BANCA D'ITALIA
EUROSISTEMA

BLACK-IT DEMO: CALIBRATING MULTI-AGENT SYSTEMS TO MIMIC FINST REALITIES *

Presented by: Antonio **Muci**

Other contributors: M. **Benedetti**, S. **Corbo**, F. **De Sclavis**, M. **Favorito**, A. **Gentili**, A. **Glielmo**, D. **Magnanimi**

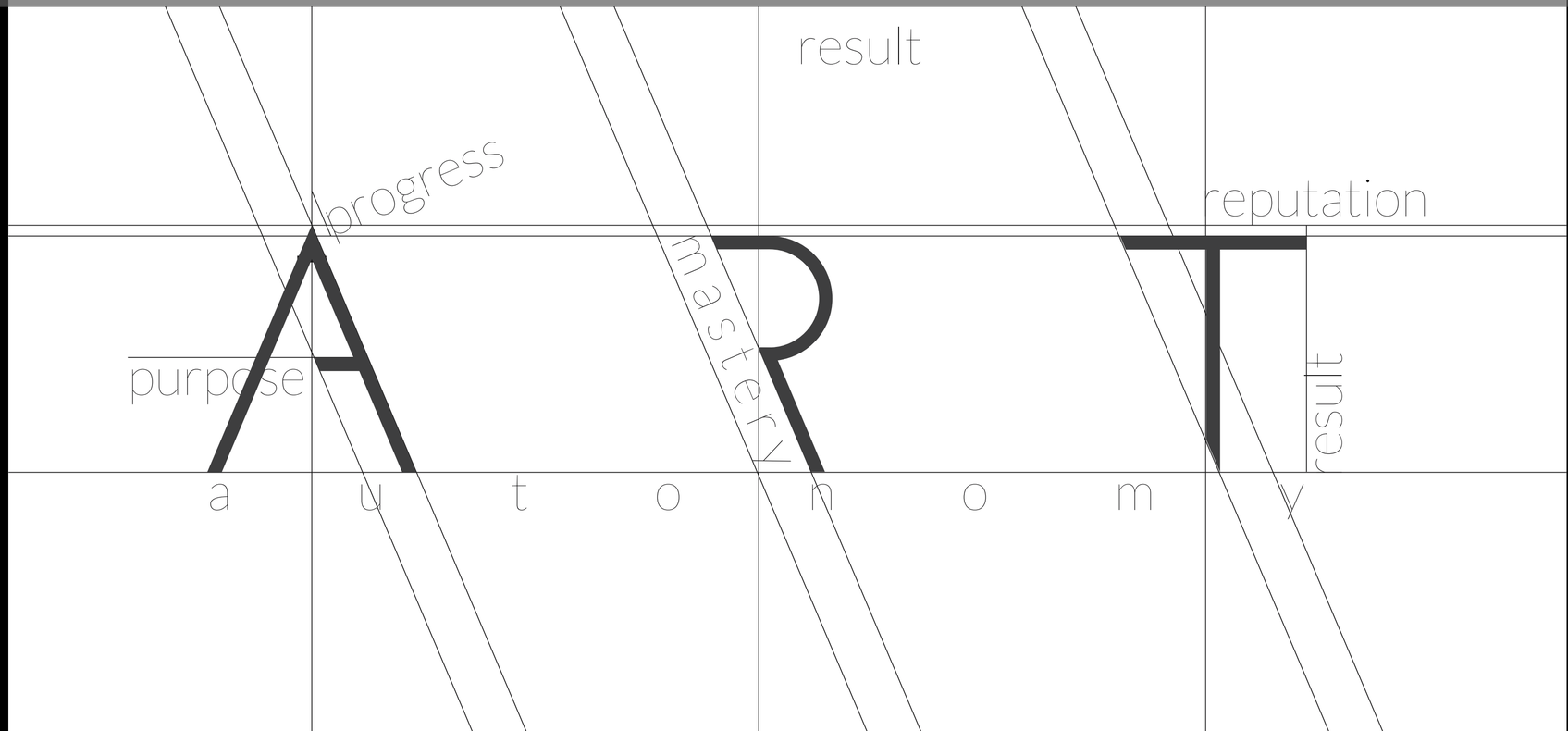
Author of the original calibrator: G. **Catapano**

Applied Research Team (ART)

aka "Divisione Ricerca sulle Tecnologie Avanzate - DRTA" (**Bank of Italy**)

AAAI Bridge FINST

February 8, 2023



*All views and opinions are those of the speaker(s) and do not necessarily reflect the position of Bank of Italy

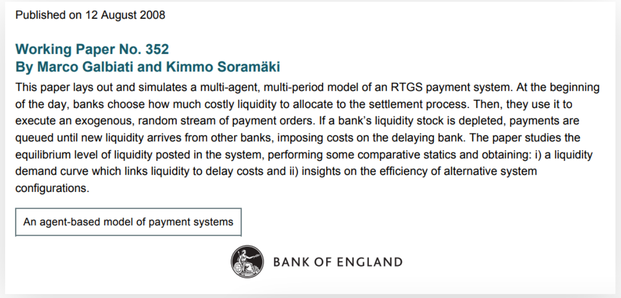
AMBS AND CENTRAL BANKS

ABMs and **central banks** | ABM **calibration** | Key **features** | Extensive **documentation**

High modelling **flexibility**
- heterogeneity
- bounded rationality

Intrinsically **non-equilibrium**

Complementary to DSGE modelling


Published on 12 August 2008

Working Paper No. 352
By Marco Galbiati and Kimmo Soramäki

This paper lays out and simulates a multi-agent, multi-period model of an RTGS payment system. At the beginning of the day, banks choose how much costly liquidity to allocate to the settlement process. Then, they use it to execute an exogenous, random stream of payment orders. If a bank's liquidity stock is depleted, payments are queued until new liquidity arrives from other banks, imposing costs on the delaying bank. The paper studies the equilibrium level of liquidity posted in the system, performing some comparative statics and obtaining: i) a liquidity demand curve which links liquidity to delay costs and ii) insights on the efficiency of alternative system configurations.

An agent-based model of payment systems

BANK OF ENGLAND

2008


No. 686 - Exploring agent-based methods for the analysis of payment systems: A crisis model for StarLogo TNG

Temi di Discussione

(Working Papers)

by Luca Arciero, Claudia Biancotti, Leandro D'Aurizio, Claudio Impenna
August 2008

Share

2008

Payment systems


BANK OF ENGLAND

Staff Working Paper No. 619

Macroprudential policy in an agent-based model of the UK housing market

Rafa Baptista, J Doyne Farmer, Marc Hinterschweiger, Katie Low, Daniel Tang and Arzu Uluc

October 2016

2016


No. 1338 - Macroprudential policy analysis via an agent-based model of the real estate sector

Temi di Discussione

(Working Papers)

by Gennaro Catapano, Francesco Franceschi, Michele Loberto and Valentina Michelangeli
June 2021

Share

2021

Housing market


CANVAS: A Canadian Behavioral Agent-Based Model

by Cars Hommes,[1] Mario He,[2] Sebastian Poledna,[3] Melissa Siqueira[4] and Yang Zhang[2]

INTERNATIONAL MONETARY FUND

To Demand or Not to Demand: On Quantifying the Future Appetite for CBDC

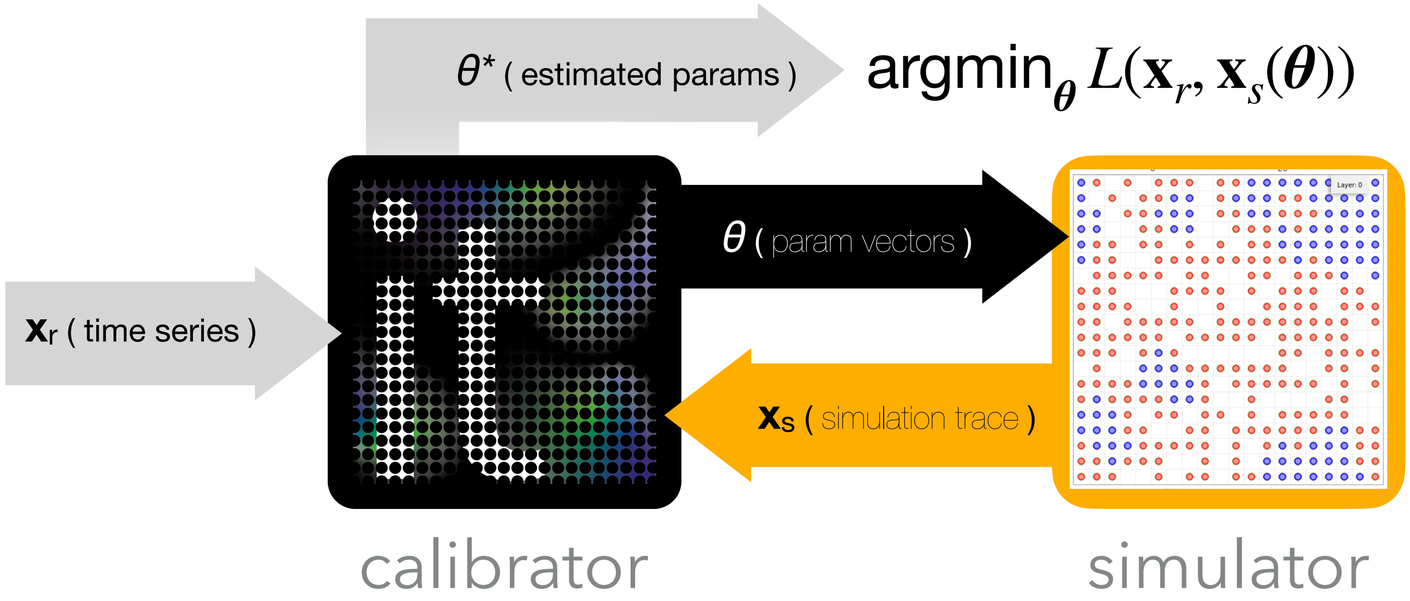
2022-2023

Macro and CBDC

ART Applied research team

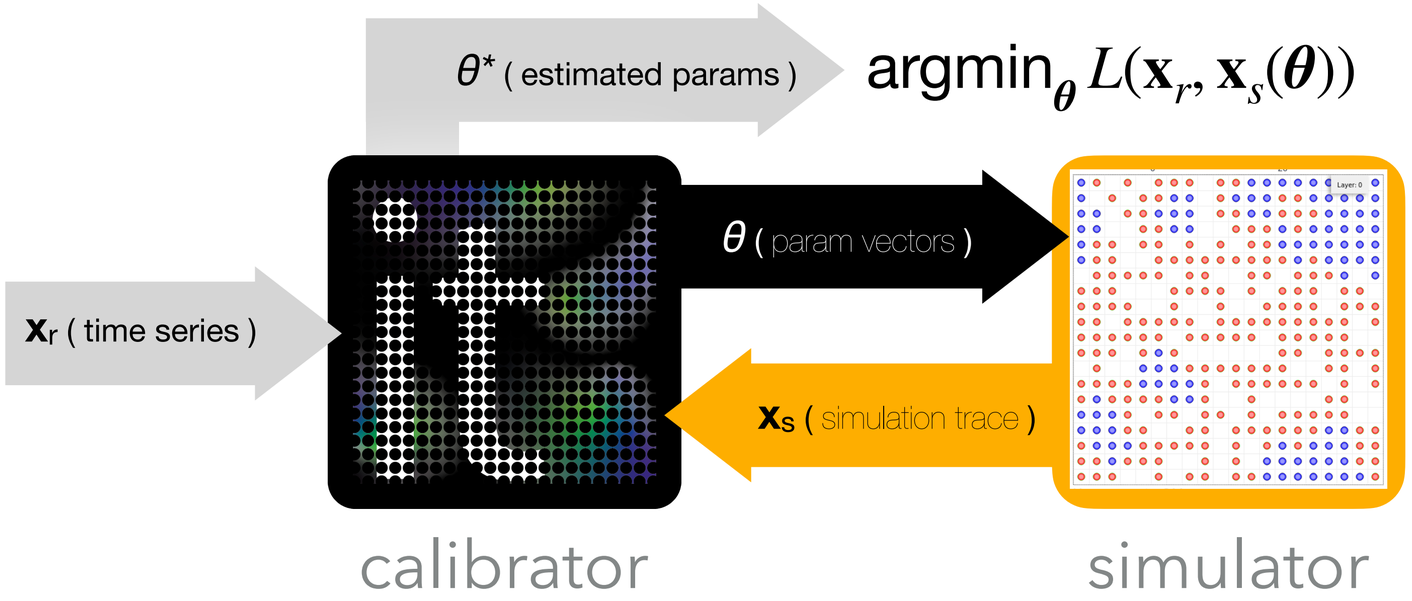
ABM CALIBRATION

A software capable of finding the **ABM parameters** that **best fit real data**



ABM CALIBRATION

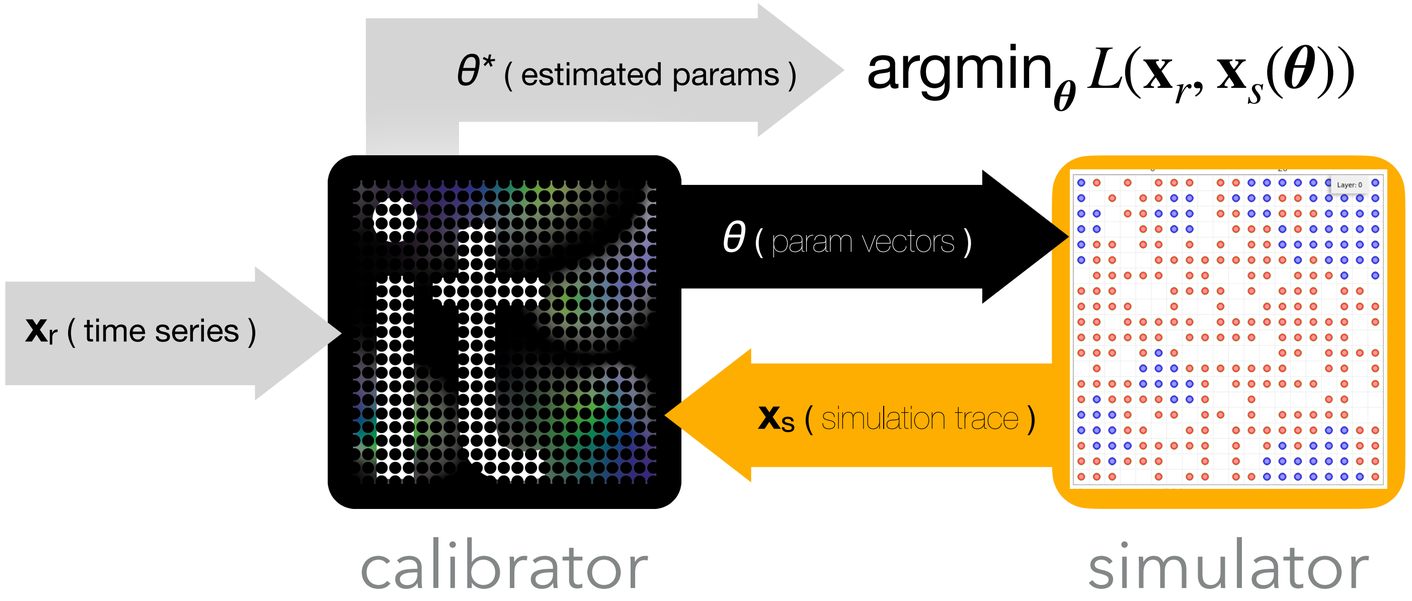
A software capable of finding the **ABM parameters** that **best fit real data**



In a typical scenario, for **20 free parameters**,
you would need $20^{20} \sim$ **10^{26} combinations**

ABM CALIBRATION

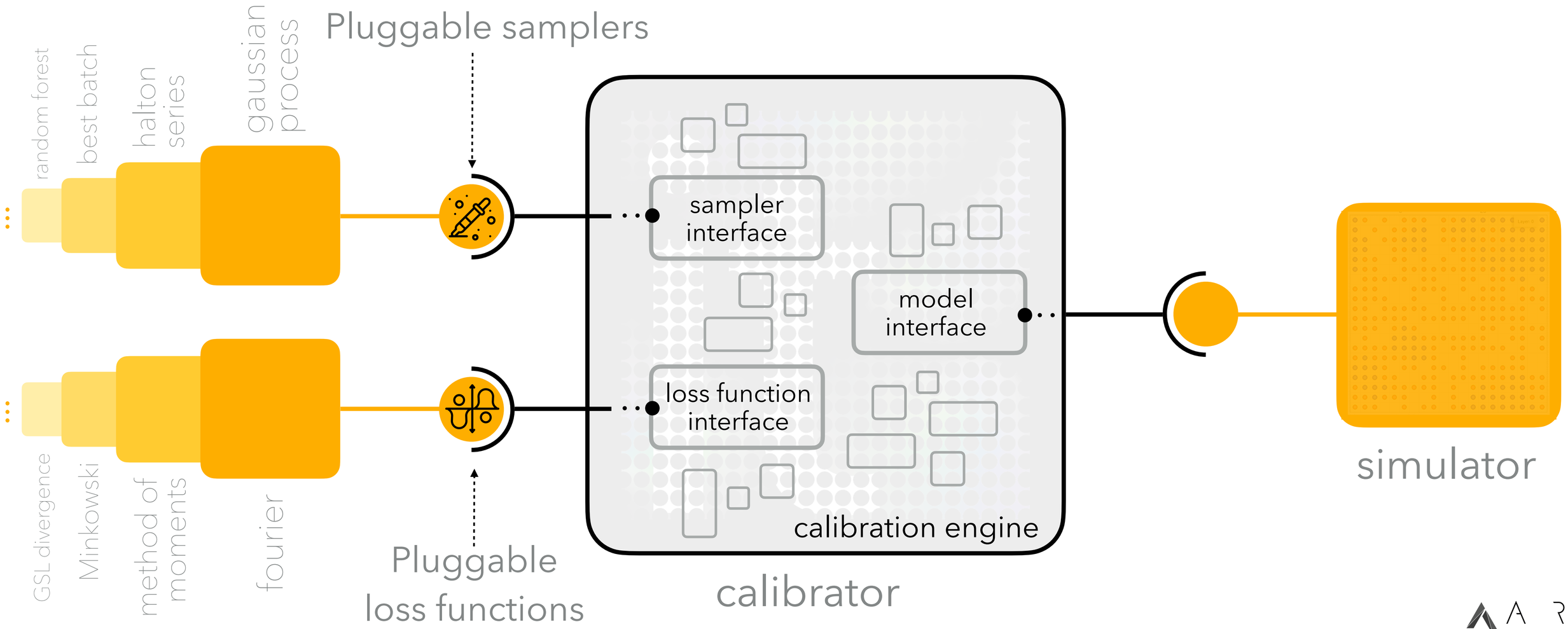
A software capable of finding the **ABM parameters** that **best fit real data**



👉 Need for efficient calibration strategies

In a typical scenario, for **20 free parameters**, you would need $20^{20} \sim$ **10^{26} combinations**

KEY FEATURES



KEY FEATURES

Independent of **language** and **domain**

Pluggable samplers

random forest
best batch
halton series
gaussian process

GSL divergence
Minkowski
method of moments
fourier

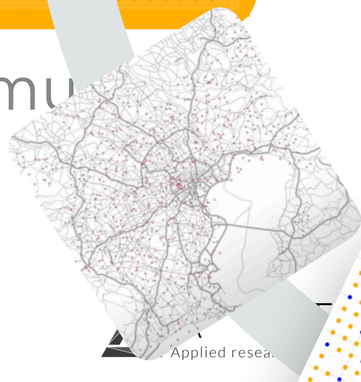
Pluggable loss functions

sampler interface
model interface
loss function interface
calibration engine

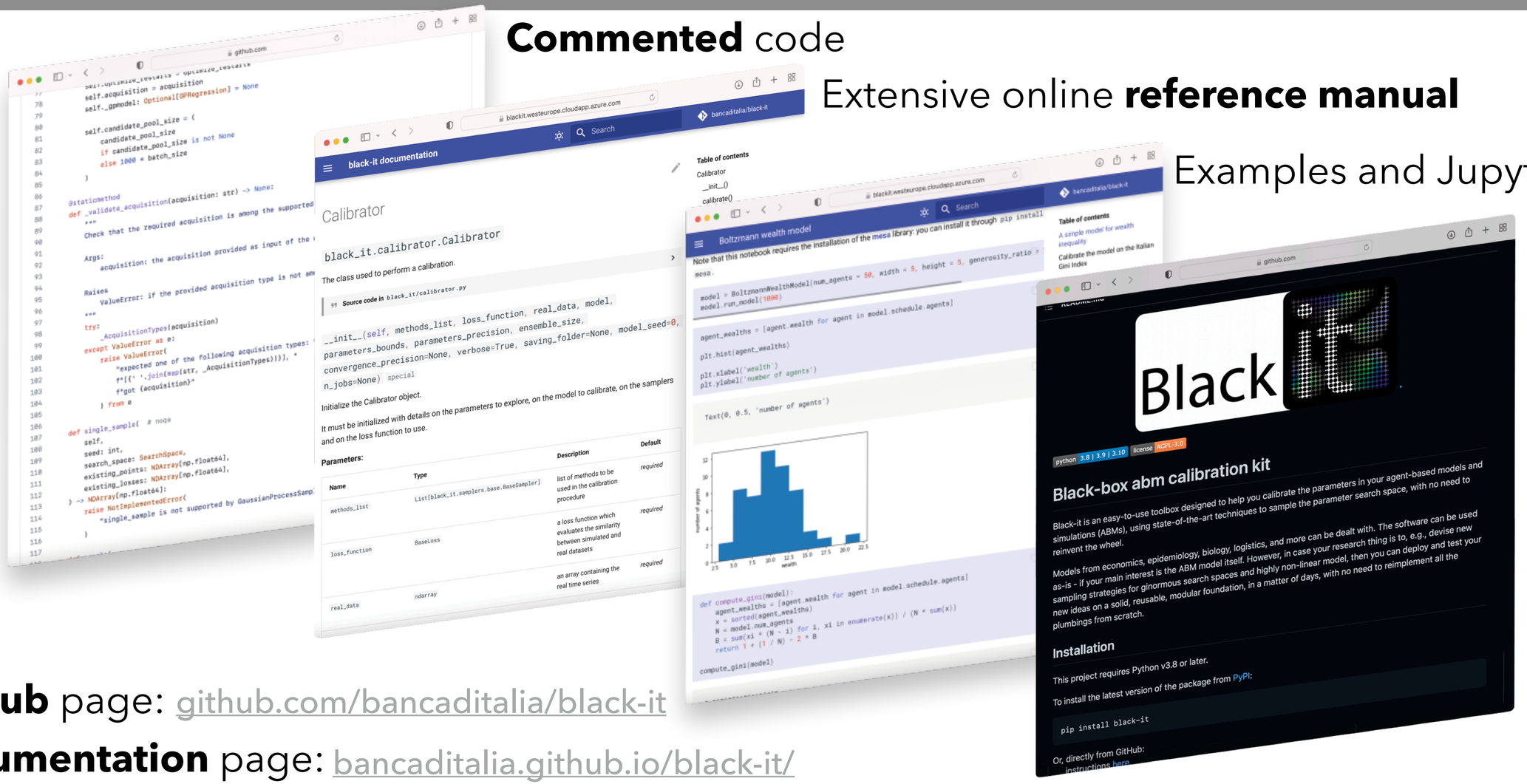
calibrator

julia
python™

simu



EXTENSIVE DOCUMENTATION



- **GitHub** page: github.com/bancaditalia/black-it
- **Documentation** page: bancaditalia.github.io/black-it/

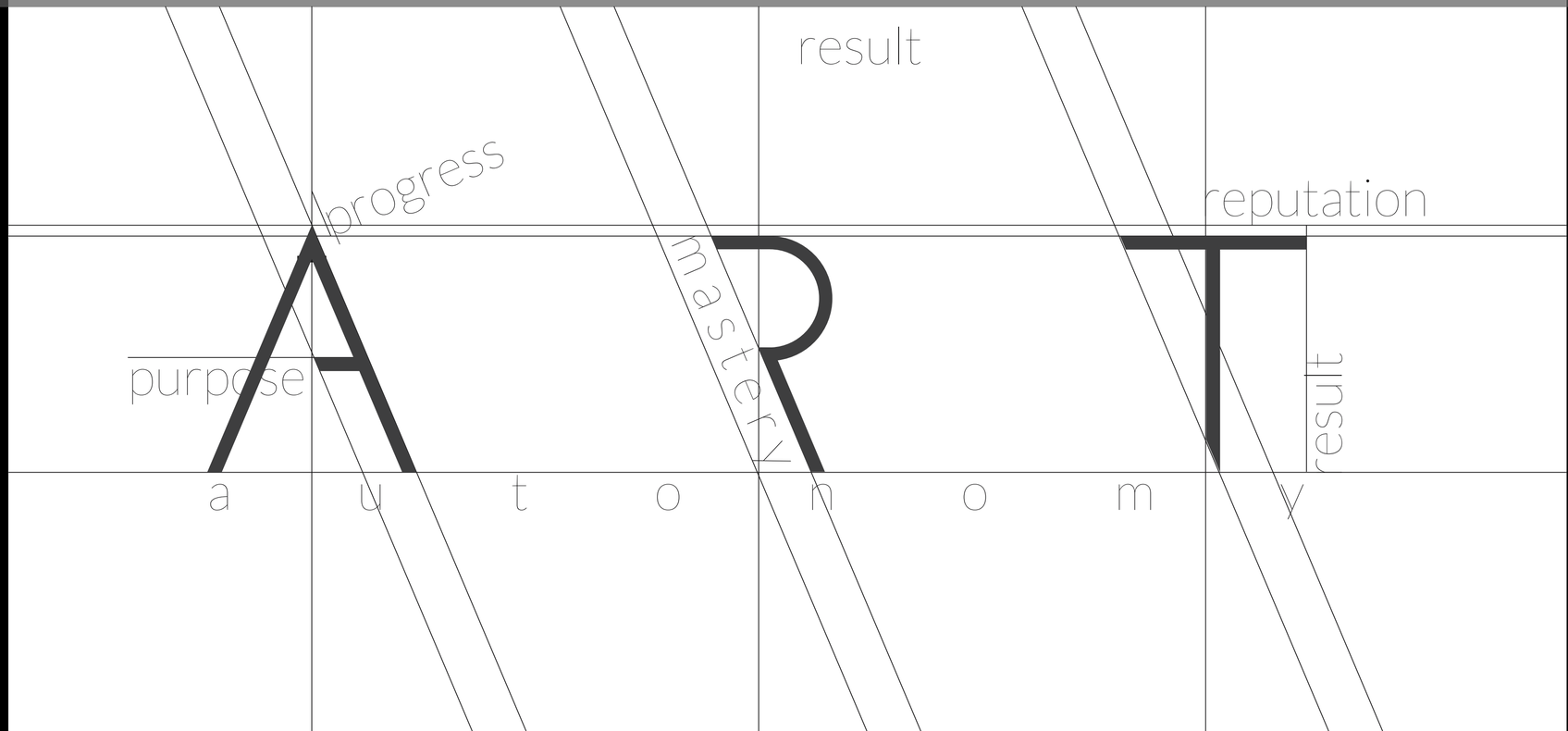
BANCA D'ITALIA
EUROSISTEMA

BLACK-IT DEMO: CALIBRATING MULTI-AGENT SYSTEMS TO MIMIC FINST REALITIES *

AAAI Bridge FINST
February 8, 2023

Thank you for your attention!

Time for a **Q&A** session: Any **Question**?



*All views and opinions are those of the speaker(s) and do not necessarily reflect the position of Bank of Italy