



EUROPEAN CENTRAL BANK

EUROSYSTEM

# Digital money \*

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\* The views expressed are those of the author and do not necessarily reflect those of the ECB

## Existing payment channels under challenge

- **Evolution of markets** – Market infrastructure and technological changes
- **New players** - Technology firms are lowering costs allowing smaller banks and new players to (re-)enter the market
- **Increasing complexity**
  - **Multiplicity of players** (banks, IT firms, telecoms, agents, card schemes, messaging services, remittances, network service providers, central banks, ...)
  - **Fragmentation vs. interconnectivity** (acquiring, access points, instruments, transmission channels, settlement, ...)
- **Shifting user needs and expectations** - changing expectations in terms of **speed, cost, transparency**
- Evolving global and national **regulatory environment**

# Digital innovations and the financial sector

- **Digital innovation comes into play**
- ***Virtual assets («crypto currencies»)*** were at the forefront of recent technological developments
- ⇒ Separation of ***assets*** (e.g. Bitcoin) and ***technology*** (e.g. Blockchain)
- **Distributed ledger technology and other digital innovations** were a first focal point of attention
- ***Potential to induce change across the value chain***
- **Network effects** (*Fragmentation, technical standardisation*)
- ***Recently focus shifts back to payment and settlement function***
- **Emphasis on process integration** (*DvP, Nexus to central bank money*)

## Potential of fintech for payments

- **Fintech and digital innovations** built to provide **alternatives** to traditional payment channels, bank relationships or money transfers
- Leveraging both the **use of digital forms of money** and **distributed ledger technology**
- Alternatives may offer **faster - potentially instant - flows, at a fraction of the current cost**
- Fintech also offers potential applications that could enhance the existing **payment infrastructure**
- **But: pressure on existing business models, risk management and supervision/oversight**
  - *Challenges to the intermediary function* of financial institutions
  - Market entry of *new (unregulated) entities*

## Digital money

- ***Money and means of payment*** are at the heart of financial markets and wider economy
- ***Digital money*** is a focal point of attention:
  - What is “***money***”?
    - Store of value, unit of account, medium of exchange (currens)
    - Representation of law and order (nomisma, Währung)
  - How can money be converted into ***digital form***?
- ***Market participants, academics*** and ***central banks*** consider the relevance of ***digital forms of money*** as a *complement to cash* or electronic payments, as a *means of payment* or as an *investment vehicle*
  - What are the ***implications and risks***?

# Digital money – a taxonomy

	Physical money		Digital deposits
<b>Central bank</b>	Cash (eg banknotes)	<b>Digital money</b>	Central bank deposits (eg settlement and reserve accounts)
		Central bank digital currencies	
<b>Commercial bank</b>	Commercial bank notes	Commercial bank digital money	Commercial bank deposits (eg transaction accounts)
<b>Other</b> (including non-bank entities and no issuers)	Other issued notes and commodities	Private digital money and crypto-assets (eg bitcoin)	Non-bank accounts and stored-value records (eg broker-dealer accounts)

## Digital money – terminology issues

### Virtual currency ↔ Virtual currency schemes

- Focus on asset or mechanism?

### Crypto currencies / assets / tokens

- **Mere record of ownership**
- **Representation of real world assets (rights attached to token)**
- **Native tokens (exists only on a blockchain)**
  - Payment tokens – to be used to discharge payment obligations
  - Investment tokens – representing a promise to pay or receive gains
  - Utility tokens – a right to access services
  - Hybrids or none of all

### Settlement coins

- Asset or cash backed?

### Electronic deposits

### E-money

### Digital fiat currency

### Central bank digital currency

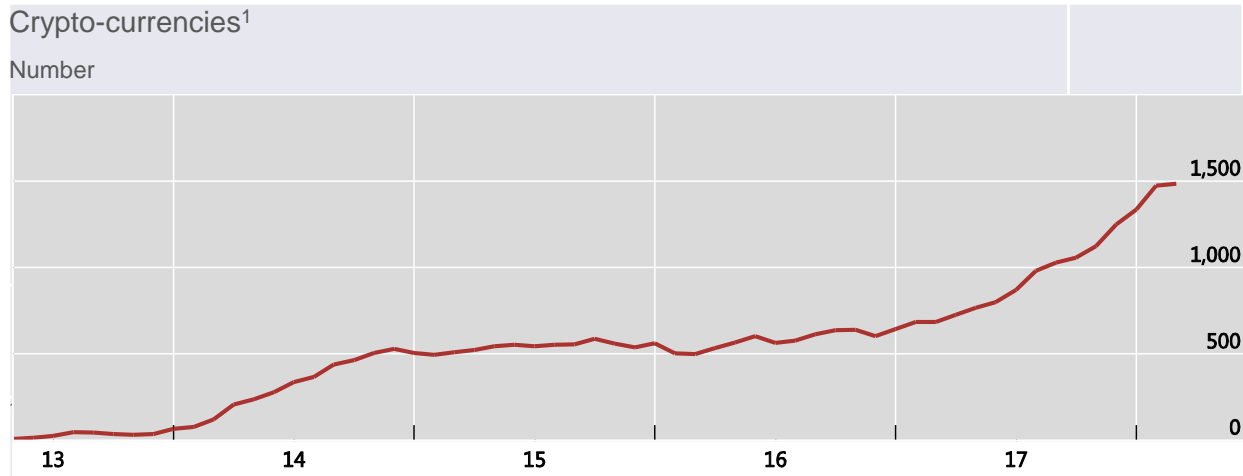
- Liability of a central bank?
- Sovereign currency?
- Legal tender?

# Digital money - implications and risks

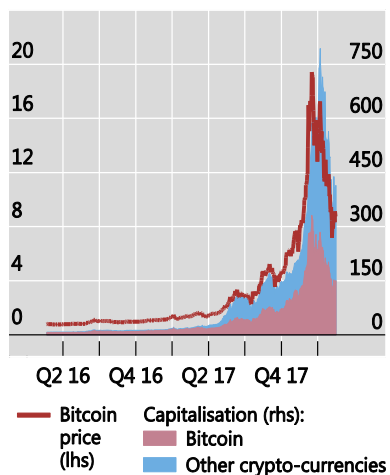
- **Technical**
  - Degree of *robustness of possible technologies, cyber risks*
  - *Standardisation* and reference architecture
- **Economic**
  - *Monetary policy impact* and *financial stability*
  - Impact on *bank business models, cost-benefits* and *user acceptance*
- **Regulatory and policy**
  - *Private sector vs. public sector* action
  - *Regulatory compliance*, tax and *privacy* considerations
- **Legal**
  - *Legal qualification* (discharge of obligations, liability, legal tender, ...)
  - **Tax** and **accounting** treatment
- **Cross-border issues**
  - *Usage abroad* and *holdings by foreign entities*
  - *Cross-currency* settlement



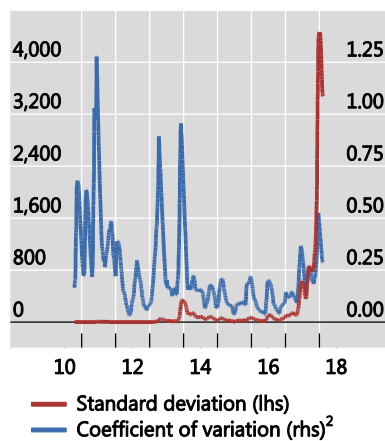
# Crypto-currencies



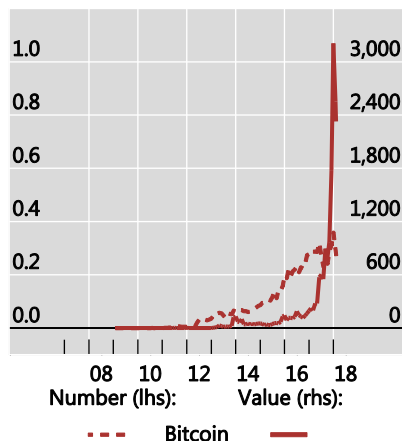
Closing price and market capitalisation



Bitcoin price volatility<sup>1</sup>



Average daily transactions<sup>3</sup>



# Crypto-asset challenges

- **> 1,500 crypto-assets** currently traded on crypto-asset exchanges
  - Issuance volumes continues to grow, even if total market cap of crypto-assets (c. 250bn USD) is well below peak
  - > 9bn USD raised through **ICOs** in 2018
  - Issuance, custody and exchange of crypto-assets mostly **unregulated**
  - Use as underlying for financial instruments (starting Dec 2017 with cash settled **derivatives on bitcoin trade** at CME and CBOE)
- **Challenges for regulators:**
  - **Challenges to the intermediary function** of financial institutions
  - Market entry of **new (unregulated) entities**
  - Circumvention **AML/CFT** controls
  - Growing number of **consumer complaints**
  - Growing **interest from financial institutions** to issue/get exposure on crypto-assets and ICOs
  - Concerns on **financial stability implications**

# Crypto-assets – limitations and risks

Crypto-assets entail significant challenges and risks:

- **Issues with money/asset functions**
  - *no formal backing*
  - *highly volatile*
  - *low market acceptance and*
  - *cyber risk and operational vulnerabilities*
- **Issues with the transfer mechanism**
  - *Unclear governance*
  - *Inefficiencies*
  - *Settlement finality issues*
- **Legal and regulatory issues**
  - *Legal uncertainties and risks* (in particular cross-jurisdictional)
  - *Regulatory issues*

⇒ However, ***newer generations of crypto-currencies evolve*** (e.g. regarding settlement inefficiencies, volatility, anonymity, etc.)

# Initial coin offerings (ICOs)

- **Crowdfunding**

- Lending based crowdfunding (repayment with interest)
- Investment based crowdfunding (investing in (transferable) securities)
- Initial coin offerings (facilitated through cryptocurrencies)

- An **ICO** is a fundraising event effected through **DLT/blockchain**, in which a «coin»/«**token**» is offered in return of cash or cryptocurrency

- Simplifying traditional securities issuance (no issuance of notes, no paying agent, no clearing or settlement)

- **Legal and regulatory issues:**

- *Identity of issuer?, nature and rights embedded in the token?, transferability/tradeability of the investment?, liability for fraud, theft, AML?*
- **Regulatory treatment** – *security, commodity, loan, other?, illegality?*

## Regulatory responses

- Absence of issuers – no natural object to regulate crypto-assets: **bans on crypto-assets remain limited** (and ineffective)
- Issuance of **warnings** – limited effects
- Regulatory **focus on “gatekeepers”**: Most activity is carried out through intermediaries - **crypto-asset exchanges and wallets**
  1. Gatekeepers subjected to existing **AML/CFT requirements** (cf. revised AML Directive in the EU)
  2. **Entity specific regulation**, i.e. regulating **wallet providers** or establish a **licensing regime for exchanges** as trading venues (cf. Japan and South Korea established ad-hoc regimes effectively forcing uncompliant exchanges to close)  
**To go further: need to qualify crypto-assets from a regulatory point of view**
  3. Targeted **crypto-asset regulation**
    - Existing financial instruments
    - New type of financial instruments (specific regulation)
    - New type of (non-financial) instrument
    - Application of rules dependent on features

## Legal status and qualification of digital money

- Legal status, e.g. a **claim, a representation of a claim, property, something else?**
  - in **account-entry form** and in **tokenised form**?
  - with **underlying assets** (eg escrow, pre-funding)?
- **Legal regime** for cash, for deposits, for e-money or for other forms of payment instruments applicable to digital currencies?
- Uncertainties and **recharacterisation risk**?

## Legal underpinning of holdings and transfers of digital money

- How to **hold and dispose DM** on-ledger or off-ledger?
- When does legal **finality** occur or an obligation be **discharged**?
- Could DM be used as **collateral** or be **set-off or netted** against other forms of claims or monetary obligations?
- How would DM be treated in an insolvency?
- **Liabilities** for fraud, cyber attacks, theft, erroneous transfers, weaknesses of the underlying technology or consumer protection?

## Applicable law, jurisdiction and conflicts of laws

- Which jurisdiction **governs** the issuance, holding and disposition?
- What **conflicts of law** issues could arise in a cross-border constellation (e.g. foreign usage of DM, holdings by a non-domestic entity, etc.)?
- How would be the **relevant forum** be determined?

## Legal status and requirements for providers of supporting technical infrastructure such as distributed ledger technology

- What would be the legality, nature and enforceability of the **records/entries kept on a distributed ledger**?
- To what extent may a DLT protocol (or smart contracts) replace provisions typically found in contractual agreements?
- What would be the legal status of the DLT provider (eg a service provider, a system operator)?

## Central bank activities

- **Analysis, academic studies or technical experimentation/ projects** by most central banks
  - central banks alone/jointly or cooperation with private sector (limits in CB resources, easier to implement, but: ultimate responsibility of CB for maintaining public confidence in currency)
  - variants explored differ depending on motivation (complement/substitute of cash, settlement inefficiencies, interoperability, security issues)
  - interest in exploring DM for interbank settlements (or wholesale payments – DvP, FX PvP) and general purpose (or retail - tiered or non-tiered, centralised or distributed) payments
  - relevant issues: technical (scalability, safety, interoperability, maturity of technology) and economical, but also: legal and policy
- **Sandboxes**
- **Regulatory agenda** (domestic/international)



## Central bank digital currency – Possible motivations

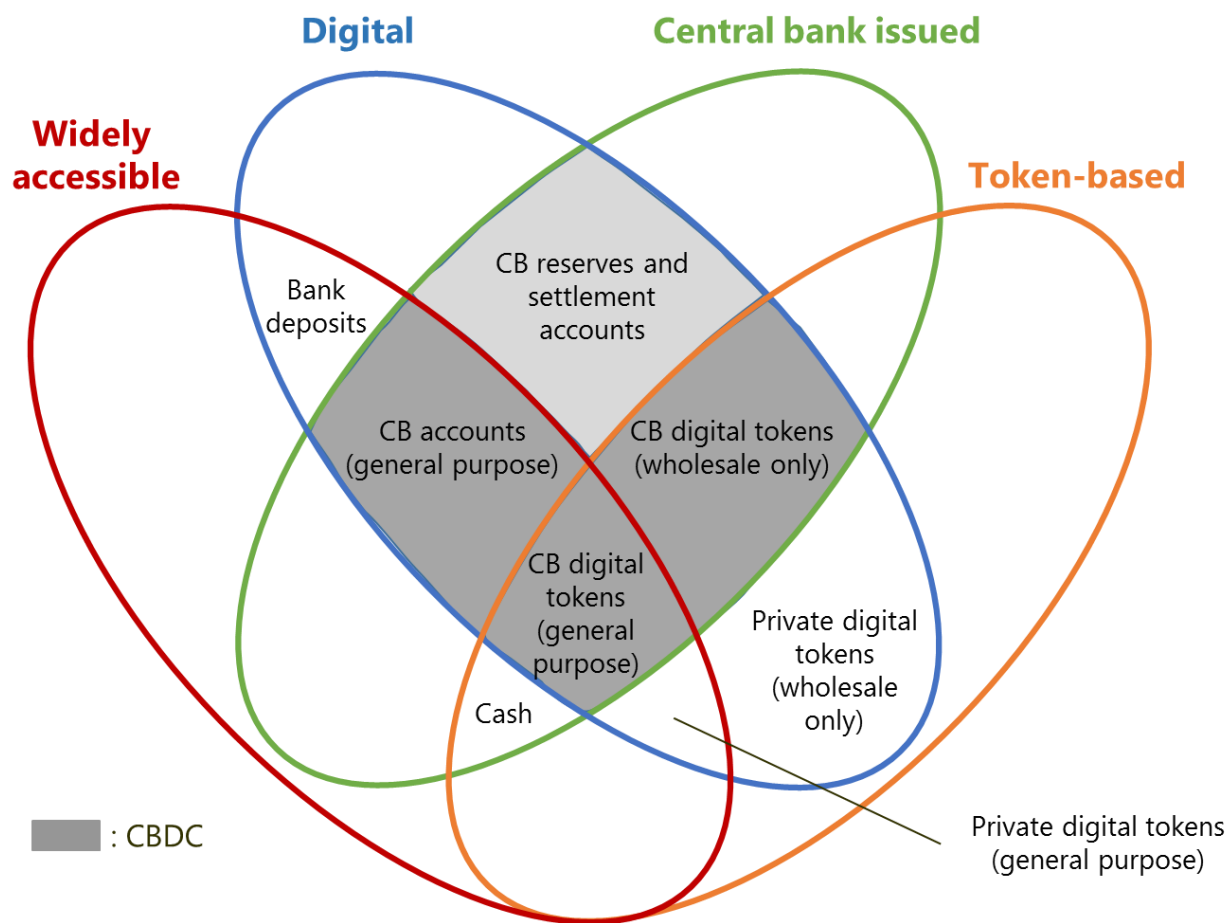
**Interest of a central bank** can vary, as do their *mandates* (eg. smooth functioning of payments, financial stability, ...):

- Reaction to **declining cash usage** (provision of safe means of payments, alternative to cash and private cryptocurrencies)
  - Promote **cashless society**
  - New instrument to enhance **settlement efficiency**
  - **Financial inclusion** considerations
  - **Control** of domestic currency
  - Inhibit **criminal activity**
  - Additional **monetary policy** instrument (reduce the lower bound on interest rates)
  - Improve **financial stability**
- ⇒ **No CBDC is like the other!**

# CPMI Working Group on Digital Innovations

- Established in **February 2016** to assess the :
  - ***potential impact on the financial market infrastructure***
  - ***potential impact on central bank functions***
- Development of an **analytical framework (February 2017)** to *understand and analyse the implications of innovative technology for payments, clearing and settlement*
- Analysis of the **implications of first generation cryptocurrencies**
- CPMI-Markets Committee joint report on **central bank digital currencies (March 2018)**
- Further work underway, including on ***wholesale digital currencies, legal aspects*** and ***cross-border issues***

# The 2018 CPMI-MC report: Categorisation of central bank digital currencies – the “money flower”



## Key elements and design features

### CBDC key elements:

- **liability of a central bank**
- **digital** form
- denominated in **sovereign currency** unit of account

### Optional design features:

- *Holders - general public or restrictions (eg wholesale only)*
- *Records of transfers and holdings - on or off the central bank ledger*
- *Transfer mechanism - peer to peer or intermediated*
- *Transparency – full, limited or anonymity of holders*
- *Availability - 24/7 or limited*
- *Convertibility- into cash and/or central bank deposits / limits or caps*
- *Interest bearing – based central bank policy*

## Payments aspects

- Digital records could improve **regulatory compliance**
  - however, **traceable CBDC** is unlikely to be used for illicit transactions
  - **KYC, AML and tax compliance** might fall on central banks
  - the appropriate degree of **privacy** is a challenge in a digital environment
- CBDC could improve **financial inclusion**
  - but **barriers to the use** of any digital currency may be large
  - the **preference for trusted alternatives**, such as cash, is strong
- **Cyber-security** and the **robustness of possible new technologies** remain a challenge
- **Legal issues** have to be considered
  - **central bank authority** to issue CBDC and “**legal tender**” status
  - **legal qualification** of CBDC (discharge of obligations, rules for holding and transfers of value, liability)
  - **finality** issues

## Monetary policy aspects

- Issuance of CBDC probably does ***not alter the basic mechanics of monetary policy implementation***
- CBDC could enrich the ***monetary policy toolkit***
  - allowing for a ***strengthening of pass-through of policy rate changes***
  - addressing the ***zero lower bound on interest rates***
  - however, implementing ***negative interest rates on a general purpose CBDC*** entails challenges
- CBDC designed as a liquid and creditworthy asset could function as a ***highly liquid safe asset***
  - substituting ***short-term government bills*** or ***guaranteed bank deposits***
  - implications for the pricing and composition of banks' funding

# Financial intermediation, stability and cross-border aspects

- Impact on ***banks business models and financial intermediation***
  - need to reconsider ***appropriate roles*** – in financial intermediation and the economy at large – ***of private and public sector***
  - similarities to discussion on ***narrow banking or full-reserve money*** (ability of banks to leverage credit)
  - commercial banks could lose **customer information** whereas central banks to obtain better real-time data on economic activity
- Challenges could arise in times of ***financial stress***
  - higher ***instability of commercial bank deposit funding***
  - a ***flight towards the central bank*** may occur on a fast and large scale
- The introduction of CBDC in ***one jurisdiction could affect others***
  - ***usage abroad*** and ***holdings by foreign entities***
  - ***cross-currency*** settlement

## State of play and outlook

- **Wholesale CBDCs** may *enhance settlement efficiency*
  - Current use cases look quite similar to what exists today
  - Alternatives to wholesale CBDC may be as efficient and reliable, e.g. *enhanced RTGS systems, expanding access and opening hours*
- **General purpose CBDC** could respond to diminishing cash usage
  - Implementation faces *significant challenges and risks* (e.g. for bank business models, privacy, regulatory compliance)
  - Alternatives to retail CBDC may be as efficient and convenient, e.g. *instant payment services, access to central bank accounts*
- **Hybrid variants**
  - Combining a *central bank issued wholesale CBDC available to banks/financial institutions only* with *general purpose digital tokens issued by banks/financial institutions to end-users*
- Particular considerations apply to **cross-border payments**
  - For currencies that are widely used in **cross-border transactions**, all legal and policy considerations would apply with added force
  - Need for *settlement infrastructure*, including FX?



## Evolution of cross-border payments

- **Cross-border payment transactions are still costly, slow, cumbersome and opaque**
- **Multiplicity of players** (banks, postal services, IT firms, telecoms, agents, card schemes, messaging services, remittances, network service providers, central banks, ...)
- **Fragmentation** (acquiring, access points, instruments, transmission channels, settlement, ...)
- **Correspondent banking** and remittance services - **concentration** and **withdrawal** of players due to rising costs and risks
- **Shifting user needs and expectations** - from exclusively wholesale payments to **wholesale and retail**; changing expectations in terms of **speed, cost, transparency**
- **Evolution of markets** - Technology firms are lowering costs allowing smaller banks and new players to (re-)enter the market

## New forms of cross-border and cross-currency settlement

- **Entry of new players and reaction of incumbents**
  - **Fintech payment service providers** reinventing remittance (Transferwise, Revolut)
  - **Alternative connectivity services** (Ripple Connect, response by SWIFT with GPI)
  - **Use of crypto-assets as a bridge currency** (Ripple Liquidity, alternatives based on DLT CLSNet)
  - **Settlement assets as proxy for CBDC** (Utility Settlement Coin (USC), **digital token** denominated in major sovereign currencies to improve wholesale (DvP and PvP) settlement in major currencies, fully backed by **funds held at the *central banks of issue***)
- Could also be **combined with wholesale CBDC** (tiered CBDC)

## Relevance of central banks

- **Risks remain with private settlement providers**
  - Potential **credit and liquidity exposures** and **operational limitations**
  - **Tiering arrangements** could challenge risk controls
- **Central bank money**
  - The ultimate **safe settlement asset**, eliminating credit and liquidity risk
  - **Neutrality** as not-for-profit actor
- **Choice of other settlement assets requires further assurances**
  - **Safety**, including investor protection schemes, collateralization of exposures and **liquidity** of settlement asset, credit facilities
- **Interest in CBDC** likely to differ from country to country
  - May be general purpose or wholesale payments focus
- Opportunities remain in streamlining and **reducing settlement risks** in cross-border payments
  - Need to study **policy, legal and regulatory implications** of **access of foreign entities** and **usage of CBDC abroad**
  - **interoperability of central bank payment systems** across borders and currencies: the missing link?

## Issues for the future (I)

### *Emergence of new players*

- **BigTech** and other players (telecoms, Amazon, Alibaba, etc.)
  - Technological giants providing global platforms or global services
  - Services and providers *not easily locatable in a jurisdiction*
- **CBDC as a game changer?**
- **'Platformification'** of financial services (Facebook, WeChat etc.)
  - Business models based on services in exchange for personal data (with or without consent by the user) - *potential data protection issues*
  - Combination of personal and financial data in one location - *facilitating social engineering and identity theft*
- **Unregulated actors** in the value chain (outsourcing, embedded products or services)
  - Unregulated service providers providing services directly to users or to financial institutions, e.g. cloud provider or blockchain fabric provider – *raising issues of liability and of critical service provision*

## Issues for the future (II)

### *Emergence of new technologies*

- Digital ecosystems, **APIs** and **Internet-of-Things (IoT)**
  - Micro-transactions in an environment of autonomous devices - *potential for cyber attacks and 'machine-originated' fraudulent transfers*
  - 'Smart machines' – *allocation of responsibilities (e.g. for access, authentication) and liabilities – user, seller, constructor?*
- **Big data** analytics
  - Potential discriminations based on algorithms – *consumer protection, responsibilities for analysing the algorithmic models used?*
  - *Data protection and privacy issues*
- **Robo advice**
  - *Liability for wrong advice, burden of proof?*
- **Quantum computing**
  - *Cyber security concerns*

## Issues for the future (III)

### *Implications for authorities*

- **Suitability/adaptations of regulatory standards** as regards market developments
- **Avoidance of competitive advantages** for disrupters compared to traditional infrastructures by applying less stringent standards
- **Need of relevant knowledge** by regulators and overseers to comprehensively understand technology, underlying protocols/codes, and to adequately assess their functioning
- **“Observer nodes”** could enable direct monitoring of new arrangements, facilitate oversight activities, but possibly creating moral hazard
- Possible **need to rethink certain legal concepts** (formation of contracts, finality, DvP, etc.)