UNIVERSITY *of* NICOSIA

Department of Digital Innovation

MSc in Blockchain and Digital Currency

BLOC 526 – Emerging topics in fintech

Session 6 – Central Bank issued Digital Currencies and Cryptos

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Learning objectives and expected learning outcomes

Summary

Session 6 delves deeper into Central Bank issued digital currencies and compares and contrasts them to non Central Bank issued monetary assets and cryptos. The impact of Central Bank digital currencies and cryptos is analysed, focusing on implications for Central Banks, commercial banks and individuals.

Learning objectives

- Recent developments pertaining to Central Bank digital currencies (retail and wholesale)
- The implications of Central Bank digital currencies for commercial banks and financial stability
- The implications of digital currencies for privacy and financial inclusion

Expected learning outcomes

- Develop a critical understanding of Central Bank action (and inaction) in the field of digital currencies
- Understand the financial stability implications of CBDCs with regards to commercial bank funding, privacy and financial inclusion

Agenda

- Introduction and recap
- Introduction to Central Banks
- A brief history of money
- Central Bank issued Digital Currencies (CBDCs)
- Important considerations pertaining to CBDCs
- Concluding remarks

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Takeaways from previous session

3. Commercial banks are not financial intermediaries

- Commercial banks are licensed to create money through the process of lending
- The amount of money creation is balanced by a number of competitive, regulatory and monetary policy constraints

Unless fintechs get a banking license, they can only be financial intermediaries.

What role can cryptos play in a Central Bank monetary universe?

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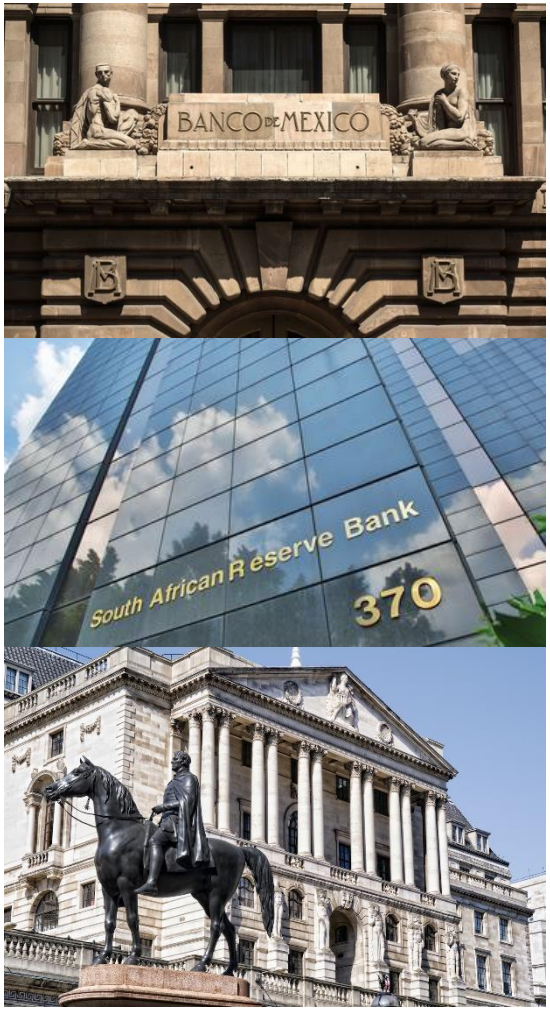
Question: What is a Central Bank?



A Central Bank should not be confused with commercial banks

Area of distinction	Central Bank	Commercial Bank
Formation	Through ordinance or special law of the Government	Formed on the basis of Banking Company laws
Ownership	Independent (or government owned)	Government, public or private
Purpose	Monetary, financial and economic stability	Profit
Number	Only one in each country (or monetary block)	Several
Lender	Lends to commercial banks (reserves and lender of last resort)	Lends to individuals and companies

Central Banks have legal monopoly status!

Question: Can cryptos challenge this monopoly status?

The role of Central Banks is quite wide…

(Please also refer to DFIN 511 – Introduction to Digital Currencies, session 8)

Monetary, financial and economic stability

Monetary stability functions	Financial stability & regulatory functions	Policy operation functions	Financial infrastructure provision functions	Other public good functions
▪ Monetary policy ▪ Exchange rate policy	▪ Prudential policy development ▪ Supervision / oversight	▪ FX intervention ▪ FX reserves ▪ Liquidity management ▪ Lender of last resort	▪ Currency provision ▪ Account management services ▪ Payment system (inter-bank) ▪ Settlement system for Central Bank money ▪ Other settlement systems	▪ Debt management ▪ Asset management ▪ Development functions ▪ Research ▪ Statistics ▪ Consumer services
Policy / framework				
Approach / methodology				
Execution oversight				
Monitoring				

BIS: Roles and objectives of modern Central Banks

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Innovation with money is nothing new

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A brief history of money - modern times

The Florin (1250AD)
The first widely accepted coin

mPesa (2007)
The first mobile wallet

Stockholms Banco (1661)
The first paper note in Europe

Bitcoin (2009)
The first widely used crypto-currency

Flatbush National Bank (1946)
The first credit card

?

Takeaways

1. Innovation with money is nothing new	▪ The forms and parameters of money have changed several times through the years ▪ Whether studying dollar notes or cryptos, the analytical parameters remain the same

"Trying to be happy by accumulating possessions is like trying to satisfy hunger by taping sandwiches all over your body"

George Carlin

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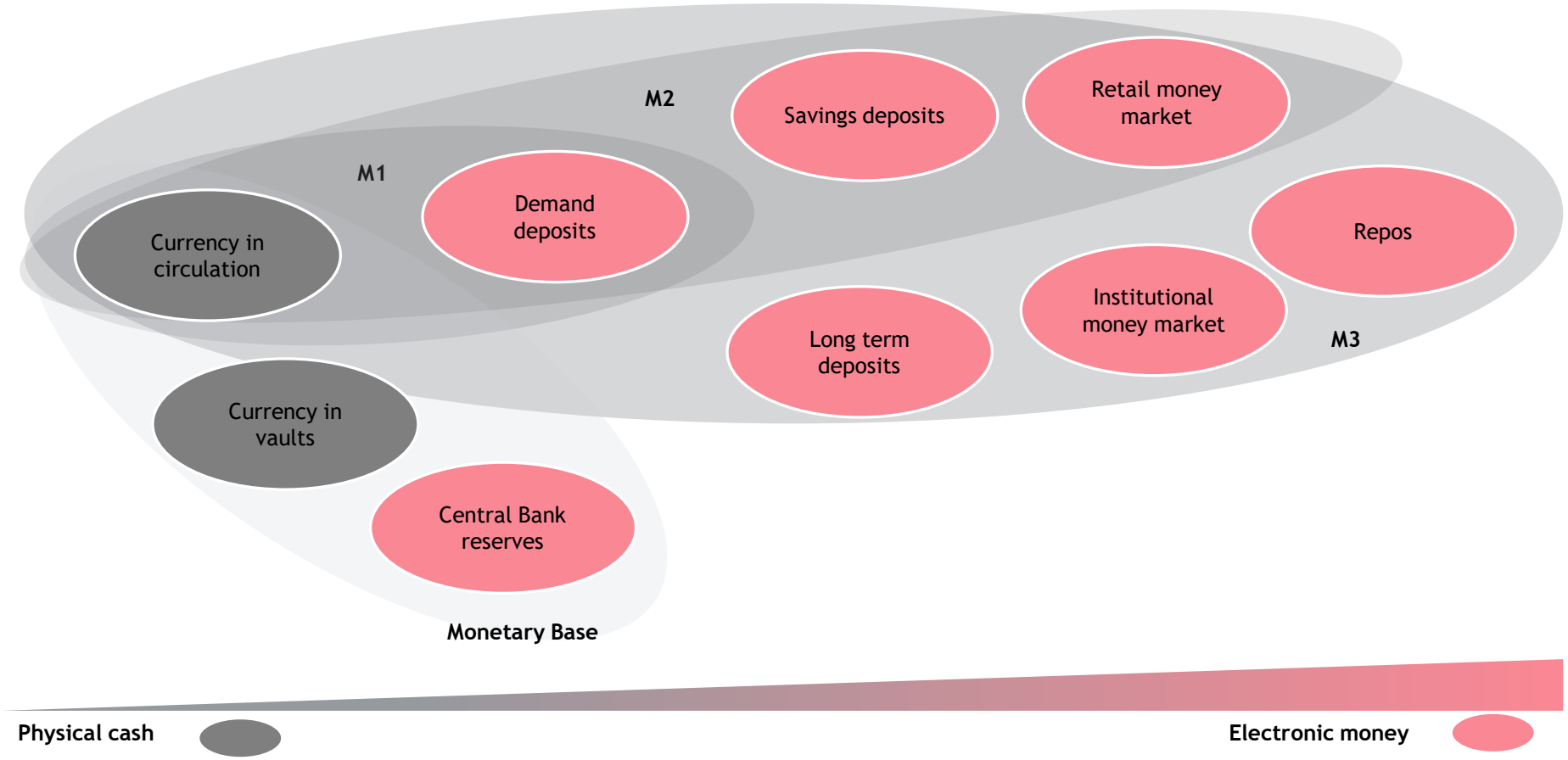
Question: What is the use case for digital currencies, given that money is already mostly digital?



Why should a Central Bank be interested in digital currencies?

1.	Refresh of payment technologies	▪ Legacy systems ▪ Obsolete programming languages ▪ 24/7 availability and time zone differentials
2.	Reduction of systemic significance of certain institutions	▪ Commercial bank failure ▪ Payment system failure (e.g. SWIFT)
3.	Improved transaction efficiency	▪ Reduction in transaction costs (bank fees, card interchange fees, logistical costs) ▪ Support of cross-border remittances
4.	Keeping up with societal preferences	▪ Move towards a 'cashless' society ▪ Increasing familiarisation with digital technology
5.	Offering access to Central Bank cash in a digital world	▪ Offering viable alternatives to private digital money ▪ Financial inclusion with Central Bank money

As always, there are pros and cons

Arguments for digital currencies

- Financial inclusion
- Remittances
- Tax evasion
- Reduction in transaction costs
- Show-casing the country as an innovative destination

Arguments against digital currencies

- Financial exclusion
- Privacy
- Crime diversion
- Espionage

A fair bit of progress has already been made

Wholesale CB digital currencies

Blockchain based prototypes

Project Dunbar

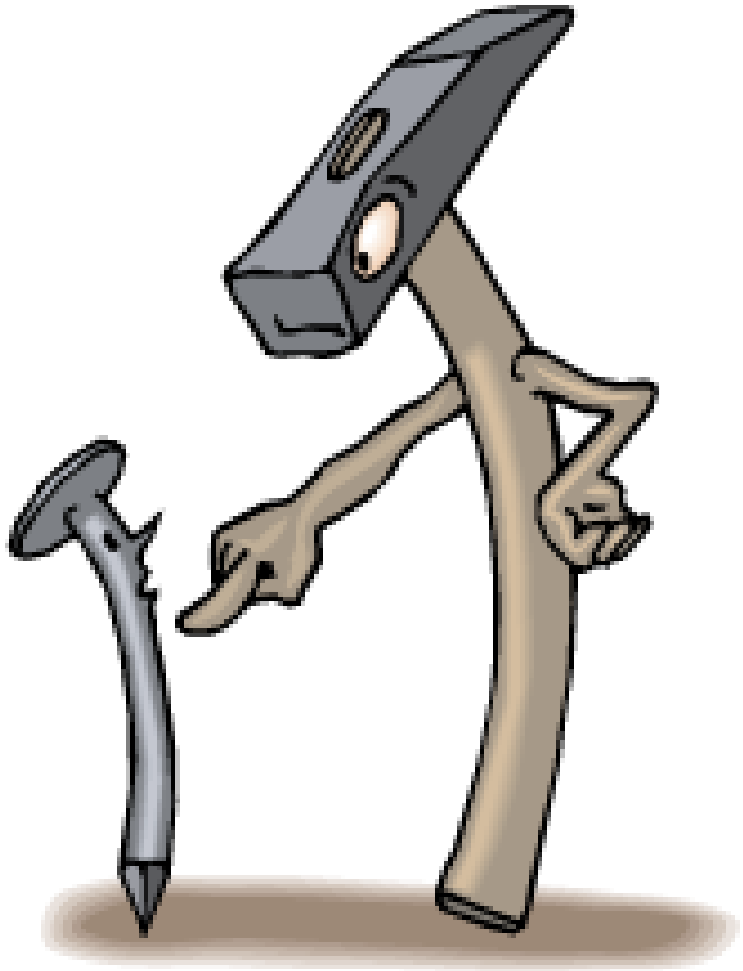
- Potential benefits:
  - System replacement: replace aging infrastructures
  - Cross border payment efficiency
  - Real time monitoring of financial activity
  - Clearing and settlement time reduction
  - Efficient payment queue handling (prioritisation, holding and cancellation)
  - Liquidity optimisation
- Potential downsides:
  - Participation in the network may be unequal for smaller banks / non-FS players
  - Central Bank still required to oversee the payment and settlement systems and processes
  - Few cost savings for Central Bank (but possibly savings from inter-bank reconciliations)

Retail CB digital currencies

Examples

- Potential benefits:
  - Efficiency of transactions and potentially reduced transaction costs
  - Real time VAT allocation and reduction in tax evasion
  - Reduced potential for anti-money laundering
  - Replacement of uncontrollable private cryptocurrencies
- Potential downsides:
  - Financial exclusion and access to payments
  - Commercial bank business model risks (funding availability)
  - Exposure of individuals to negative interest rates
  - Privacy concerns (counterparty privacy and third party privacy)

Question: Do CBDCs have to be based on a distributed ledger architecture?



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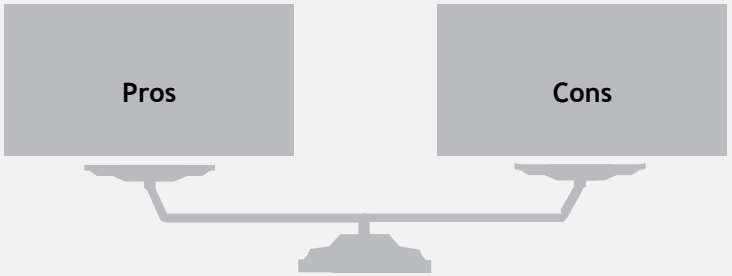
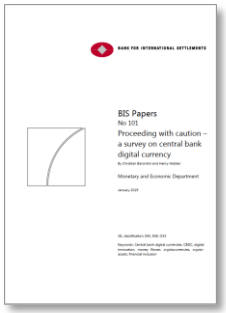
Central Bank Digital Currencies do not have to be based on blockchain!



- Unlike peer to peer coins, exchanged between non-trusting counterparties, Central Banks are an established and trusted intermediary
- Decentralised architectures are by definition inefficient
- All CBDC use cases at the moment are centralised (e-CNY, e-Naira, Sand Dollar)

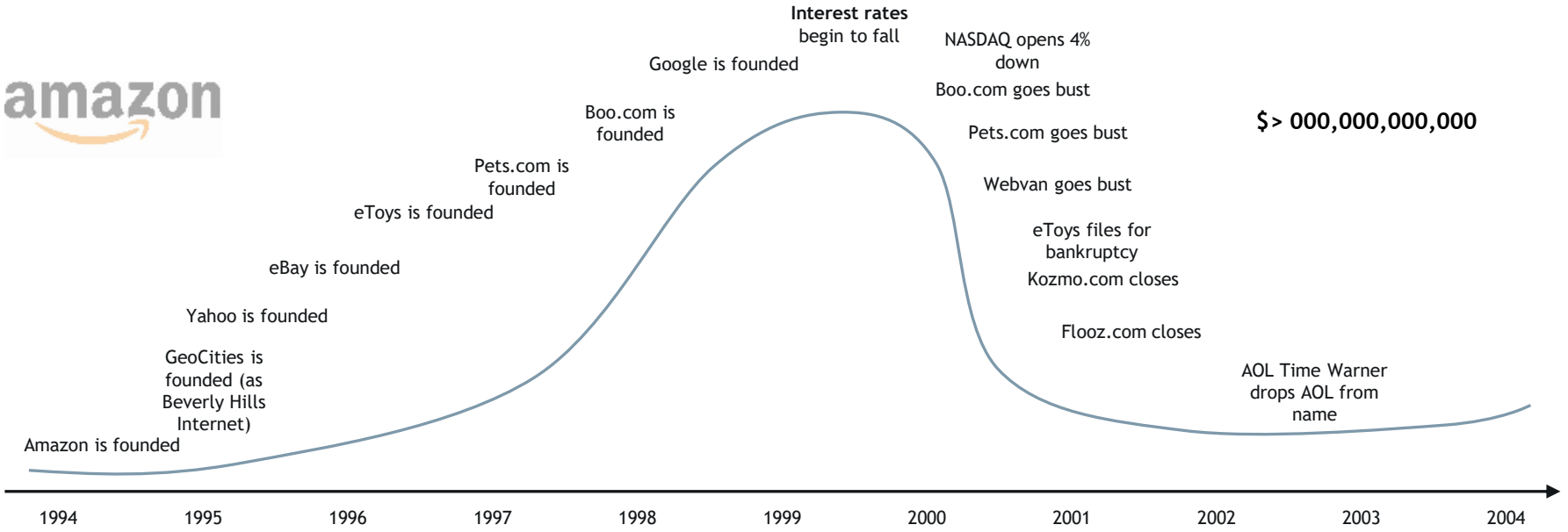
So, what are Central Banks actually thinking of?

2019	2020	2022
		
“Although a majority of central banks are researching CBDCs, this work is primarily conceptual and only a few intend to issue a CBDC in the short to medium term.”	“Emerging market economies are moving from conceptual research to intensive practical development […]. Central banks representing a fifth of the world’s population say they are likely to issue the first CBDCs in the next few years.”	“Nine out of 10 central banks are exploring central bank digital currencies (CBDCs), and more than half are now developing them or running concrete experiments.”

Definitely playing catch up, but better late than never…

CBDCs are often considered alongside the banning of cryptos. But, banning has rarely been an optimal solution…

We have seen this graph in a previous session, but the conclusion remains the same…



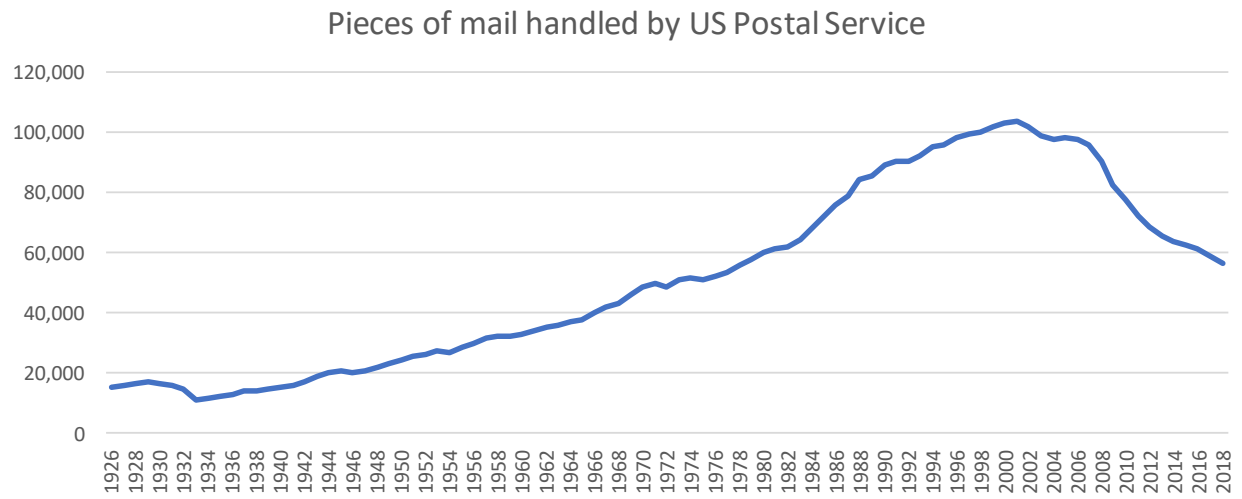
We only need one survivor to challenge the role of Central Banks

Takeaways

2. CBDCs is an inevitable evolution for money

- Central Banks are already tinkering with the idea of CBDC
- However, the progress has to be accelerated if CBDC is going to win the hearts and minds of consumers

We cannot control the future, but we can influence it”



When it comes to the issuance and use of money, Central Banks have an obligation to try to influence it

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  - Privacy
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Commercial Banks may not be financial intermediaries, but that doesn't mean they don't need deposit funding…

Step 0

Savers keep money with Commercial Bank

Borrower		Commercial Bank	
Assets	**Liabilities**	**Assets**	**Liabilities**
▪ Cash at hand: 20 ▪ Deposit: 60	▪ Equity: 80	▪ Cash: 20 ▪ Reserves: 80	▪ Deposits: 60 ▪ Equity: 40

If savers kept their cash in CBDC, commercial bank funding structures would be under pressure

Step 1

Savers move money to CBDC

Borrower		Commercial Bank		Central Bank	
Assets	**Liabilities**	**Assets**	**Liabilities**	**Assets**	**Liabilities**
▪ Cash at hand: 20 ▪ CBDC: 60	▪ Equity: 80	▪ Cash: 20 ▪ Reserves: 20	▪ Deposits: 0 ▪ Equity: 40	▪ Non-money: 80	▪ CBDC: 60 ▪ Reserves: 20

Therefore, the design of CBDC should be carefully considered!

CBDC could be held on the Central Bank's balance sheet, or on commercial banks' balance sheets, reflecting today's monetary structure

Deposits with CB?	Deposits with commercial banks?	Would CB deposits work?

" A widely available CBDC would serve as a close—or, in the case of an interest-bearing CBDC, near-perfect—substitute for commercial bank money. This substitution effect could reduce the aggregate amount of deposits in the banking system, which could in turn increase bank funding expenses, and reduce credit availability or raise credit costs for households and businesses.

Federal Reserve, January 2022

" 'Central bank electronic money for all' would have a disciplining effect on commercial banks. To attract deposits, they would need to alter their business model or to increase interest rate payments on deposits to compensate users for the additional risk they assume"

Berentsen & Schaer, 2018

CBDC design options

Most disruption of commercial banks

	Account (claim) based (Verification of the holder)	Object (token) based (Verification of the token)	
Single Tier (CBDC distributed directly by the Central Bank)	▪ Monetary policy benefits (direct passing of interest rates, visibility of payments) ▪ Commercial banks may be pushed aside ▪ Requires robust, high volume / small value platform	▪ Central Bank provides digital wallets directly to the public ▪ Non-interest bearing tokens will not be as attractive as deposits	▪ Better calibration of monetary policy (?) ▪ Comm Bank clients and funding models ▪ Privacy concerns
Dual Tier (CBDC distributed by authorised institutions)	▪ Comm Banks offer CBDC account, alongside private money account ▪ Can offer complementary financial services products and maintain client relationship ▪ Some deposit substitution	▪ Comm Banks offer digital wallets for storing CBDC (which is on Central Bank's balance sheet) ▪ Non-interest bearing tokens will not be as attractive as deposits ▪ Losing the phone could result in loss of money (tokens)	▪ No shifting of Central Bank / Comm Bank roles ▪ CBDC add on functions ▪ Potential transaction costs
	▪ Possible to be interest bearing ▪ Little (if any) anonymity	▪ Offline transactions possible ▪ More private (?) ▪ Tokens can be easier lost or stolen	Least disruption of commercial banks

Terraciano & Somoza (2020)

The e-CNY solution

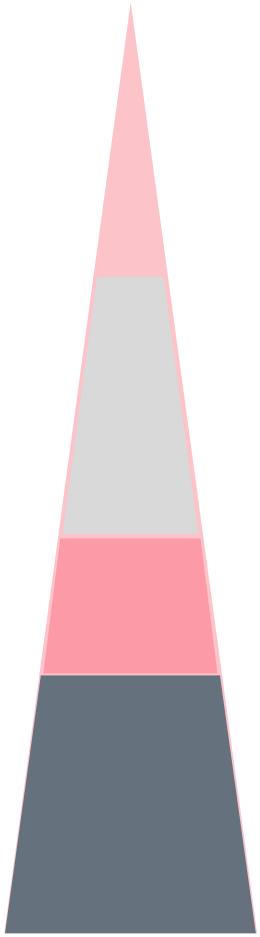
What is e-CNY?

- The e-CNY is a centralised, cash-like digital currency expected to be primarily used for retail payments
- The People's Bank of China (PBOC) and e-CNY operating institutions have conducted large scale e-CNY pilot programs in multiple cities and the 2022 Winter Olympics

How does the e-CNY work?

- The e-CNY is fully backed by the People's Bank of China (PBOC) and put into operation by PSPs
- The PBOC has defined e-CNY as cash in circulation (M0 in the language of central banks.) Defining e-CNY as M0, rather than M1 or M2, has a number of implications:
  - e-CNY will be a liability of the PBOC, i.e. will be completely risk free
  - The digital wallets that hold e-CNY are not be considered bank accounts
  - No interest can be paid (interest can be paid on M1 or M2 (bank deposits), but not on M0 (cash))
- The e-CNY's M0 definition will likely prevent disintermediation of banks. By defining e-CNY as M0 and banning interest payments, the PBOC likely envisages only a limited amount of e-CNY in circulation to replace cash, but not to replace bank deposits

The e-CNY's structure



People's Bank of China (PBOC)

(issues e-CNY)

Operating institutions (6 large, state owned banks + 2 internet banks)

(Open e-CNY wallets; disseminate; KYC; convert e-CNY into bank deposits and vice versa)

Other banks and PSPs

(Provide services to e-CNY users)

End users: business and consumers

(Only a mobile phone number is requires to have an e-CNY wallet)

Takeaways

3. CBDC is a lot more complex than cryptos	▪ Unlike cryptos, which are funded instruments, CBDC is an obligation out of thin air ▪ Therefore, CBDC has to be designed properly to avoid unintended monetary system consequences

"Authorities would first need to be confident that issuance [of CBDC] would not compromise monetary or financial stability and that a CBDC could coexist with and complement existing forms of money, promoting innovation and efficiency"

BIS (2020)

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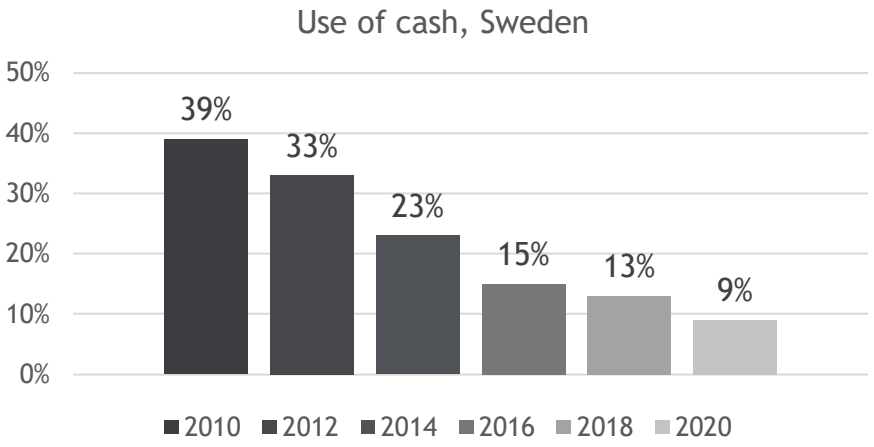
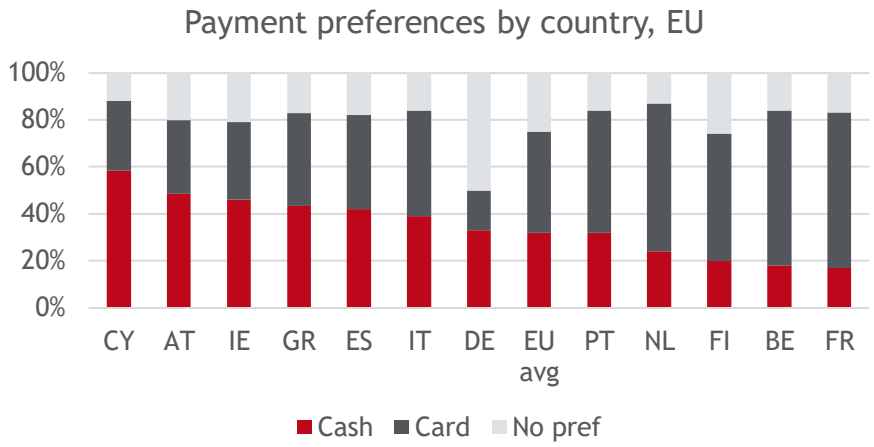
The Economist
February 2007

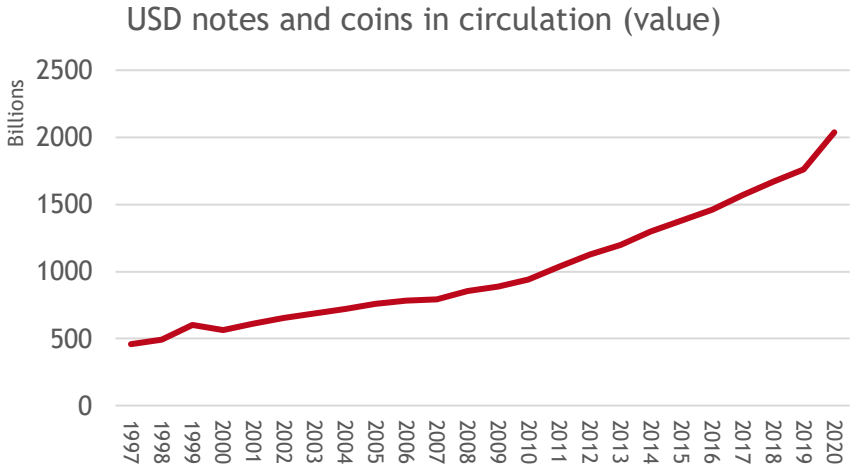
"The *reports* of *my death* are greatly exaggerated"

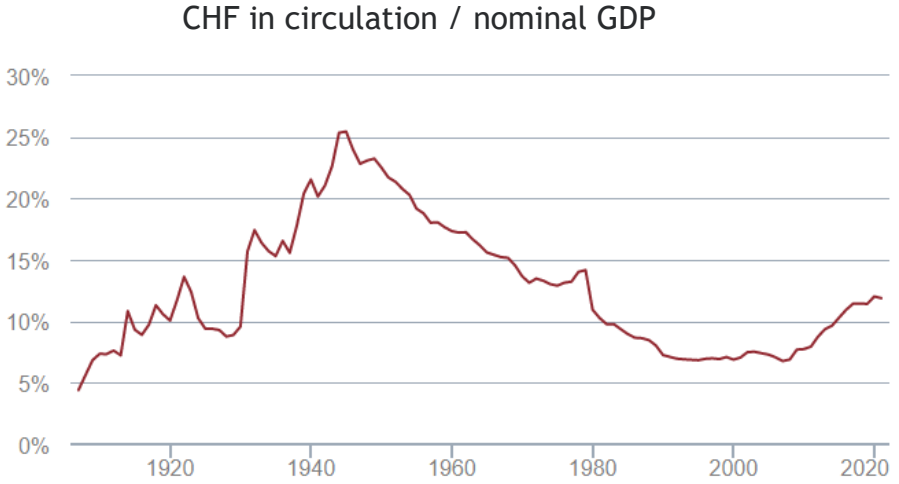
Mark Twain

Are we ready for a cash-less world?









Sources: Riksbank, ECB, Federal Reserve, Swiss National Bank

Financial inclusion or exclusion?

Sweden is a special case!

- Cash in circulation has dropped dramatically and several businesses do not accept physical cash anymore
- Over 50% of the population has installed Swish, a C2C peer-to-peer money transfer app created by Nordic Financial Institutions [1]

Not all countries are the same…

- Internet access is not universal or costly
- People not technology savvy (esp. older population)
- Habits and culture (e.g. ability to know how much is spent, how much is left)

A digital money only world is still a long prospect

[1] SEB, Danske Bank, Handelsbanken, Länsförsäkringar Bank, Nordea, Swedbank and Sparbankerna


CHANGE THE WORLD
ONE SCAN AT A TIME
FIND OUT MORE
giving
streets

Takeaways

4. The world is not ready for digital money (yet)

- When considering monetary innovations, we should not forget about the underprivileged
- Digital money can assist with financial inclusion, but at the moment physical cash remains king

"What is growth for, if not to help ordinary people thrive?"

Winnie Byanyima (Oxfam International)

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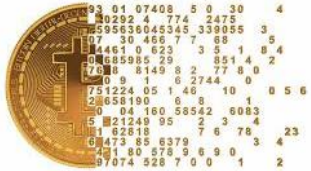
What about privacy and anti-money laundering?



- Addressing a misconception: Bitcoin transactions are not private at all!
  - All transactions are public and visible to everyone
  - However, the identity of the transactor is not known if the unique identity is not linked to a person (similar to email ID)

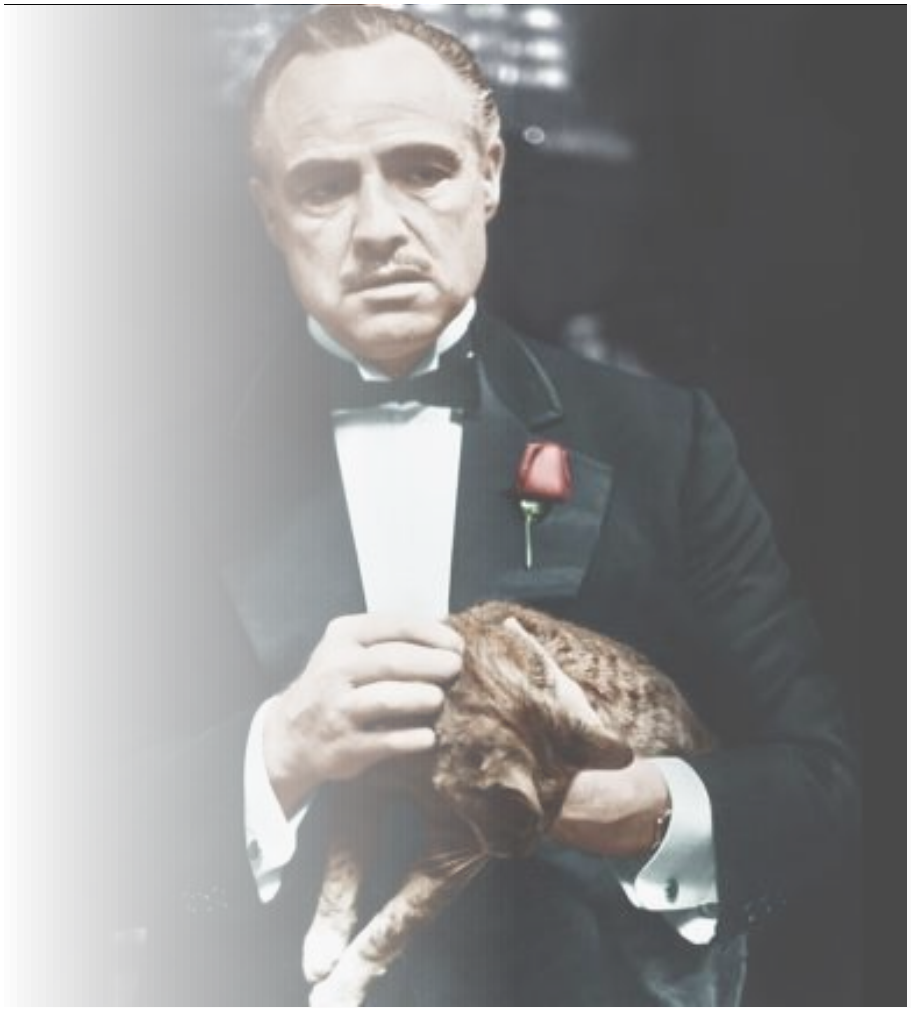
MONERO

- Monero is a lot more private and untraceable
  - And this is the reason why it is so popular in the dark net and for illicit transactions

	Counterparty Privacy	Third Party Privacy
Wholesale	▪ Several technological options exist for protecting privacy of non-transacting parties (channel architecture, confidential identities etc)	▪ Central Bank naturally has full visibility of all transactions (the decentralised model of transactions does not imply doing away with a governing party)
Retail	▪ Generally speaking, even cash payments do not protect counterparty privacy (I usually know who I receive cash from) ▪ Illicit transactions are secretive but not necessarily anonymous	▪ Third party privacy can be achieved with non-authorised nodes ▪ Linking digital currencies to digital identities can be deeply detrimental to individual privacy

The anonymity of cash was a consequence of the technology available (or lack thereof), rather than a conscious design option

No cash, no crime?



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Summary of takeaways

1. Innovation with money is nothing new	▪ The forms and parameters of money have changed several times through the years ▪ Whether studying dollar notes or cryptos, the analytical parameters remain the same
2. CBDCs is an inevitable evolution for money	▪ Central Banks are already tinkering with the idea of CBDC ▪ However, the progress has to be accelerated if CBDC is going to win the hearts and minds of consumers
3. CBDC is a lot more complex than cryptos	▪ Unlike cryptos, which are funded instruments, CBDC is an obligation out of thin air ▪ Therefore, CBDC has to be designed properly to avoid unintended monetary system consequences
4. The world is not ready for digital money (yet)	▪ When considering monetary innovations, we should not forget about the underprivileged ▪ Digital money can assist with financial inclusion, but at the moment physical cash remains king

It is really important in which code we trust

Any questions?

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Questions?

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