

A Work Project, presented as part of the requirements for the Award of a Master's degree in Finance from the Nova School of Business and Economics.

CENTRAL BANK DIGITAL CURRENCIES CONSULTING PROJECT
THE LAUNCH OF THE DIGITAL EURO – HOW IT EVOLVES AND DIFFERENTIATES FROM CRYPTOCURRENCY

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Abstract

This work project has been developed around the scope of CBDC, a central bank issued digital currency for the general population, with the goal to foster financial inclusion and provide a fully digital programmable means of payment. Central banks are experimenting with blockchain, in order to benefit from the features of the technology while also introducing a digital coin which complements cash and enforces regulation. In this report we deep dive on how CBDC evolves from cryptocurrency nascent technology and features, while differentiating major legal, structural and functional differences.

Keywords: Fintech, Cryptocurrency, Blockchain, MICA, CBDC, Retail Banking, DeFi

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What's Crypto currency?

“Cryptocurrency is **decentralized digital money**, based on **blockchain** technology...a medium of exchange that is **digital, encrypted and decentralized**...there is no central authority that manages and maintains the value of a cryptocurrency. Instead, these tasks are broadly **distributed among a cryptocurrency's users** via the internet.”

Forbes Advisor “What's cryptocurrency”, December 2020

Is Crypto currency considered to be money?

Economists define assets considered as money, to fulfil three criteria's: unit of account, medium of exchange and storage of value

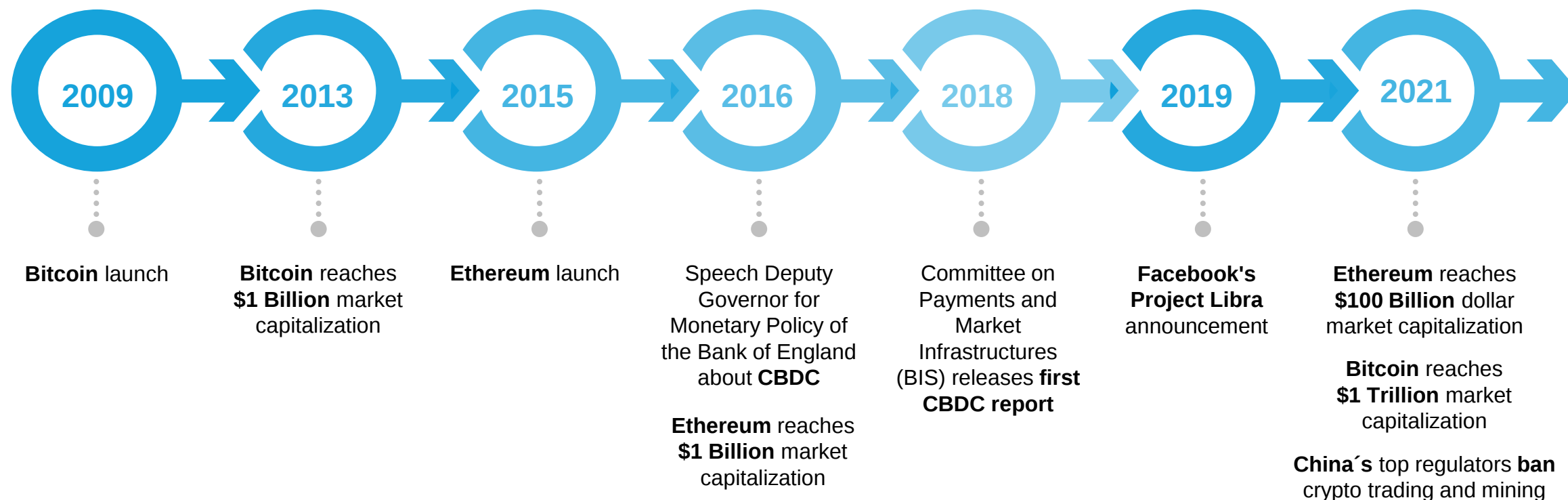
The main purpose of a **unit of account**, is to measure the value of goods/services and compare them. This property grants money the ability to price what we consume. Given crypto's inability to stabilize their value (at least in the short-term), it is **not yet** considered to be unit of account, given that people that hold crypto on their wallets quote their wealth in terms of a fiat currency, which has a much more stable value.

For an asset to be considered **medium of exchange** it should represent a standard of value. Crypto does **not qualify** at least yet, as medium of exchange, since it has not gained widespread acceptance, even when accepted prices are quoted on fiat currencies and putting aside special events, it is not considered as legal tender, which means companies/merchants may not recognize it as means of payment. Indeed, most cryptos are hold for speculative rather than to transfer value.

Although crypto's volatility generates huge price fluctuations, making it a risky asset for wealth storage, a growing number of people has come to **accept Bitcoin as a storage of value**, given its set of features. Being them, its durability and transportability driven by its nature as digital asset, scarcity given by the limited supply of 21 million coins, divisibility (1 Satoshi=0,00000001 BTC) and lastly, even though prices fluctuate a lot, in the long-term they might converge to more stable values, preserving its purchasing power.

Timeline Crypto currencies

List of major happenings from bitcoin launch and subsequent all time highs, first CDBC talks and private issued tokens announcements



CBDC vs Crypto – Major core differences

Although CBDC might evolve from crypto nascent technology, severe technical, legal and functional differences need to be accounted for



Centralized vs Decentralized



CBDC

Issued and supplied by central banks which manage the network, guarantee the stability of value and security of the system

Crypto

Network jointly managed by a community of participants without central authority, through consensus mechanisms



Currency value



CBDC

One-to-one relationship with a national currency
Used for payment and monetary transactions

Crypto

Price is set by demand and supply
Used as a means of payment and as an investment opportunity

CBDC vs Crypto – Major core differences II

Although CBDC might evolve from crypto nascent technology, severe technical, legal and functional differences need to be accounted for



Data privacy and security



CBDC

Need to validate credentials – KYC procedures
High chunks of data – traceability and cross selling

Crypto

Users make use of cryptographic keys to access the network
Low volume of data and enhanced anonymity



Regulation and enforcement



CBDC

Compliance with law: tax evasion, money laundering, terrorism
Ability to switch PSP when network crashes

Crypto

Every participant can hold a node and transactions are purely P2P
Extreme events won't hold the network responsible as legal entity

Types of crypto assets

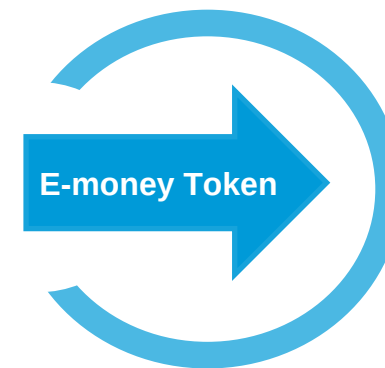
The EU lies ahead of other geographies grouping crypto assets according to their category, with a defined regulation framework (MICA) whose major contribution is the standardization of crypto assets types in three categories, with the goal to improve consumer protection, define crypto industry conduct and introduce new licensing



- DLT technology
- Provides access to an application, resources or services
- Value determined by demand vs supply
- i.e. Ethereum



- Centralized technology (majority)
- Acts as means of payment for goods/services and store of value
- Value determined by baskets of currencies/commodities/cryptos
- i.e. Theter



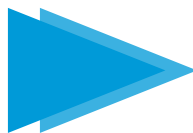
- Centralized technology (majority)
- Primary goal is to act as electronic money (substitute to fiat)
- Value determined by a single fiat currency
- i.e. USDC

Utility tokens

The use of tokens as an enabler to access particular services/products or act as a means of payment has contributed successfully to the adoption of blockchain technology



Ethereum is seen as the cryptocurrency with most utility. Some major features of it have contributed for its emergence to the top



Programmability

Largest blockchain optimized for smart contracts
Allows peer-to-peer transactions without escrow third parties

Platform of choice

Ranked #1 issuer and holder of stablecoins via its platform
Marketplace for investment, borrowing/lending and insurance

Growing acceptance

81 stores and apps recognize Ethereum as a payment method, ranging from travel agencies, online retailers, gambling, gaming..

All features allow holders of Ether to successfully make transactions without fees, waiting time or biases

Aave – Decentralized finance

Aave is a decentralized, anonymous, open source application where users can act as depositors and borrowers, the former being able to earn interest on deposits and borrowing assets, with a market size of \$ 25.9 Billion

Assets ▼	Market size ▼	Total borrowed ▼	Deposit APY ▼	Borrow APR ▼	Borrow APR ▼		
DAI	\$ 1.95B	\$ 1.59B	7.53 % 1.13 % APR	10.24 % 1.40 % APR	18.24 %	Deposit	Borrow
Gemini Dollar	\$ 17.68M	\$ 15.1M	23.77 % 1.57 % APR	30.93 % 1.83 % APR	—	Deposit	Borrow
sUSD	\$ 60.93M	\$ 52.33M	22.98 % 2.41 % APR	33.44 % 2.81 % APR	—	Deposit	Borrow
TrueUSD	\$ 102.63M	\$ 85.13M	11.18 % 0.72 % APR	15.06 % 0.88 % APR	23.06 %	Deposit	Borrow
USD Coin	\$ 4.67B	\$ 4.25B	7.70 % 0.95 % APR	9.39 % 1.05 % APR	16.39 %	Deposit	Borrow
USDP	\$ 16.62M	\$ 15.03M	5.38 % 2.21 % APR	6.61 % 2.44 % APR	—	Deposit	Borrow
USDT Coin	\$ 1.25B	\$ 1.17B	19.15 % 1.44 % APR	23.04 % 1.57 % APR	31.04 %	Deposit	Borrow
Balancer	\$ 15.09M	\$ 2.17M	0.26 % 9.74 % APR	2.24 %	—	Deposit	Borrow
Ethereum	\$ 7.21B	\$ 124.1M	0.00 % 0.26 % APR	0.21 % 0.82 % APR	3.26 %	Deposit	Borrow

To start deposit your asset of choice and respective amount



Your funds are allocated in a smart contract



The funds generate passive income based on the demand for market borrowing (variable vs fixed rates)



You can borrow using your deposited assets as collateral if you have enough liquidity (HF>1)



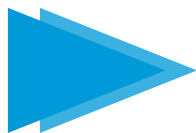
You can both withdraw your funds from the pool-on demand as well as export a-tokens

Asset referenced token

In recent years we have seen the emergence of privately issued cryptocurrencies, which seek to stabilize their value against sovereign currencies or other safe assets



Born in 2014, **Tether** is the most widely integrated digital-to-fiat currency today, reaching a market capitalization of more than \$69 billion - **52% market share**



Credibility

All Tether value in circulation is backed by an at least equal value of currency reserves, cash like items and other safe asset categories

Security, efficiency and transparency

Tether's blockchain technology enables **secure**, **fast** and **cheap** transactions, while complying with existing regulation

Recognition

Traditional players including PSP already recognize Tether as a means of payment, including VISA

Is Tether really paired 1:1 to dollars

Recent joint investigation by the US treasury, federal reserve and the SEC has showed that Tether might not be 100% backed by an equal amount of dollar reserves

Major breakthroughs have lifted **red flags** around tether credibility:

John Betts one former banker for Tether, announced that its top executive had been investing the stable coin reserves in risky projects for its own profit, risking a possible devaluation of its parity in case one of those investments did not materialize

A settlement with NY attorney general **Letitia James**, who emphasized that Tether operates under unlicensed and unregulated supervision

After Tether announced that \$30 Billion worth of reserves were allocated to short-term loans to corporations, **Deborah Cunningham** (CIO at Federated Hermes) discredit the claim, saying no one in the market has ever heard or seen physical evidence of such move

Errol George (Director of the British Virgin Islands) has denied allegations of company representatives regarding Tether supervision

However, even after all these allegations fact checking the stability and veracity of current dollar reserves, most interviewed Tether investors didn't seem to be bothered, as they see the stablecoin as an important vehicle that facilitates their access to **trade** and **wealth creation**

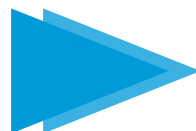
E-money tokens

Crypto assets backed by a single fiat currency recognized as legal tender, whose main purpose is to act as a means of exchange

USDC Issuance Process



User **transfers** USD to issuers bank account. Issuer uses USDC smart contract to **create an equivalent** amount of USDC. User **receives** the newly created USDC ready to use and the USD is held on reserve



Lower volatility and global access

The main idea is to allow everyone to be able to hold a token with 1:1 parity against the reserve currency without the need to create a bank account, simply using their cell phone

Means of storage and payment

Can be used to **facilitate** blockchain payments and **transfer** of value in the context of Ethereum smart contracts or simply be **held** on a wallet

Low asset diversification base

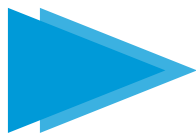
Although, the total fair value of US dollar denominated assets held on behalf of USDC holders is **at least equal** to total USDC in circulation, is completely **dependent** on the value of the reserves, in this case the dollar

Crypto assets not regulated by MICA – Bitcoin

Previous directives (MIFID and EMD) began definition of crypto-assets between financial instruments and electronic money, and for that reason are out of the scope of MICA categorization but inside MiFID and EMD



Bitcoin is the founding cryptocurrency behind decentralized finance, with the highest market capitalization and the first decentralized coin to be considered legal tender



Crypto Asset

A digital representation of value or rights which may be transferred and stored electronically, using distributed ledger technology

Speculation versus utility

Bitcoin as most cryptocurrencies is seen as a speculative financial instrument, however evolved to be used as means of payment, store of value and even operate alongside with national currencies (El Salvador)

Payment acceptance

Several firms accept Bitcoin as payment method: airlines, insurance, real estate and tech companies. The reasoning for its acceptance lies behind the growing number of customers that holds bitcoin wallets ready to use

Central Bank Digital Currency

DIGITAL BANKING CONSULTING PROJECT

Alexandre Fortunato
Diogo Salgueiro
Tomás Carnall



Project ambition

The goal of our project is to introduce and explain CBDC taking into account an Eurocentric approach with the purpose of producing short/medium/long run analysis of inherent challenges and opportunities for commercial banks

- 1 Understanding CBDCs**
 - Introducing CBDC
 - Understanding the differences with other crypto assets
 - Analyzing three different use cases
- 2 Deep dive in ECB vision**
 - Preliminary legal considerations
 - Presentation of most probable adopted models and other aspects
- 3 CBDC impact on commercial banks**
 - Current challenges and opportunities
 - Analyzing risks and impact of CBDC
 - Providing solutions to mitigate risks and presenting further opportunities
 - Addressing clients' specific questions

Team Members



Alexandre Fortunato

EDUCATION

**NOVA SBE – Bsc in Economics
Masters in Finance**

WORK EXPERIENCE

Ânfora, Lda.

EXTRACURRICULAR

Tennis Practitioner



Diogo Salgueiro

EDUCATION

**NOVA SBE – Bsc in Management
Masters in Finance**

WORK EXPERIENCE

PepsiCo

EXTRACURRICULAR

**Amateur Footballer
Volunteering**



Tomás Carnall

EDUCATION

**NOVA SBE – Bsc in Management
Masters in Finance**

WORK EXPERIENCE

TradInveste

EXTRACURRICULAR

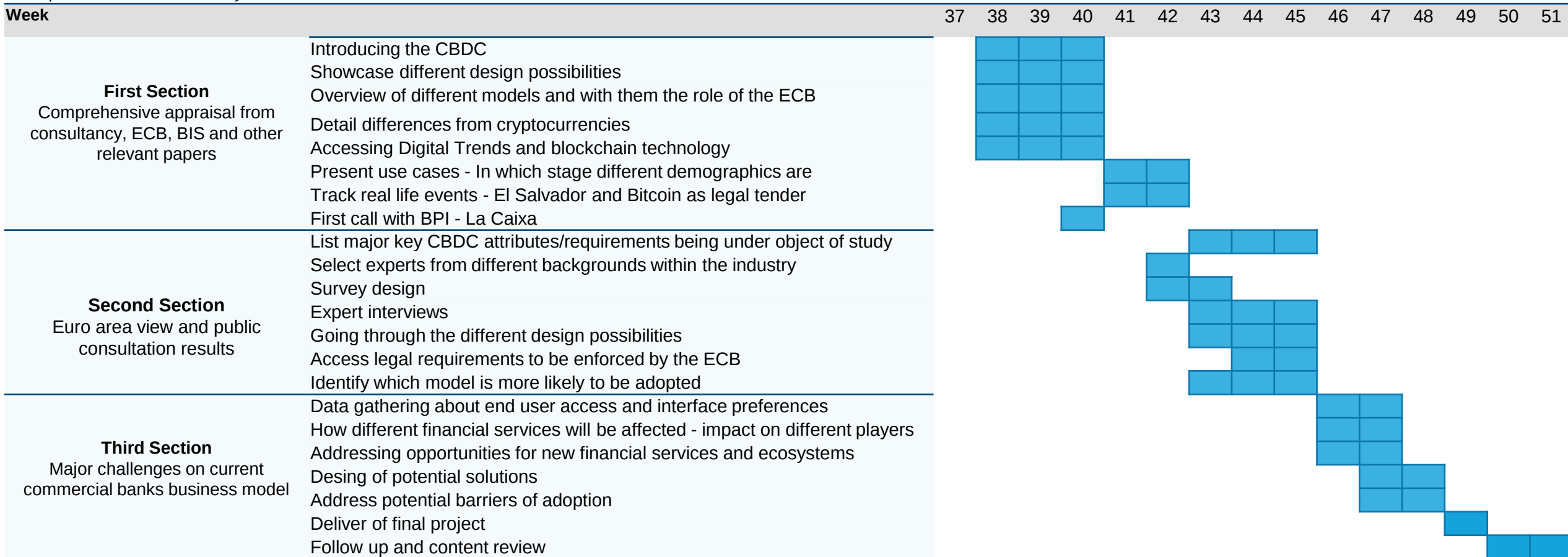
**Math Tutor
Tennis Practitioner**

Proposed Timeline

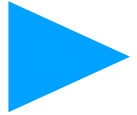
Two steering committees:

- 26th October
- 2nd December

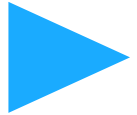
Final presentation – 4th January



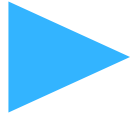
Introducing CBDC's



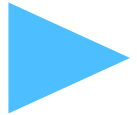
Why do we need CBDC?



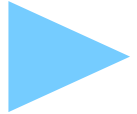
What are CBDC's?



Money Flower



Understanding the different design possibilities for CBDC's



More on CBDC design and cultural preferences

Why do we need CBDC's?

“While cash is still the dominant means of payment, new technologies and the increasing **demand for immediacy** from consumers are changing the way European citizens pay. This is evident in the expanding role of **fast electronic payments**.

To ensure that consumers continue to have unfettered access to central bank money in a way that meets their needs in the digital age, the ECB's Governing Council decided to advance work on the possible issuance of a digital euro – an electronic form of central bank money **accessible to all citizens and firms**. A digital euro would be **introduced alongside cash**, it would not replace it.

A digital euro would create synergies with private payment solutions and contribute to a more innovative, competitive and resilient European payment system.”

Report on a digital euro - October 2020

What are CBDC's?

- Virtual format of a fiat currency
- Issued by a central bank
- Represents a claim on the central bank
- Regulated by the central bank
- Work as a unit of account, store of value and medium of exchange
- Backed by the issuing government and central bank

Central Bank



Assets

12.6k

Liabilities CBDC

Client A: 100

Client B: 200

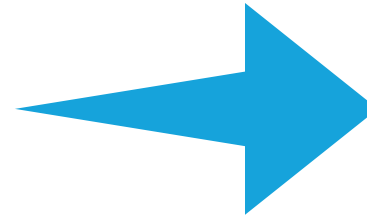
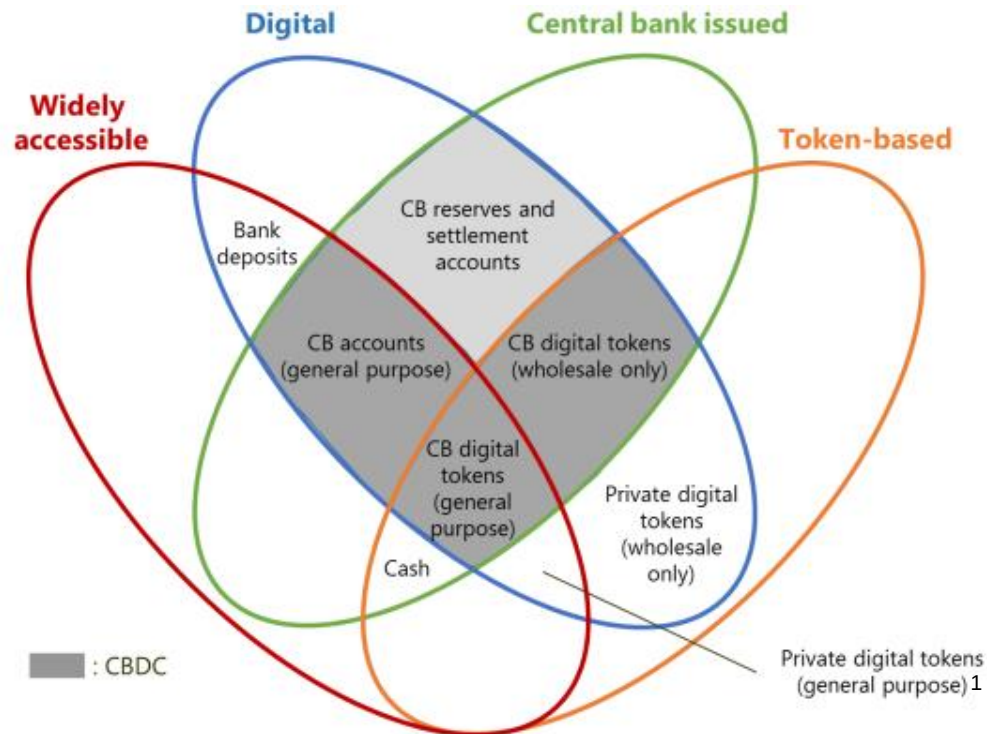
Client C: 300

Banknotes in circulation: 10k

Capital and reserves: 2k

Money Flower

The Veen diagram groups different money forms on the context of **four key features**: issuer (CB/other), form (digital/physical) accessibility (widely/restricted) and technology (token/account-based)



As we can see on the diagram **central bank digital money** is at the **core** of the money flower

The grey shaded highlights three different forms of **CBDC**, distinguished by **potential use** and **access** (account vs token based)

Retail CBDC token-based is the only area that meets **all four** criteria's

We can argue that CBDC **already exists** in Central bank reserves and settlement accounts. It is not token-based and not widely acceptable. But it exists. So what we are really discussing is changing the **technology** behind Money (tokenized or not) and the **access** to the “new Money”.

1. Private digital tokens (general purpose) = Bitcoin and others

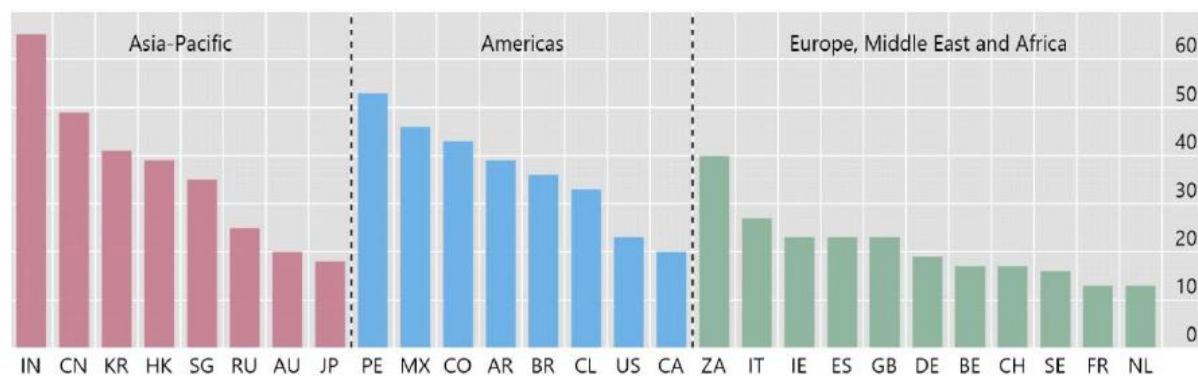
More on CBDC design and cultural preferences

Countries' differing cultural preferences will lead Central Banks to consider different design features for their CBDC

Preferences regarding privacy vary across countries

In per cent

Graph 8



Agree or strongly agree to share the data¹

¹ The question in the survey reads, "I would be comfortable with my main bank securely sharing my financial data with other organisations if it meant that I received better offers from other financial intermediaries"; for Belgium, the figure covers Belgium and Luxembourg.

Source: S Chen, S Doerr, J Frost, L Gambacorta and H S Shin, "The fintech gender gap", *BIS Working Papers*, forthcoming; EY, *Global FinTech Adoption Index 2019*, June 2019.

Source: *Digital currencies and the future of the monetary system – BIS Report – January 2021*

Attitudes towards **privacy** is one example of a key aspect that changes a lot whenever we change region/country

The **West** is generally **more concerned** regarding privacy than other regions. Because of that, Western Central Banks are taking citizen's privacy concerns as a core pillar when developing their digital currencies

On the other hand, countries like **China** do not have such constraints and can even use their digital currency to further their **social** or **political** agendas (ie. credit system)

The type of CBDC's each region will develop, as well as the impact they will have, are therefore going to be significantly different.

- Understanding the differences with other crypto assets

Prequel of CBDC – cryptoassets and inherent technology

- ▶ What's Crypto currency?
- ▶ Is Crypto currency considered to be money?
- ▶ Timeline Crypto currency
- ▶ Digital trends
- ▶ Blockchain – Digital Ledger Technology (DLT)
- ▶ Tokenization
- ▶ Digital Wallets and Smart contracts
- ▶ CBDC vs Crypto – Major core differences
- ▶ Types of crypto assets

Why a digital Euro will become a reality

To support the digitalization of the European economy and the strategic independence of the European Union

To avoid other currencies becoming dominant and threatening the financial stability of the EU

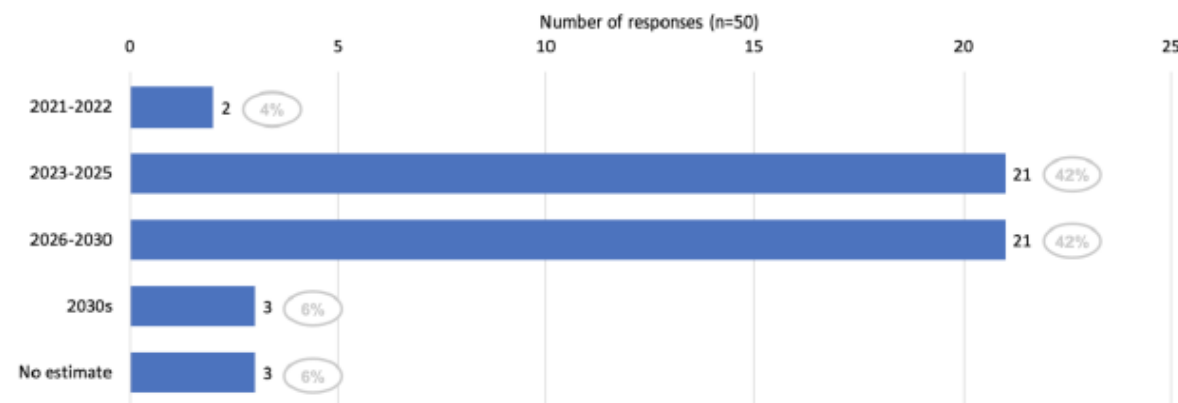
To respond to a significant decline in the role of cash as a means of payment

To promote the relevance of the euro and its international role

To act as a new monetary policy transmission channel

To mitigate risks to the normal provision of payment services

Expert Survey: When will a Euro CBDC be issued by the ECB?



(Source: Frankfurt School Blockchain Center)

Note: The survey was conducted to a panel of 50 experts in many areas, from regulators and central bankers, to academics and industry leaders.

Central Banks are lagging as legal enforcers for CBDC issuance

“The issuance of CBDC should be founded on a robust, ideally explicit, legal basis in the central bank law. Absent such a basis, the issuance of CBDC may expose central banks to legal and political challenges. Applying textual, contextual, historical and purpose-based interpretation methods, the paper concludes that few central bank laws today offer a sufficiently strong legal basis”

- IMF Working Paper – Legal Aspects of Central Bank Digital Currencies; Central Bank and Monetary Law Considerations, November 2020

Legal considerations behind the digital euro

The legal basis behind a digital euro issuance will be determined by the design choice of the ECB together with its purpose (according to the EU report more likely to be an instrument equivalent to a banknote)

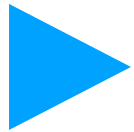
Article 128 of the TFEU in conjunction with first sentence of Article 16 of the Statute of the ESCB

- The European Central Bank shall have the exclusive right to authorize the issue of euro banknotes within the Union. The European Central Bank and the national central banks may issue such notes. The banknotes issued by the European Central Bank and the national central banks shall be the only such notes to have the status of legal tender within the Union.
-
- Member States may issue euro coins subject to approval by the European Central Bank of the volume of the issue. The Council, on a proposal from the Commission and after consulting the European Parliament and the European Central Bank, may adopt measures to harmonize the denominations and technical specifications of all coins intended for circulation to the extent necessary to permit their smooth circulation within the Union.

If the digital euro is to be treated as a banknote [Article 128 of the TFEU](#) “authorize the issue of banknotes within the union” can be called upon to enable the status of legal tender for the CBDC

Most probable digital euro models

WHOLESALE VS. RETAIL



The Banque de France Wholesale CBDC project (a wholesale example within the EU)



Retail CBDC as part of a broader strategy

Banque de France Wholesale CBDC project

During the experiment, CBDC and security tokens were issued and transacted in a permissioned blockchain (DL3S), where authorized participants ran separate virtual nodes being assigned different functionalities on post-trade market operations

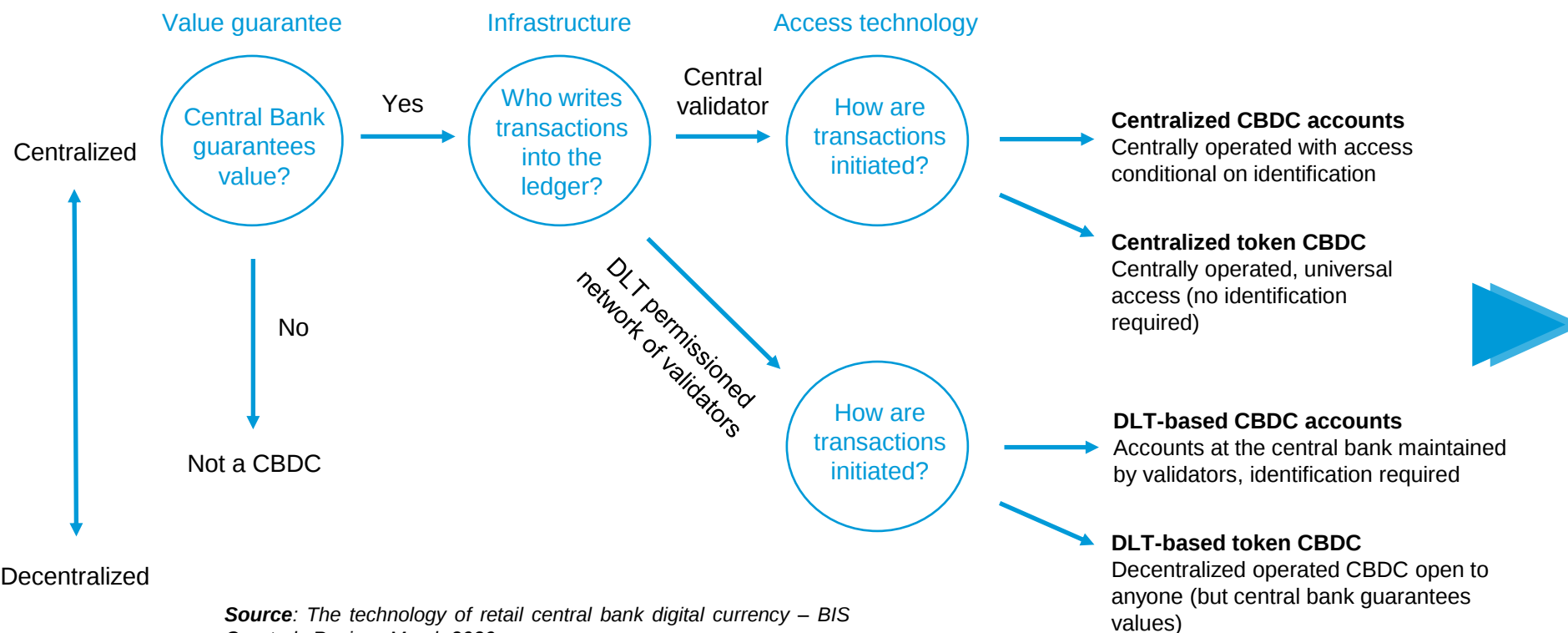
Entity	Role
Banque de France	CBDC issuer/wallet manager/supervisor. Acts as a Central Bank
Euroclear	Securities wallet provider for authorized participants, settlement supervision
AFT	Issuer of the OATs (French Government Bonds)
BNP Paribas CIB, Crédit Agricole CIB, HSBC and Société Générale	Primary dealers for the OATs and securities wallet managers for their customers

Although further work needs to be made (especially relating to scalability), the experiment produced valuable insights:

- **Permissioned blockchain** would be the preferable network, as it would combine blockchain features, along with control over participants under the heavy regulated capital markets
- The use of blockchain **reduces** trade to settlement cycles, **increases** direct market participation and could **reduce** operational costs
- Showcased the capacity of several blockchain platforms to **coexist** and **interoperate** within settlement platforms
- A CBDC token would require **less data** and be **more manageable** and **easier of transfer**. It would also be more suitable for cross border movements between blockchain platforms

Most probable digital euro models

ELEMENTS OF DECENTRALISATION: DLT AND TOKEN BASED ACCESS



This graph maps out the **four possible combinations** of whether a CBDC infrastructure is **distributed** or **centralized** and whether access is based on **identification** (accounts) or **cryptographic knowledge** (digital tokens).

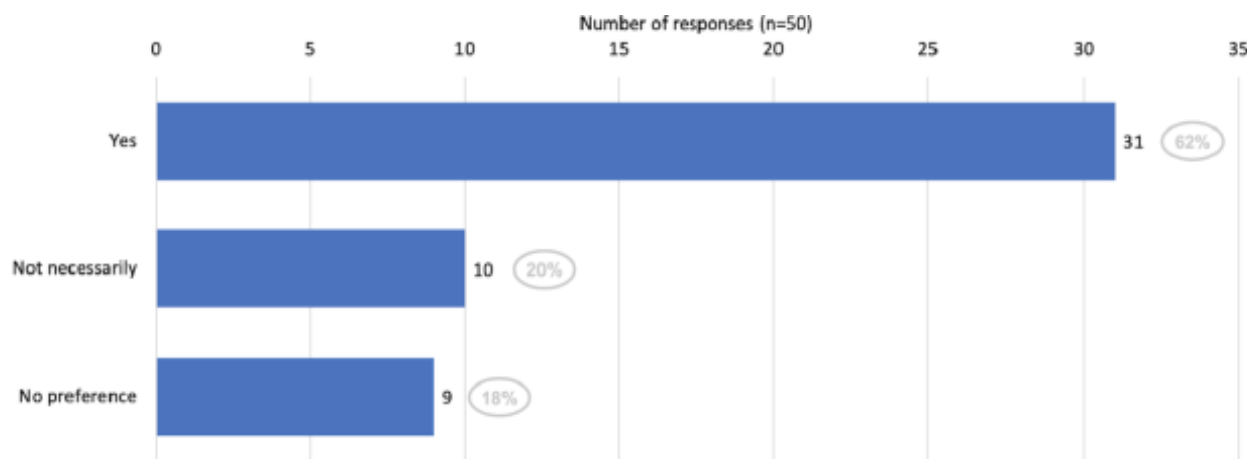
All four combinations are possible for any CBDC architecture (indirect, direct or hybrid), but in the different architectures, the central bank and the private sector operate different parts of the respective infrastructure.

Most probable digital euro models

ELEMENTS OF DECENTRALISATION: DLT AND TOKEN BASED ACCESS

Expert survey:

Is DLT the appropriate technology to implement a digital programmable Euro?



(Source: Frankfurt School Blockchain Center)

Note: The survey was conducted to a panel of 50 experts in many areas, from regulators and central bankers, to academics and industry leaders.

"In total, **31 experts**, mostly working for banks, associations, or in the industrial sector, are convinced that these **benefits** can **only** be achieved if the digital Euro is **based on a DLT system**. [...]"

10 experts argue that the digital Euro must **not necessarily** be implemented on a **DLT** but that using DLT has **significant advantages** over other technological choices. [...]"

Academics suggest that **transparency** and **interoperability** can **only** be achieved through the use of **DLT**.

9 experts, mainly central bankers, are **undecided** whether DLT is the appropriate technology to implement the digital Euro. They do **not exclude** the possibility that DLT can be used, however, they are also open to other approaches. [...]"

Furthermore, most experts indicate that the DLT system should be **permissioned**, meaning that access would be **restricted** so that participants would need permission to join and interact with the network. [...]"

On the other hand, experts from the industrial sector point out that the economy can **only** profit from the full advantages of a DLT if the system is **permissionless**."

- The Digital Programmable Euro, Libra and CBDC: Implications for European Banks

Scenario Analysis

A CBDC own mobile app would possibly reduce banks' share in payment services and with it associated data used for cross-selling

Independent mobile app

The central bank may aspire to create a CBDC mobile app available to merchants and citizens. This move would allow the central bank to have a higher control over payments privacy and how data is managed.

Clients would get onboard via deposit taking institutions and then use the independent app to make payments.

For banks this would probably translate into a lower participation into the client's life cycle, as it would no longer process payments and still need to compete for clients' deposits (assuming banks will be able to hold CBDC wallets)

Virtual wallet integrated within PSP app

There is the case for CBDC wallets integration into payment service providers apps.

Clients would benefit from one vertical integrated application and get more used with banks interface.

Under this scenario banks will continue to perform payment services to their clients, benefiting from the low capital intensive and high data processing operation.

Scenario Analysis

CBDC as a card technology standard

The central bank may aspire to create a CBDC whose purpose is to serve as a standard for the EU, harmonizing card acceptance across jurisdictions without no extra fees.

This scenario would enable merchants to have access to a POS standard hardware which would smooth take up, while also cutting reliance on US multinational card schemes such as Visa and Mastercard along with their high fees.

In the scenario where CBDC payments system is built to compete with foreign payment solutions, only price-based safeguards would be established (two-tier remuneration), and quantity-based safeguards would be reserved only for special, temporary situations, ie, to deal with a crisis

CBDC as a digital payment gateway

CBDC could be integrated into e-commerce payment solutions as one of the possible wallets from which to pay, being a new way to perform digital payments.

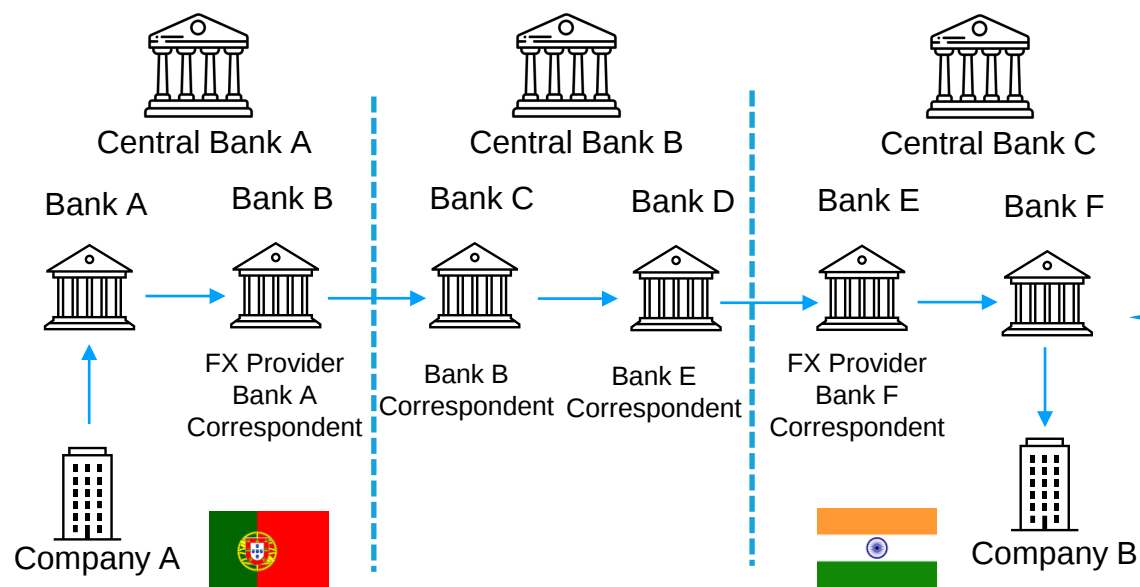
Under this scenario CBDC could condition the level of the merchant service charge applied.

National interbank wallets (i.e. MbWay) would need to integrate with the digital wallets held by the deposit holding institutions.

Significant investment and coordination between central banks is needed for CBDC to be competitive on international e-commerce as the major card-schemes enjoy large economies of scale due to their massive network. Adding a global dimension is a complex task, and there is the possibility to initially test CBDC at a domestic POI payment and once released start considering interoperability and cross-border use for upcoming releases.

Cross-border Payments

Central Banks ought to tackle the systemic risk caused by the current shortcomings



Correspondent Banking Network inefficiencies

- High Costs** - FX conversion (extra fees and unfavourable exchange rates), trapped liquidity and delayed settlements
- Low Speed** - business hours on different time zones, lack of standardization
- Low Transparency** - on fees and on status of process
- Heavy Regulation** - AML, CFT, KYC

Cross-border Payments II

CBDC interoperability can mitigate current frictions

Multi-currency Central Bank Digital Currency (mCBDC) Network

*dependent on chosen model

- Exchangeable across Countries, Currencies, and Payment Systems
- 24/7 and real-time
- Payments and FX PvP settlements
- Enhanced efficiency, lower costs, wider use and adoption
- Remove opacity and complexity
- Improve remittances

Standardization of processes permits:

- **Accessibility** (easier access to liquidity without cut-offs and cross-border delays)
- **Convertibility** (easier compatibility by converting to different currencies at will)
- **Reachability** (beyond bank accounts)
- **Traceability** (transparency in the trace of funds)

Key Points

- Political will is necessary for consistent access frameworks and interlinkages
- Commercial bank's role and relevance varies across models. At this moment it is uncertain which will prevail. However, the new network can still rely on correspondent banking network, albeit in a tokenized form.
- Threat of dollarisation in CBDC form
- Single mCBDC multi-currency system: jointly operated payment system hosting multiple CBDCs, FX settlements would be payment-versus-payment.



Model labelled by BIS as “greatest potential for improvement” is perpetrated by Project Dunbar - Australia, Singapore, Malaysia, and South Africa

What will the digital euro look like

Retail CBDC: Anyone can hold it

Hybrid Model: Intermediaries handle payments and customer interactions

Mainly account-based: Requires customer accounts for large (tier 2) holdings

Tiered system: Convenient for payments but unattractive as store of value

Final considerations on interoperability, privacy, technology, environmental impact etc..

More than a centrally-backed digital currency, the digital Euro will be introduced as a strategic means of payment available to everyone (**retail**), capable of competing with foreign payment giants, at least locally and at large scale for small and medium size payments. It will heavily rely on the banking system and intermediaries (**hybrid model**), and be designed with features to prevent disintermediation and minimize financial risks (**tiered-remuneration system**). It will most probably adopt some form of decentralization elements such as functioning within a **permissioned DLT network**, but be mostly **account-based**, with a reduced place for tokens. Its strength and main cause of adoption will be its ease of access and **interoperability**, both locally and across borders, at a European level, and maybe even further. Optimistically, the digital Euro is seen as a new technology that will bring about a cheaper, faster, more efficient and more reliable means of payment for EU citizens. The ensuing loss of revenues for banks means that the banking system is expected to undertake the crucial role of using this new payment tool to create some innovation into the services it provides and eventually reorganize to some extent its business model. This will in turn create a more resilient and thriving financial ecosystem.

Exploring the opportunities and risks in the Digital Currencies world. How can banks adapt?

Before CBDC: Opportunities in crypto services

- Banks are losing new business avenues for FinTech's
- Snapshot on how major US banks are leveraging blockchain
- Opportunities in crypto related services: e.g., Loans, escrows, custody of crypto assets

CBDC risks and impact on commercial banks

- Flights of deposits and consequent decrease in the provision of credit
- Increase in competition in the payments sector due to new entrants and shifting of existing roles
- Higher risk of systemic bank runs in periods of crisis

How to mitigate risks: solutions and opportunities

- Enhancing existing product offering to address clients' specific requirements
- Access new ways of funding, e.g., wholesale, capital markets
- Leverage CBDC programmability to extend services and create new revenue streams

Banks are losing new business avenues



Gemini

Same day withdrawals and instant trading capability from cold storage

Gemini instantly credits withdrawals to exchange accounts whilst maintaining high security and verification standards around funds movement

Multi-layered security architecture

Multi-signature technology, role-based governance protocols, multiple layers of biometric access controls

Designed for compliance and transparency

All customer assets are segregated using unique digital addresses that are independently verifiable on their respective blockchains



Anchorage

Anchorage Custody

Advanced security engineering beyond cold storage, alongside top-industry insurance which protects the assets during their custodian lifecycle

Anchorage trading

Access multiple venues with a single onboarding - use crypto collateral to borrow crypto or fiat currency or earn returns by lending the assets under custody

Anchorage staking

Stake assets under custody directly on the chain, with no additional security risks

Paving the road to meet CBDCs

The best way to prepare for CBDC issuance is to start today developing and implementing a strategy to respond to the changing landscape. Management and digital asset teams will need to collectively build the appropriate competence and capabilities to perform business operations, as well as to understand and effectively manage the related risks

What won't change:

- 1) **The two-tier banking system will remain intact:** Screening, onboarding, offboarding, servicing, the building and maintenance of technology platforms—no one is better positioned to perform these activities in the CBDC era than the regulated entities who already do so, namely, commercial banks.
- 2) **Banks will remain responsible for much the same things** such as cash distribution, electronical processing of payments, safe holding of deposits, and for lending capital. Plainly put, CBDC is not a payment system, but simply a new format of money that enables alternative payment options with features of a digital instrument that allows for greater programmability and offline functionality.

What will change:

- 1) **New approaches to processing payments** – the task at hand is to understand and address how functionality will change, knowing that things like know your customer and anti-money laundering practices will still apply to CBDC.
- 2) **New possibilities for payments** - Imagine using your phone to pay a small, Fair Trade farmer in Ecuador for a cup of coffee you're enjoying at a café in Chicago.
- 3) **Integrating with new systems** – While many of the systems to support CBDC in its various forms have yet to be built, they are nonetheless unavoidable. Significant integration efforts will have to be planned as a result.
- 4) **A new range of banking services yet to be imagined** – As the world's CBDCs take shape, our banking services must evolve to meet emerging needs. Picture, for instance, a world in which businesses, households and individuals access CBDC through an electronic wallet they hold with their commercial banks—therein lies a whole new range of service opportunities.

Based on Accenture Report, March 2021: CBDC for commercial banks, by John Velissarios

Before CBDC: Opportunities in crypto services

There is a way to answer simultaneously these two parallel realities - banks losing business avenues as financial intermediaries, and the need to start preparing the coming of CBDCs. This consists in starting today developing the necessary infrastructure to provide crypto services, thus killing two birds with one stone: develop the necessary knowledge to be ready when CBDCs come into play while assuming the position and building the reputation of competent digital intermediaries and capturing some of the otherwise fleeing customers.

There's no way around it: CBDC is a new payment rail and banks need to create a new IT infrastructure to process CBDC transactions. However, **it's a good opportunity to modernize legacy systems they've had on the back-burner.**

What banks create will depend on how the central banks implement their networks, where they'll be hosted, and how banks will participate in the ecosystem, as well as jurisdictional requirements. In the meantime, they can and should start preparing.

Given that a CBDC is simply a centralized digital asset, the best way to develop the right knowledge and expertise to adapt to it, is to **start working on developing the infrastructure and the operational knowledge to work with decentralized digital assets**, such as cryptocurrencies and stablecoins. In doing so, banks get two benefits:

- 1) They develop industry knowledge and digital asset teams that are capable and competent enough to adapt their systems to whatever model or shape future CBDCs might take.
- 2) They provide crypto services to their clients and compete in an industry where they are losing ground to emerging players such as FinTechs, thereby putting themselves in a superior operational position and building a reputation of trust and competence as intermediaries of all kinds of digital assets.

To undertake this, banks should consider whether to focus on in-house development or work with a third party for services related to digital assets. Similar to traditional business processes, there might be functions related to digital assets that would be more efficient if outsourced to a third party.

Entering the crypto services market

A snap-shot of how other banks are entering this market and competing with FinTechs to become more relevant digital currencies intermediaries. They are in a unique position to leverage their main advantage in this market: a history of customer trust.

JPM Morgan → JPM Coin

First global bank to design a network to facilitate instantaneous payments using blockchain technology

Facilitates real-time value movement, helping to solve common hurdles of traditional cross-border payments

Goldman Sachs

Partnership with Galaxy Digital for Bitcoin trading, as demand by HNW individuals increases towards this asset class

New head of digital assets with a crypto agenda, betting on blockchain as the future for financial markets

Morgan Stanley

First large US bank to offer its wealthy clients access to Bitcoin funds

Offering blockchain based investment products since 2018

New opportunities at glance for retail banking, cryptocurrency services

Retail banking clients and institutional investors express increased interest for cryptocurrencies and DLT products

Indeed, HNW individuals might be attracted to **crypto-based growth assets** or **transaction-monitoring** services based on DLT, while retail investors may favor access to potential **rapid-growth assets** and portfolio diversification, advising clients on the relatively few offerings that are likely to succeed

“It could become mainstream for people to move from holding all or much of the money now in current accounts at banks, to holding it in Stablecoin, in virtual wallets provided by non-banks”

Bank of England deputy governor, February 2020

New opportunities at glance for retail banking, cryptocurrency services II

Retail banking clients and institutional investors express increased interest for cryptocurrencies and DLT products

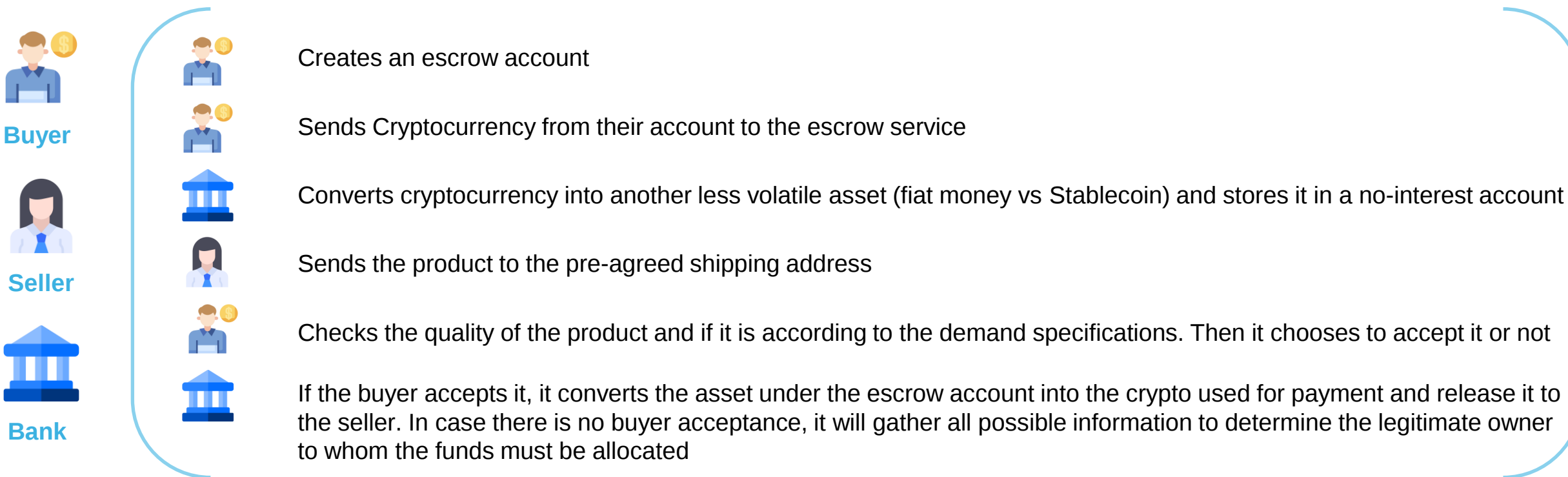
Banks can answer to the professionalization of the industry and incoming regulation and **adopt cryptocurrency** (Morgan Stanley and JPMorgan did already) offering payment processing, escrow services, currency trading services, loans on cryptocurrency, international transaction facilitation, real estate investment on blockchain technology, smart contract settlement, and are **well positioned** for the job due to their established network and trustworthy reputation

“Banks need to transform themselves under three vectors. First, internally clarify which services they provide. Second, to fully digitize the user experience. Third, establish partnerships in a way to be able to compete with new players.”

Founder of an NFT real time loan provider Start Up, November 2021

Escrow services

Given the increased ecommerce activity and search for crypto payments, banks can enter the market for provision of escrow crypto services, ensuring proper fund securing, using their security mechanisms to detect scammers and allocate the funds to the rightful owner



Loans on cryptocurrency

Due to the increased amount of crypto under virtual wallets, borrowers might choose to use it as collateral when in need of liquidity, without the necessity of liquidating or trading any amount of their crypto

How it works

- 1 The borrower must set up an account at the platform of choice (i.e. Binance, BlockFi, Abra)
- 2 Then it must select the amount of the loan and preferred currency
- 3 Based on the cryptocurrency used as collateral, the Loan-to-Value-ratio will be calculated to infer how much collateral is needed
- 4 Once the collateral has been deposited, the borrower will receive the loan funds. Afterwards it will need to pay the interest and principal over the agreed term length

Benefits

No credit check

Lower rate

Faster settlement

Crypto as single collateral

Drawbacks

Higher collateral volatility

No universal crypto acceptance

Assets frozen until loan repayment

No federal insurance

Banks leveraging crypto as legal and safety enforcers

The Basel committee on the banking sector established four practices to be met in order to mitigate customers risks associated with DLT technology. These are: due diligence on cryptocurrencies, internal governance and risk management framework, disclosure of all activities in financial statements and dialogue with regulatory supervisors

Know your transaction (KYT) services

- Track origins of transactions using blockchain technologies
- Remove much of the concern about dark money and laundering

Structured regulatory compliance (SRC) practices

- Manage the diverse array of regulators and authorities across many regions
- Provide a common diagnostic and priorities so that banks can have uniform risk policies

Due diligence by banks

Innovation of custodian services

- Monitor and protect cryptocurrency assets for customers and banks
- Create opportunities for bank revenues and improved customer service

According to the **embedded supervision** concept proposed by Raphael Auer (BIS Economist), rather than fitting cryptocurrencies to the existing regulatory-compliance practices, the technology should be put into track and be leveraged to reveal any real problems that occur.

Due to inconsistencies across jurisdictions concerning crypto assets, banks should develop their own guidelines, starting with a **regulation heat map**, then inventory the sources of **expertise and technology** needed for the selected cryptocurrency initiative, and finally develop a **risk management software solution** for their own transactions.

Banks can leverage their high levels of cyber protection, along with their reputation, track-record, regulation-oriented skills and established network to offer **custodian** services, benefiting from the holding of such assets while fighting and competing with FinTechs which have been filling the market gap.

Source: BCG Analysis

Risks and impact of CBDCs on commercial banks

- ▶ Responsibilities framework for CBDC network participants
- ▶ Flight of deposits
- ▶ Financial implications for retail banking
- ▶ Bank runs in case of crisis
- ▶ Lower fees for payments processing (including cross-border)

Responsibilities framework for CBDC network participants

Roles	Performed by	Key prerequisites	Responsibilities
Payment Service Providers	- Commercial Banks - Non-bank Payment Service Providers	- Connectivity to the mCBDC network - Able to support the payment orchestration requirements	- Hold mCBDC accounts on the network - Responsible for KYC of the corporates, AML, CFT, and sanctions screening
Liquidity Providers	- Commercial Banks (for convenience liquidity or AMM) - Non-banks for AMM/liquidity smart contract pooling	Hold liquidity in the relevant currency pairs, which is key to the staking process for pooling smart contracts	Provide liquidity to FX providers as part of conventional market making, or into liquidity pool smart contracts as part of AMM
Market Makers	- Commercial Banks (for convenience liquidity or AMM) - Non-banks for AMM/liquidity smart contract pooling	- Access to the liquidity provider on the mCBDC network For Automated Market Makers - Require access to the liquidity pools - Algorithmic market-making ability on liquidity pools - Ability to meet the infrastructure requirements to support connectivity	Provide Board Rate and RFQ services to the participants in the network
CBDC Issuer	- Central banks - Commercial banks - Payment service operators (PSOs), with omnibus accounts setup by central banks	- Minting and redeeming capabilities - Regulatory authorization - Expertise in local compliance requirements	- Establish connectivity between the PSO account and mCBDC network, enabling minting and redemption to/from the mCBDC network - Provide account services to the participants in the network
Third-party Services	- Banks - Technology service providers - Law firms	- Access to transaction data - Knowledge in international regulatory frameworks - Expertise in smart contracts and FX execution	- A shared service on regulatory compliance-related processes (e.g. KYC, AML and CFT) - FX PvP Matching; Payment-netting services - EOD FX position management
Hosting Providers	- Technology service providers, e.g. Consensys and Blockdaemon - Multiple hosting providers could co-exist	- Strong in privacy, scalability, resiliency, and finality - Established domestic adoption with regulatory approvals, given participating central banks are more willing to vote for the same DLT platform for domestic and international transactions	Service the infrastructure needs (DLT platform, cloud service, etc.) of the participants (central banks/ commercial banks)
Network Operator	Profit/ not-for-profit independent governing entity	A trusted governing body by all network participants	- Onboard/ offboard participating commercial and central banks - Push through smart contract upgrades - Provide technical support - Administer the network rule book - Arbitrate in dispute resolution

Source: Oliver Wyman and J.P. Morgan analysis

Flight of deposits

A remunerated CBDC with the purpose of servicing as store of value rather than a means of payment would be an even more attractive substitute to low interest-bearing deposits, switching banks access to low-cost funding as banks are no longer perceived as the best safe guarders for households' or business income

Fernandez-Villaverde et al (2020), Keister and Sanches (2019) stipulates that a CBDC would structurally decrease deposit funding available to commercial banks as a CBDC, being on a par with deposits with regard to liquidity and convenience, would also offer advantages as a safe haven asset

Piazzesi and Schneider (2020) argue that the introduction of a CBDC by the central bank could cause a reduction in commercial bank deposits which would consequently translate into more expensive credit lines

Chiu et al (2019) and Kumhof and Noone (2018) argue that in an imperfectly competitive deposit market, the existence of CBDC as an outside option forces banks to match the CBDC rate to retain their deposits, which would eventually have a crowd-in effect of encouraging saving

As we can see from the above academic research, different assumptions regarding CBDC remuneration, feature (cash vs deposit like) and usability will have different impacts on deposit substitution from commercial banks. Yet, it is possible to infer that either lending rates or loans supply, savings rate or deposits funding will have to be adapted to compete with CBDC and other payment alternatives which might be developed by new entrants into the financial ecosystem

Financial Implications for retail banking

CBDC issuance must be thoroughly examined, as it can disrupt the existing banking infrastructure and business models, with severe impacts on bank disintermediation

Sensitivities of lending rates to assumptions		
	Upward pressure on the change in lending rates.	Downward pressure on the change in lending rates.
The cost of Long-term wholesale debt, and banks' weighted average marginal funding cost	Cost might rise as banks increase debt issuance if investors want additional compensation to shift their portfolios from government bonds to bank debt. Bank debt is often bought by institutional investors in international markets. So the impact on lending rates could also depend on international cross-currency swap markets.	Cost might fall if banks' higher demand for government bonds (HQLA) resulted in lowering government bond yields. In that case, the risk-free rate component of wholesale funding costs could fall. However, a fall in government bonds yields would also reduce the return banks earned on their HQLA portfolios and so offset the benefit on the funding side.
Deposit rates	Could increase if banks bid up deposit rates to slow non-pecuniary deposit outflows or if the interest rate on a CBDC is attractive.	
Non-interest income	Banks could seek to increase lending rates if they lose non-interest income associated with deposit activity. Alternatively, they might charge more fees or seek other business activity.	Banks could seek to reduce lending rates if they lose non-interest income associated with lending activity
Banks' marginal funding rate used to price lending may not include deposit costs		Banks may price lending based on long-term wholesale funding costs alone. In that case, the impact on lending rates from CBDC would depend on the extent to which increased long-term wholesale issuance drove up long-term wholesale funding rates. In this case, the shift from deposit to wholesale funding may have less impact on banks' loan pricing.
Competition for lending		An increase in loan rates might be mitigated by competition from non-bank lenders and capital markets. However, this effect could be stronger for some forms of lending (eg large corporates) than for others (eg SMEs)



The issuance and take up scalability of CBDCs, depending on its design, might impact the **ability** of commercial banks to **hold deposits**, possibly leading to a decrease of their lending activity, which would affect the lending rate charged to borrowers, while also creating the necessity for wholesale funding to substitute deposit activity

These effects will be felt differently according to each bank's characteristics. To highlight the ones with **higher-rate saving deposits** which might suffer less deposit outflows and the **larger banks** (due to their bigger and liquid asset base) which might easily find wholesale funding at lower cost

All in all, CBDCs can impose different **operational costs** for retail banks, **diminish** revenue capacity (i.e. increasing competition), while also **decreasing costs** associated with cash circulation. A more in-depth analysis needs to be made, to infer if the tradeoff will hold positive or negative outcomes for the banking industry

Source: BIS Report - Central bank digital currencies: financial stability implications, September 2021

Bank runs in case of crisis

Nowadays households can instantly and digitally move deposits from a weaker to a stronger institution in a bank run, at a lower burden than before, lowering barriers such as ceilings on daily withdrawals or inability to transfer funds at a fast pace

How CBDC might increase systemic bank runs

- Safe-haven destination for uninsured deposits, due to perceived credibility by the ECB
- Lower transactional costs than traditional processes: Limits on cash withdrawals, waiting in line, physical storage
- Instant capacity to move funds to a CBDC account

How its design might influence uptake during bank runs

- Limits on individual holdings (corporate and households), preventing clients from holding all their wealth on CBDC
- Restrictions on daily withdrawals from commercial bank accounts to CBDC wallets
- Setting up less attractive interest rates than private institutions

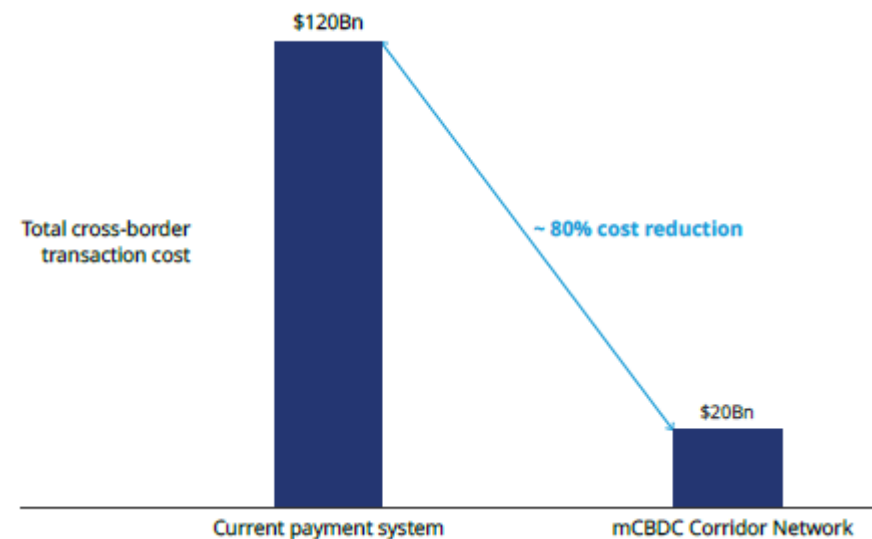
Lower fees for payments processing (including cross-border)

In the absence of multiple correspondent banks along the payment cycle, mCBDC solutions have the potential to reduce the cross-border transaction revenue by 80% annually from approximately \$120Bn annually to \$20Bn (excluding FX revenues).

- The 80% transaction cost reduction derives from the assumption that instead of many banks/financial intermediaries participating in each transaction, only one, at most, correspondent bank will continue to be utilized to facilitate cross-border payments.
- As corporates may not need to hold as much liquidity in their nostro accounts, commercial banks could see their overnight balances reduce significantly by about \$10 billion, further impacting their traditional liquidity revenue streams from overdraft fees and interest.
- In a world of both traditional cross-border payments and mCBDC solutions, commercial banks may need to consider the need to operate two cross-border payment systems in parallel.

- Unlocking \$120 billion value in cross-border payments -
Oliver Wyman and J.P. Morgan

Impact to cross-border transaction cost



Sources: Oliver Wyman and J.P. Morgan analysis

Note: The \$100Bn reduction assumes 100% migration to the mCBDC corridor network. The estimated average transaction cost will come down from \$27 involving 2 correspondent banks to \$5 in a mCBDC world, implying 81% saving.

- Providing solutions to mitigate risks and presenting further opportunities

How to mitigate risks: solutions and opportunities



User needs framework



Flight of deposits: new ways of funding



Bank runs in case of crisis: mechanisms for prevention



Lower fees for payments processing (including cross-border)

“A digital programmable Euro enables the programmability of money through smart contracts and thereby enables automated processes as well as financial services such as interest payments, loans, escrow accounts, leasing and factoring. Therefore, a digital programmable Euro could also yield efficiency gains for banks.”

- The Digital Programmable Euro, Libra and CBDC: Implications for European Banks, July 2020

User needs and adoption requirements

Example of user stories

	Persona and Pain Point	CBDC Motivation/need	CBDC design concept to gain the adoption by this type of user
A well-connected consumer	Consumer with bank account and several options for digital payments	Highly interoperable CBDC	Enhanced interoperability and privacy features, offline functionality, new features (eg programmable payments)
User with no/limited internet	Consumer on limited budget who lives in a remote region without reliable internet	Low-cost/free payment method with offline capacity	CBDC universal access device with both online and offline functionality
Unbanked person	Consumer who does not have/desire a bank account	A CBDC to make digital payments without having a bank account	Low-cost, dedicated, universal access device with a variety of easily accessible end-point solutions/a CBDC supported by institutions other than banks
User with accessibility needs	Consumer who is partially sighted	Accessible mean of payment	Single purpose payment device with large fonts and haptic feedback
User that prioritizes privacy	Consumer who does not want commercial banks to know his or her identity or track his or her spending	A CBDC universal access device	Unregistered wallet at a money service business (with limits for compliance)
The small merchant at the PoS	Retailer who wants to accept CBDC payments in store	A way of accepting non-cash payments that is cheaper and more flexible than current solutions	A CBDC designed with low onboarding cost and that does not depend on existing (costly) point-of-sale hardware

Source: Central bank digital currencies: user needs and adoption - BIS Report, September 2021

Flight of deposits: new ways of funding

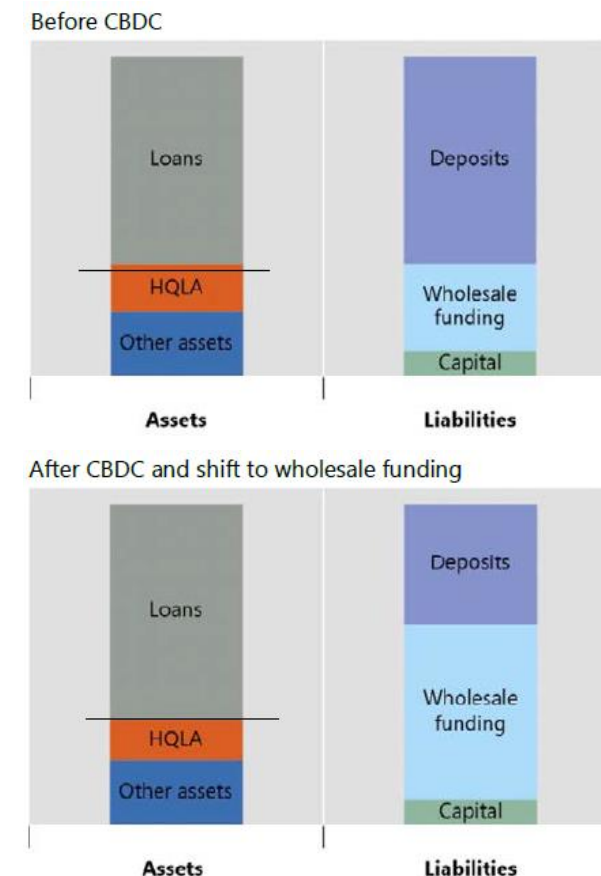
SCENARIO ANALYSIS

Consider one case where the banking system seeks to offset all CBDC capture of customer deposits via long-term wholesale funding – a costlier alternative to customer deposits

“In this case, following deposit outflows, banks seek to **maintain** their **lending volumes** and leave their **regulatory liquidity ratios unchanged**. They do this by **issuing long-term wholesale debt** to buy enough high-quality liquid assets (HQLA). Under current regulatory design, banks do **not need** to replace all their lost deposits with wholesale funding because long-term wholesale funding requires less HQLA to be held against it than deposits.

For simplicity, long-term wholesale funding rates, non-interest income and non-funding expenses are assumed to remain unchanged. Banks' weighted average funding costs increase due to the substitution of deposits with relatively more expensive wholesale funding.”

- Central bank Digital Currencies: financial stability implications –
BIS Report, September 2021



Flight of deposits: new ways of funding II

SCENARIO ANALYSIS

For a range of CBDC take-up scenarios, we estimate how much this response increases banks' weighted average funding costs and reduces net interest margins (NIMs) and return on equity (RoE), other things held constant (graph, left-hand side).

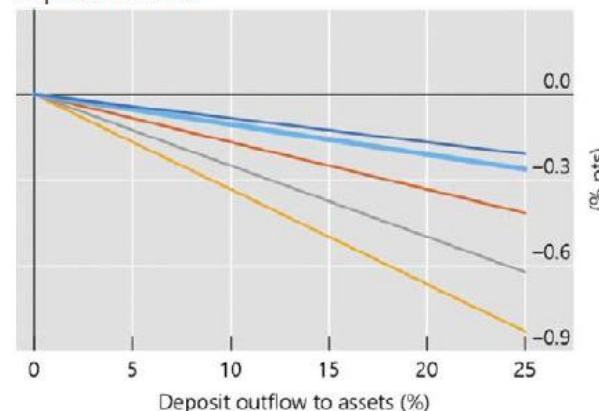
The model estimates that **wider spreads between deposit and wholesale funding rates, coupled with sizeable deposits outflows, translate into a larger profitability loss.**

Finally, banks may seek to offset that impact on their profitability by raising lending rates on loans, which for simplicity is assumed not to trigger reduction in lending volumes. **We estimate by how much banks would need to increase lending rates to maintain profitability for a wide range of take-up scenarios (graph, right-hand side)**

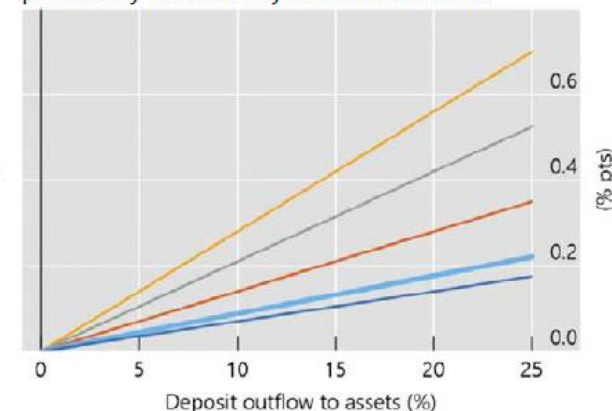
- Central bank Digital Currencies: financial stability implications – BIS Report, September 2021



Change in banking sector RoE resulting from outflow of deposits to CBDC



Change in banking sector lending rate to maintain profitability measured by net interest income



Wholesale to deposit rates spread (% pts): — 0.5 — 0.63 — 1 — 1.5 — 2

Source: BIS Report - Central bank digital currencies: financial stability implications, September 2021

Notes:

- a line showing the average wholesale funding-deposit spread for advanced countries from 2017 to 2021 of 0.63% pts is included in the graphs.
- Both graphs are shown under different illustrative spreads between wholesale funding and deposit rates (0.5 to 2% pts)

Bank runs

A CBDC supplied in unlimited quantities and without other control tools, as for banknotes, could make bank runs worse, as it would neither create physical security issues nor be subject to scarcity-related price disincentives

How commercial banks may prevent deposit runs

- Credible deposit insurance until a certain threshold, safeguarding customers deposits
- Clearly define resolution frameworks for banks under stress facing solvency issues
- Effective banking regulation encouraging best of cases management practices

How Central banks may limit excessive holdings of CBDC

Limited convertibility – Kumhof and Noone (2018), postulate that in situations of financial instability “CBDC and reserves are distinct and not convertible into each other” . During economic turmoil's crisis, suspending convertibility would stop the outflow of bank deposits into CBDC

Simple per capita limits – Panetta (2018) suggested “setting a ceiling on the amount of CBDC that each individual investor can hold”. The ECB has provided a proof of concept for CBDC solution under DLT, implementing caps in holder's wallet, so that payments directed to a wallet/account which would produce excess holdings (above pre-determined threshold) would be rejected

Per capita limits with waterfall to designated account – Under this scenario, a payment transferring excessive CBDC holdings above the threshold, would automatically trigger a transfer of the excess CBDC from the respective wallet to a designated account with a commercial bank

“If depositors did temporarily move funds from bank deposits to CBDCs during financial turmoil, central banks could also quickly re-channel liquidity back to commercial banks, much as they do now with open market operations.” - **BIS Report – January 2021**

Lower fees for payments processing (including cross-border) – Manage impacts

The mCBDC solutions would present new opportunities for commercial banks, as they would be able to provide innovative on-chain products and services, such as subscription-based mCBDC corridor access, or smart-contract-enabled cash management services. Commercial banks could also leverage their in-house technological capabilities to participate in the building of the new infrastructure.

Opportunities for Commercial Banks

*Roles and responsibilities are dependent on domestic CBDC and mCBDC models

- Connection to mCBDC network
- Provide liquidity to participants
- Mint & redeem CBDC's on behalf of central banks
- CBDC wallet
- API's development
- Client onboarding and offboarding
- Compliance checks – AML, KYC, CFT

Smart-contracts have the possibility to remove large fees third-parties such as legal teams and banks earn from the development and enactment of contracts. As such, banks would be wise to be first-movers in this space and offer innovative solutions in order to cement their position as a relevant stakeholder. For example, in real estate purchases the agreement on the movement of funds can be automated without the usual large amount of paperwork; and as cross-border payments are a sequence of individual contracts between participants, smart-contracts can manage the streamline as each participant fulfils his duty.

Besides the business model impacts, mCBDC solutions would require technology enhancements for all players. While some legacy technology stacks could be leveraged in an mCBDC world (e.g. onboarding and compliance systems / capabilities), more systems would need to be built.

Further opportunities for innovation

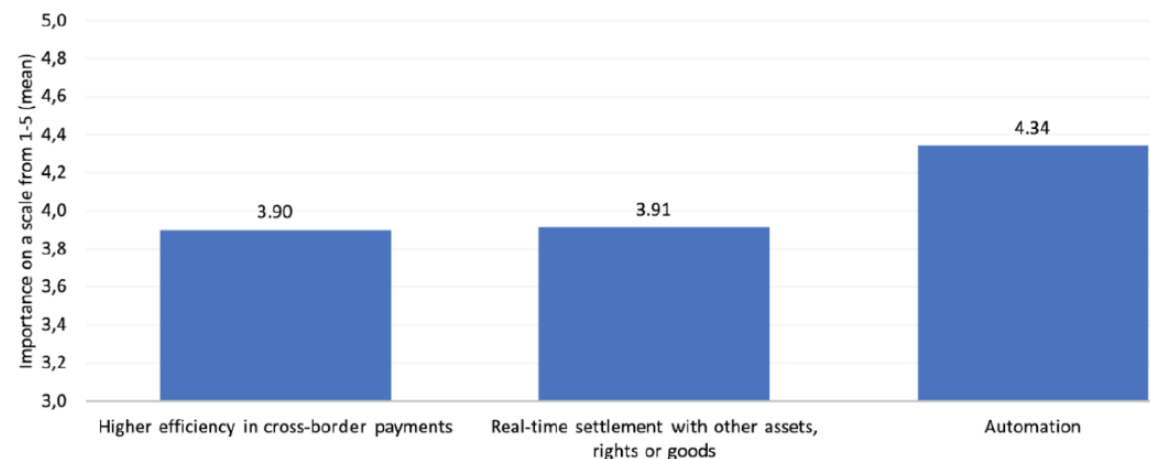
“Depending on its functionality and level of interoperability, the introduction of a CBDC could enable banks and other intermediaries to offer innovative payment services to their customers (such as **programmable payments**). Or it could allow for more diverse forms of finance, with less need to rely on centralized payment intermediation, e.g., less reliance on correspondent banks in international payments. This could facilitate new opportunities for innovation” – BIS Report on financial stability

“DLT provides new opportunities, for example, for DLT-based pay-per-use business models within the framework of IoT. Here, a **programmable and digital form of the Euro serves as a backbone for applications in the fields of e.g., Industry 4.0, mobility and energy**. The emerging networked economy facilitates new forms of inter-organizational and inter-industry collaboration. Within this framework, banks could act as issuers of a DLT-based (digital programmable) Euro and tokenize commercial bank money for the use in e.g., integrated business ecosystems. [Studies] show that the industry demands such a DLT-based Euro e.g., in the field of IoT, the machine economy and prospective digital business models. Therefore, banks could address this market gap and generate new business models by providing such a DLT-based Euro.”

- The Digital Programmable Euro, Libra and CBDC:
Implications for European Banks - July 2020

Expert survey:

What are the key benefits of the digital programmable Euro?



(Source: Frankfurt School Blockchain Center)

Note: The survey was conducted to a panel of 50 experts in many areas, from regulators and central bankers, to academics and industry leaders.

- Addressing clients' specific questions

Recap of Clients questions

What financial services for individuals, SME's and Companies are expected to be most affected, and what are these impacts?

The banking industry will be most affected on the deposit side (see slide 74). CBDCs will most likely not require an account for access, so banks will lose part of their funding (see slide 75) which might result in higher lending rates, decreasing credit activity. They might need to compete for funding, either by increasing deposit rates or compete for wholesale funding/central bank liquidity (see slide 81/82). As a result, large companies and SMEs will both be affected when wanting to access credit, although on different scales, as volume is a key criteria when access funding. However, the effect is still dubious as competition might increase in the lending space, via access to capital markets funding, peer-to-peer lending or other non-bank lenders, which might push lending rates down (see last column slide 75).

Are there also opportunities for new financial services or new financial ecosystems?

Banks should start experimenting crypto related services (see slide 66), leveraging their trustworthy reputation on wealth management/advisory services. Also, as traditional gatekeepers for fiat currency, they can offer a secure way to access funds, validate identity and fight AMM/CFT (see slide 71). New upcoming regulation, will likely enable them to provide such services, concentrating their product offering on more mature and established cryptocurrencies and balance a trade-off between the ability to produce in house services or outsource them via partnerships (see quote slide 68). FinTech's can leverage their digital capacity along with their flexible structure, to deliver best of practice services, which banks will not be able to do. The most prominent model is the one of partnerships. For one side, banks are constantly in line with existing regulation and might use this, scaling up Fintech's product offering in line with their capability to respect existing law and requirements to operate in the industry.

How dependent from consumer uptake will the Digital Euro be, and what the different usage growth scenarios?

For one side, the ECB does not want the Digital Euro to be a vehicle for storage of value but rather a means of payment. Consumers already have access to digital native solutions to process payments and the design of the CBDC must bear in mind clear digital innovations that will leave the user better off than today's system, otherwise they will not derive utility from its usage (see slide 79). Also, being a complement to cash, it will enjoy legal tender status, and so merchants will be obliged to accept it at POS terminals (being it via card or mobile app). Its programmability will play a pivotal role, allowing payment intermediaries to develop features on the new existing technology (see slide 84). Having this said, the ECB might want to control the amount of CBDC held by citizens due to possible implications for the banking industry - quantity limits, together with price mechanisms (see slide 51/52) and in-crisis measures (see slide 82) have been studied by authorities to safeguard existing financial institutions, moderating CBDC take-up and usage.

Will the Digital Euro compete or complement national peer-2-peer digital wallets and payment solutions, like MB WAY in Portugal, or other payment solutions sponsored by ECB?

The goal of the ECB is to complement not to replace cash, this means that CBDC will be a fully digital cash like item. Being MB WAY a platform with more than 3 million active users, it is not likely that the ECB will want to interfere with national PSPs, given that it does not want to undertake an operational role, but instead to supervise the network. While conducting an interview with a senior employee at SIBS, our team ascertained they are fully aware of the current CBDC developments, being in contact with senior employees at Banco de Portugal and will be prepared in terms of technological and regulatory requirements, set out by the EU. So, the only difference will be that instead of transferring euros from our current account into MB WAY digital wallet, we will use CBDCs.

How are CBDC digital currencies related to other cryptocurrencies?

Like cryptocurrencies, although regulated/supervised by the central bank (see slide 23/24), CBDCs are a response of our financial system to an evolving maturing technology (DLT) and increasing digitalization of cash. Both are designed with focus on sustaining financial inclusion, enabling client onboarding and KYC due diligence without the hurdles of the current banking system. Also, crypto (more at an extreme) and CBDC have democratized the payment system, increasing competition, lowering margins and pressuring for best in house digital features/interfaces. Another pain point are cross border payments, which consist of lucrative business for banks (high margins) and are still much inefficient due to the waiting clearing time related to complicated national and international gross settlement mechanisms. DLT would enable transactions to be settled in real time. To conclude, although clear legal and structural differences exist, both currencies are emerging as a response to a more decentralized financial industry with the goal to maximize consumer utility.

Other risks for banks?

CBDC might be a vehicle that will spur further bank runs during economic crisis. Indeed, retail clients might want to move uninsured deposits (maximum threshold of 100k) to CBDC holdings as they might perceive this asset as a safe liquidity access backed by the ECB. However, different approaches might be put into practice in order to control such deposit outflows during periods of major volatility and uncertainty (see slide 82).

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