



From the current Financial Market Infrastructure to Distributed Ledger Systems

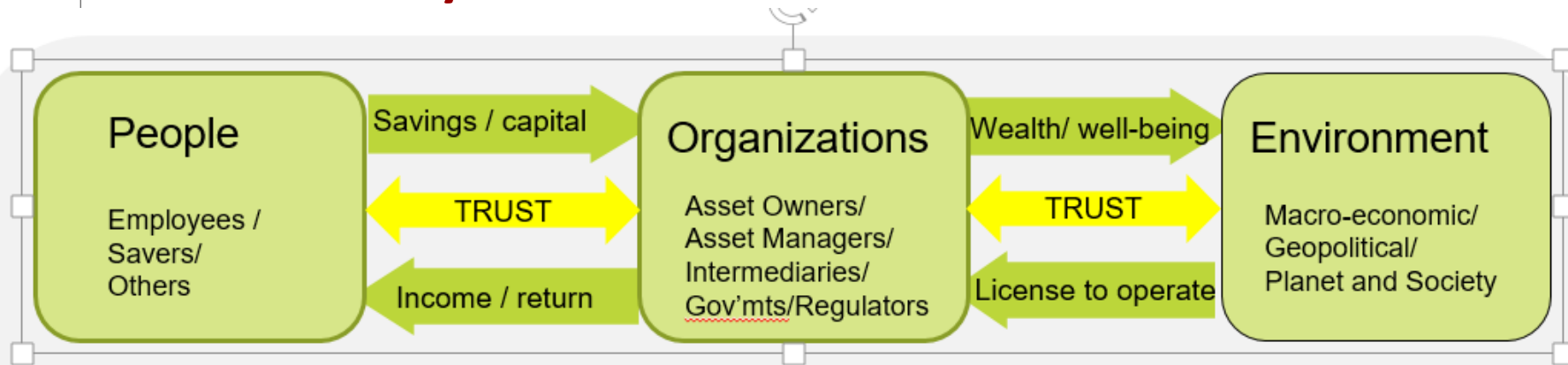
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Perm Winter School, 1 February 2020

Outline

- The current financial ecosystem and fintech disruptions
- DLT for securities and tokenization
- Money
 - Global Payments
 - What is the future of money?
- Governance and trust

Financial ecosystem



Source: CFA Institute, Future of Finance project

The ecosystem driven by values, beliefs and other motivations plus business models plus change, innovation and disruption evolving in various possible scenarios here:

I Low for Longer

III. Parallel Worlds

II Fintech Disruption

IV. Inclusive Capitalism

■ Finance: over-ripe for fintech disruption

- Incumbents: protected by brand/regulation

cultural obstacles to innovation

- Fintech likely to impact finance infrastructure before asset management

Need for fintech disruption: global payments

From Revolut blog: *“Back in the ‘80s, the quickest way to send money from London to New York was to physically take cash with you on a plane, just like in the movies. Surprisingly, this still holds true today, but have you ever wondered why?”*

- Communication between banks: near real time, but correspondent banks may take days.
 - Exception processing may take a lot longer.
- Opaqueness of the correspondent banking network: settlement times and fees may be unpredictable.
 - Increasing compliance requirements cause complication; they may cut some banks off the network.

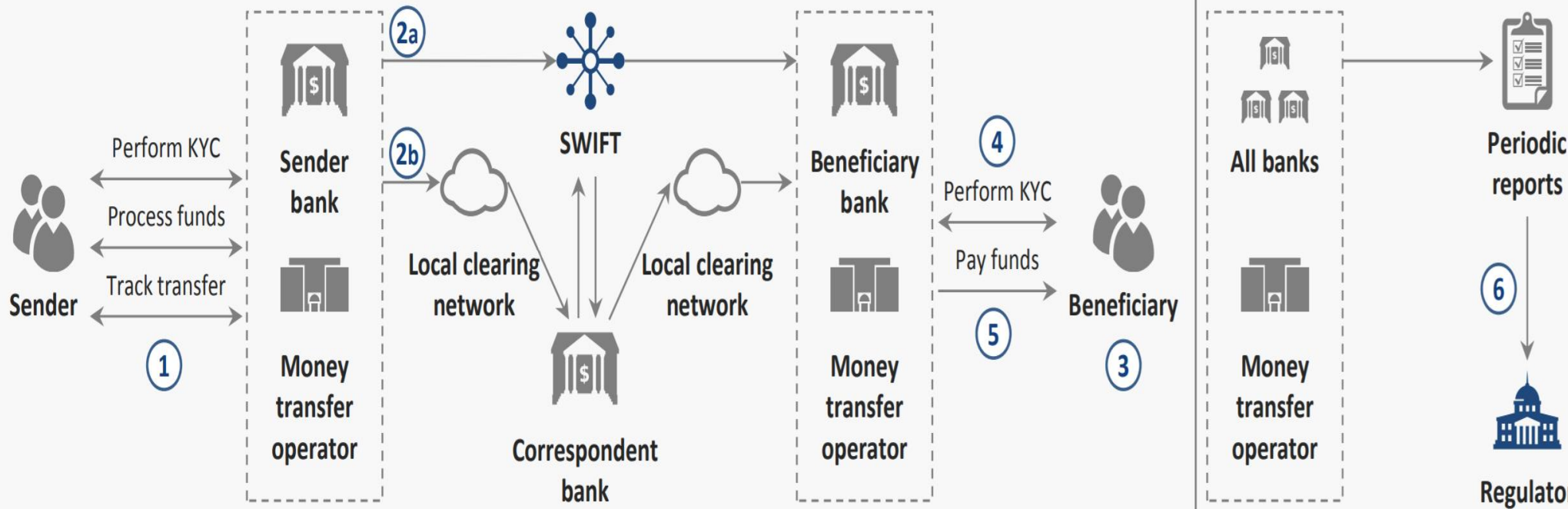
Global payments

Initiate relationship

Transfer money

Deliver funds

Act post payment



- Distinguish architecture from technology
- The above architecture relies on correspondent banking (which dates from the late Middle Ages)

Need for fintech disruption: security operations

- “Intermediaries such as banks and broker-dealers are typically **trusted** by end users to store, maintain ownership records of, and transfer assets on their behalf » (Federal Reserve Board, 2016-95)
- But is trust deserved?

Q Search

Bloomberg Opinion

Deals

Dole Food Had Too Many Shares

It's enough to make you wish for a blockchain.

Need for fintech disruption: security creation

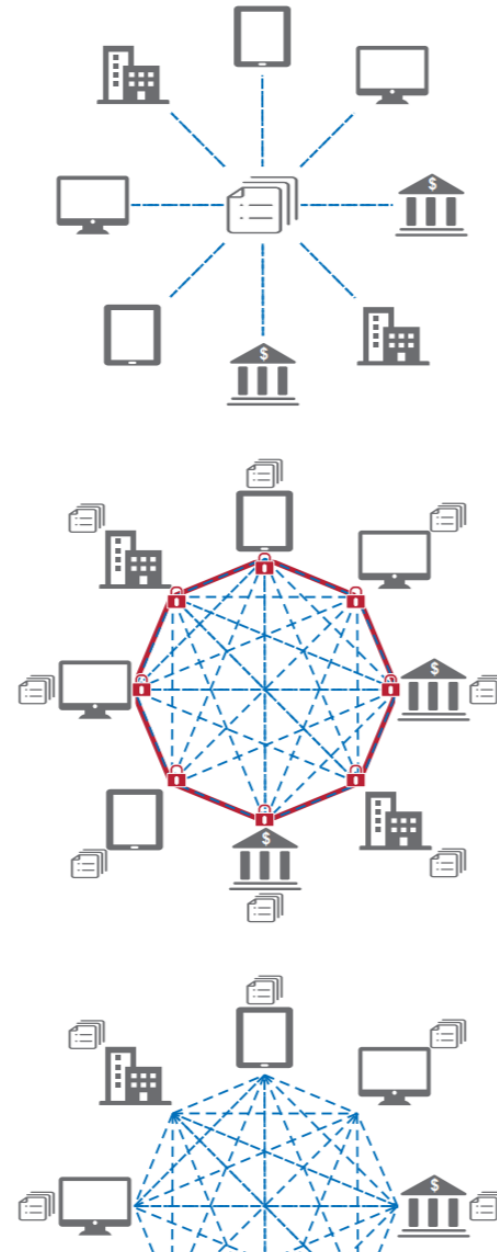
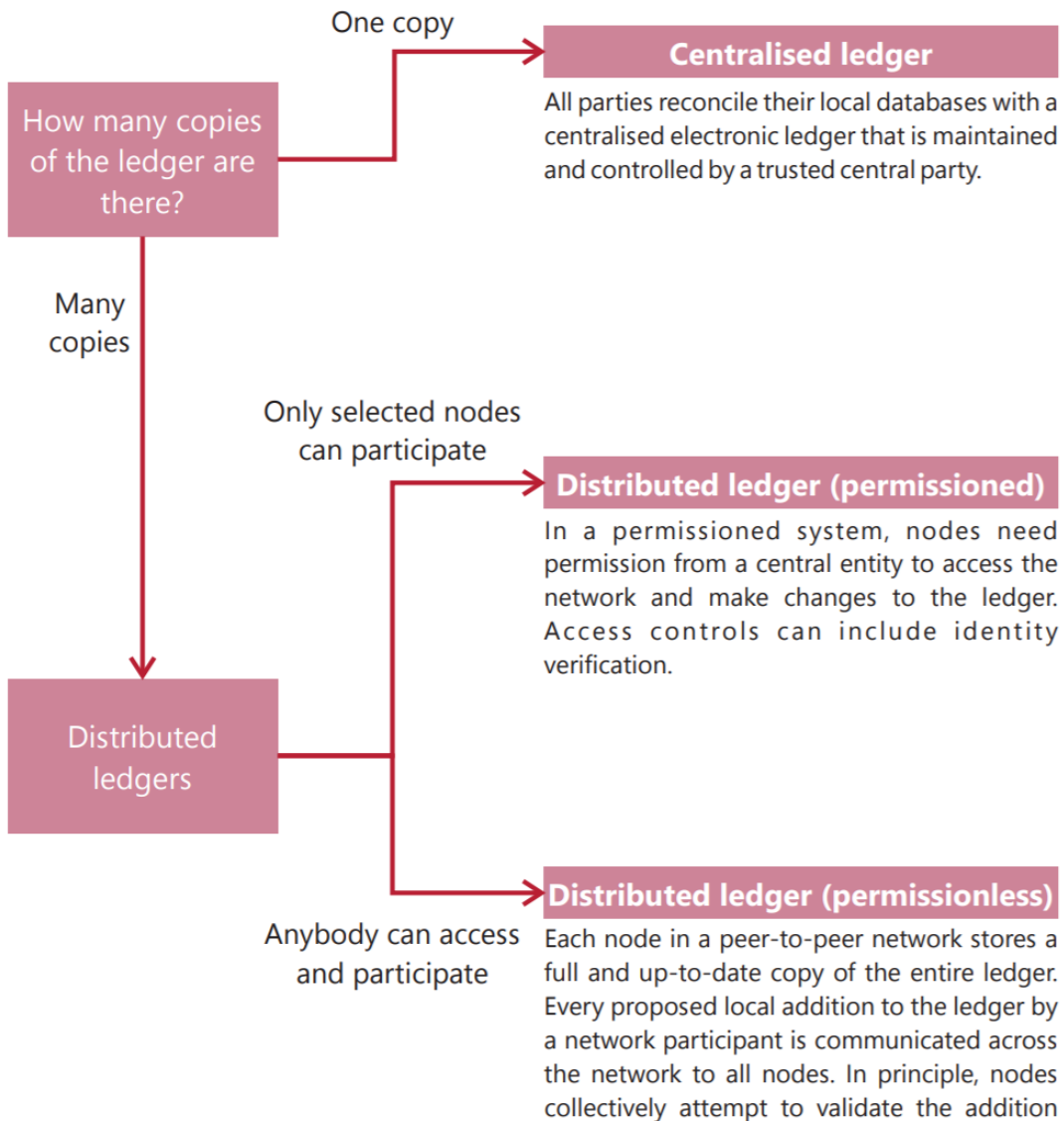
- It is very costly to make assets tradable across jurisdictions and make them into securities that can be added to investment portfolios.
- In that, capital markets are still quite inefficient.
- The true frontier for investment management is not finding new sources of **alpha**, but expanding the universe of investable assets (**beta**)
 - The quest for alpha is a **zero-sum game**, the expansion of investable assets is a **win-win game**.

The promise of DLT for payment, clearing and settlement

"Distributed technology could become a game changer for payment, clearing and settlement activities if fintech companies and financial institutions can leverage the technology to meet demanding legal, operational and risk management requirements."
(B. Cœuré, Board Member, ECB and Chair of the Committee on Payments and Financial Infrastructure).

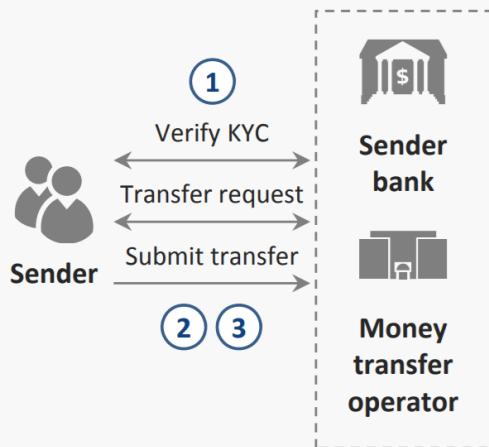
- Unprecedented technology:
 - Lower back office costs
 - Lower capital and collateral requirements
 - Disintermediate non-core actors

Centralised and permissioned/permissionless decentralised ledgers

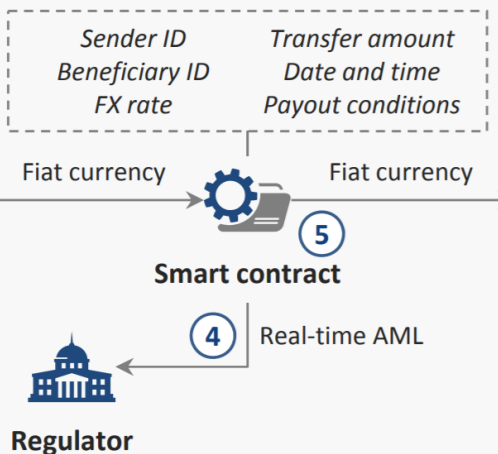


DLT-enabled global payments without correspondent banks

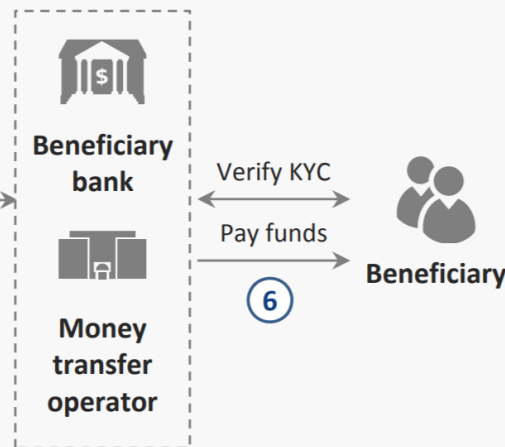
Initiate relationship



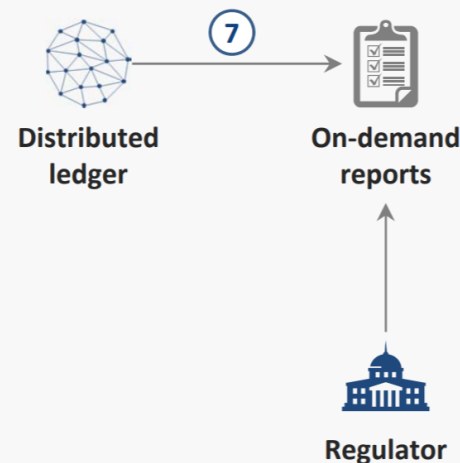
Transfer money



Deliver funds



Act post payment



Future-state process description

- | | | | |
|--|--|---|--|
| <p>1 Trust between the sender and a bank or money transfer operator is established either via traditional KYC or a digital identity profile</p> <p>2 A smart contract encapsulates the obligation to transfer funds between sender and beneficiary</p> <p>3 The currency conversion is facilitated through liquidity providers on the ledger</p> | <p>4 The regulator can monitor transactions in real time and receive specific AML alerts through a smart contract</p> <p>5 A smart contract enables the real-time transfer of funds with minimal fees and guaranteed delivery without the need for correspondent bank(s)</p> | <p>6 Funds are deposited automatically to the beneficiary account via a smart contract or made available for pickup after verifying KYC</p> | <p>7 The transaction history is available on the ledger and can be continuously reviewed by regulators</p> |
|--|--|---|--|

Potential configuration of DLT arrangements

Description of arrangement	One entity maintains and updates the ledger (for example, a typical FMI)	Only approved entities can use the service; entities can be assigned distinct restricted roles	Only approved entities can use the service; entities can play any role	Any entity can use the service and play any role
Operation of the arrangement	Single entity	Multiple entities		
Access to the arrangement	Restricted			Unrestricted
Technical roles of nodes	Differentiated		Not differentiated	
Validation and consensus	Within a single entity	Within a single entity or across multiple entities	Across multiple entities	

- First column is an incremental change from today's FMI, last column is like bitcoin
- Issues with last column: scalability; authorities prefer centralization

Potential advantages of DLT for payment, clearing, settlement

- Reducing complexity
- Improving end-to-end processing speed and thus availability of assets and funds
- Decreasing the need for reconciliation across multiple infrastructures
- Increasing transparency and immutability in transaction record keeping
- Improving network resilience through distributed data management

Challenges and risks in DLT use

- Uncertainty about operational and security risks
- Lack of interoperability with existing processes and infrastructures
- Ambiguity relating to settlement finality
- Soundness of the legal underpinning
- Absence of an effective and robust governance framework
- Scalability for large scale application

Operational and security risk

- Resilience and reliability
- Security, with threats from future technological advances (e.g. quantum computing).
 - Is it « *Particularly concerning for arrangements with a weak governance structure, which may not be able to react quickly enough to emerging security issues and threats* » ?
- Operational capacity and scalability
 - Large daily volumes
 - Peak volumes

Privacy and DLT

- DLT may also enhance market transparency if information contained on the ledger is shared broadly with participants, authorities and other stakeholders.

Source: BIS

- Can DLT become the ultimate perfect « audit trail »?

Asset Tokenization

- Asset tokenization: converts the rights to economic assets into digital tokens
- Advantages of tokenized assets:
 - Immutable
 - Accessible
 - Divisible
 - Cost-effective

Asset Tokenization: risks

- Risk of fraud/misrepresentation
 - Who performs the due diligence on the underlying physical assets?
- Immutability
 - Can the technology meet the standards of e.g. notarial archives of real estate ownerships, which are still there (e.g. in France/Italy) since the Middle Ages, despite wars and revolutions?

Announcements in Switzerland



BIS to set up Innovation Hub for central banks



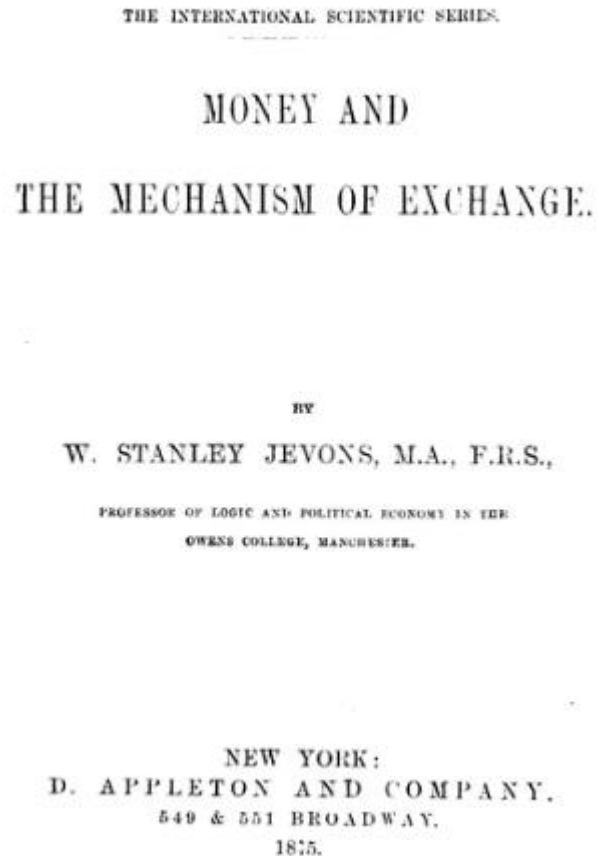
Press release | 30 June 2019

SNB and BIS sign Operational Agreement on BIS Innovation Hub Centre in Switzerland (Oct 8, 2019).

SIX and the Swiss National Bank Explore Technological Approaches for the Use of Digital Central Bank Money in the Settlement of Tokenized Assets (8 Oct . 8, 2019).

CRYPTOCURRENCY Swiss central bank, BIS working on a digital currency (Oct. 9, 2019).

Functions of money



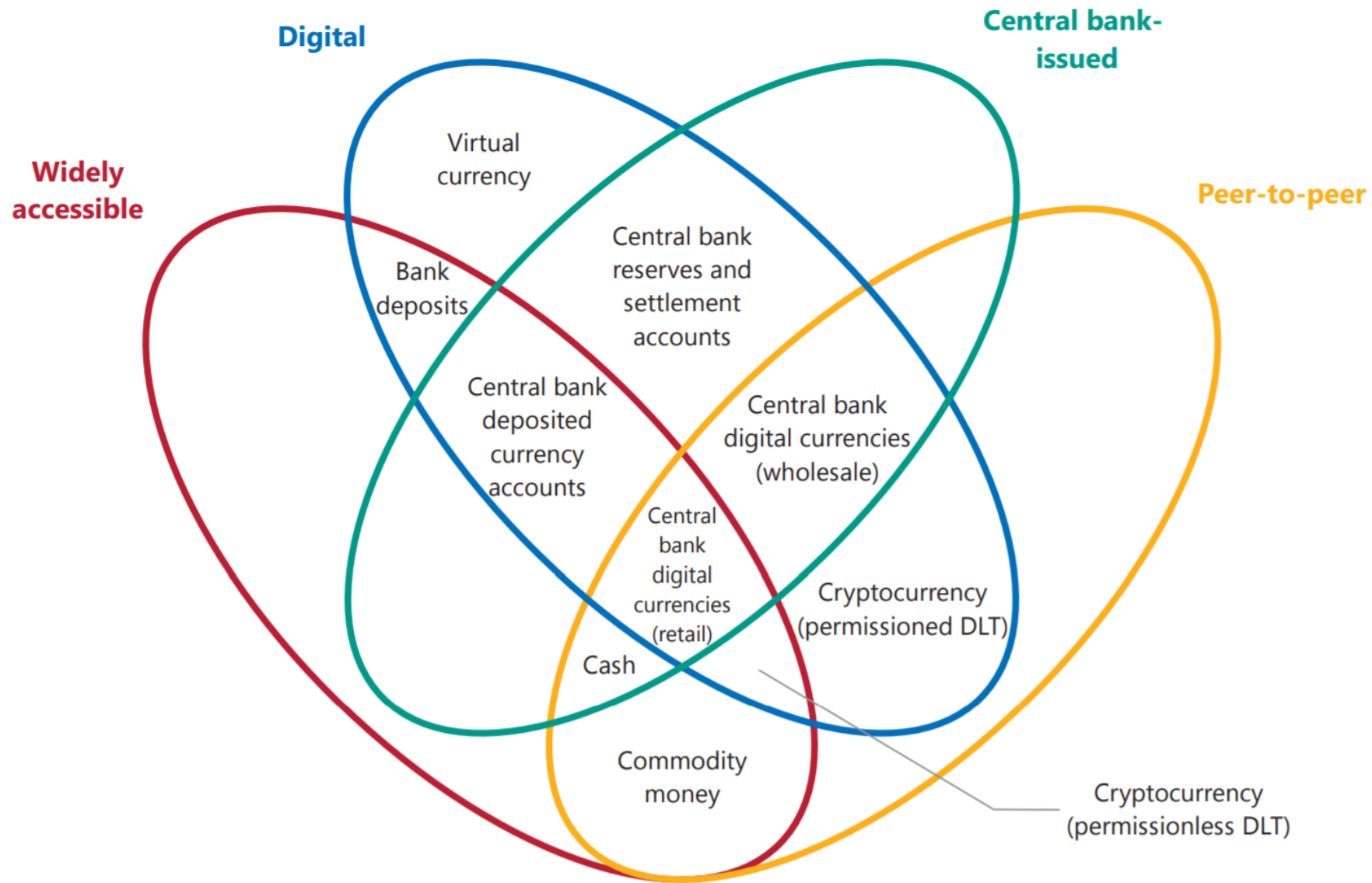
Normative point of view:

1. Store of value
2. Medium of exchange
3. Unit of account

Positive point of view:

Do available currencies fulfil these functions?

The money flower: a taxonomy of money



Forms of Money



	Private electronic money based on fiat system	Privately issued cryptocurrencies	
		Permissioned	Permissionless
1 Storage of balances/holdings	Ledger (accounts) stored centrally by banks and other financial institutions	Decentralised storage of ledger	
2 Verification to avoid double-spending	Identity-based concept	Peer-to-peer concept: distributed ledger can be checked to see whether a specific unit of a currency has already been spent	
3 Processing of transactions	Accounts updated by bank	Updating of ledger via trusted nodes	Updating of ledger via proof-of-work Rule to follow longest chain
4 Finality/settlement concept	Settlement ultimately via central bank	Settlement in cryptocurrency itself	Probabilistic concept of finality via rule to follow longest chain
5 Elasticity of supply	Central bank policy, eg regarding intraday credit	Protocol can be changed by trusted nodes	Protocol-determined
6 Trust-creating mechanisms	Reputation of banks and central banks, banking supervision, lender of last resort, legal tender laws, central bank independence and accountability, AML/CFT checks, cyber-security	Reputation of issuing firm and nodes Trusted nodes, some of which may be subject to regulation	Proof-of-work requires honest computing majority

Money: the present

- Uncomfortable cohabitation among fiat currencies, gold and cryptocurrencies.
- The increase in gold price may signal diminishing trust in fiat money and concern for systemic risk.
- Regulatory resistance to cryptocurrencies. Also difficulty to open bank accounts for companies in the cryptocurrency business.

The exorbitant privilege: the US dollar

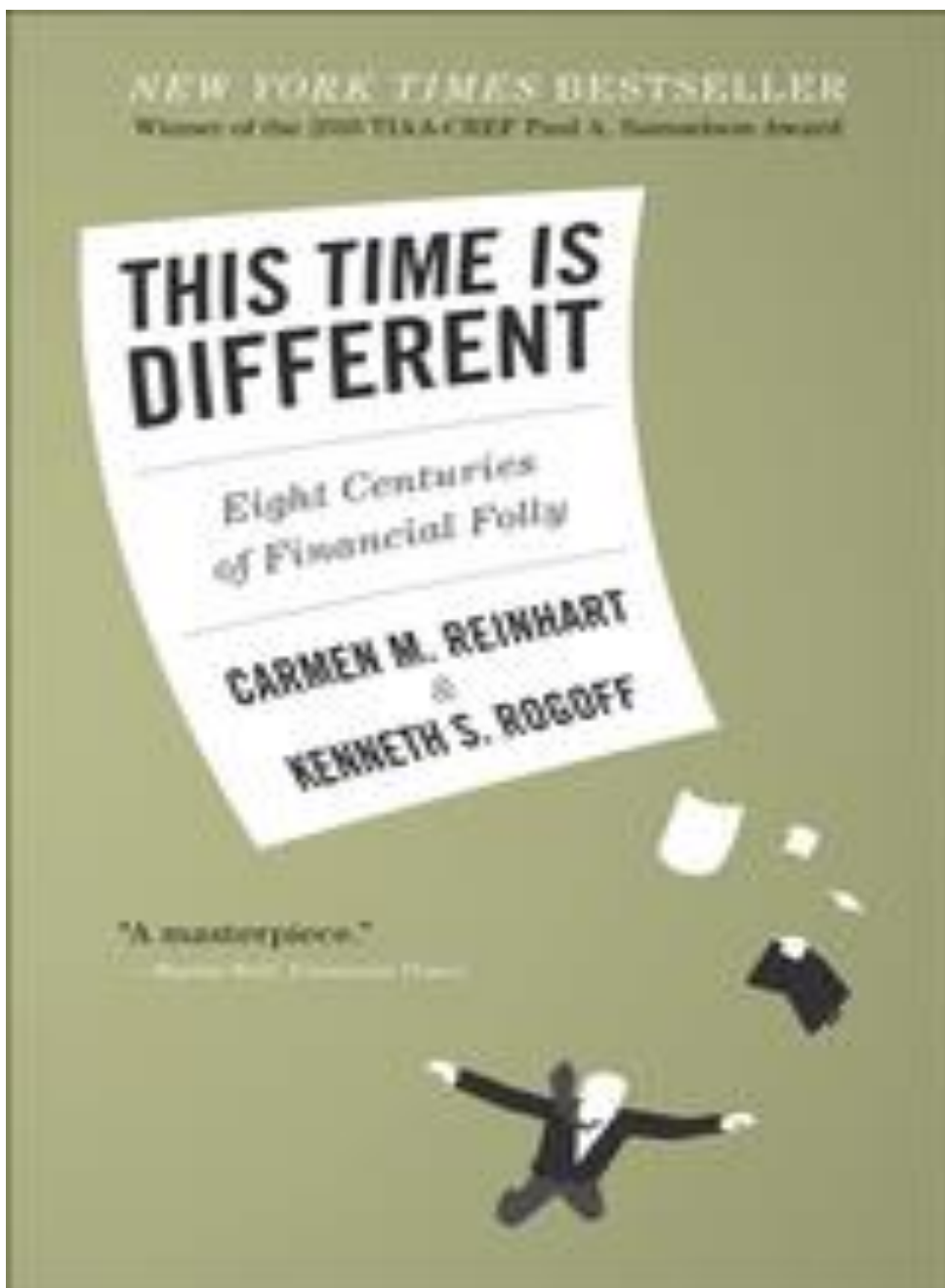
- Charles De Gaulle: the USD status as a reserve currency and the principal medium for global trade confers an exorbitant privilege to the USA.
 - In 1965 he sent the French military navy to repatriate the French gold from the USA.
- Roosevelt's abolition of the gold clause in 1933 and Nixon's suspension of the gold convertibility of the dollar in 1971 amounted to at least partial default.
- The USA have weaponized the USD: US authorities have extraterritorial jurisdiction on USD payments.
 - See also Robert Morgenthau's prosecution of BCCI and Bank Wegelin's closure in 2013.

Private money is an old idea...

- *For in every country of the world, I believe, the avarice and injustice of princes and sovereign states abusing the confidence of their subjects, have by degree diminished the real quality of the metal, which had been originally contained in their coins (Adam Smith, The Wealth of Nations, 1776) .*

F. Hayek, Denationalization of Money, 1976:

- *History is largely inflation engineered by government.*
- *Competition would provide better money than would governments.*
- *There is no answer in the available literature to the question why a government monopoly of the provision of money is universally regarded as indispensable.*
- *A single monopolistic government agency can neither possess the information which should govern the supply of money, nor would it,..., usually be in a position to act in that manner.*



Hard lessons from history disproving **common assumptions** in economics:

- Government debt is not risk-free:
 - Nearly all governments (including USA) have defaulted on their financial obligations in the past
 - Even domestic debt default occurs

Money: the future

- In the discussion, differentiate governance from technology.
- The denationalization of money would be a dramatic change:
 - Competition in money could cause confusion
 - Sovereigns will not give up **seignorage** without a fight. USD will not give up its exorbitant privilege without a fight.
- Money can be still be issued by the sovereign in crypto form:
 - If private citizens get access to central bank crypto-money, banks may be disintermediated

Existing Financial Market Infrastructure and trust

- Shift to an apolar world: → quid of existing financial order (US dollar as world reserve currency, Bretton woods institutions)?
 - Is the globalized financial world risking fragmentation?
- Unprecedented financial impact of unconventional monetary policy measures: → visible hand of central bankers replacing A. Smith's invisible hand? Impairment of price discovery?
 - When prices are formed by the sum of a sufficiently large number of independent random variables we have a **Gaussian distribution** (central limit theorem): → **benign risk conditions**
 - When few influencers make the market and/or we have price caps/floors we have **very fat tails**: → **extreme risk**
- Can Central Bank be such large market players, supervise markets and maintain trust?

Trust and information asymmetry

- Trust is the cornerstone of finance:
 - Is a permission-less world without a **trusted third party** or a supervised gatekeeper a utopian approach that flies in the face of human history? (Mensch, ECB)
 - Is the elusive promise of **decentralised trust** not so elusive after all?
- **Information asymmetry** is prevalent in finance. It should be mitigated by regulation and ethical codes.
 - Can DLT help?

Disingenuous use of compliance requirements

- Compliance requirements should be subject to:
 - The proportionality principle
 - A rigorous cost/benefits analysis

- Overly onerous compliance requirements (and the conflict-of-interest ridden effective outsourcing of law enforcement to private sector entities):
 - Protect incumbents by raising barriers to entry
 - Enable oligopolistic pricing
 - Cause financial exclusion (e.g. for small companies)

Conclusions

- DLTs carry the promise to make FMI much more effective and cheaper:
 - Substantial improvement in transaction processing.
 - Expansion in the universe of investible assets through tokenization, with large benefits for society.
 - But there are scalability, risk and governance issues.

- The future of money depends on:
 1. Trust (decentralized versus centralized trusted entities).
 2. Whether governments are willing to give up a key privilege they had since money was introduced.

- Geopolitical changes and unconventional monetary policy may erode trust in centralized entities.

Bibliography

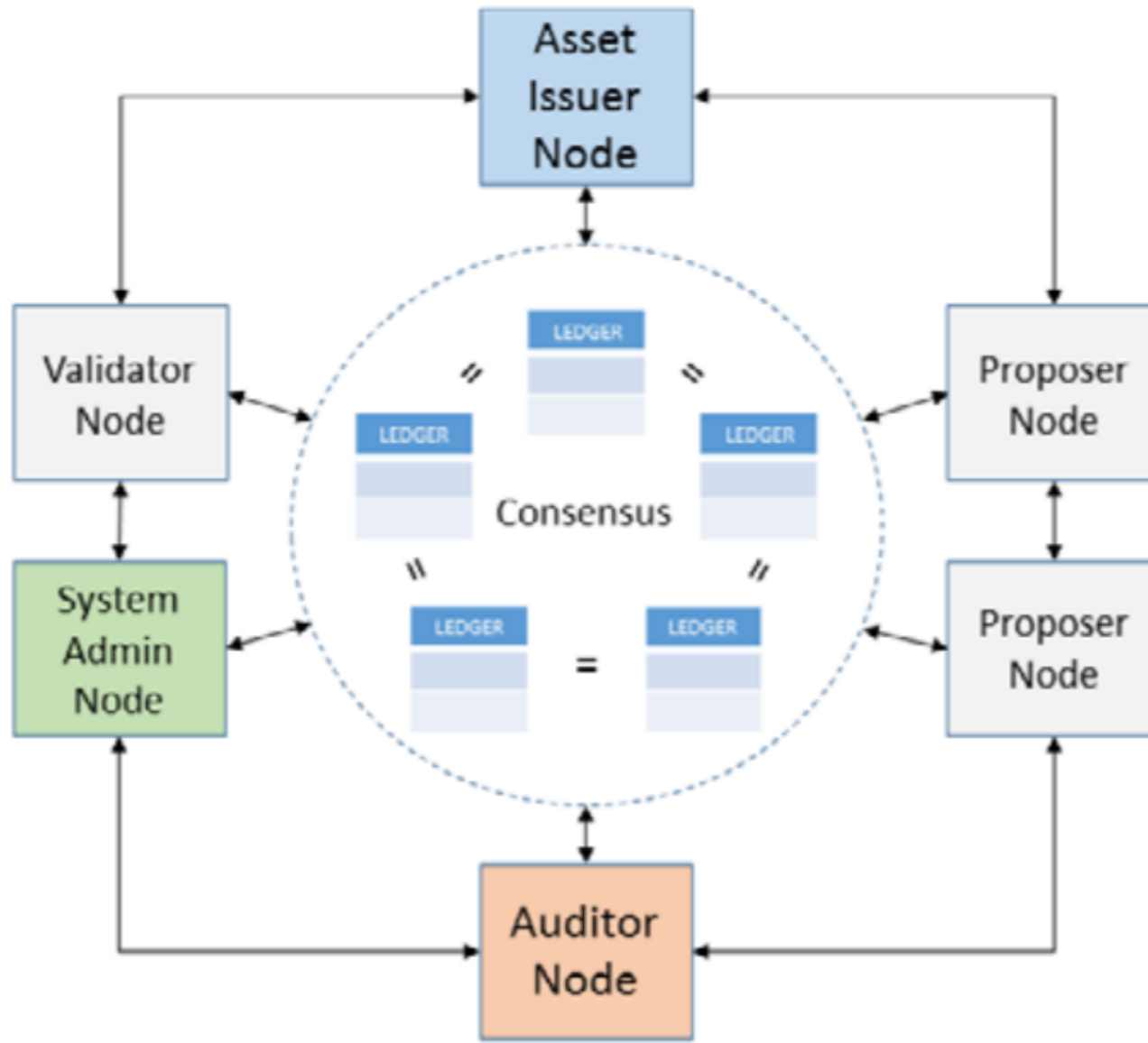
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Additional slides

Financial securities: pain point and opportunity

- It is very costly to make assets tradable across jurisdictions and make them into securities that can be added to investment portfolios.
- In that, capital markets are still quite inefficient.
- The true frontier for investment management is not finding new sources of **alpha**, but expanding the universe of investable assets (**beta**).
- H. Kohler, former President of Germany: “There could also be new ways to use the gigantic amount of capital in the savings-heavy ageing societies to redirect it to where it is really needed, in the real economies of the South.”

Ledger with nodes with different permissions



Possible node differentiation with permissions

- System administrator: controls access to the system and provides dispute resolution, standard-setting and regulatory reporting.
- Asset issuer: issue new assets.
- Proposer: propose updates to the ledger.
- Validator: confirm the validity of proposed state change.
- Auditor: view the ledger but not make updates.

Becoming T-shaped

KEY CONCEPT

T-Shaped People/Teams :

A combination of (1) deep knowledge in a single field or part of the ecosystem and wider knowledge in other fields or other parts of the ecosystem and (2) the competencies to connect them.



- Digital assets require knowledge of IT, finance and law
- Technical skills by themselves: a commodity?

The current monetary/payment system

- **Money:** a liability of either private banks or the central bank:
 - Electronic bank deposits (liability of private banks) are the means of payment between users.
 - Reserves of private banks held at the central bank (liabilities of the central bank) are the means of payment between private banks.
- If you trust the independence of the central bank, you can trust money.

The importance of economic history

It rejects the argument that purchasing power may be showered in a gentle rain of greenbacks from heaven, that collapse due to excessive debt may be remedied by incurring new and larger debt, that our foreign trade may be strengthened by deliberately weakening our currency.

- Capital markets have been shaped and their return impacted by geopolitical factors and regulation.
- Going forward, such factors are likely to increase in importance.
- History provides a far richer set of scenarios than the recent past.

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Securities

- **Security:** a negotiable financial asset. The exact definition is provided by applicable laws.
 - Fungibility: the asset is not different/can be exchanged with other assets of the same type.
- Two main types of securities:
 - Debt
 - Equity