

1. Introduction

It is a well-known fact that financial innovation does not necessarily lead to improvement. In accordance with the ongoing development in the field of digital currencies, it is important for one to familiarize themselves with the different categories of stakeholders in the field, understanding their origins, advantages, and limitations, as well as their potential impacts on the current financial system. Beyond the social hype of cryptocurrencies, CBDCs and big-tech money; ‘What is it about digital currencies that generates vast amounts of social engagement and how will it impact the traditional financial system?’. This report will investigate the social phenomenon of fascination with digital currencies and will introduce important concepts of DeFi, in addition to explaining its underlying technology.

2. Background Information

2.1 How Did Digital Currencies Develop Into What They Are Today?

The first well-known Cryptocurrency – *Bitcoin* (BTC) was created after the 2008 financial crisis to disintermediate third parties (i.e. banks). This means that the currency is decentralized without a central bank or any single authority. The currencies network is backed by cryptography (i.e., the consensus generating machine that allows individual miners to verify the transactions).

Bitcoin’s monetary policy is predetermined, and disinflationary. Currently 6.25 new BTCs are produced every block (~10mins). However, when bitcoin was first launched the amount was 50 BTCs. The rate of inflation is halved approximately every 4 years (every 210,000 blocks) to retain said disinflationary state. This supply side shock usually corresponds with a subsequent

boom, creating a cyclical dynamic in the price.

The *legitimacy* of Cryptocurrencies as an investment has *improved significantly* over the last year as well-known publicly traded companies such as ‘Tesla’ and ‘MicroStrategy’ decided to hold Bitcoin as an alternative asset for its treasury. In its early days, Bitcoin was perceived as a scam with an inability to obtain intrinsic value, and only being useful as a facilitator for criminal transactions. However, the ground is shifting. The current Macro-monetary environment is beneficial for Cryptocurrencies and DeFi as they share somewhat similar characteristics with the tech sector. This year alone, we’ve seen *\$17 Billion of institutional capital flowing into the space from 16 mutual funds* including ‘BlackRock’ and ‘Morgan Stanley Investment Management’.

Since 2008, we’ve seen the emergence of many more Cryptocurrencies, today the global crypto market has a market cap of *\$2.24T* (24 Aug 2021), of which 41.46 % is taken up by Bitcoin. Cryptocurrencies have the reputation of being highly speculative, however, that’s not always the case due to the emergence of “*Stablecoins*”.

2.2 CBDC’s in Comparison with Cryptocurrencies

Central Bank Digital Currencies (CBDCs) allow households and businesses to make direct electronic payments using money issued by a central bank. Unlike cryptocurrencies, CBDCs are centralized and issued by the Central Bank. Currently 90% of the central banks are working on developing their own CBDC ⁱⁱ. The ECB, the Fed as well as BoE have confirmed that they are in the investigation phase of the CBDC project while Fed Chief Jerome Powell also disclosed that a *digital dollar project is moving forward partially because of the pressure from*

*stablecoins*ⁱⁱⁱ. Meanwhile China has already started the domestic rollout of their own digital currency.

3. Digital Currencies and Their Impact

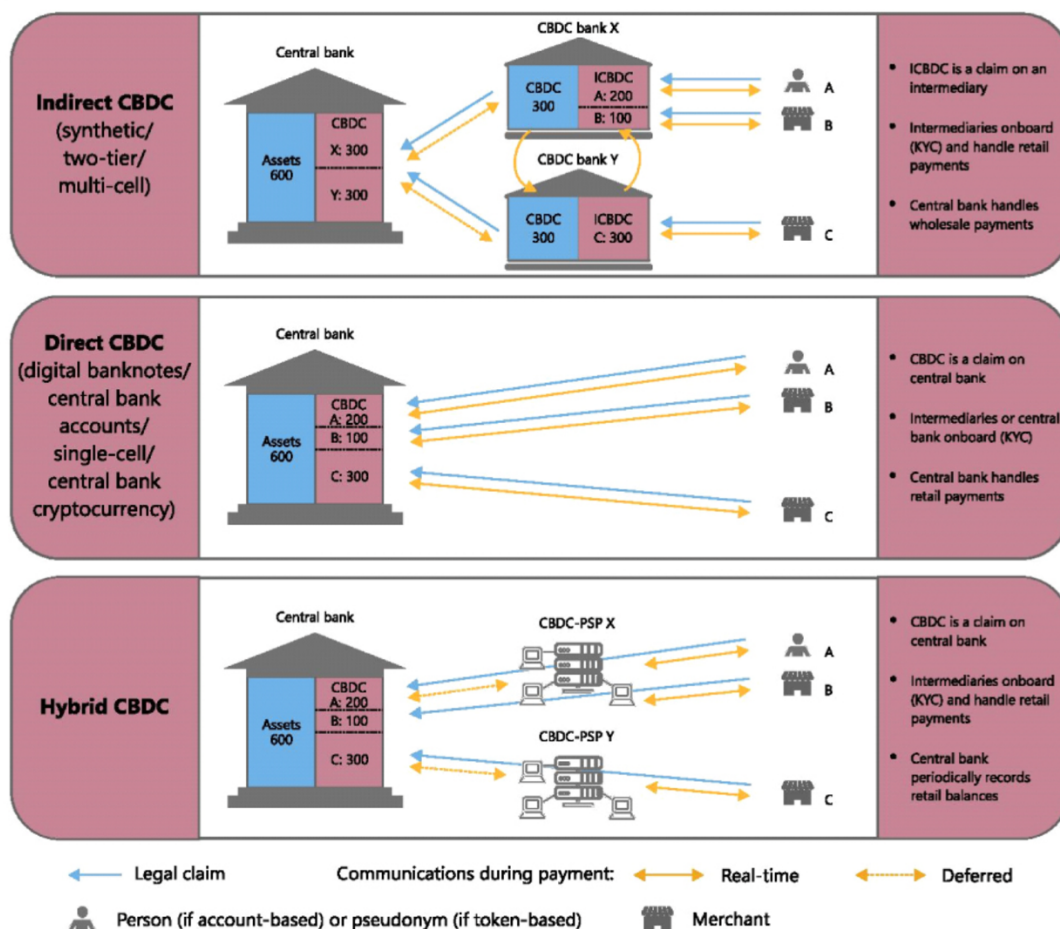
“Aren’t we using digital currencies already? PayPal, credit cards, electronic payments?”,
people often mix up digital currencies with digital representations of bank deposits.

The term **Digital Currencies** is very vague, and consequently used interchangeably to describe financial tools entirely unrelated to digital currencies. Whilst Cryptocurrencies (i.e. BTC, ETH), CBDC’s (e.g. China’s e-RMB, Facebook-Diem/Libra and permissioned blockchains ¹ used for internal settlements (e.g. J.P. Morgan Coin ²) all fall under the term: ‘Digital Currencies’, online banking, Pay Pal, electronic payments are unrelated.

3.1 Central Bank Digital Currencies (CBDC's)

An overview of potential retail CBDC architectures

Graph 2



In all three architectures, the CBDC is issued only by the central bank. In the indirect CBDC architecture (top panel), this is done indirectly, and an ICBC in the hands of consumers represents a claim on an intermediary. In the other two architectures, consumers have a direct claim on the central bank. In the direct CBDC model (centre panel), the central bank handles all payments in real time and thus keeps a record of all retail holdings. The hybrid CBDC model (bottom panel) is an intermediate solution providing for direct claims on the central bank while real-time payments are handled by intermediaries. In this architecture, the central bank retains a copy of all retail CBDC holdings, allowing it to transfer holdings from one payment service provider to another in the event of a technical failure. All three architectures allow for either account- or token-based access.

Source: Authors' elaboration.

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Figure 1, CBDC architectures, "BIS"

Although currently, no real adoption of digital currencies exists (apart from the Chinese experimental roll-out), 90% of central banks are currently developing a CBDC. For example BIS's project 'Dunbar' (including the central banks of Australia, Malaysia, Singapore and South Africa).

There are still ongoing debates on the choice of underlying technology as well its designs, but it is believed that due to its novelty, the process of adoption would be gradual. It is beyond the scope of this report to discuss which design is superior. It can be speculated whether there will be a cap on how much CBDCs each person's wallet ³ will hold. It shall be assumed it is in the interest of the central banks to minimize the initial impact of digital currencies on commercial banks. Based on an individual cap of €3000 in the Euro area, approx. €652B of bank deposits might be turned into digital euros. However, according to Morgan Stanley Research the timing of a ECB roll out could be quite far away – approximately 2026.

With a direct CBDC – one tier system (*Figure 1*) the central bank will quickly find itself assuming financial intermediation functions including account opening, account maintenance, enforcement of AML/CFT and customer services. To prevent this from happening the central bank would be likely to adopt a two-tier system, delegating the retail operations to commercial banks and non-bank providers (e.g., PayPal, Alipay).

As a payment method a CBDC is going to look like a prepaid spending card or a debit card. The CBDC is likely to be stored on a digital wallet on smartphones (like many contactless payments). Money is often whatever the cheapest medium of exchange happens to be at that time. Therefore, we assume that the merchant fee for CBDC is at 0%, and that Central bank digital cash would likely replace some of credit card transactions in physical in store purchases (Credit cards have the highest fees for merchants around 1% – 4.5%), while online purchases would possibly remain unaffected as CBDCs are not likely to offer complementary services (e.g., buyer / seller insurances, air mileages).

According to this calculation, assuming online purchases using credit cards remain unchanged, a 25% decrease in physical purchases with credit cards will lead to a 18.7% decrease of overall credit card transactions, given that the spending ration online against physical purchases is [USD 1700: 5000]. Thus, it will negatively impact payment card network providers (e.g. MasterCard, Visa).

Payment methods	Fees for merchants
Credit cards	~ 1% - 4.5%
Debit cards	~ 0.25% - 0.35%
Cash	~ 0.7% - 1%
PayPal	~ 3.4%

Figure 2, Merchant fees for each payment methods

It is also obvious that Central Banks are also going to replace physical cash with the new digital cash due to lower maintenance fees. Besides traceability and programmability, CBDCs are also set to help the unbanked population. For example, in the UK 2% of adults are unbanked (FCA) as well as 20% of Chinese (Finbold) . Currently they are either using physical cash and / or private digital payments, again because digital payment providers like PayPal often offer e-commerce insurance etc. CBDCs are likely going to gradually replace physical cash rather than impacting digital payment providers. For example, because of the reduction in cash the world's largest ATM operator Cardtronics and its mother company NCR corporation are likely to get hit.

Central banks in theory can completely disintermediate the banks and remove the money-creating ability of commercial banks, i.e., requiring all loans to be created in CBDCs. If there is a central bank interest rate being paid on CBDCs, commercial banks' lending rate will have to follow it more closely, thus giving the central banks tighter control on monetary policies.

Since some central banks are forbidden to deal with retail customers directly and others might find it inefficient, a possible outcome will be that commercial banks are granted the ability to issue CBDCs as well.

3.2 Consumer Benefits

Once CBDCs are fully launched, the cost of sending remittances would decrease drastically as they do not exist in physical form. However, there is already the alternative of sending remittances through *stablecoins*. This will be further explained in the following passages. This might be an existential threat to the business model of Money Transfer Operators (MTO) for example Western Unions and MoneyGram.

Due to lower fees charged to the merchants, small businesses may charge consumers less if paid with CBDCs. Consumers are incentivized to pay via CBDCs if the seller gives it a better rate.

3.3 The Aim of a Digital Currency For Central Banks and Governments

1. A tool for better monitoring the economy
2. Better transmission of monetary and fiscal policies
3. Anti-money laundering, spotting illegal transactions, Anti-tax avoidance

4. Barrier free, fast international payment and investment, less reliant on reserve currency, and more resilient against sanctions
5. Enhance financial inclusion - reasons of the unbanked may include remote locations, poverty... (competing with big tech)

A critical mass is needed for CBDC to become useful for the government. For example, a negative interest rate would not be possible with physical cash still widely available. Since there isn't a big incentive for consumers to use CBDCs, the government can pay its workers in CBDCs thus forcing them to spend them. One way for the government to introduce CBDCs is through welfare provisions. The government can also provide the option for unemployment benefit and stimulus checks to be paid in CBDCs instead of per bank transfers. It is easy and appealing for people to download software and receive instant payment. This is also a more cost-effective way for the implementation of government fiscal policy.

3.4 Chinese Central Bank Digital Currency

The digital Renminbi “E-CNY” has *two tiers*, the lower tier includes commercial banks and the digital wallets (Ant Group, Tencent...), whereas the high tier consists of the People's Bank of China (PBOC). E-CNY is built upon the concept of *“one coin, two databases, three centers”*, “one coin” refers to its *legal tender status*. The “two databases” refers to (1) The PBoC's ledger that keeps track of all e-CNY outstanding and (2) all the e-CNY ledgers maintained by the lower tier intermediaries either on a physical device locally or on the same database used by the central bank. The “three centers” are all reportedly PBOC entities, (a) the certification center, which records the real identities against all digital wallet users; (b) the registration center, which tracks

the transactions of e-CNY; (c) the big data analysis center, which monitor payment flows for all types of analysis e.g., financial risks and monetary environments, illegal activities. Presently, e-CNY is used primarily for domestic “retail payments” i.e., relatively small amounts. More importantly, the e-CNY is not interest bearing. This makes it less desirable for park savings and unable to compete with bank deposits. Thus, the e-CNY is currently designed to be a form of money used for payments only. It will compete with popular digital payment with existing forms of money such as Alipay and WeChat Pay (commercial bank deposits required to be used to back all Alipay and WeChat pay e-wallet balances.

3.5 Private Digital Currencies

Some argue that the private sector innovation might create the best currency in the future. But big tech can be disincentivized to create the currency as a public good rather than something that serves themselves best. As seen in *Brazil, an example where Facebook leveraged its network advantage to charge higher fees, WhatsApp Pay was stopped by the antitrust watchdog shortly after the launch, as it was charging merchants with a fee of 4% per transaction* across its e-commerce platform. It would be an interesting possibility to see if the big tech can design a CBDC that is appealing enough in order for some central banks to simply decide to adopt it.

Bank Name Investments in Crypto/Blockchain Companies

1. Standard Chartered \$380 million

2. BNY Mellon \$321 million
3. Citibank \$279 million
4. UBS \$266 million
5. BNP Paribas \$236 million
6. Morgan Stanley \$234 million
7. JP Morgan Chase \$206 million
8. Goldman Sachs \$204 million

In the short term **DeFi Tokenization** is not going to be a replacement of the current financial system but rather an improvement, making the existing financial transactions more efficient and faster. The World Bank has issued the first Blockchain Bond called BONDI – Blockchain Operated New Debt Instrument, where the settlement of the bond is completed entirely on the blockchain. Through tokenization we can achieve a T+0 (instant) settlement in any asset.

There is a trend for banks beginning to invest in cryptocurrencies and blockchain companies figure 2 JPMorgan has issued its own JPM digital coin on the Ethereum blockchain. 1 JPM is equivalent to the 1 USD deposit, it was launched in 2019 and is mainly used in internal settlements for faster, secure clearing and a clear audit trail internally. *JPMorgan is also working on programmability such as conditional payments where the money carries the message and follows it on its own without any manual intervention. This is unlikely to be a major change for their customer but would decrease internal operational costs.*

3.6 Cryptocurrencies

Bitcoin cannot serve as a daily unit of exchange, despite proposals to improve the code and update the block chain via “forking” it is *slow, dirty, and not very functional*. Bitcoin can only

handle 4.6 transactions per second compared to Visa's 1,700 transactions per second. Additionally, it is *environmentally unsustainable*. In 2019 bitcoin had a carbon footprint 40,000 times bigger than that of TARGET Instant Payment Settlement (TIPS) in the Euro system. Moreover, people cannot use its blockchain to program, unlike Ethereum, bitcoin's blockchain has one primary focus – record transactions. However, Bitcoin is symbolic in representing cryptocurrencies as it was the first. It was considered to be the gold standard, especially in early days where most cryptocurrencies were traded against Bitcoin. Bitcoin bulls argue that it is a Hedge against inflation. Other than the generic advantages of decentralization the reality is most of Bitcoin's value is from speculation. Due to the heterogeneity of cryptocurrencies, it is hard to evaluate cryptocurrencies. It includes native currencies to blockchains which are used to pay Gas, tokenized securities, stable coins and **ICOs**.

We must highlight the recent adoption of *Stablecoins*. It is one of the competitors to CBDCs and Big Tech e-payment. For example, Tether (USDT) is a Stablecoin running on the Ethereum blockchain, it can be sent anywhere in the world (transaction usually takes less than 10 seconds) and can be converted to dollars or any other fiat currencies at local exchanges. This makes it perfect for sending *remittances and by-passing capital controls*. Most of the stablecoins are centralized. For example, Tether is issued by Tether Limited, although it's pegged with dollar but only about 75% are backed by reserves (2.9% of Tether are backed by cash while 65% are backed by cash equivalents)^{iv} which make them vulnerable in the event of a “run” (redemption). USDT is the largest stable coins \$66B in circulation this could be a systematic risk as most of the Bitcoin trading is paired with Tether and a large amount have been stored on DeFi protocols and exchanges, the consequence of it imploding will be apocalyptic for Cryptocurrencies markets over a short period of time.

Regulators have flagged the systematic risks of stable coins and the regulatory challenges of crypto entities as the UK's FCA says it is not capable of supervising crypto exchange Binance. Earlier this year the IPO of Coinbase attracted lots of attention from the regulators into the Cryptocurrencies space. Coinbase has previously launched Visa-branded crypto debit card which allows consumers to spend their crypto holdings including Stalecoins without going through the manual process of converting then depositing from the crypto-exchange to banks. Some central banks fear that the further integration of Cryptocurrencies will compete with the legal tender. Cryptocurrencies can break existing capital control measures, for example the restrictions on overseas transfers. That's one of the reasons why China has tightened its ban on cryptocurrencies.

4. Conclusions

The primary beneficiaries of CBDC's are central banks and governments. It does not benefit banks and consumers directly. However, merchants are likely to be the main beneficiaries (lower transaction costs). Secondly, we speculate that initially the introduction of CBDCs is not likely to impact banks as much as feared, as, at least in the initial stages there would not be a large decrease in bank deposits, because of the expected monetary cap on CBDC wallets. Thirdly, digital currencies are likely to reduce the fees that banks generate from payments. These fees currently make up 7% of revenue and 20% of PBT^v. This reduction is due to the expected decrease in credit card usages in physical purchases. Fourthly, Card payment networks such as Visa and Mastercard are likely to get hit. Money transfer companies (MTOs) will be impacted the most (e.g., Western Union, MoneyGram) because digital currencies are borderless,

international transaction fees (currently up to 8%) should decrease drastically. Lastly, not all banks are impacted only negatively. As shown in figure 2 blockchain presents the opportunity for banks to cut down its operation cost and speed up settlements.

Although massive adoptions of CBDCs might seem far away, the day is almost definitely going to come. It is not going to be long before we can feel the initial wave of change as individuals and businesses have already started to anticipate and adopt different forms of digital money.

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