



Irving Fisher Committee on  
Central Bank Statistics

BANK FOR INTERNATIONAL SETTLEMENTS

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IFC – Bank Indonesia International Workshop and Seminar on *“Big Data for Central Bank Policies / Building Pathways for Policy Making with Big Data”*

Bali, Indonesia, 23-26 July 2018

## How do central banks use Big Data to craft policy?<sup>1</sup>

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<sup>1</sup> This presentation was prepared for the meeting. The views expressed are those of the authors and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

**Per Nymand-Andersen**  
Adviser, European Central Bank

# How do central banks use big data to craft policy?



**Bank Indonesia - IFC/BIS seminar “building pathways for policy making with big data”**

**July 26, 2018**

**Disclaimer:** The opinions expressed in this presentation are not necessarily those of the European Central Bank (ECB) or the European System of Central Banks (ESCB)

## 2018 *This Is What Happens In An Internet Minute*



Which preparations are needed today to have the capacity and functionality required in 3 years time?

- From experimenting to central banking tool kits?
- Linking current and past data
- Querying variety of formats
- Analytical techniques & tools
- Technical independent
- Skill sets

# Data mania versus phobia – a paradigm of borderless records

Digital transformation in finance and economics



E- trade



Settlement systems



Credit cards



Mobile transaction



Lending & financing



**Big data**



S-media



Price scans



- Fintech
- Virtual tokens
- DLT
- S-contracts

**Data lab**

**Systematic acquire, Structure, Process,**

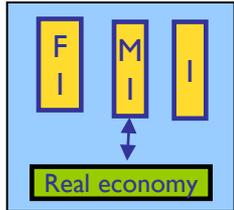
**Statistical algorithm and data explorations**

**Packaging data for Insights & business**

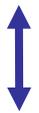
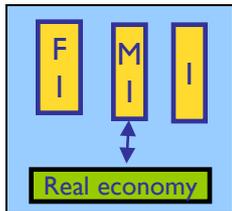
# Impact of digital transformation on Monetary Policy & Financial Stability

Other systems ↔ Financial system ↔ Real economy

## Financial systems



## Financial systems



## Other sources

Policy events,  
fiscal policies,  
Global economy  
External shocks  
Sector failures

Transmission of central banking policies,  
managing expectations, feed-back loops

## Regulatory and oversight framework

### Financial Intermediaries (FI)

Banks  
Insurance,  
pension  
hedge funds,  
Rating agents,  
others

### Markets and instruments (MI)

Securities,  
Derivatives  
and other  
products

### Financial infrastructures (I)

Pre-trading,  
Trading,  
post-trading  
Infrastructures  
Clearing,  
settlements

### Raw sources:

Pre-trading, trading and post trading activities, actors, instruments, platforms, volumes, prices, frequencies, maturities, regulators and overseers alike

### Derived indicators:

Yield curves, density, liquidity, price measures,  
Functioning of markets, instruments and post trading activities  
Risks measures and contagions indicators  
Imbalances and concentrations measures  
Effects on performance (Collective behaviour, Interconnections networks, transmission of instability measures)

CORPORATE  
SECTOR

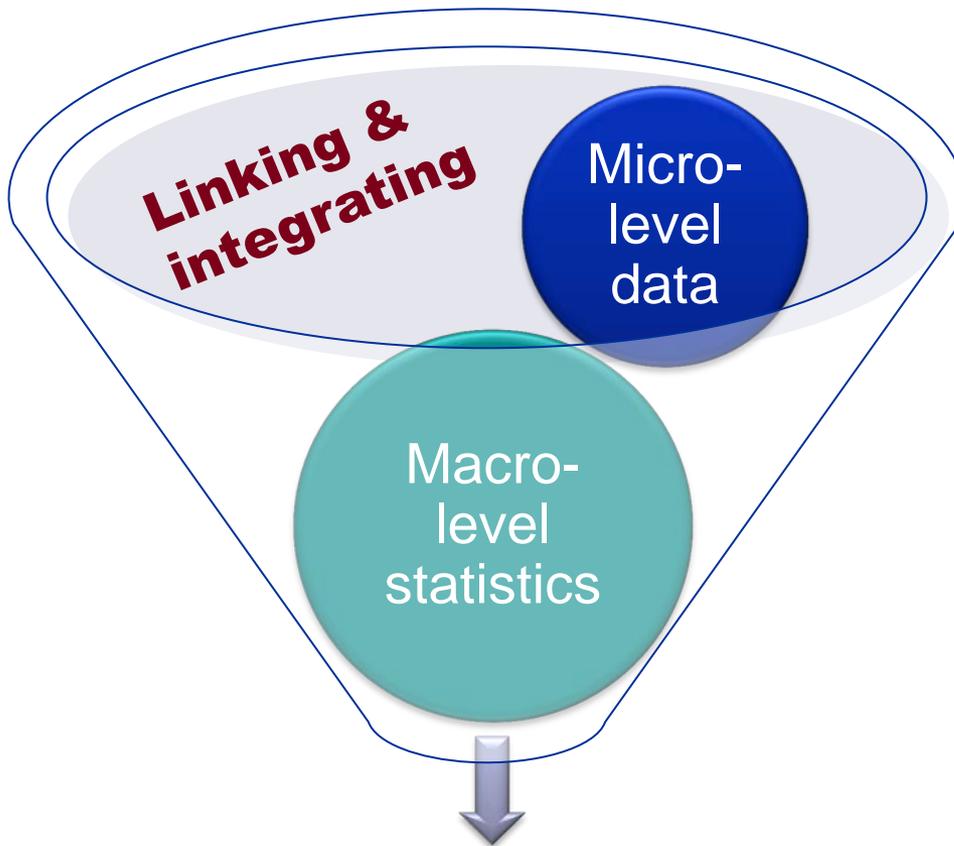
HOUSEHOLD  
SECTOR

GOVERNMENT  
SECTOR

FOREIGN  
SECTOR



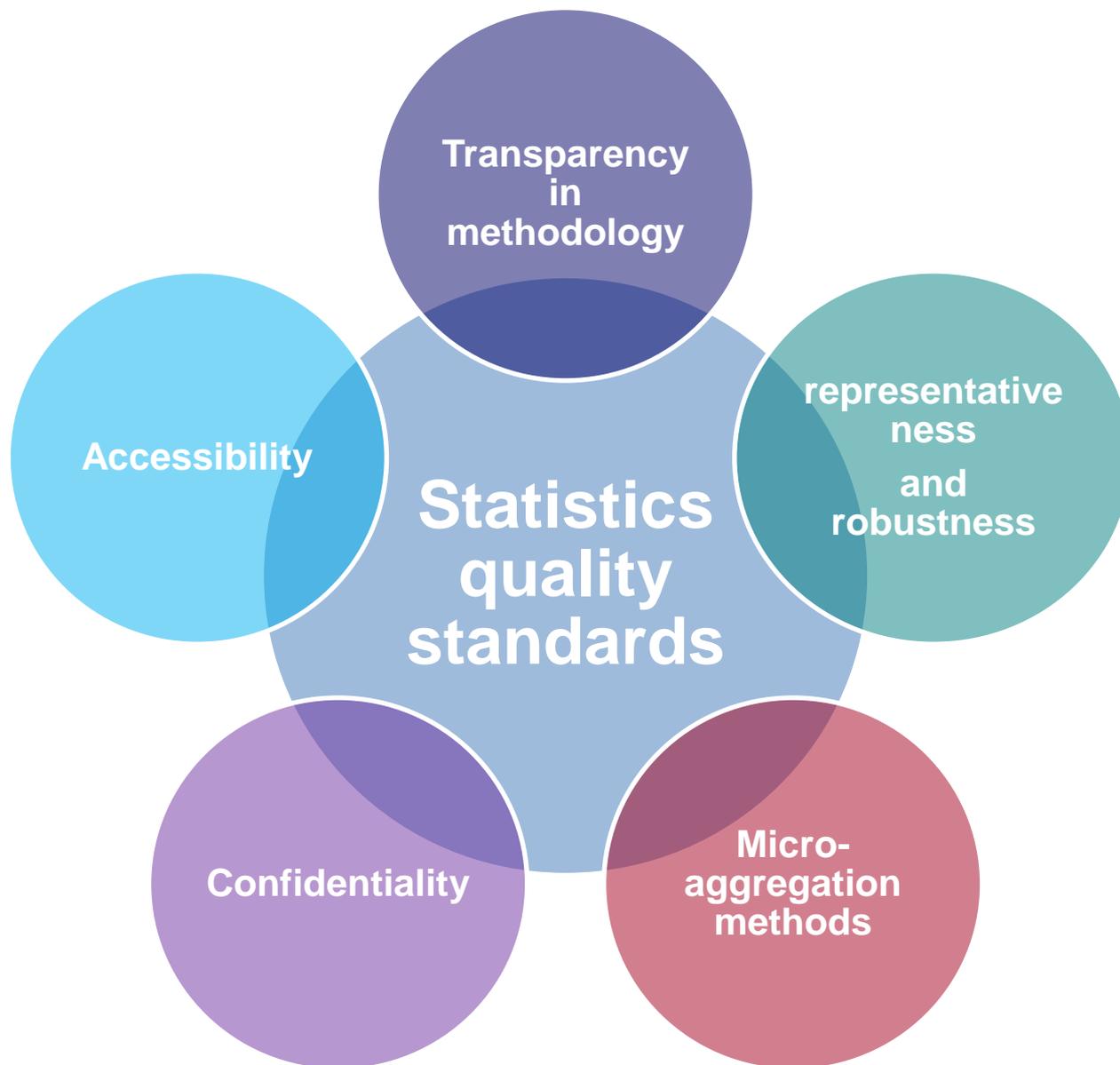
Central bankers are collecting structured and standardised “big data”



## New micro-level statistics

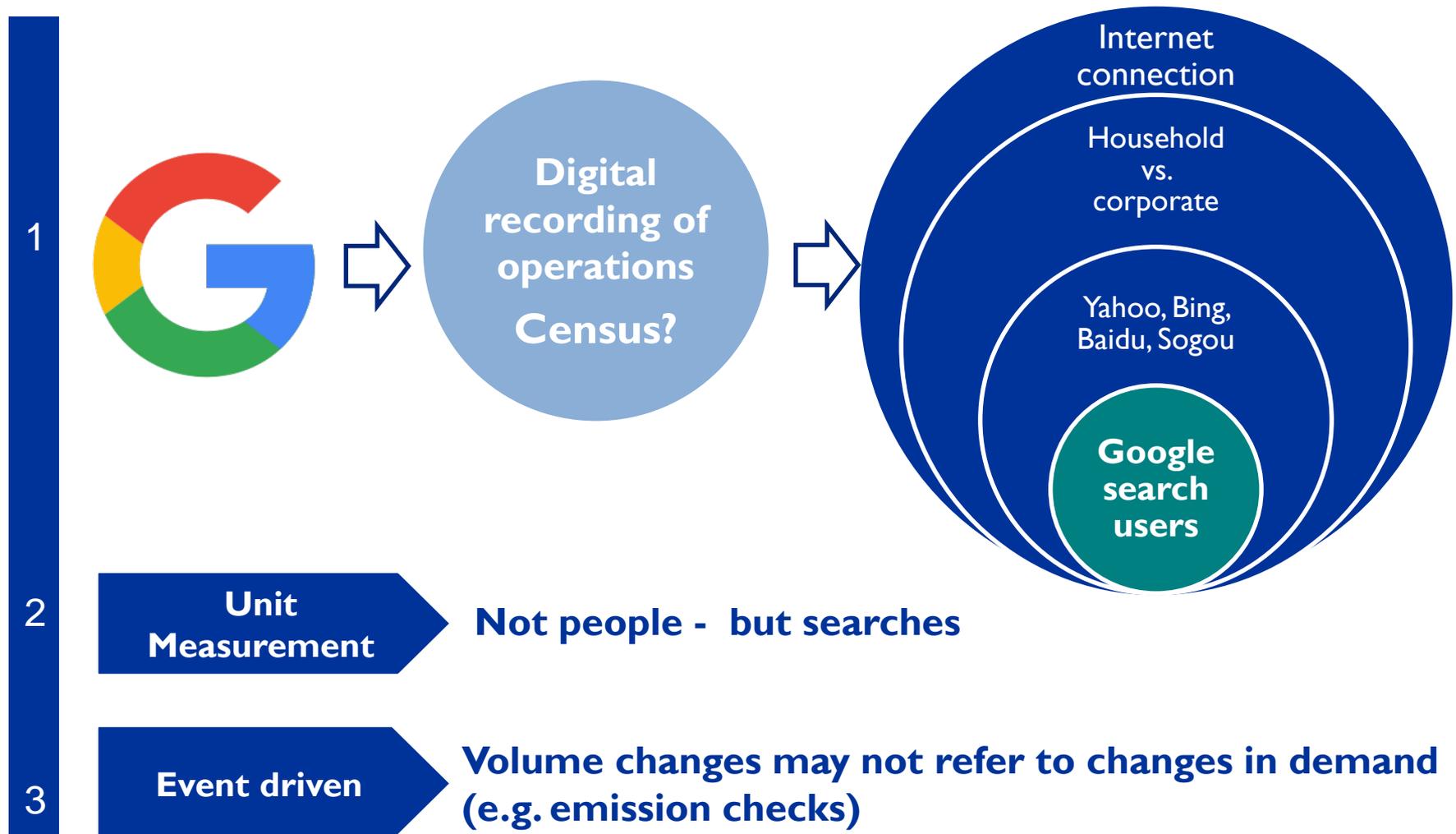
- Security-by-security statistics
- Holdings of individual securities
- Money market transactions
- Loans by loans transactions (Ana Credit)
- Register of Financial Institutions
- Individual bank supervisory data
- Financial markets price & volumes
- Digital records of operations
- Private data sources

New insights for crafting policies



# Big Data analytics – Quality assessment

One misperception of big data is that we **do not need** to worry about **sample bias and representativeness**, as large volumes of information supersede standard sampling theory, since big data provide census-type information



## *Three takeaways*

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Significant digital  
transformations in  
finance and  
economics  
experimenting for  
supplementary  
insights

Anticipate its impact  
and move from  
experimenting to  
central banking tool-  
kits

Collaborations -  
build effective  
partnerships for  
excellence

# Any question?



EUROPEAN CENTRAL BANK  
EUROSYSTEM

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*Fact-check your talk  
before you walk*



**WHAT ABOUT YOU WRITING?**

**Bank Indonesia / IFC-BIS international Seminar on big data,**

***“Building pathways for policy making with big data”*,**

**Session 3: Panel discussions “How do central banks use big data to craft policy?”**

**Per Nymand-Andersen<sup>1</sup>, Adviser, European Central Bank**

**26 July 2018**

- [Slide 1 – cover page]

Selamat Siang

Saya senang berada di Bali

Nama saya Per Nymand-Andersen

I would like to thank

- Bank Indonesia
- Irving Fisher Committee and its secretariat; and
- Mrs Yati Kurniati, Executive Director and Mr Erwin Rijanto, Deputy Governor of Bank Indonesia,

for the kind personal invitation to contribute to this exclusive seminar.

Now let's me start with Charles Darwin who published his “theory of evolution” within his book “**On the origin of species**” in 1859. In this book, he explains the process of natural selection, whereby successful species adapt to changing environments and those who fail to change and reproduce, die off.

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<sup>1</sup> Contact: Per.nymand@ecb.int

- [Slide 2 – One minute of internet]

Likewise, the wide spread application of innovations and inventions influence our lives; the way we operate and interact both as individuals, as market operators and regulators. The *ability to adapt* to changes seem to be fundamental for survival, being it species, cultures or established institutions, such as central banks operating, regulating, overseeing financial markets.

- [Slide 3 – Data mania vs phobia]

While digital transformation is a relatively new phenomena, it differs from past changes, at least in terms of the “speed to market” and the “short life cycles” of digital applications. For instance, in March 2018, there were 2.1 million apps available for downloading from the Apple store up from 800 apps 10 years ago (July 2008). Source: lifewire.com.

The speed of the digital transformation kicks-in following the mass production and widespread of technologies, such as

- **The internet** has changed the way people obtain and share information. Citizens spend more time online, perform more tasks and are more social activate – belonging to several niche communities, exchanging videos, playing games and are themselves digital creators and spreading digital footprints.
- **Smart devices** – the widespread use of tablets and smart phone devices enable citizens to be on-line, shop online and access information anywhere. These devices have facilitated the way people operate in real time staying connected 24-7.

- **Digital social communities**, affecting the way citizens socialize using digital media, how they engage and meet friends, dating and become members of multiple sub-cultures sharing common interests. Digital social media allow people to join and switch among social platforms and contribute collaboratively to social projects, such as, Wikipedia and/or benefits from “the shared economy”.

- [Slide 4 – impact of digital transformation]

The impact is widespread and has transformed economic behaviors, how financial markets interact, which then impacts central bank’s monetary policy, the transmission mechanism and Financial Stability. Just think of digital trading platforms, consumer online spending, crowdfunding, mobile payments and algorithm trading. The latter - the hunt of executing first - have been reduced to mille-seconds or even nano-seconds – contributing to efficiency gains, market transparencies and the pass-through of monetary policy to the real economy.

- [Slide 5 – reflections for central banking]

Given the impact of the widespread use of technology within our society, central banks naturally should continue to react prudently and in a similar forward-looking way as we have implemented policies. Central bankers do not need to be front-surfers on the digital wave – though needs to understand, analyse and assess the dynamics and impact of the digital transformation not only within the financial system but also in the real economy, including changes in consumer patterns, spending and saving behavior of households.

Big data may overcome some of the shortcomings of traditional Macro-economic data – by timely and richer details, allowing to test new theories and behavioral economics, hoarding effects and psychology.

It will eventually provide supplementary insights and early warning indicators as part of the central banking tool kits.

- [slide 6 - Moving to micro-level/granular data]

The recent financial crisis has given a boost to obtain more granular and timelier data supplementing the Macro-level statistics: Central bankers are becoming producers of big data. We have started collecting daily euro money market transactions which refer to approximately 10.000 daily unsecured money market transactions with the value of round EUR 100 billion/day and around 30.000 secured short term loans of the value of around EUR500 billion;

This will be shortly supplemented with individual bank loans to corporates (AnaCredit) with significant larger daily volumes of transactions. We are expecting approximately 70 million loan exposures per month granted to approximately 15 million counterparties.

These statistics will provide meaningful complement to existing official data – for instance to assess the impact of our Assets Purchasing Programme (APP) on market functioning and for calculating a new overnight unsecured interest rate for the euro area (ESTER). All structured and standardised data.

From private sources, we are experiencing with

- 1) The use of google search terms for nowcasting macro-economic indicators such as unemployment (lagging indicator) and car sales (leading indicator) providing evidence that the search terms may correlate and may reduce the forecasting errors;
  - 2) On-line price data and barcode scanner data can improve short term forecasts for checking robustness and reliability of current price indexes and factors determining prices and price dispersion.
  - 3) Electronic payment data from credit cards and ATMs has providing insights on forecasting private consumptions and so far as GDP growth;
  - 4) Textual exploration from financial news reports and central banking communications are used to gauge public sentiments
- [slide 7 – Statistics quality requirements]

Central banks are *significantly experienced* in handling large and structured datasets – which requires using machine learning techniques for instance for quality checking daily transactions and operations.

Though the quality challenges of micro-data remains very similar as for the regular provision of macro-economic statistics

The challenges remain the same for complying with the statistics quality requirements, as part of using a source for regular policy purpose, such as

transparency in methodology, micro-aggregation methods, preserving confidentiality while facilitating access.

- [slide 8 – Assessment of quality requirements]

Let me give you one example relating to representativeness. While one may have access to the full census of all available internet searches, it may not fully represent the household sector as not all households have access to the internet and corporates a likewise using search engines so statistical adjustments are required also for big data sources. Furthermore, for unit measurement, an internet search may not relate to a person, as one person can make several searches and may likewise be driven by events rather than increases in demands. Other challenges relate to that Fintech is borderless and challenges the concept of national territories and statistics.

- [slide 9 – three take away(s)]

Allow me though to conclude.

As central banker, we need to take a holistic view as part of ensuring trust in markets, statistics and systems and assess the viability of new digital transformation in finance economics.

1 - Technological progress and Digital transformation are integral drivers of economic and financial development and have a profound impact on financial markets. They are borderless and impacts the structure and functioning of our economies and societies.

Big data is part of this technological service evolution. New sources for explorations, new methods, new software and hardware combined with open sources technology

and cloud services enable central banks to experiment using big data sources for central banking purposes, without necessary spending large IT investments and maintenance costs.

We have started this path of experimenting with google search data, on-line price and scanning data, electronic payment data and textual from financial news.

2 - Progress lies in experimenting with these now digital outlets for laying the grounds for moving **from experimental to policy tool kit** – more efforts are required for applying standards, obtaining structured data and the inter-operability of datasets. It is of paramount importance to ensure that data remains of sufficient quality and reliability to systematically inform policy makers.

We need to explore and experiment with the new data and technologies as not to fall too far behind the curve and to *anticipate* its impact on central bank's monetary policy and its transmission throughout the economy, financial stability and for banking supervision.

3 – Collaborative efforts among central banks has been initiated by the Irving Fisher Committee, bringing central banks together in showcasing few pilot projects on the use of big data for central banking purposes. Collaborative efforts are needed to build effective partnerships for central banking excellence.

We are on a journey which will continue to drastically rework the financial ecosystem. Central banks need to monitor closely, assess - and now I will come back to the thinking of Charles Darwin – adapt - to the new market place.

Thank you very much for your attention.