

Digital-Age Finance:

Staying in Control as

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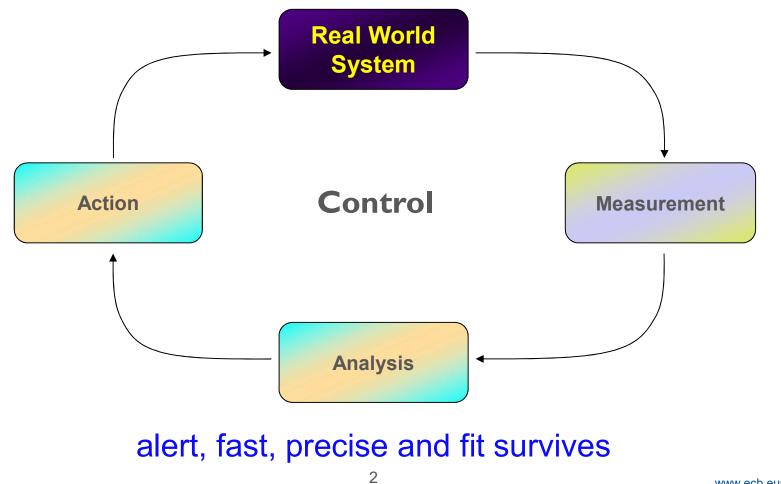
a Systemic View

Eurofiling Conference, Future Day

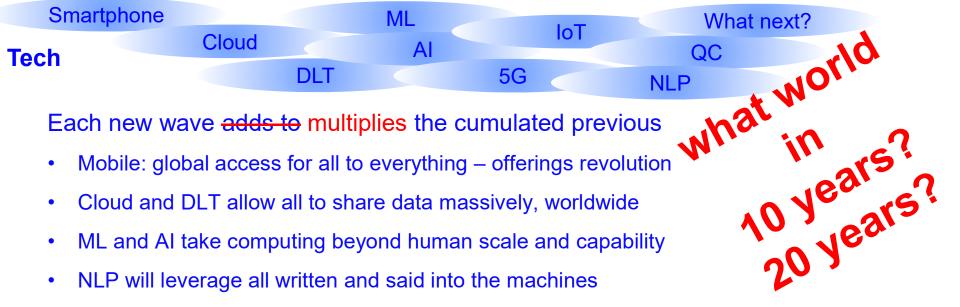
Frankfurt, 19 June 2019

The views expressed are those of the author and do not necessarily represent the views of the ECB or the ESCB.

Control, the flip-side of risk – (and the engineer's angle of choice)



Technology is changing our world – sounds trivial? Think again

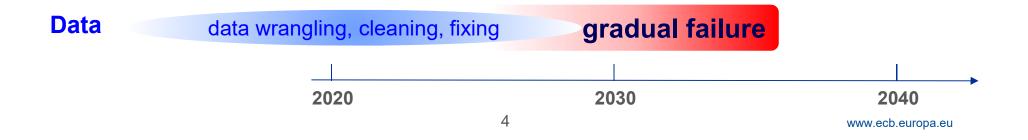


- 5G will connect everything faster; connected machines turn into a large single machine
- IoT will multiply data volumes
- Quantum Computing will take processing power even further





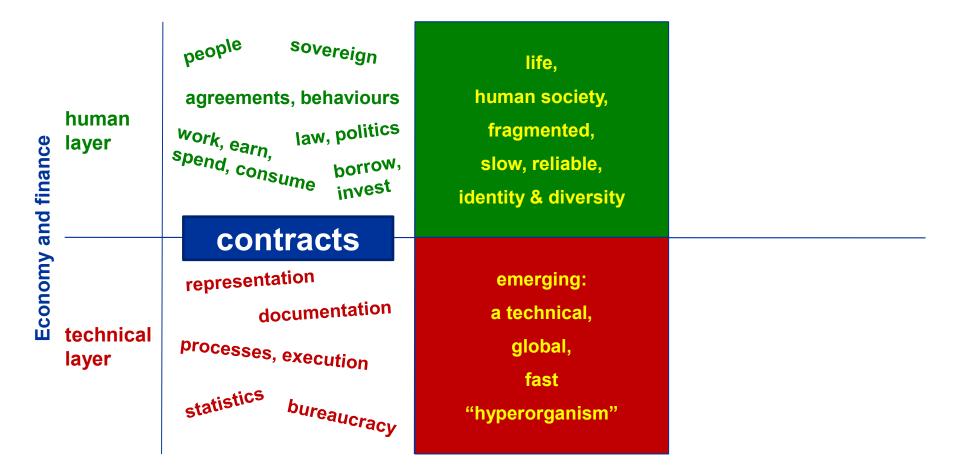
EMERGING: an underlying global tech-"hyper-organism", messy – a new source of risk driven by ongoing, exponential growth of data volumes, speed, complexity, reach



society, economy and technology

the challenge

After three decades of digital revolution: a new technical reality underneath?



people and technology

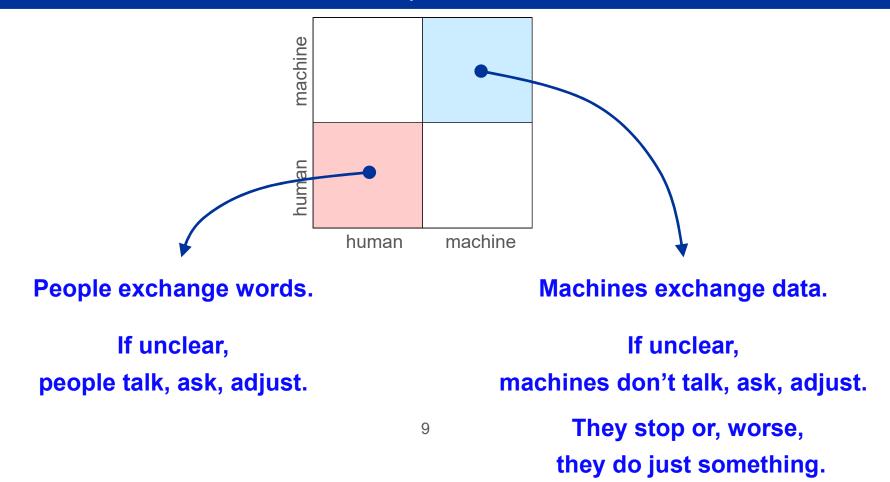
the challenge

We need artifical senses to "see" economy and finance – reporting as usual won't do much longer

the economy and finance are entirely immaterial systems

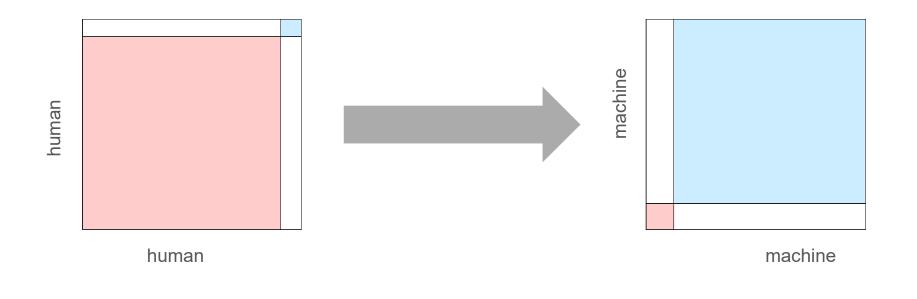
o out of reach of our natural senses – we must develop artificial senses o effective senses work at the speed and scale of the system o to build them, we might need to rethink the substance we measure o we need a vision, a theory of that substance to shape our concepts

Human-to-human, machine-to-machine: two very different conversations



Human-to-human, machine-to-machine: two very different conversations

Technology has shifted the human-machine interface



artificial senses for the economy and finance in the digital age

what specifications?

A look at military doctrine

US military doctrine, Directive 3000.09 from 2012:

• "human-in-the-loop": a human has the last call in a decision

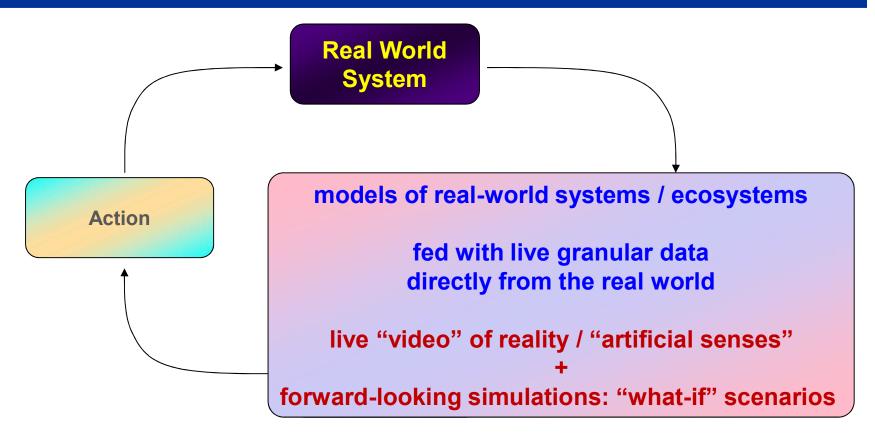
When human brain capacity is dwarfed by machines' speed, data volumes, AI:

• How do we keep the "human-in-the-loop"? And what if we cannot?

DARPA's "Mosaic Warfare" foresees complexity itself as a weapon: "An orchestrated multitude of systems overwhelm the enemy by creating a range of simultaneous dilemmas in multiple domains"

In finance we could face that same kind of situation (*e.g. if a large bank fails*) and we didn't need an enemy – we did it to ourselves

Control – when machines are endlessly bigger and faster than human brains



Measurement and Analysis: Specifications to address Digital-Age Challenges

- 1. measure at scale and speed of the system (global, real time)
- 2. analysis flexible and fast enough to address sudden surprises
 - 3. granular data serves system-level analysis (*)
 - 4. large scale granular data
 - 5. collected near time
 - 6. data directly from operational systems to analytical systems, for speed
 - 7. fully automated chain from reality through measurement to analysis
 - 8. standardise data globally (identifiers first)
 - 9. operational data standardised at sufficient depth, in all systems in markets

(*) everything in a single agent-based model

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10. all contracts represented in a single, universal algorithmic language





digital age

what is data? how will we master data?

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stone age

Just what IS "data" ???

Chinese 人人生而自由

همهٔ افراد بشر آزاد به Persian

Three fundamentally different approaches to language...

... and there are and were many more.

English All human beings are born free

data is language!

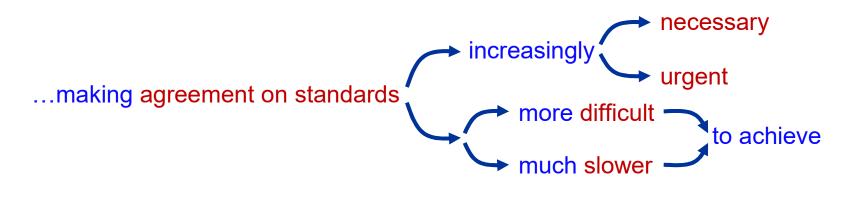
...as diverse as human language...

...but computers need it clear and homogeneous

Data has become an obstacle to the delivery of the technology promise



Technology increases social complexity by connecting more diverse people...



More IT can deliver value only if data quality improves

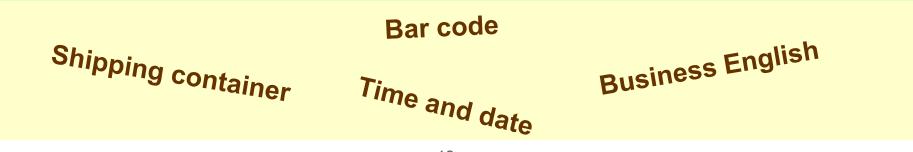
What strategy is possible?

The problem is deep, global, growing fast, potentially even to critical is beyond a single solution

A possible strategy: transformational power

- Feasible measures with immediate benefits to many across the system
- Designed to free potential for market forces to reconfigure the system

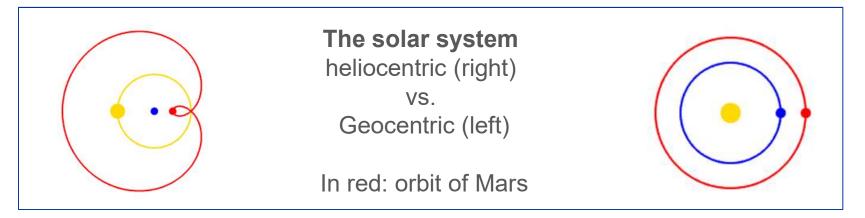
Standardisation is often at the heart of deep transformational processes.



vision

Vision: technical tool, not flight of fancy

- A way we choose to view the world
- A representation that structures our perception, shapes our joint action



- "All models are wrong; some models are useful" George E.P. Box, statistician
- "It is the theory that decides what we can observe" Albert Einstein
- *"Combining visions gives us more possibilities"* Hans Poser, philosopher

A vision of the technical substance of finance better suited to emerging digital reality

- Our vision of digital finance conditions the solutions we can conceive together
- The technical substance underlying finance keeps changing radically, fast:

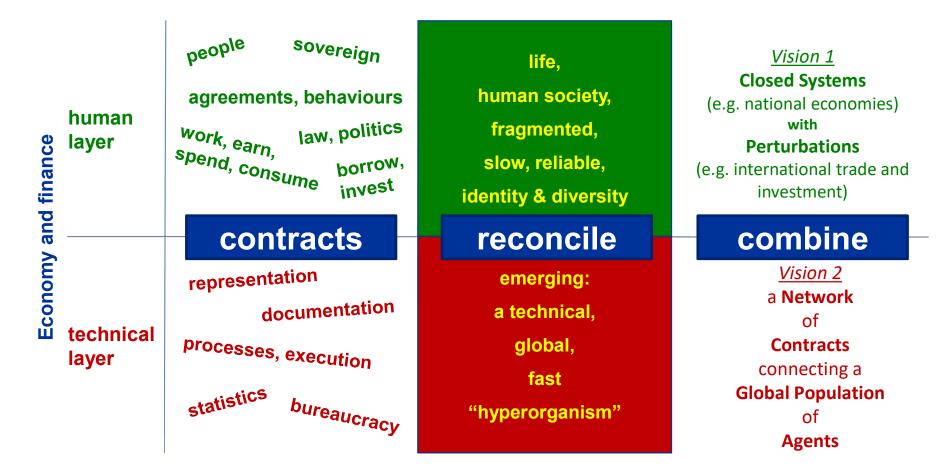
Global reach for all / Speed / Data volumes / complexity

• It helps to see the technical substance of digital-age finance as

a Network of Contracts connecting a Global Population of Agents

That vision was valid already in Roman times but not very important back then

After three decades of digital revolution: a new technical reality underneath?

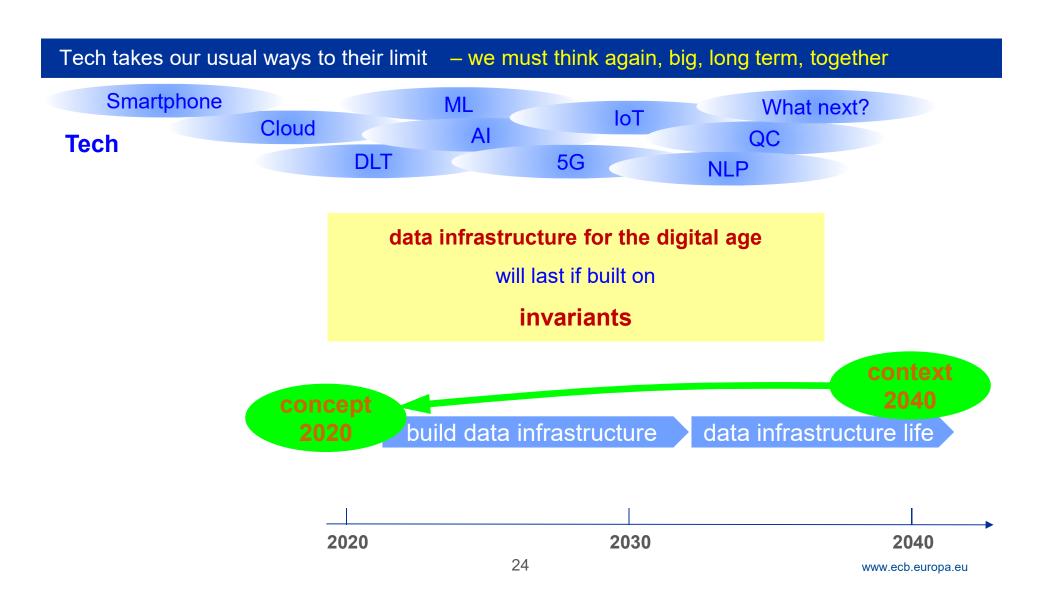


How does that vision reconcile with our world of today? How could it be useful?

a Network of Contracts connecting a Global Population of Agents

- Each contract, each party is anchored in one or more legal system
- The network is seamlessly global and very messy: the technical reality of markets
- Each node has a **contractual footprint** (1, 2 ... n legs remote)
- Is the node a <u>sovereign</u>, the footprint reflects national economy and foreign trade
- Is the node a <u>holding</u>, the footprint reflects the group structure and its business
- Exposures: ask how an event impacts a given node through chains of contracts

Statistics, simulations and analysis from a single graph (the network) serve many questions, near (real-) time. And they are consistent.



Possible path forward: standardise the digital representation of invariants we all agree upon

establishes social consensus, e.g. about a legal entity Law makes an immaterial object into a fact, for all, globally identification (a name, a number) A fact can be given and representation (a data sheet, paper, photo) makes a legal entity into a fact, for all, globally Law should also mandate a globally standardised, unique digital representation and identification of that legal entity

Possible path forward: standardise the digital representation of invariants we all agree upon (ctd.)

An operational solution could reflect a simple architecture:



Then, all processes use the same digital twin, interoperate more easily, globally

Global LEI System

and

Shared Data Infrastructure

A no-brainer: uniquely identify each legal entity

The solution is there:

Global Legal Entity Identifier System

The Global LEI System is operational – it needs further development towards:

- Global, universal coverage, by law: every legal entity in every country
- · Free for registrants and users
- Accurate in real time: users can trust the data represents official truth

The EU must not wait. We must mandate the LEI in the EU through

a new infrastructure law, e.g. an EU Directive

EU market authorities must lead the movement, in cooperation with the private sector

Smart Regulation: a long-term benefit from standardising identifiers and contracts?

