

## Synthetic microdata and central bank data disclosure in Paraguay

### Abstract

Transparency is a key element of public trust and stability for financial regulators. While the amount of information collected and stored has increased, access to banking microdata is, for good reasons, constrained by banking secrecy and privacy laws, which limits the ability of researchers to externally validate and study such datasets.

Existing frameworks are, as a result, usually limited to data queries executed by the regulator or dedicated on-site labs with application processes, which are not always feasible for institutions in emerging markets. To overcome these limitations, and as the to our knowledge first application in this domain, we adapt and compare recent developments in machine learning models featuring built-in privacy guarantees to generate synthetic data reflective of the microdata available to the Central Bank of Paraguay.

Three different use cases are explored and evaluated; financial inclusion indices, term deposit yield curves, and credit card transition matrices, with the latter in particular having been introduced as a core tenet of the G20 Summit's global development agenda in 2010. The introduction of simplified accounts in Paraguay in 2013, for example, is reflected in our results for the creation of a financial usage index, with a high level of savings operations, while the generated data also shows the maintained difficulty to access loan products.

We find that marginal-based inference models tend to be more robust than generative adversarial approaches in terms of data representativeness, discuss the importance of strict privacy considerations, numerical versus categorical generative modelling, and pre-processing and post-processing strategies, and demonstrate the potential of synthetic data as a tool to enhance current statistical disclosure.

### Authors & Affiliations

Hugo Caceres<sup>1</sup>, Ben Moews<sup>2</sup>

<sup>1</sup>Central Bank of Paraguay, Asuncion, Paraguay. <sup>2</sup>University of Edinburgh, Edinburgh, United Kingdom