

The background of the slide is a vibrant green and blue gradient. On the right side, there is a stylized globe showing the continents of Europe and Africa. To the left of the globe, a vertical line of colorful human figures (in shades of blue, purple, and red) is arranged in a slightly curved path. Several curved lines in various colors (yellow, orange, red, white) sweep across the background, creating a sense of movement and global connectivity.

Central bank digital currencies and crypto assets

Ayse Zoodsma-Sungur, 4 June 2019

DeNederlandscheBank

EUROSYSTEM

Overview

- 1) Introduction
 - 2) Cash and card payments: some figures
 - 3) Possible objectives and motivations for CBDC
 - 4) How to define and design CBDC?
 - 5) A Wholesale variant and a general purpose CBDC
 - 6) Role of CB and CBDC
 - 7) Possible opportunities and risks
- Bonus material 1: #some concepts revisited#
2: #considering CBDC?#

Introduction

A number of major central banks are actively exploring whether they might issue digital currencies of their own.

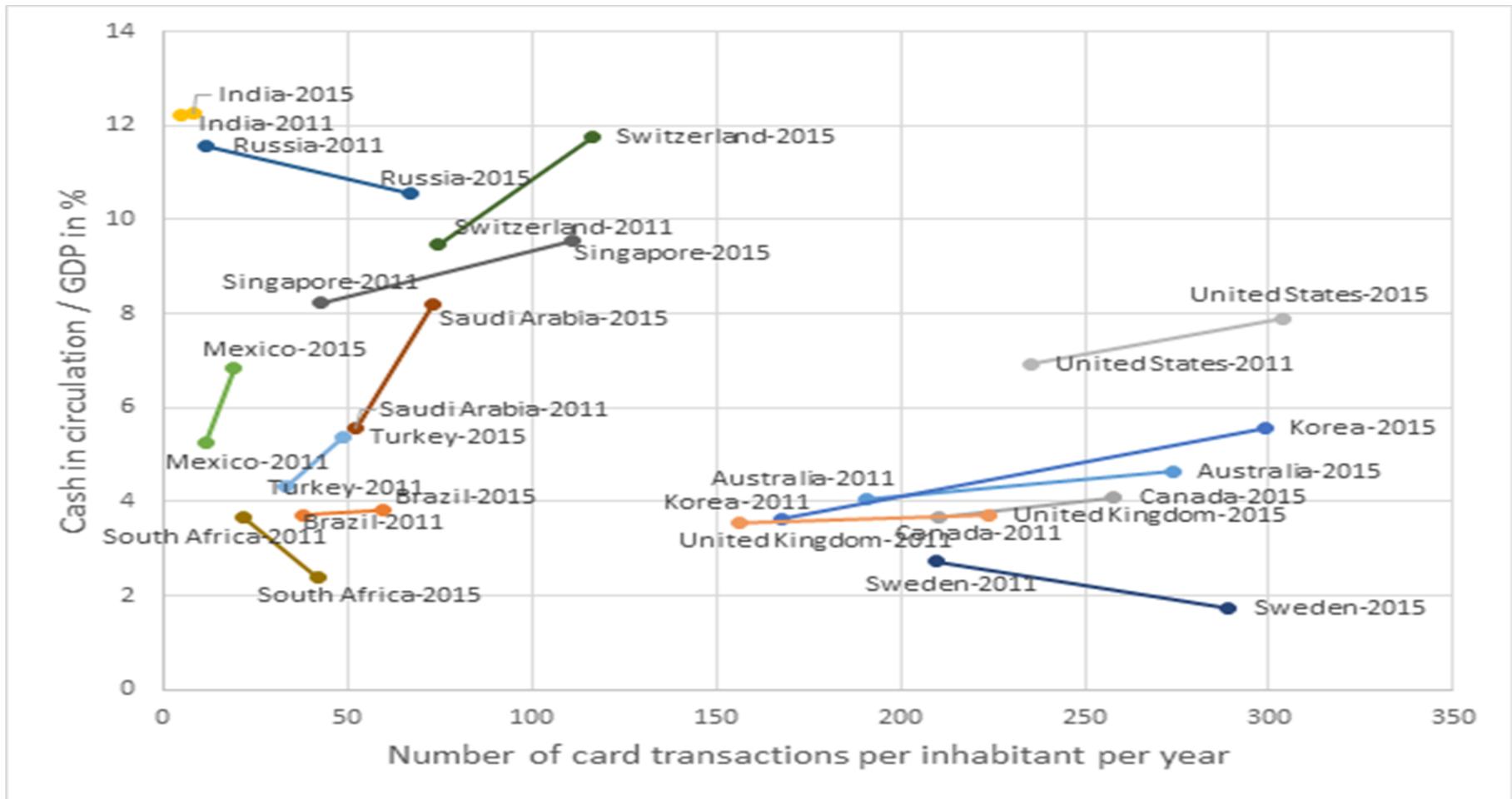
Although, providing greater access to digital forms of central bank liabilities is not an entirely new idea* the recent debate has been motivated by a number of factors.

These include, among others, :

- interest in technological innovations for the financial sector;
- the emergence of new entrants into payment services and intermediation;
- increasing attention to so-called private digital tokens;
- financial inclusion; and
- **declining use of cash in a few countries.**

*eg Tobin (1985)

Is cash really disappearing?



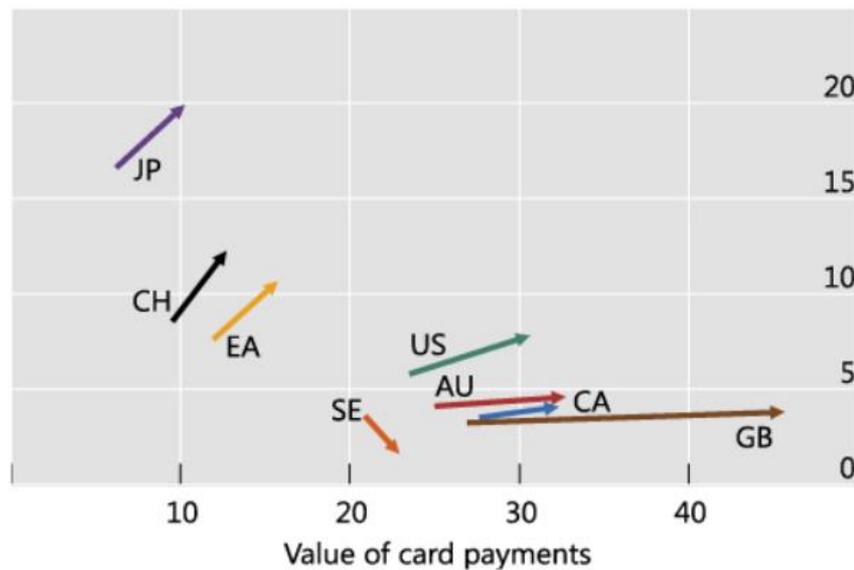
Card payments and cash demand

Card payments and cash demand have generally increased since 2007¹

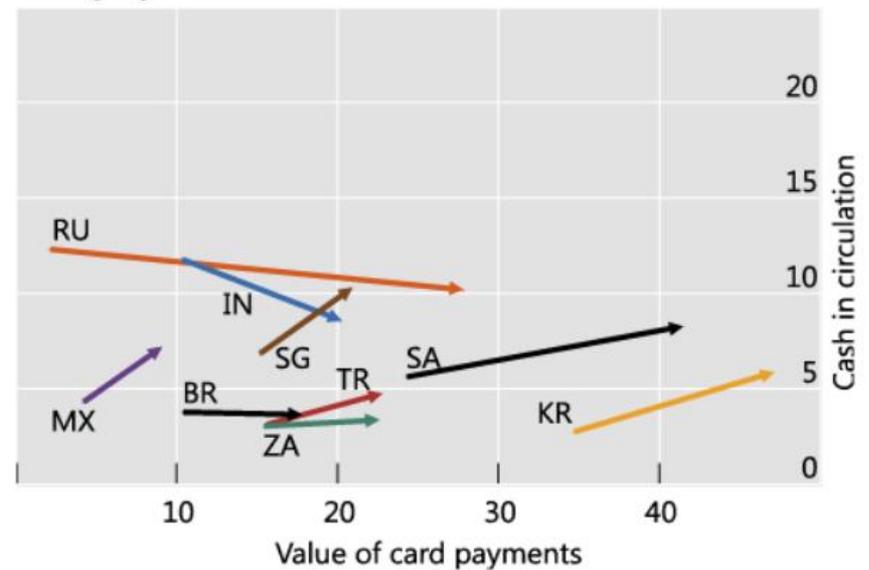
As a percentage of GDP

Graph 1

Advanced economies



Emerging market economies²



¹ 2007–16 changes. The start/end of an arrow represents 2007/2016, respectively. ² For South Africa, 2009–16 change. Data for China are not comparable with other jurisdictions and thus are not shown. Data are not available for Hong Kong SAR.

Sources: CPMI (2017b); authors' calculations.

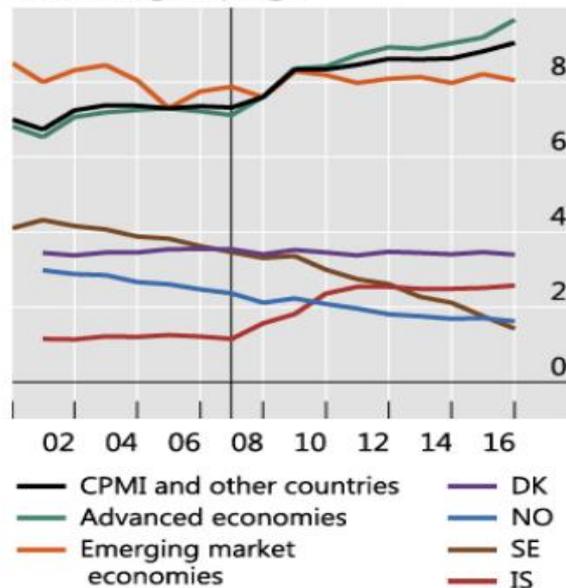
Cash still rules in many places

Cash demand varies across countries

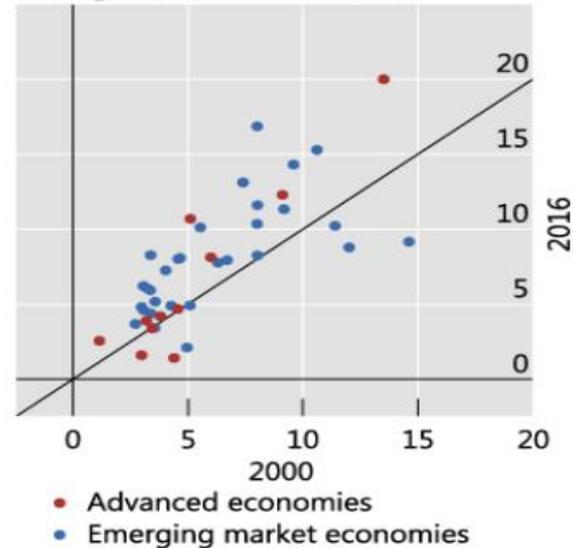
As a percentage of GDP

Graph 4

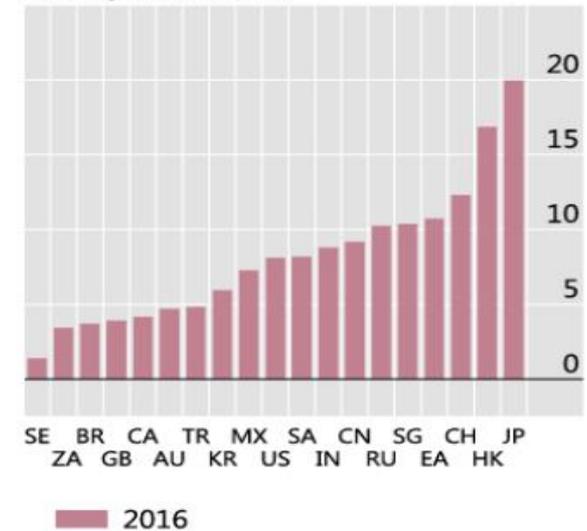
Selected groupings¹



Change from 2000 to 2016²



CPMI jurisdictions³



¹ Includes CPMI and other countries (AE, BG, CL, CO, CZ, DK, HR, HU, ID, IL, IS, KW, MY, NG, NO, PH, PL, RO, RS, TH, UA and UY). Data start in 2002 for India, 2004 for Mexico, Turkey, South Africa and 2005 for Russia. The vertical line indicates the start of the GFC in 2007. ² For countries with no data available in 2000, the first data point available is used for the x-axis value. For the euro area, 2002 data. ³ For China, 2015 data from the People's Bank of China webpage. Data for Russia include banknotes and coins in the vaults of the Central Bank of the Russian Federation. Data for Singapore include Brunei notes and coins held at banks.

Sources: People's Bank of China; IMF, *International Financial Statistics*; CPMI (2017b); authors' calculations.

Possible objectives and motivations for CBDC

- A central bank may have multiple objectives for issuing CBDC, such as
 - promoting a sound payment system;
 - maintaining monetary and financial stability;
 - objectives related to capital markets development and financial inclusion.

- Frequently cited motivations are the provision of
 - settlement instrument for potential DLT-based clearing and settlement platforms;
 - digital central bank alternative to cash for use by consumers.

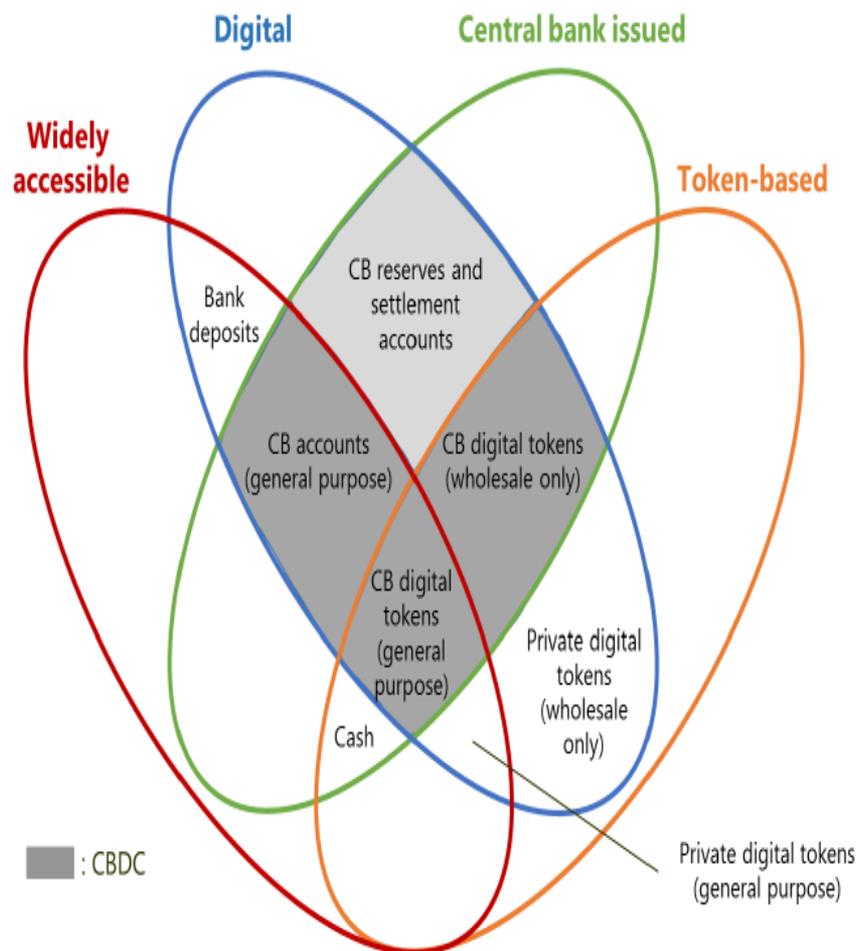
But, the question is ?



How to define and design CBDC?

The money flower: a taxonomy of money

G



Bech and Garratt's money flower introduces a taxonomy of money that is based on four key properties:

- issuer (central bank or other);
- form (electronic or physical);
- accessibility (universal or limited); and
- transfer mechanism (centralised or decentralised).

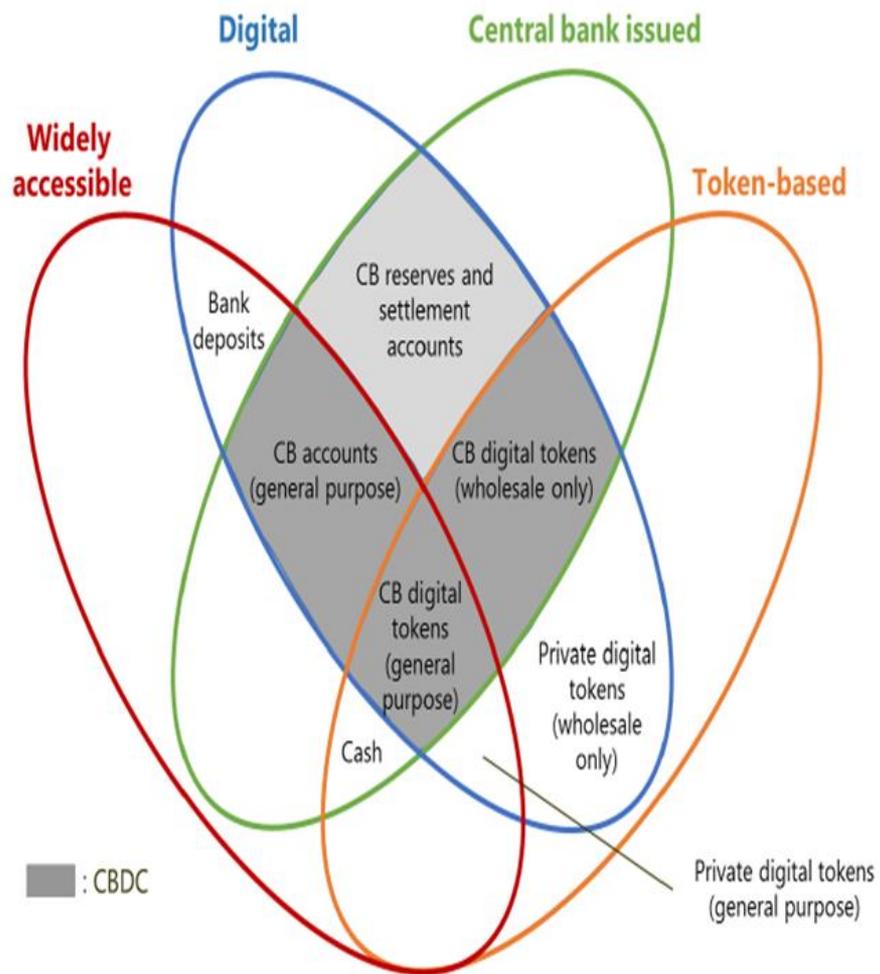
How to define and design CBDC?

This distinguishes CBDCs from other existing forms of electronic central bank money, such as reserves, which are exchanged in a centralized fashion across accounts at the central bank.

The flower distinguishes between two possible forms of CBDC:

- a widely available, consumer-facing payment instrument targeted at retail transactions; and
- a restricted-access, digital settlement token for wholesale payment applications.

The money flower: a taxonomy of money



- Potentially a new form of digital central bank money that can be distinguished from reserves or settlement balances held by commercial banks at central banks.
- Various design choices are possible for a CBDC, including:
 - access (widely vs restricted);
 - degree of anonymity (ranging from complete to none);
 - operational availability (ranging from current opening hours to 24 hours a day and seven days a week); and
 - interest bearing characteristics (yes or no).
- Many forms of CBDC are possible, with different implications for payment systems, monetary policy transmission as well as the structure and stability of the financial system. The different combinations of features mean that there are many potential CBDC variants.

How to define and design CBDC?

4

The different combinations of features mean that there are many potential CBDC variants.

Key design features of central bank money

Table 1

| | Existing central bank money | | Central bank digital currencies | | |
|----------------------------------|-----------------------------|----------------------------------|---------------------------------|----------|----------------------|
| | Cash | Reserves and settlement balances | General purpose token | accounts | Wholesale only token |
| 24/7 availability | ✓ | ✗ | ✓ | (✓) | (✓) |
| Anonymity vis-à-vis central bank | ✓ | ✗ | (✓) | ✗ | (✓) |
| Peer-to-peer transfer | ✓ | ✗ | (✓) | ✗ | (✓) |
| Interest-bearing | ✗ | (✓) | (✓) | (✓) | (✓) |
| Limits or caps | ✗ | ✗ | (✓) | (✓) | (✓) |

✓ = existing or likely feature, (✓) = possible feature, ✗ = not typical or possible feature.

A Wholesale variant and a general purpose CBDC 1

A wholesale CBDCs, combined with the DLT, may increase settlement efficiency for transactions involving securities and derivatives.

However, currently proposed implementations for wholesale payments look generally similar to, and not clearly superior to, existing infrastructures.

The main argument made is that settlement systems for financial transactions could be made more efficient:

- In terms of operational costs and use of collateral and liquidity;
- More secure by using wholesale CBDC.

A Wholesale variant and a general purpose CBDC 2

Some central banks have been conducting experiments involving CBDC and its underlying technology (DLT) for various reasons such as;

- to meet evolving needs from financial markets and to ensure an overall stable and sound financial system,
- it could improve the application of rules aimed at anti-money laundering and countering the financing of terrorism (AML/CFT), and possibly help reduce informal economic activities,
- to improve financial inclusion.

A Wholesale variant and a general purpose CBDC

3

If and when the use of cash declines significantly, a general purpose CBDC could be one argument to provide a safe, robust and convenient payment instrument.

For example, this is the case in Sweden and the Riksbank of Sweden started a project aimed at examining whether the krona needs to be issued in an electronic form, an “e-krona”. If the Riksbank decides to issue an e-krona, it would not be to replace cash, but so that the e-krona could act as a complement to cash.

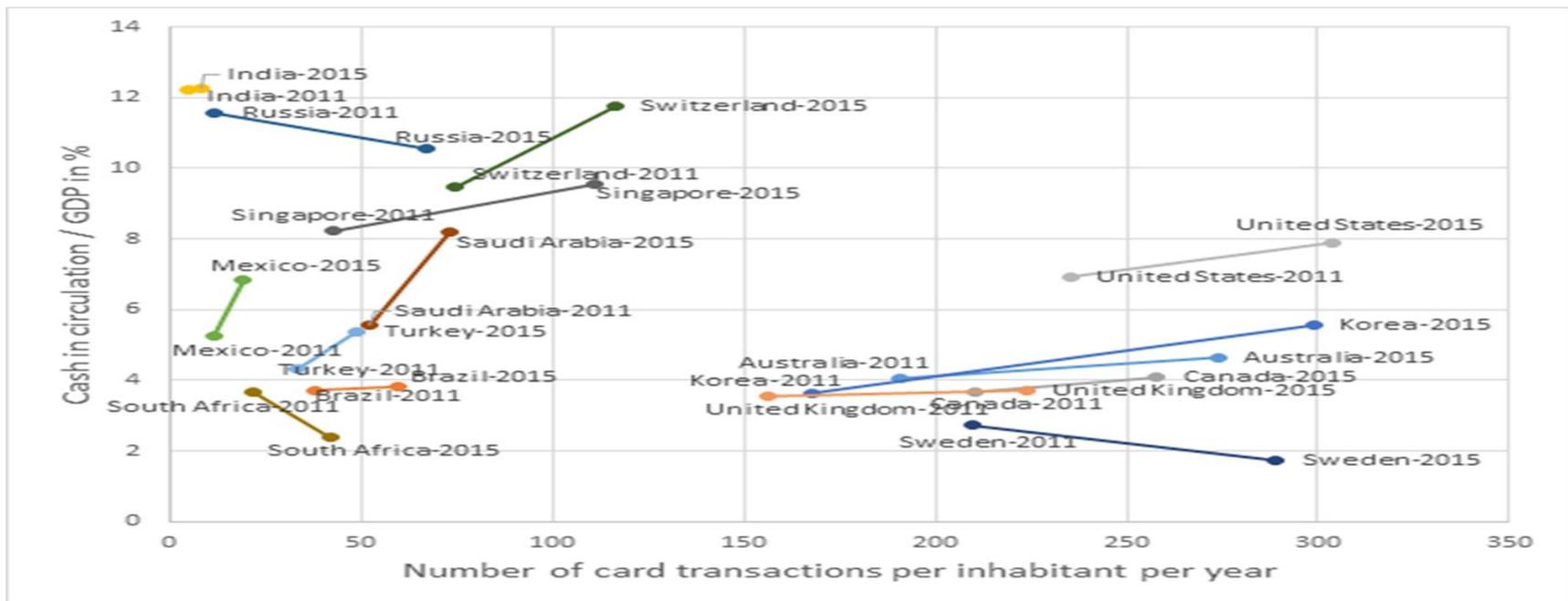


A Wholesale variant and a general purpose CBDC

3

While specifics will vary according to a country's circumstances and economic conditions, payment-related motivations for issuing CBDC appear at the moment not to be compelling for most jurisdictions.

The growing use of electronic means of payment has generally not yet resulted in a substantial reduction in the demand for cash.



Role of the central bank and CBDC

With CBDCs, there could be a larger role for central banks in financial intermediation.

As the demand for CBDC grows, and if holdings of cash do not decline in lockstep, central banks might need to acquire (or accept as collateral) additional sovereign claims and, depending on size, private assets (eg securitized mortgages, exchange-traded funds and others).

If demand becomes very large, central banks may need to hold less liquid and riskier securities, thereby influencing the prices of such securities and potentially affecting market functioning.

Central banks may also need to provide substantial maturity, liquidity and credit risk transformation at times to both banks and markets.

All this could challenge the two-tier banking system. That's why structural implications need to be understood better before CBDC issuance can take place.

Possible opportunities and risks

Opportunities

Wholesale coin could facilitates credit-riskfree settlement?

Fill the gap caused by a decline of cash usage?

Resilience: alternative payment circuit or technology?

Competition: alternative to bank deposits?

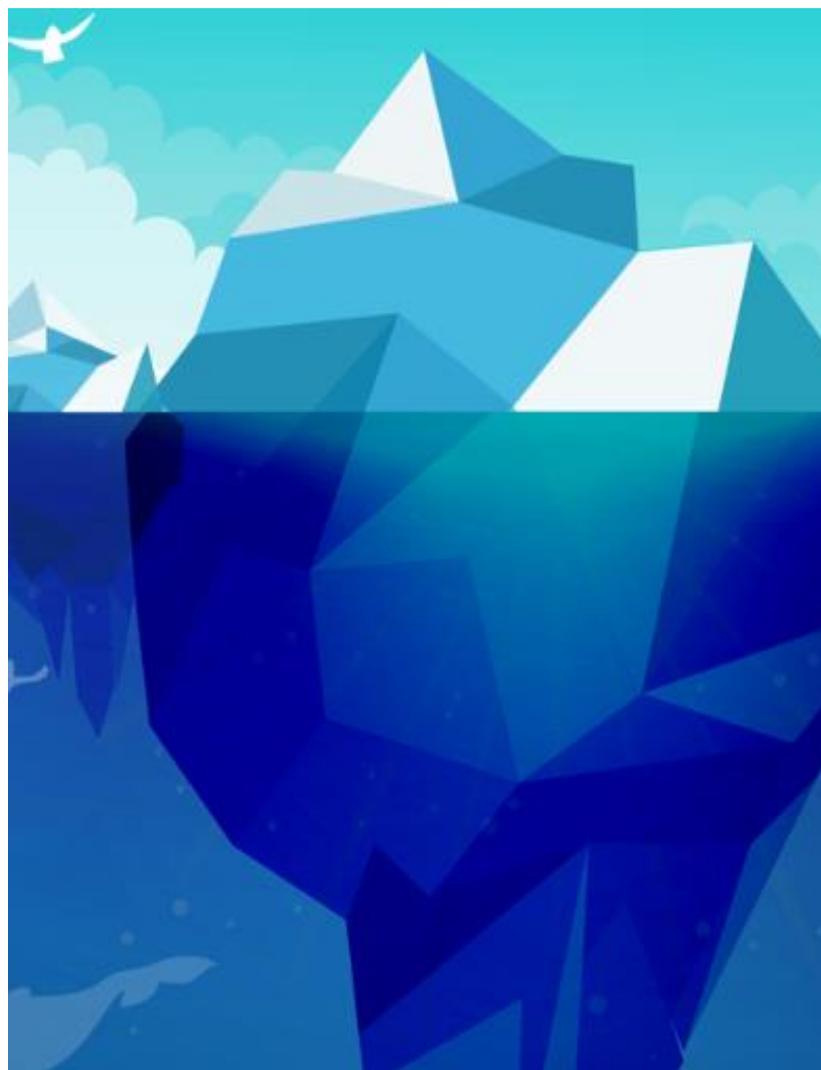
Monetary policy? transmission, interest

Financial inclusion through modern technology?



Risks

- Financial stability: financial structure, risks to banks
- Monetary policy
- Cyber risks
- Will it be used and how?
- Operational cost and risks



Bonus material 1#some concepts revisited#

| | Central bank as issuer | Authorized banks as issuers |
|---|---|---|
| Digital currency in the commercial bank repository | <ul style="list-style-type: none"> • Asset of commercial bank; • Liability of central bank. | <ul style="list-style-type: none"> • Asset of commercial bank; • Liability of issuing bank. |
| Digital currency in the customer accounts at commercial banks | <ul style="list-style-type: none"> • Asset of customer; • Liability of central bank. | <ul style="list-style-type: none"> • Asset of customer; • Liability of issuing bank (the issuing bank does not necessarily be the account bank). |
| Customer peer-to-peer digital currency transactions | <ul style="list-style-type: none"> • Transactions verified and managed by the central bank's digital currency issuance system; • Central bank responsible for the transactions. | <ul style="list-style-type: none"> • Transactions verified and managed by DFC issuing banks (the issuer of DFC is liable for its management); • Transactions regulated by the central bank. |
| Electronic currency transactions | <ul style="list-style-type: none"> • Realized by central bank's payment system and commercial banks' core banking systems, same as current situation. | <ul style="list-style-type: none"> • Realized by central bank's payment system and commercial banks' core banking systems, same as current situation. |

Bonus material 2#considering CBDC?#

- How likely is your central bank going to issue CBDC?
- Has your central bank engaged, or will engage in academic, policy or operational work related to the development and use of CBDC?
- How would CBDC be technically implemented?
- Do you see DLT as an appropriate technology or is there an alternative solution?
- Who would be the participants in the system?
- How would transactions be initiated, validated, and processed and by whom?
- How would users interact with the system (for example, via third-party wallet providers or accounts at a central bank)
- Does your central bank also follow developments on private digital currencies or hybrid arrangements (for example, private issuance backed or supported by a central bank)? If yes, what specific work is your central bank conducting?

Which CBs are experimenting with CBDC



Source: Central bank websites, newflows, Bordo and Levin (2017) and Andrade and Ketterer (2016)



CRYPTO ASSETS



Overview

- 1) Introduction and some features
- 2) Crypto asset world: who-is-who
- 3) Crypto assets : some facts and figures
- 4) Crypto assets: get your terminology RIGHT
- 5) Crypto assets and regulators

Bonus material #how it works#

Introduction and some features 1

A physical object, usually a coin or a note, represent cash. When this object is handed to another individual, its **unit of value** is also transferred, without the need for a third party to be involved.

No credit relationship arises between the buyer and the seller. This is why it is possible for the parties involved to remain **anonymous**.

Advantage of physical cash is that whoever is in possession of it, is by default the owner of the unit of value.

This ensures that the property rights to the **units of value** circulating in the economy are always clearly established, **without a central authority** needing to keep accounts.

Furthermore, any agent can participate in a cash payment system; nobody can be excluded. There is a **permissionless** access to it.

Introduction and some features

2

Cryptos are a type of **private financial asset** that depends primarily on cryptography and distributed ledger technology (DLT) as part of the perceived or inherent value.

The 'crypto' refers to the fact that many encryption algorithms and cryptographic techniques are used to ensure security across the network. This level of security also makes cryptos hard to counterfeit.

Many cryptos operate as blockchain-based **decentralized systems without the need for a trusted third-party such as a central bank, or credit card company.**

In this instance, peer-to-peer transfers are facilitated through the use of private and public keys.

For that reason they are outside the control of governments and are unregulated by financial watchdogs.

Bitcoin is undoubtedly the most well-known – and most widely used – blockchain-based cryptocurrency. It's also the most valuable, currently sitting at \$----???--- per coin.

Introduction and some features

3

Due to their virtual nature, cryptocurrencies **do not have a central repository**, meaning they can be wiped out by a computer crash if there's no backup copy of the holdings or if the user misplaces their private key.

Unlike cash, which is entirely anonymous, **transactions carried out with crypto assets can, in the case of Bitcoin, be traced** on the blockchain without initially knowing participants' identities.

It's worth noting, however, that **some crypto assets are less private than others**. For example, *Dash*, *ZCash*, and *Monero* are far more difficult to trace than Bitcoin.

On another note, cryptos tend to be characterized by price volatility because their value is based solely on supply and demand.

Crypto assets



Cryptocurrency is a digital money, created from code.



Free of all governmental oversight, The cryptocurrency economy is monitored by a peer-to-peer internet protocol .



Cryptocurrency is an encrypted string of data or a hash, encoded to signify one unit of currency



Bitcoin Market Cap
\$11,322,347,786



Ethereum Market Cap
\$928,068,434



Ripple Market Cap
\$293,888,278

Crypto asset world: who-is-who

Ethereum is focused on removing middlemen from digital applications. So instead of using Apple's and Google's app stores, you can use apps online through a decentralized community.

Dash is focused on creating a cryptocurrency that can be used as digital money more conveniently. That's why its name is short for digital cash. It also has built-in community systems to pay for ongoing development and to vote for updates.

What's really interesting about Ripple is that the type of money you put in doesn't have to be the same that comes out. Ripple works like a universal translator for money. You can send Euros and the other party can receive dollars. A global network that's constantly moving money around makes this possible.

NEO is the first cryptocurrency launched in China. It's similar to Ethereum in that it's designed to remove middlemen from applications. But it's also designed to help manage your digital identity.

Litecoin is based on the ideas behind Bitcoin but is focused on being able to process more payments in a shorter period of time. The goal is to make cryptocurrency ready for millions of everyday transactions.

Monero is building very private, digital cash. It's designed to be completely anonymous and untraceable. The main goal of Monero is to put you in charge of your money – banks and governments can no longer control or even monitor it.

Facebook plans to launch 'GlobalCoin' cryptocurrency in 2020

Facebook is planning to launch its own crypto asset in early 2020, allowing users to make digital payments in a dozen countries.

The currency, dubbed GlobalCoin, would enable Facebook's 2.4 billion monthly users to change dollars and other international currencies into its digital coins.

The coins could then be used to buy things on the internet and in shops and other outlets, or to transfer money without needing a bank account.

Mark Zuckerberg, the founder and chief executive of Facebook, last month met the governor of the Bank of England, Mark Carney, to discuss the plans, [according to the BBC](#).

Crypto assets- Some facts & figures

How big is the cryptocurrency market?

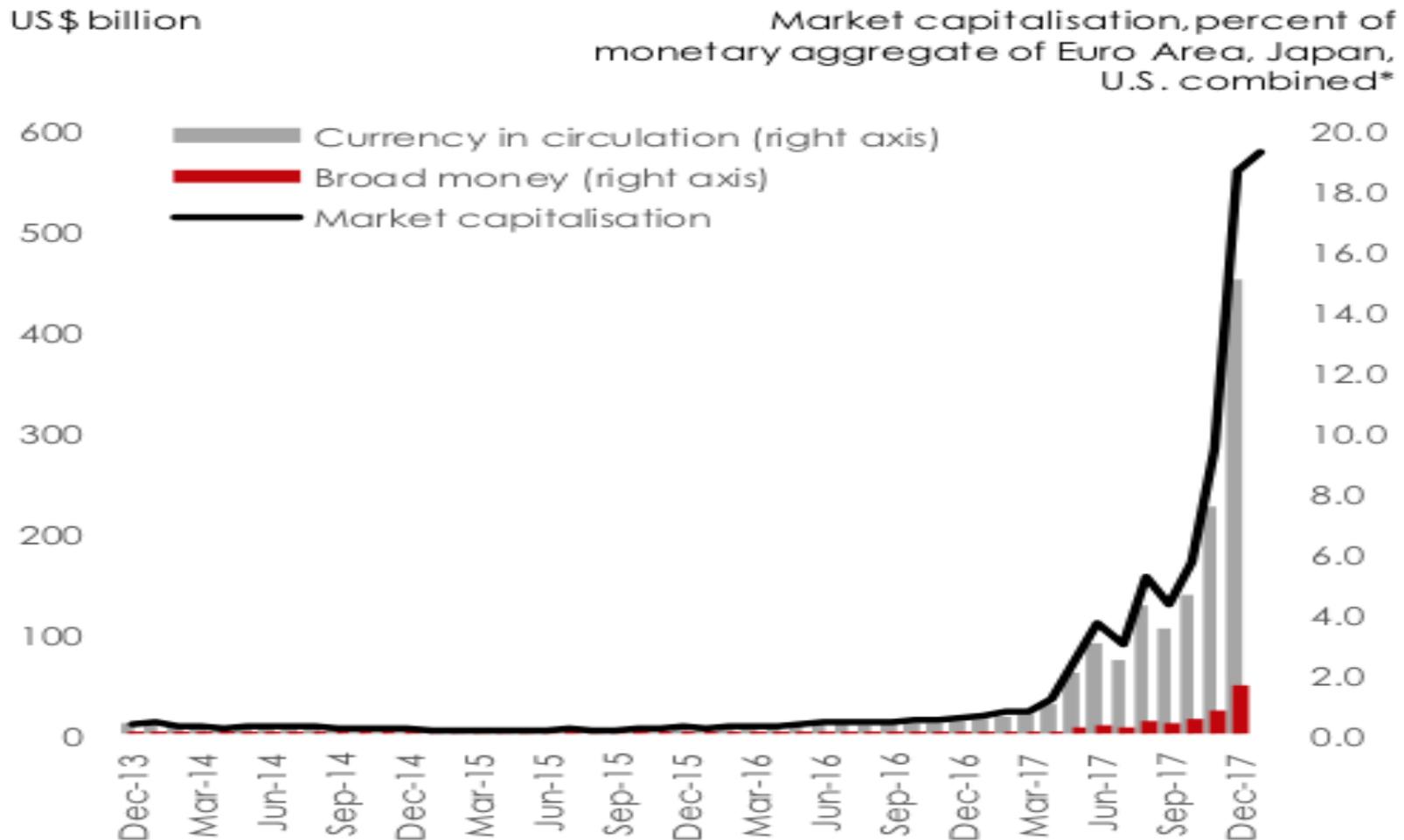
The total market capitalisation of digital coins and tokens at the end of January 2018 was \$520 billion (down from US\$830 billion in early January 2018).

There were 1,474 crypto assets at the end January compared with 682 at the same time in 2017, and a total of 9.1 trillion cryptocurrency coins outstanding.¹

The market capitalisation at the end of December 2017 represents more than 15% of currency held by the public in the US, Japan, and the euro area combined, compared with less than 1% in December 2016.

Some facts & figures

2



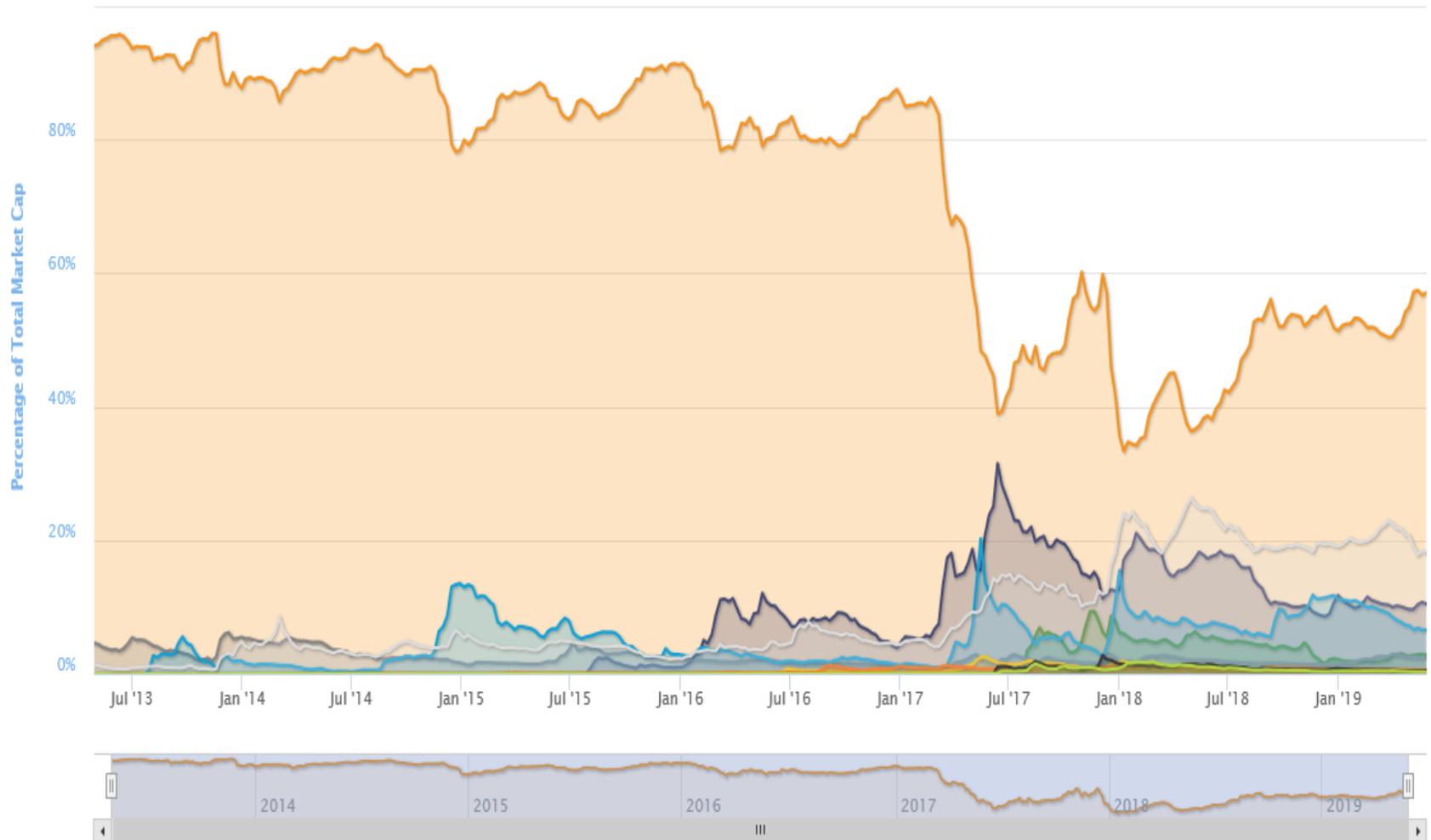
Source: Bank of Japan, Coinmarketcap.com, ECB, Federal Reserve, IMF. Currency in circulation seasonally adjusted for Euro Area and Japan; weekly averages for U.S. Broad money (M2) seasonally adjusted.

Percentage of Total Market Capitalization (Dominance)

Overlapping Stacked

Zoom 1d 7d 1m 3m 1y YTD ALL

From Apr 28, 2013 To May 28, 2019



Bitcoin Ethereum Bitcoin Cash Litecoin XRP Dash NEM Monero IOTA NEO Others

Crypto assets : get your terminology RIGHT

From a legal perspective, crypto is not money or currency as they do not fulfill the functions of money:

- **a medium of exchange,**
- **a store of value,** and as
- **a unit of account.**

ECB defines cryptos as*:

“A digital representation of value, not issued by a central bank, credit institution or e-money institution, which in some circumstances can be used as an alternative to money.”

*Virtual currency schemes –a further analysis (2015)

Crypto assets: get your terminology RIGHT

What does BIS CPMI say*?

Mostly they are assets with their value determined by supply and demand, similar in concept to commodities such as gold.

However, in contrast to commodities, they have zero intrinsic value.

Unlike traditional e-money, cryptos are:
not a liability of any individual or institution,
nor are they backed by any authority.

As a result, their value relies only on the belief that they might be exchanged for other goods or services, or a certain amount of sovereign currency, at a later point in time!

*Digital currencies November 2015

Crypto assets: get your terminology RIGHT

What does European Parliament say?

The European Parliament adopted the revised Anti-Money Laundering Directive (AMLD5) on 19 April 2018, defining virtual currency as

“a digital representation of value that is not issued or guaranteed by a central bank

or

a public authority, is not necessarily attached to a legally established currency and does not possess a legal status of currency or money,

but

is accepted by natural or legal persons as a means of exchange and which can be transferred, stored and traded electronically”.

Crypto assets and regulators

As demand for cryptos grows, global regulators are divided on how to keep up.

There is a call for more cooperation to look at various issues posed by this topic.

These issues are, among others, :

- i) money laundering, ii) financing of terrorism, iii) consumer protection,
- iv) financing of illicit activities, etc.

The AFM and DNB recommend regulation of cryptos at an international level

<https://www.dnb.nl/en/news/news-and-archive/Nieuws2019/dnb381599.jsp>

Thank

you



Bonus material #How it works#

How it works:

