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8th EBA Policy Research workshop, “The future of stress tests in the banking sector – approaches, governance and methodologies”, Paris, 27-28 November 2019.

Anastasios Petropoulos, Vasilis Siakoulis, Nikolaos Vlachogiannakis, Evaggelos Stavroulakis, "Deep-Stress: A deep learning approach for dynamic balance sheet stress testing"

Discussion by Kim Abildgren

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Views and conclusions expressed in the presentation are those of the presenter and do not necessarily represent those of Danmarks Nationalbank.

Brief recap of the paper

- **Background**:
  - Recent financial crises revealed a need for improved stress tests.
- **General research question**:
  - Can big data and machine learning techniques add value in stress testing frameworks?
- **Approach**:
  - Simulating dynamic balance sheets for US banks using deep learning algorithms based on public bank-level data 2008-2015.
- **Key findings**:
  - Significantly lower prediction error of the Capital Adequacy Ratio under the deep learning approach compared to other stress testing approaches.

Overall assessment

- Addresses a topic of **high relevance** for the main topic of the workshop.
  - Should be of great interest for regulators, central banks and other actors involved in stress testing of the banking system.
- The paper is **well written** and presents the results of a **well-conducted** empirical study.
- The paper **adds to the literature** by illustrating how big data and machine learning techniques might be used in relation to stress tests.

Comments - 1

- **"Observations regarding failed banks are excluded from the analysis since stress testing is performed on healthy financial entities."** (page 6)
  - Might seem somewhat surpricing to many readers.
  - Contagion channels (interbank exposures vis-a-vis failed banks and fire sales of assets by failing banks) can be important during financial stress.
  - Furthermore, non-linearities might have been most important for the failed banks.
  - **Why is the information contained in observations for failed banks not of importance for estimating a good model?** Please elaborate for the benefit of the reader.

Comments - 2

- **The out-of-sample period 2014-2015 is located after the financial crisis** (cf. page 13).
- It would - as acknowledged by the authors in the concluding section - strengthen the paper if it was explored how well the deep learning approach performs relative to other approaches if it was fitted on pre-crisis data and used to forecast Capital Adequacy Ratios in 2008-2009.
- If the necessary data are not available for the US, it could be an interesting exercise to do the experiment on data from other countries.

Comments - 3

- **Why is the Deep Learning approach superior to the other approached studied?**
  - Better estimation technique (for instance better at taking non-linearities into account)?
  - Utilise more data (more variables)?

- **How important is dynamic balance sheet modelling comparred to constant balance sheets for a given estimation method?** Can we quantify this issues?

Summing up

- **Great paper**!
- **Innovative use** of data and machine learning techniques.
- **Very timely**: Address the opportunities of using big datasets within the areas af stress tests to assess the resilience of the banking system.
- I look forward to the **future research** mentioned in the conclusion involving pre-crisis data and evaluation of the ability of the deep leaning approach to predict bank failures during the crisis.