold. By doing this, it finally became evident that currency note value was only backed conceptually, not physically.

There are substitutes for cash – credit cards or other digital payment services for example – although not necessarily perfect substitutes, either because of a credit fee or on account of partial adoption. While the former is on account of a competitive market, the latter may be influenced by government policy. Therefore, if a government decides to abolish the use of cash, e-wallet adoption would likely increase immediately.

An extreme example of this is the *2016 Indian banknote demonetization*, a part of the overall *Cashless India*⁸ project. Their goal was to fight the prospering shadow or black market economy in many parts of the country. The Indian government banned the use of billions of 500 and 1,000 Rs notes, the most valuable notes at the time, on two weeks’ notice. Instead, it issued two new notes of 500 and 2,000 Rs, knowing that it would take time to get them into circulation, thus encouraging Indians to increase usage of digital payment services. The debate whether this initiative was successful or not is still ongoing, however there is no doubt that the event had lasting impact on the use of digital payment services, including a 1,540-percent increase in Unified Payments Interface (UPI) transactions. PwC India writes⁹, “Post demonetisation, there has been a marked reduction in the resistance towards digital payments, and this medium should continue to see sustained adoption going forward.”

The increase in digital payments, notably UPIs, reduced the average ticket size of those transactions. India also saw the stable rise of so-called AEP¹⁰ transactions, in which Indians use their citizen’s ID number (Aadhaar) to authenticate micro-ATM transactions at a point of sale interoperably with a participating bank.

Naturally, any migration to a cashless economy should be gradual in order to deploy proper digital infrastructure, anticipate potential security threats, and educate the public for the upcoming change (something that India’s demonetization experiment did not do). We believe that removing a reliance on cash is in the best interest of most, if not all, countries. Furthermore, we estimate that the general public would consider CBDC as the closest substitute for cash, hence issuing it could be the first step towards a cashless economy.

⁶ Many terms associated with general money or currency have their origins in terms connected to silver, either the metal itself or the process of mining it. French and Hebrew both use the same word for both “silver” and “money,” while the word dollar is etymologically descended from *Joachimsthal*, the location of a Bohemian silver mine whose output was minted into silver coins in the early Renaissance period.

⁷ The original purpose of printing portraits on notes was to associate them with a reputable party that was backing the note’s value. A more dignified, well-known and rich nobleman could guarantee a higher value. With time, notes were issued by banks and became banknotes, and later on by countries’ central banks.

⁸ <http://cashlessindia.gov.in/>

⁹ <https://www.pwc.in/consulting/financial-services/fintech/fintech-insights/demonetisation-effect-digital-payment-gain-new-momentum.html>

¹⁰ <http://cashlessindia.gov.in/aeps.html>

Driving Competition in Banking Industry

The banking industry is undergoing a major change. Digitization technologies make core banking services trivial. As a result, banking services broaden the reach to wider audiences, undermining the advantage of deep acquaintance with customers.

Core banking services, such as a checking account, are already becoming redundant as consumers have alternatives such as e-wallets. In addition, calls for reform, such as Narrow Banking¹¹ have been proposed as a better solution for most consumer checking account. CBDC will provide the public with an additional, central bank-based, alternative. We believe this is the next step in making those trivial banking services into true public utilities. This shift will probably result in transition of checking accounts out of commercial banks.

Some, like the Bank of International Settlements¹², suggest that this might threaten financial stability as banks' cash reserves decrease, and in certain scenarios might end up in a bank run. We consider this to be an extreme scenario, and believe that central banks have the tools to prevent that, as discussed in the next section. An alternative and far more likely scenario in our view, is that commercial banks will readapt. In order to be competitive, they would likely have to increase the interest rate on deposits to attract these deposits back, which may result in increasing credit spreads. In the short term, banks' profits might decrease forcing them to be more efficient. This is due to the excess profit that banks make out of these services. We consider this to be a positive outcome from the general public's perspective, both in releasing value and in improving the efficiency of the financial system. In the middle and long terms, we expect banks to start generating new revenue streams by providing new financial services¹³, and by focusing on services that produce real value to the consumer.

Potential Difficulties

Certain difficulties will inevitably occur during any transition period deploying the new platform. Therefore, all relevant authorities must be attentive and responsive in order to effectively mitigate issues as they present themselves.

Among the potential difficulties we foresee, we expect the impact on the banking industry to be the most significant. As briefly described above, banks to some extent will experience a liquidity challenge affecting their available credit reserves, thus making that credit more expensive through higher interest rates. We see several paths to alleviate this and increase cash reserves:

- Generating new lines of business - The banking industry is about to undergo a major shakeup as new blockchain-based platforms are deployed, and many traditional (and highly profitable) services will no longer be provided by banks. It will challenge banks to redefine their role in the new economy and to adapt accordingly. While some banks probably see this as a danger, others may see this as an opportunity to grab substantial market shares, as the demand for new financial services grows. From the general public's

¹¹ Narrow Banking suggests that deposit accounts should be separated from all other banking activities, and be kept in dedicated banks, *i.e.* *Narrow Banks*. Those banks will have full reserve against those deposits, and could only lend money of depositors who agreed not to keep their deposits liquid. For more see <http://www.narrowbanking.org/>

¹² <https://www.coindesk.com/central-bank-digital-currencies-fuel-bank-runs-bis-says>

¹³ We discuss some of the new services that banks will start providing, as a result of the increasing use of blockchain technology, *The impact of Blockchain Technology on Financial Services Provided by Banks*, September 2018

perspective and even the central bank's, this spur in competition is positive, forcing banks to become more efficient overall

- As mentioned earlier, central banks are in control of the deposit discount rate, and are therefore in control of the demand for CBDC and for banks' cash reserves. Therefore, the likeliest scenario is one where the central bank will set an interest rate (on CBDC reserves) to reach a new, improved and stable equilibrium. That equilibrium will see only a limited portion of banks' cash reserves flow to CBDC deposits, not most of it and certainly not all of it. As with these kinds of economic stabilization measures, it may take some time for the market to readjust, but the market will reach a new and better state, given that the central bank is trusted by the commercial banks
- The role of central banks is to balance several responsibilities in order to maintain a reliable, growing financial market. Providing the option of opening a CBDC account with the central bank makes any person or entity a de facto customer of the central bank. No one actually intends to have them deal directly with the general public, rather they would essentially outsource this service to commercial banks, generating a new line of business and new stream of revenues
- The new CBDC deposit accounts will not be credit facilities. Those will only be provided by commercial banks. Thus banks will focus on offering their customers active financial services rather than just money storage

While there may be additional difficulties involved in the process of migrating to CBDC, we will only discuss two more: user privacy and raising sufficient public awareness.

Firstly, privacy and anonymity, especially in the context of payment services, will always be a point of contention. On the one hand, many want full domain over their privacy by having the option to use fully anonymous means of payment. On the other, such features are critical avenue for illegal activity and tax evasion. As noted earlier, CBDCs may provide different levels of user privacy, depending on the central bank's policy. The most simple solution would be leaving only the lowest value banknotes available, while limiting the allowed value per cash transaction. That would make the transition towards a true cashless economy smoother and quicker. In certain countries, it may even allow policy makers' to roll their eyes in defense of critics, as not *all* cash has been abolished.

Secondly, getting the public on board may present difficulties. Public awareness campaigns and proper education should mitigate this. We truly believe that any argument that certain parts of the population could not handle this transition and might be victims for potential fraud are patently absurd. Yes, there will be fraudsters and it will take longer for some to "master" the use of digital payments. However, this genuine concern is not reason enough to reject change outright. Had that been the case, there would have been no move to e-banking, internet or mobile devices. Can you imagine our world today without any of them?

To Decentralize or not to Decentralize?

As we stated earlier, CBDCs can be centralized *or* decentralized. In our view, this may be the second-most strategic decision after the question of whether or not to issue CBDCs at all. Therefore, it must be on the agenda of any central bank that opts for issuance. In review of existing literature we found that the papers by *Berentsen and Schär* and *Raskin and Yermack* discuss this question with, relatively, the most attention. The former are against it and the latter indecisive, which is reasonable given that they published the paper in May 2016, a year before the surge in the cryptocurrency market.

There are benefits and risks associated with decentralized CBDC. Each central bank will have to weigh the utility based on characteristics of its economy, *e.g.* portion of foreign trade, banking system stability, consumer access to banks, digital policies, etc.

With the current level of technology, a decentralized CBDC poses privacy and security concerns, and consequently we do not advocate embracing a fully decentralized protocol at the moment, though we can foresee the potential positives for this type of solution. It will require more time to better analyze the impact of a decentralized CBDC on the financial industry before reaching a decision. Having said that, we hope that central banks will start discussing this in parallel to their discussions on implementing CBDC. We would like to hereby present arguments for and against CBDC decentralization.

The Argument Against

Berentsen and Schär argue that the reputational risk is far too high since this anonymous cryptocurrency might be used by drug cartels, terrorists or money launderers. Secondly, commercial banks will resent that central banks would allow opening anonymous accounts while they are required to meet AML and KYC regulations. Lastly, they argue that the technology is too young.

We find these arguments valid only if the CBDC is *completely* anonymous, meaning that anybody can open an account, *i.e.* crypto wallet, on the ledger. Some of the newer blockchain protocols are designed with the intent of being compliant with AML requirements, including account identification, reporting, etc. We will refer to these as “White Chain” protocols. Establishing a White-Chain-based CBDC would require a full KYC in order to open an account. The White Chain solution tackles the first two problems introduced by *Berentsen and Schär*. As for the third one, the technology is indeed young, but is maturing at a high pace thanks to extraordinary venture funding of blockchain infrastructure development. In addition, we believe that their arguments refer only to the applicative level of blockchain, while ignoring infrastructural aspects such as who the nodes are that validate and record transactions.

The biggest challenge of a decentralized CBDC, as we see it, is user privacy. People have the right to financial discretion and this cannot change. On the face of it, blockchain provides high level of anonymity and privacy, however there is more than meets the eye. Current protocols may be divided into two groups, based on the user privacy level they provide:

1. Exceptionally high level - these protocols were designed for the purpose of maximizing anonymity. Some of them were developed out of genuine concern for user privacy. However, these protocols pose a serious threat to society, when put in the hands of malicious parties, either for criminal activity or terrorism. It is obvious that governments cannot allow implementing these protocol for decentralized CBDC, as they would forfeit the option to identify account owners and track their financial activity, when necessary. Therefore, it is not in the best interest of the public to allow this kind of anonymity, especially for a critical financial platform
2. Pseudo high level - the other group consists of protocols that do not make extraordinary efforts to hide users activity. For the untrained eye they may seem to provide anonymity, but the trained observer can analyze the activity and see through this pseudo privacy. For the purpose of our matter, banking secrecy would be de facto abolished, allowing anyone, *e.g.* individuals, banks, government agencies, etc., to track the financial activity of public CBDC accounts. There is no doubt that this is unacceptable

This gap has to be mitigated. To date, there are certain protocols, under development, that try to provide varying levels of transparency to different types of users. Meaning that under special circumstances, *e.g.* a court order, a law enforcement agency may get access to verify the identity and analyze the financial activity of certain accounts despite the protocol’s anonymity features. However, it may take some more time before these protocols are available.

The Argument in Favor

On the other hand, we see various advantages to decentralized CBDCs that are White-Chain-based. A White-Chain-based protocol presents a strong opportunity for countries wishing to take innovative financial initiatives and introduce new concepts to the world economy. The countries may benefit from influx of foreign currency. In addition they could become beacons of economic and technological leadership, setting an example for the rest of the world. Leadership of this sort is bound to attract the global attention, and thus, very likely, empower the economy of the forward thinking state.

Cryptocurrency markets are longing for a real stablecoin – a cryptocurrency designed to minimize volatility, commonly pegged to a certain fiat currency and backed by reserves of said currency. These designs may be risky and expensive to maintain. There are quite a few companies that have already created stablecoins. However, their toughest challenge is proving the reserves that they claim. Any respectable central bank that issues a stablecoin would probably eliminate competition, given that its reliability is far greater than anything a private company might have. The results upon issuance might be immediate as the demand for that currency will rise, solidifying that economy.

Moreover, once that currency is decentralized, the central bank's monetary measures are out in the open, especially measures such as issuing new units or buying them back to maintain price stability. As supporters of transparency, we believe that there cannot be a more evident demonstration of a central bank's strength and confidence than a willingness to expose the central bank's inner workings, ex post, to stabilize the economy.

Suggested Strategic Outline

In light of the above, and assuming that we have been able to persuade the reader that CBDCs are a powerful instrument that ought to be adopted by central banks, we suggest the following strategy, which calls for a centralized CBDC on a private blockchain protocol but which allows for development into a decentralized protocol if the technology proves itself to be viable. Deployment would occur in three steps according to this strategy, spread over several years, but starting immediately. There is no point in indicating the length of each phase, which would be an open question, but we certainly expect a central bank to set reasonable targets on this roadmap and stick to that plan.

1. **Phase 1 - Introducing CBDC Light, for digital payments only.** This currency is the light version of the later full-featured centralized CBDC. The general public may open reserve accounts at the central bank, but they will not carry interest and are intended to be used as the central bank's certified digital wallets. The goal is to introduce the advantages of using digital payment services and reduce the use of cash to a minimum, leaving only the lowest value bills in circulation. This period will allow commercial banks to start getting used to the idea of having a CBDC, knowing that a full-featured CBDC is waiting just around the corner
2. **Phase 2 - Introducing a full-featured centralized CBDC.** Once the public and commercial banks are accustomed to this lighter CBDC, the central bank upgrades it to a full-featured implementation in order to maximize its merits and utilize it as a full monetary instrument. This period involves potential disruptions to the economy, as discussed above. It is up to the central bank to manage the process carefully in order to drive the economy towards its new equilibrium, in which commercial banks are more efficient and generating new revenue streams. In parallel, the central bank during this time closely examines blockchain technology and cryptocurrency markets in order to determine when it would be suitable to deploy a decentralized CBDC

3. **Phase 3 - Discussing decentralization.** As noted earlier, we are still not convinced that CBDC decentralization is necessary. Still, we urge central banks to start thinking about it, so that as technology advances, they will be in a position to decide if implementation is the correct strategy for the bank. We are certain that with time, new technology would provide better solutions to problems that we now cannot see being resolved. Central banks should focus their efforts on understanding several key topics which are critical to a decentralized protocol:
 - a. What is the desired level of user privacy and anonymity?
 - b. Who are the participating nodes?
 - c. How does the White chain operate?
 - d. What are the KYC & AML procedures for opening an account on that chain?

Conclusion

In this paper, we have provided a brief overview of CBDCs and why they should be implemented sooner rather than later. Since CBDCs are a powerful instrument, their implementation must be calculated and methodical in order to maximize their merits and minimize their demerits.

The roles and importance of major actors in our global economy are constantly questioned as we head towards a 'new economy.' Each and every one of them will have to adapt to technological innovation in order to maintain relevance and in their position of maintaining market stability. The same goes for central banks. Being the economy's equivalent of the "responsible adults" in the room, they must engage. Many central banks have published their own reviews of the CBDC concept, but have not reached clear operational conclusions or a timeline for taking action. We consider this to be a strategic mistake that could lead to regrettable outcomes. We believe that the time is now to be bold and innovative in order to not lag behind the few central banks rightfully seizing the moment.

We believe that CBDCs should be implemented, even if only as a lighter version for digital payments, in order to minimize and possibly eliminate, the use of cash. In that context, it is highly interesting to closely examine the ongoing developments of the e-krona project in Sweden¹⁴. As the Riksbank evaluates its potential impact, public discourse involves commercial banks, financial services providers and the general public.

The second, more complicated discussion revolves around CBDC decentralization. While, there are still no clear answers on this issue, it is clear that this discussion should also begin immediately in order to allow central banks to better understand the disruptive economic potential of decentralization. The Ubin Project¹⁵ in Singapore is a significant test case, where there are already pilot projects with different models of decentralized interbank payments and settlements mechanisms.

We support the recent call of Ms. Christine Lagarde¹⁶, Chairwoman of the IMF, that central banks should experiment and consider issuing a CBDC. In our view, central banks that are looking to lead rather than be led, cannot ignore the potential benefits of this opportunity nor the pitfalls of failing to follow what seems like an inevitable culmination of digital economic innovation over the last two decades.

¹⁴ <https://www.riksbank.se/en-gb/payments--cash/e-krona/>

¹⁵ <http://www.mas.gov.sg/Singapore-Financial-Centre/Smart-Financial-Centre/Project-Ubin.aspx>

¹⁶ <https://www.forbes.com/sites/tedknutson/2018/11/14/christine-lagarde-central-banks-should-consider-the-possibility-of-issuing-digital/#74780d101006>

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Who We Are

Hexa Foundation is a not-for-profit organization focused on using blockchain to create social impact. The organization was co-founded by Netta Korin, who comes to the Foundation following years of experience in business, government and non-profit industries. Most recently, Netta worked as a Senior Advisor in the Israeli Ministry of Defense to General Yoav (Poly) Mordechai, Head of CoGAT, and has an in-depth knowledge of the socioeconomic problems in the Gaza Strip. Prior to that position, Netta worked as a Senior Advisor to Deputy Minister Dr. Michael Oren in the Prime Minister's Office in Israel, focusing on Palestinian issues. Netta has held board positions in several non profit foundations in both Israel and the United States.

The Hexa Foundation is part of the Orbs Group. Both were created by the founders of Orbs, a blockchain platform for consumer applications. Orbs Group is the largest group dealing in blockchain solutions in Israel, with close to 60 employees focused on the blockchain field. The Hexa Foundation aims to use blockchain for social impact and harness the mind power of our ecosystem and network to help solve the region's and the world's most pressing humanitarian problems.

For more information please contact Netta Korin (netta@hexa.org)

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