How can big data support financial stability work?

Bruno TISSOT

Head of Statistics and Research Support, BIS

Head of Secretariat, Irving Fisher Committee on Central Bank Statistics (IFC)

2018 CIRET Conference - Workshop on Big Data for Economic Statistics: Challenges and Opportunities

Rio de Janeiro, 11 September 2018

Overview

❑Introduction

    ❑Big Data for Central Banks

    ❑Three Key Developments

    ❑Nature of Financial Big Data

    ❑Financial Stability Work with Big Data

❑Looking Forward

❑ Annexes: Selected References/ Projects
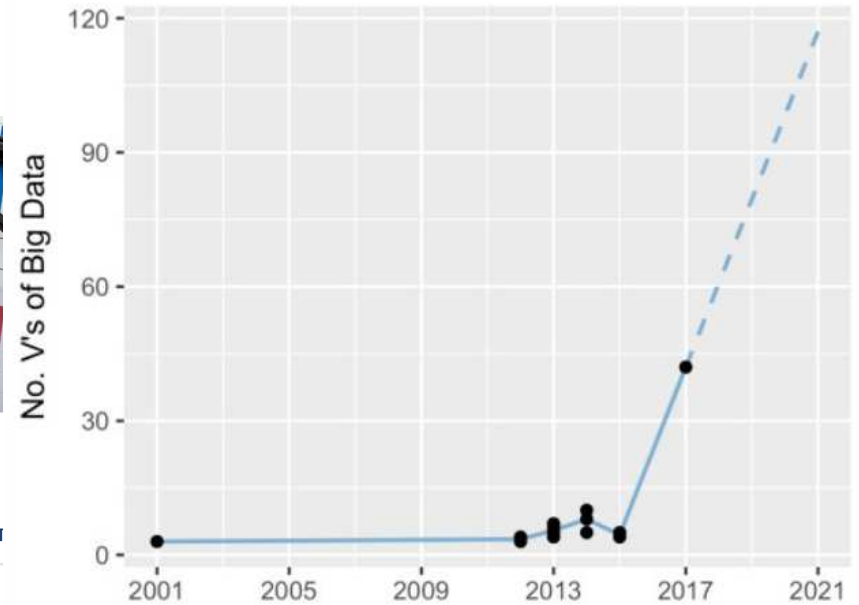
Introduction: Big Data / Big Noise?

The 10 Vs of Big Data

The 42 V's of Big Data and Data Science

Sources:
The Four V's of Big Data, IBM (2016): https://www.ibmbigdatahub.com/infographic/four-vs-big-data
The 10 Vs of Big Data, George Firican (2017): https://tdwi.org/articles/2017/02/08/10-vs-of-big-data.aspx
The 42 V's of Big Data and Data Science, Tom Shafer, Elder Research, Inc. (2017): https://www.kdnuggets.com/2017/04/42-vs-big-data-data-science.html

I – Big Data for Central Banks: increased interest…

- **Private sector** use

- New opportunities **also for Central Banks (CBs)?** – as well as macro-prudential authorities and financial supervisors?

- **Focus on information** supporting
  - ➤ Monetary policy eg economic forecasts & analysis
  - ➤ Financial stability eg macro/micro prudential, payment systems etc.
  - ➤ Other types of data – eg geospatial information – of lower interest

I – BD for Central Banks: … with significant opportunities…

- Big data provide **new "business opportunities"** for CBs, such as:
  - ➤ Qualitative statements to decipher communication
  - ➤ Large number of big data pools generated by financial regulations
  - ➤ In turn, big data can strengthen the monitoring capacity of public authorities

- **Feedback loop** inherent to policy-makers
  - ➤ Big data sources can affect policy
  - ➤ Policies implemented can generate new data-sets

I – BD for Central Banks: … and the need to be proactive

- **IFC survey** of central banks (2015, 2017)
  - ➤ Big data work still on an exploratory mode, yet increased interest

- Key objective for central banks is to **better understand**
  - ➤ The new data-sets and related methodologies
  - ➤ The value added in comparison with "traditional" statistics

- Focus on **pilot projects**

II – Nature of Financial Big Data: A broad approach…

- **Big Data:** by-product of commercial or social activities, providing a huge amount of very granular information

- **Coverage**:

1. **Unstructured data-set** (often quite large):

  ➢ The "**internet of things**", produced organically
  → *Strong interest, but not really the core*

2. **Large records**, relatively well-structured

  ➢ By-products of **3 types of activities**: financial, commercial & administrative
  →*"Simpler", but can benefit from big data techniques*

II – Nature of Financial Big Data: … 4 main types of datasets

Web-based indicators

Commercial data

BIG DATA

Financial market data

Administrative records
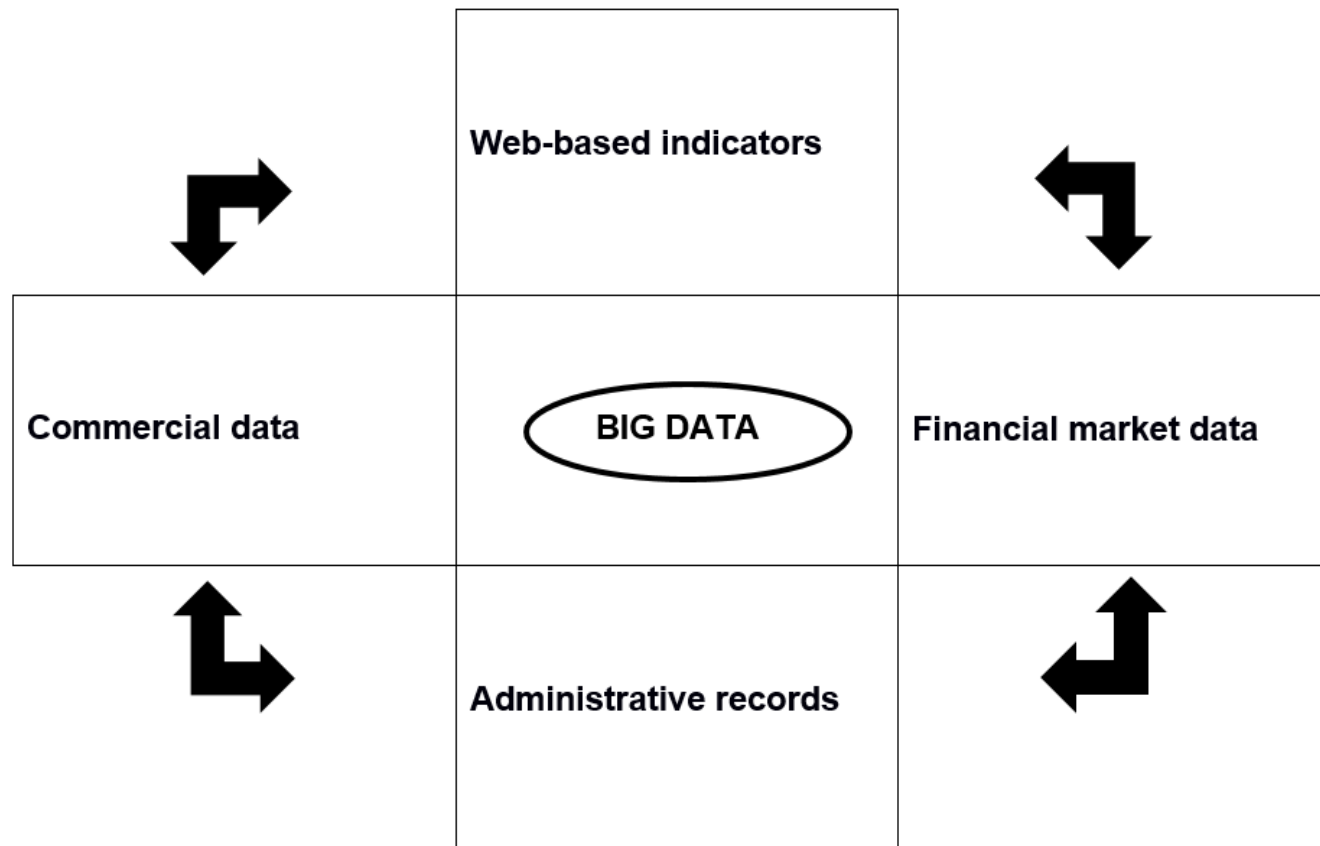
III – Three key developments

- Big Data as a result of the **combination of three key developments in the financial area**

  ➢ The **internet** of things

  ➢ **Digitalisation**

  ➢ Expansion of **micro financial data-sets** in the aftermath of the Great Financial Crisis (GFC) of 2007-09

III – 3 Developments: Internet of things (new data)

- Information generated by **web and electronic devices**

- **Complement "standard" statistical processes**

  ➢ More rapid information and improved timeliness

  ➢ New ways of analysing / estimating economic patterns

- Usage relatively **limited,** often targeted at methodological improvements (eg quality), reducing reporting lags & revisions

  ➢ Especially for economies with **less developed** statistics?

III – 3 Developments: Internet of things (new insights)

- **Estimates in advance** of actual publication dates (nowcasting)

- **Unsuspected data patterns**
  - ➢ BD algorithms to capture various effects without ex ante assumptions

- **Qualitative information**
  - ➢ Sentiment indicators
  - ➢ Important but difficult factors to model (non-linearities, network effects)

III – 3 Developments: Digitalisation (new data)

- **Expanded access** to digitalised information

  ➢ Rise in textual information moving to the web

  ➢ Not just produced by internet activities strictly speaking

  ➢ Reference documents can be digitalised, accessed and analysed like "web-based" indicators

III – 3 Developments: Digitalisation (new insights)

- Text can be more easily and automatically **exploited through ad hoc BD techniques:** eg text semantic analysis

- Measuring economic agents' **sentiment & expectations**

- Assessing **policy**
  - ➤ Perceived stance of policy
  - ➤ Impact of policy communication / action

III – 3 Developments: Revolution in financial statistics (new data)

- **Impact of the GFC**
  - ➤ *"To see the forest as well as the trees within it"* (Borio, 2013)
  - ➤ Distribution matters: "*fat tails*"

- Unprecedented **efforts to use more micro** information
  - ➤ High demand for large, granular data-sets
  - ➤ Well structured, often more complex compared to "typical" internet data
  - ➤ Often derived from confidential registers
  - ➤ Example: **loan-by-loan / security-by-security** datasets

III – 3 Developments: New financial statistics (new insights)

- **Richer view** of the population of interest

  ➢ Data collected regularly, over a long period of time

  ➢ Need for anonymization / confidentiality protection

  ➢ Information often already available but not exploited (administrative data)

- **CBs learning from private sector**

  ➢ Increased experience in dealing with large data-sets (eg "stress tests")

  ➢ Supervisors of financial firms to develop their expertise in these areas too

IV – Financial stability work with big data: variety...

- In practice **various & heterogeneous "big data"**

  ➤ Usually **not designed** for a direct statistical purpose

  ➤ **Indirectly**, data exploited for addressing statistical needs

- Public authorities at the beginning of **making sense** of these data

  ➤ Use of specific sources depends on policy questions

  ➤ Eg payment systems : of interest to supervisors and tourism analysis

  ➤ "**Smart data**": treatment of the raw, "organic" data is key

IV – Financial stability work: … complexity…

- **Micro-level BD universe** is complex and evolves over time
  - ➤ Interaction between data available, specific needs and policy actions

- **Transforming data into information that is relevant for policy**

→*"Connecting the dots is as important as collecting the dots, meaning the right data"* (Caruana, 2017)

IV – Financial stability work: … and challenges…

- Specific **challenges** reflecting central banks' nature
  - ➤ **Public status** of financial authorities and public trust
  - ➤ Central banks concerned about **ethical & reputational** consequences
  - ➤ Risk of **misusing** big data for policy actions?

- **Security concerns linked** to internet / big data, such as:
  - ➤ Risk that large private records of individual information could be accessed and potentially misused by unauthorized third-parties
  - ➤ Peculiar position of central banks if private information is reported to them but not protected adequately
  - ➤ Resilience of financial market infrastructures

IV – Financial stability work: ... esp. in <u>handling</u> big data...

- **Resources** (IT, staff) and proper arrangements for managing BD

- The statistical **production process** itself has to be adapted
  - ➤ Need to set up a clear and comprehensive information management process

- **Reputation risk when handling** big data

IV – Financial stability work: ... and <u>using</u> big data

- Does "big data" provide a more **accurate economic** picture?
  - ➢ Coverage bias unknown, can be significant (eg social media users)
    - →*Extremely **large big data samples may compare unfavourably** with (smaller) traditional probabilistic samples*

- **Reputation risk** when using big data
  - ➢ Concerns about lack of transparency, poor quality of some sources
  - → *Social costs of misguided policy decisions*

- Can big data **alter decision-making**?
  - ➢ Bias towards responding to news, encouraging shorter horizons?
  - ➢ Risk of fine-tuning policy communication based on expectations?
  - ➢ How to communicate the results of "black boxes"?

V – Looking forward: CBs to be alert…

- Information needs evolve over times:

  - ➤ The **financial system changes**… not least due to policy actions

  - ➤ Assessment of how **fragilities are building up** typically rely on **aggregated** statistics to spot "abnormal patterns"

  - ➤ In contrast, **resolution work** in the aftermath of a financial crisis will request much more timely and **granular** information

→*"Generally, rough aggregates suffice to indicate that imbalances are building. Once a crisis breaks out, however, more granular data are needed for taking decisions* (Carstens, 2018).

V – Looking forward: ... focus on information strategy...

- ***Decisions on data*** have become of strategic importance for central banks

- **Big Data reinforces the need** to:
  - ➢ Balance costs and resources implications
  - ➢ Consider the various financial, legal and reputational risks

- Proper **information governance frameworks** needed to adequately manage BD-sets collected / used by central banks

V – Looking forward: ... and evolving business models

- What is still unknown is whether and how far Big Data will trigger **a change in CBs' "business models"**

  ➤ CBs are relatively new in exploiting big data, in contrast to the greater experience gained by NSOs

  ➤ CBs have traditionally been **data users rather than data producers**, though the situation has clearly changed since the GFC

  ➤ CBs are thus in a **key position** to ensure that BD can be transformed in useful information supporting policy

Annex (1): Selected references

Bean, C. (2016). *Independent review of UK economic statistics*, March.

Borio, C. (2013). *The Great Financial Crisis: setting priorities for new statistics*, Journal of Banking Regulation.

Carstens, A. (2018): Are post-crisis statistical initiatives completed? Taking stock, speech at the 9th Biennial Irving Fisher Committee Conference Basel, 30 August 2018Caruana, J. (2017). *International financial crises: new understandings, new data*, Speech at the National Bank of Belgium, Brussels, February.

Cœuré, B. (2017). *Policy analysis with big data*, speech at the conference on "Economic and Financial Regulation in the Era of Big Data", Banque de France, Paris, November.

Financial Stability Board (FSB) (2017). *Financial Stability Implications from FinTech*.

Haldane, A. G. (2018). *Will Big Data Keep Its Promise?* Speech at the Bank of England Data Analytics for Finance and Macro Research Centre, King's Business School, 19 April.

Hammer, C., Kostroch, D., Quiros, G., & Staff of the IMF Statistics Department (STA) Internal Group (2017). *Big data: potential, challenges, and statistical implications*, *IMF Staff Discussion Note*, Staff Discussion Notes (SDN)/17/06, September.

Hill, S. (2018). *The Big Data Revolution in Economic Statistics: Waiting for Godot… and Government Funding*, Goldman Sachs US Economics Analyst, 6 May.

Irving Fisher Committee on Central Bank Statistics (IFC) (2015). *Central banks' use of and interest in 'big data'*, October.

Irving Fisher Committee on Central Bank Statistics (IFC) (2017). *Proceedings of the IFC Satellite Seminar on "Big Data" at the ISI Regional Statistics Conference 2017*, IFC Bulletin, no 44, September.

Meng, X. (2014). *A trio of inference problems that could win you a Nobel Prize in statistics (if you help fund it)*, in Lin, X., Genest, C., Banks, D., Molenberghs, G., Scott D., & Wang, J.-L. (eds), *Past, present, and future of statistical science*, Chapman and Hall, 2014, pp 537–62.

Nymand-Andersen, P. (2015). *Big data – the hunt for timely insights and decision certainty: Central banking reflections on the use of big data for policy purposes*, IFC Working Paper, no 14.

Annex (2): Selected BD projects by central banks

Big data areas	Types of data-sets	Examples of projects
Administrative records	Foreign trade operations / investment transactions	Balance of payments statistics eg tourism, exports
	Taxation / payroll / unemployment insurance	Employment, wages, business formation (SMEs)
	Central balance sheet offices	Performance vulnerabilities assessment
	Loans registers	Measurement of credit risk, FX exposures
	Financial market supervisors	Network analysis, exposures
	Public financial statements	Corporate balance sheet, group-level supervision
	Financial market activity indicators	Payments systems, Trade repositories
Web-based indicators	Internet clicks	Google searches
	social networks	confidence & economic sentiment
	Digitalised content / text	policy communication , analysis of expectations
	Websites' scraping	Various uses
	Job portals	Employment / activity
	Prices posted directly on websites	Measure specific components of the CPI, PPIs, Inflation nowcasting / forecasting, Pricing strategy analysis
	Real estate agencies	House price indices
Commercial data-sets	Credit card operations	Payments patterns, Tourism
	Mobile operators	Mobile positioning data (eg travelers'), Financial inclusion
	Geo spatial information	National statistical system Tasks
Financial data-sets	Credit institutions	Balance sheet exposures, Investor behaviour/expectations
	Settlement operations	Operational risks, Market functioning
	Securities issuance	Security-by-security databases
	Market liquidity	Bid/ask spreads
	Custodians records	Securities holding statistics
	Tick-by-tick data	Real-time analysis of financial patterns

Thank you!!

Questions?

bruno.tissot@bis.org

IFC.secretariat@bis.org