Francesco Giovanardi, PhD

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EDUCATION

Bocconi University, Department of Economics **2019**
Ph.D., cum laude, in Economics & Finance

- Doctoral Thesis: "*Essays on Confidence and Macroeconomics*"

Politecnico di Milano, Department of Mathematics **2012**
MSc. in Mathematical Engineering

- Main subjects: Stochastic Differential Equations, Mathematical Finance, Financial Engineering

University of Bologna, Department of Mathematics **2009**
BSc. in Mathematics

- Main subjects: Mathematics for Economics and Finance, Probability and Statistics, Numerical Analysis

WORK & RESEARCH EXPERIENCE

Prometeia SpA, Economic Analysis and Forecasting Unit & GRINS Research Team **Feb 2023-today**
Economic Research Specialist

- The Prometeia GRINS Team contributes to the GRINS (Growing Resilient, INclusive, and Sustainable) project, involving 14 universities, 13 private entities, and funded by the Italian NPRR.
- Within GRINS, I am involved in several research projects related to the **measurement, adaptation, and mitigation of climate risks**, such as (from latest to earliest stage):
  1. Measuring cost and benefits of **residential housing energy retrofits**;
  2. Measuring the degree of **under-investment for physical risk mitigation** in Italian Municipalities;
  3. Measuring **ESG Ratings for SMEs** combining satellite environmental data and idiosyncratic firm data through a machine learning approach;
  4. Extracting **ESG information from corporate non-financial disclosures** through a novel Natural Language Processing algorithm leveraging LLM prompting and RAG techniques;
  5. Measuring the **macroeconomic effects of physical risks** using a IAM bottom-up approach;
  6. Exploring the **climate-nature nexus**: how public investments in physical risk mitigation affect local biodiversity losses?

University of Cologne, Center for Macroeconomic Research **Sep 2019-Apr 2023**
Assistant Professor of Economics

- Worked on several academic research projects **published in international economic journals**, such as the *Review of Economic Dynamics* and the *European Economic Review*.
- Advised and **supervised Master students' final dissertations** on macroeconomic and financial topics such as unconventional monetary policies, sustainable finance, and central bank digital currencies
- **Organized and taught courses** on "*Macroeconomics*" (MSc Econ., 150 students/year), "*Monetary Economics and Financial Markets*" (MSc Econ., 40 students/year), and "*Advanced Macroeconomics*" (PhD, 15 students/year)

Bocconi University, Department of Economics **Sep 2015 - Jul 2019**
Research Fellow

- Finalized my doctoral dissertation on the role of confidence for macroeconomic fluctuations.
- Collaborated as Research Assistant to projects published in top-level peer-reviewed international journals.
- Contributed to the writing of the book "*Applied Economic Forecasting*" (Oxford University Press) and coded the replication material in *EViews*.

European Central Bank, Directorate General Economics **Jul 2016 - Feb 2017**
PhD Trainee

- Collaborated with the *Fiscal Policies* and *Output & Demand* divisions on two research streams:
  1. "*Optimal Fiscal Policies at the Zero Lower Bound for a Monetary Union*"
  2. "*Structural Estimation of Output Gaps in DSGE Models with Financial Frictions*"

Prometeia SpA, Financial Markets Area **Mar 2012 - Jul 2013**
Junior Economist, Research Trainee

SKILLS & INTERESTS

Softwares & Programming: MATLAB, Dynare, R, EViews, Python, SQL, Latex, Microsoft Excel, Word

Languages: Italian (native), English (full professional proficiency), French (basic)

Interests: blockchain enthusiast, technophile, cinema addicted

ACADEMIC PUBLICATIONS

- *The Preferential Treatment of Green Bonds*, joint with M. Kaldorf, L. Radke, and F. Wicknig
  Review of Economic Dynamics (51), December 2023, Pages 657-676
  [Vox.eu] [Suerf Policy Brief] [Bundesbank Research Brief]

  Abstract: We study the preferential treatment of green bonds in the central bank collateral framework as a climate policy instrument within a DSGE model with climate and financial frictions. In the model, green and carbon-emitting conventional firms issue defaultable corporate bonds to banks that use them as collateral, subject to haircuts determined by the central bank. A haircut reduction induces firms to increase bond issuance, investment, leverage, and default risk. Collateral policy solves a trade-off between increasing collateral supply, adverse effects on firm risk-taking, and subsidizing green investment. Optimal collateral policy is characterized by a haircut gap of 20 percentage points, which increases the green investment share and reduces emissions. However, welfare gains fall well short of what can be achieved with optimal carbon taxes. Moreover, due to elevated risk-taking of green firms, preferential treatment is a qualitatively imperfect substitute of Pigouvian taxation on emissions: if and only if the optimal emission tax can not be implemented, optimal collateral policy features a preferential treatment of green bonds.

- *Pro-Cyclical Emissions, Real Externalities, and Optimal Monetary Policy*, joint with M. Kaldorf
  European Economic Review (179), October 2025, 105124
  Abstract: We study optimal monetary policy in an analytically tractable New Keynesian DSGE-model with socially harmful emissions. Emissions are strongly pro-cyclical such that natural output in the competitive equilibrium under flexible prices overreacts to positive productivity shocks relative to the efficient allocation. When prices are sticky, actual output increases by less than natural output: the relationship between actual and efficient output depends on the emission externality and the degree of price stickiness. We show that it is not optimal to simultaneously stabilize inflation and close the natural output gap, even though this would be feasible. Divine coincidence is broken also in the presence of productivity shocks. For central banks with a dual mandate, we characterize the optimal monetary policy response and show that it places a larger weight on output stabilization. Optimal inflation volatility is larger than in the baseline New Keynesian model without an emission externality.

- *The Green Buildings Directive: a Quantification of its Costs and Benefits for Two Italian Regions*, joint with L. Forni, F. Fortuna, E. Giarda, and D. Panarello
  Journal of Housing Economics (68), June 2025, 102057
  Abstract: The building sector is responsible for a significant portion of greenhouse gas (GHG) emissions in Europe. Thus, achieving 2050 net-zero emissions targets necessitates the decarbonisation of the sector. This paper assesses the monetary costs, based on current technologies, of meeting the intermediate targets for 2030 and 2033 outlined in the EU Energy Performance of Buildings Directive (EPBD). The analysis focuses on two Italian regions with an ageing building stock and demonstrates that these costs are substantial. We employ open-source microdata on Energy Performance Certificates (EPCs) for the Lombardy and Piedmont regions, which provide information on dwellings' energy class and recommendations of the necessary retrofits to reach a higher energy class, as well as CO2 emissions and energy consumption. We estimate a total expenditure of €118.9 billion to take Lombardy's and Piedmont's residential stock to at least energy class D, which is 20.2%

of the two regions' GDP and 5.6% of Italy's GDP. Understanding the balance of costs and benefits is crucial to evaluate the economic incentives for homeowners to adopt energy efficiency measures. Households are estimated to save yearly €3.3 billion in lower energy bills in the two regions, and CO2-equivalent emissions are estimated to drop annually by 6.9 million tons. While homeowners may internalise the private benefits, they are unlikely to account for the social benefits in terms of lower emissions. As a result, achieving the EPBD targets is likely to require public subsidies.

- *A Quantification of the Costs and Benefits of the 'Green Buildings' Directive in Two Italian Regions*, joint with L. Forni, F. Fortuna, E. Giarda, and D. Panarello
  Chapter in "Sustainability, Innovation and Digitalization: Statistical Measurement for Economic Analysis of Housing Economics", Enzo Albani Edizioni.
  Abstract: This paper assesses the monetary costs and benefits of meeting the targets for 2030 and 2033 outlined in the Energy Performance of Buildings Directive (EPBD). We employ open-source microdata on Energy Performance Certificates (EPCs) for the Lombardy and Piedmont regions, which provide information on dwellings' energy class and recommendations of the necessary retrofits to reach a higher energy class, as well as CO2 emissions and energy consumption. We estimate a total expenditure of €118.9 billion to take Lombardy's and Piedmont's residential stock to at least energy class D, which is 20.2% of the two regions' GDP and 5.6% of Italy's GDP. Households are estimated to save yearly €3.3 billion in lower energy bills in the regions, and CO2-equivalent emissions are estimated to drop annually by 6.9 million tons.

WORKING PAPERS

- *Climate Change and the Macroeconomics of Bank Capital Regulation*, joint with M. Kaldorf
  R&R at Journal of Monetary Economics. Bundesbank Discussion Paper 13/2024
  Abstract: This paper proposes a quantitative multi-sector DSGE model with bank failure and firm default to study the interactions between bank regulation and climate policy. Households value the liquidity of deposits, which are protected by deposit insurance. Banks collect deposits and issue equity to extend defaultable loans to clean and fossil energy firms. Bank capital regulation affects liquidity provision to households, bank risk-taking, and loan supply across sectors. Using a calibrated version of the model, we obtain four results: first, fossil penalizing capital requirements can be discarded as climate policy instrument, since their effect on sector-specific investment is quantitatively negligible in general equilibrium. Second, Ramsey-optimal capital requirements in response to a tax-induced clean transition decline to counteract negative loan demand effects. Third, differentiated capital requirements are only necessary if banks are not perfectly diversified across sectors. Fourth, nominal rigidities induce a temporary tightening of capital requirements if the transition is inflationary and, thus, spurs a boom on the loan market.

- *Firm-level data extraction from corporates' Non-Financial Reports*, joint with L. Bacchini, M. Cimino, F. Giuglini, A. Lanza, M. Penza, M. Rispoli, L. Zicchino, and S. Zucchiatti.
  SSRN
  Abstract: We present a novel algorithm to extract a set of 26 ESG Key Performance Indicators (KPIs) from corporate Non-Financial Reports (NFRs) using a two-step LLM-based pipeline. First, a sparse retrieval model identifies relevant text for each KPI; then, tailored prompts guide a Large Language Model to extract structured data. Tested on a sample of European and Italian NFRs, the method achieves 86% accuracy with strong precision. Case studies on emissions and circular economy indicators highlight differences in disclosure across sectors and compare extracted KPIs with data from commercial data sources. The approach enables scalable, cost-effective ESG data extraction and supports the development of harmonized firm-level sustainability datasets.

- *Confidence, House Prices and Financial Frictions*, joint with Francesco Amodeo
  Draft coming soon.
  Abstract: What share of the fluctuations in real estate prices cannot be rationalized by the most commonly imputed economic factors? How much should we care about the "animal spirits", intended as exogenous fluctuations in agents' beliefs, when studying the origination of financial crises? The goal of this paper is to assess the role of confidence in understanding the boom-bust dynamics of credit and house prices in the United States, with a focus on the Great Financial Crisis.

WORK IN PROGRESS

- *Measuring Under-investment for Hydrogeological Risk Mitigation in Italian Municipalities*;
- *The Role of Green Bonds for the Green Transition*; *Extracting Macroeconomic Beliefs from Financial Markets*;
- *Confidence and Heterogeneity: Evidence from a HANK Model.*

INVITED TALKS & CONFERENCE CONTRIBUTIONS

University of Cagliari, 36th SIEP Annual Conference **2024**

University of Cyprus, 28th EAERE Annual Conference **2023**

University of Naples - PARTHENOPE, 1st Conference on Sustainable Banking & Finance

Bundesbank, 2023 Spring Conference (invited discussant)

University of Bologna, 27th EAERE Annual Conference **2022**

Institute of Energy Economics at the University of Cologne Research Seminar Series (invited seminar)

NGFS-GRASFI-INSPIRE Seminar Series on Green Monetary Policy (invited seminar)

University of Copenhagen, 2021 European Economic Association - Econometric Society Meeting **2021**

University of Crete, 25th International Conference on Macroeconomic Analysis and International Finance

University of Milano-Bicocca, 3rd International Conference on European Studies

University of Bonn (invited seminar)

e-axes Climate Change, Macroeconomics and Finance Forum (invited seminar)

University of Cologne (invited seminar) **2019**

Bank of Italy (invited seminar)

Federal Reserve Board of Governors (invited seminar)

Cardiff Business School, 2018 Anglo-French-Italian Workshop **2018**

Università Cattolica del Sacro Cuore in Milan, 5th Macro Banking and Finance Workshop **2017**

University of Edinburgh, 2017 Annual Meeting of the Society for Economic Dynamics

PEER REVIEW & RELATED ACTIVITIES

Referee for the following journals: *Journal of the European Economic Association*, *Italian Economic Journal*, *Economic Inquiry*.

PROFESSIONAL TRAINING

European University Institute - Florence School of Banking and Finance **2025**
Executive Seminar on "Making Europe's Financial System Resilient and Competitive"

Stanford Online & Coursera **2022**
Machine Learning Specialization

EDHEC Business School & Coursera
Climate Change and Sustainable Investing Specialization

IBM Data Science Professional Certification

European University Institute - Florence School of Banking and Finance **2021**
Macro-Prudential Policy Implementation

London School of Economics **2017**
Methods Summer Programme - "Tools for Macroeconomists"

European University Institute **2016**
EABCN Training School on "Advances in Bayesian Analysis of DSGE Models"

Banque de France **2015**
2015 Dynare Summer School on "DSGE Modeling"

AWARDS & SCHOLARSHIPS

Fondazione Romeo ed Enrica Invernizzi **2017-2019**
Scholarship for most promising Bocconi PhD Candidates

Bocconi University **2013-2017**
PhD Scholarship