


Piero Mazzarisi

University of Siena

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 **Research topics:** Network Science,
Financial Networks, Systemic Risk,
Quantitative Finance, Statistical Methods,
Time Series Analysis, Machine Learning.

Personal Info

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CURRENT POSITIONS

Tenure-track Assistant Professor (RTD-B, SSD: SECS-S/06) 1 Oct. 2022 – present
Organization: University of Siena, Department of Economics and Statistics, Siena, Italy.
Industrial Professor 1 Sep. 2022 – 30 Aug. 2023
Organization: University College London, Institute of Finance & Technology, London, UK.

PREVIOUS POSITIONS

Fixed-Term Assistant Professor (RTD-A, SSD: SECS-S/06) 27 Dec. 2021 – 30 Sep. 2022
Organization: Scuola Normale Superiore, Class of Science, Pisa, Italy.
Post-doc Research Fellow 1 Feb. 2020 – 26 Dec. 2021
Organization: Scuola Normale Superiore, Class of Science, Pisa, Italy.
Post-doc Research Fellow 1 May 2018 – 30 Nov. 2019
Organization: University of Bologna, Department of Mathematics, Bologna, Italy.

EDUCATION

Ph.D. in Financial Mathematics 4 Nov. 2014 – 30 Apr. 2018
Organization: Scuola Normale Superiore, Class of Science, Pisa, Italy
Doctoral thesis: Dynamic network models with applications to finance
Supervisors: Prof. Fabrizio Lillo (SNS, Pisa, Italy), Prof. Stefano Marmi (SNS, Pisa, Italy)
Thesis defense: 24 Oct. 2019
Score: 70/70 cum Laude

M.Sc. in Physics 1 Oct. 2010 – 29 Sep. 2014
Organization: University of Pisa, Department of Physics, Pisa, Italy
Thesis: A dynamical systems approach to systemic risk
Supervisors: Prof. Fabrizio Lillo (SNS, Pisa, Italy)
Score: 110/110 cum Laude

B.Sc. in Physics

1 Oct. 2007 – 18 Nov. 2010

Organization: University of Catania, Department of Physics, Catania, Italy

Thesis: Transizione ordine-disordine in quasicristalli unidimensionali

Supervisors: Prof. Giuseppe Angilella (Univ. of Catania, Italy)

Score: 110/110 cum Laude

TEACHING EXPERIENCE

- ▶ **2022-2023**
 - **University of Siena:** *Matematica finanziaria* (60h) B.Sc. course (**LC, IT**)
 - **Scuola Normale Superiore:** *Quantitative Finance* (15h) Ph.D. Course (**EN**), *Statistical and Machine Learning models for Time Series Analysis* (15h) Ph.D. Course (**EN**)
 - **UCL, Institute of Finance & Technology:** *Financial Analytics and Machine Learning* (40h) M.Sc. Course (**LC, EN**)
- ▶ **2021-2022**
 - **Scuola Normale Superiore:** *Statistical and Machine Learning models for Time Series Analysis* (10h) Ph.D. Course (**EN**), *Mathematical Models for Quantitative Finance: Market Microstructure, Networks, and Systemic Risk* (6h) Ph.D. Course (**EN**)
- ▶ **2018-2019**
 - **University of Bologna:** *Crash course in Mathematics* (34h) Undergraduate Course (**LC, EN**)

SCHOLARSHIPS AND GRANTS

- ▶ Member of the project “Network analysis of economic and financial resilience” within the Pro3 Italian program (Mar. 2022 - Dec. 2023)
- ▶ Member of the project “Dynamic models for a fast changing world: An observation-driven approach to time-varying parameters” within the Italian PRIN2020 program (Mar. 2022 - Feb. 2025)
- ▶ Member of the Italian project “Percorso di formazione su data analysis, network science, artificial intelligence e big data per gli abusi di mercato” founded by the Commissione Nazionale per le Società e la Borsa (CONSOB) (Sep. 2021 - Feb. 2023).
- ▶ Member of the EU project H2020 SoBigData++: European Integrated Infrastructure for Social Mining and Big Data Analytics (Jan. 2020 – Dec. 2023).
- ▶ Research Fellowship at Scuola Normale Superiore co-funded by EU project H2020 SoBigData and Unicredit S.p.a (Feb. 2020–Feb. 2022).
- ▶ Member of the EU project H2020 DOMINO: Novel tools to evaluate ATM systems coupling under future deployment scenarios (May 2018 – Dec. 2019).
- ▶ Visiting Researcher at the Queen Mary University of London, School of Mathematical Science (working with Prof. Vito Latora).
- ▶ Ph.D. scholarship at Scuola Normale Superiore financed by the Ministry of Education, University and Research – MIUR (Nov. 2014 – May 2018).

SCHOOLS AND COURSES

- ▶ 1st edition of the School on Mathematical and Computational aspects of Machine Learning, Pisa, Scuola Normale Superiore (2019).
- ▶ 2nd edition of the Lake Como School of advanced studies in Complex Networks: theory, methods and applications, Como, Villa del Grumello (2016).
- ▶ 8th European summer school in Financial Mathematics, Le Mans (2015).

VISITING PERIOD

University College London (forthcoming, January-March 2023, three months); Baruch College, New York (June 2022, one week) University of Westminster, London (June 2019, one week); Queen Mary University, London (May 2017 – Jul. 2017, three months).

ORGANIZATION OF WORKSHOPS AND CONFERENCES

- ▶ Second edition of the “School in Machine Learning of Dynamic Processes and Time Series Analysis”, November 9-10, 2022, Pisa, Scuola Normale Superiore. Co-organized with Dr. Giulia Livieri, Prof. Fabrizio Lillo, Prof. Stefano Marmi.
- ▶ “Networks, Big Data, and Artificial Intelligence in Economics, Finance, and Social Sciences”, Sept. 22-24, 2022, parallel session of the annual meeting of A.M.A.S.E.S. XLVI. Co-organized with Prof. Fabrizio Lillo, Prof. Michele Tumminello.
- ▶ “Networks, Big Data, and Artificial Intelligence in Economics, Finance, and Social Sciences”, Sept. 13-18, 2021, parallel session of the annual meeting of A.M.A.S.E.S. XLV. Co-organized with Prof. Fabrizio Lillo, Prof. Michele Tumminello.
- ▶ “School in Machine Learning of Dynamic Processes and Time Series Analysis”, Nov. 26-27, 2020, Pisa, Scuola Normale Superiore. Co-organized with Dr. Giulia Livieri, Prof. Fabrizio Lillo, Prof. Stefano Marmi.
- ▶ SMMN satellite on “Statistical Mechanics Methods for Networks”, satellite conference of NetSci2020, Sep. 17, 2020, Roma (online). Co-organized with Dr. Mateusz Wilinski.

SUPERVISION OF STUDENTS

M.Sc. students

- ▶ Gabriele Poidomani, M.Sc. in Physics at the University of Pisa, Oct. 2021 - Sep. 2022. “A Statistical Mechanics approach to Hypergraph reconstruction”. 101/110 (then Ph.D. candidate at IMT School for Advanced Studies Lucca)
- ▶ Federico Paltrinieri, M.Sc. in Physics at the University of Bologna, jointly with Prof. Fabrizio Lillo, Jan. 2019 – Sep. 2019. “Modeling temporal networks with dynamic stochastic block models”. 110/110 cum Laude.
- ▶ Elena Stella, M.Sc. in Economics at the University of Pisa and Sant’Anna School of Advanced Studies, jointly with Prof. Giorgio Fagiolo and Prof. Fabrizio Lillo, Apr. 2018 – Dec. 2018. “A discrete autoregressive model for preferential lending, Network analysis of the e-MID interbank market”. 110/110 cum Laude (then Ph.D. candidate at the Kellogg School of Management at Northwestern University, Chicago, Illinois).

Ph.D. students

- ▶ Adele Ravagnani, Ph.D. in Computational Methods and Mathematical Models for Sciences and Finance at Scuola Normale Superiore, jointly with Prof. Fabrizio Lillo, Nov. 2020 – .
- ▶ Valentina Macchiati, Ph.D. in Data Science at Scuola Normale Superiore, jointly with Prof. Diego Garlaschelli, Nov. 2020 – .
- ▶ Ioanna-Yvonne Tsaknaki, Ph.D. in Mathematics at Scuola Normale Superiore, jointly with Prof. Fabrizio Lillo, Nov. 2020 – .
- ▶ Andrey Shternshis, Ph.D. in Computational Methods and Mathematical Models for Sciences and Finance at Scuola Normale Superiore, jointly with Prof. Stefano Marmi, Nov. 2020 – .

ACADEMIC ACTIVITIES

- ▶ **Ph.D. Committees:** Dr. Domenico Di Gangi, Ph.D. in Financial Mathematics, Scuola Normale Superiore (2022), Dr. Tonio Möllmann, Ph.D. in Financial Mathematics, Scuola Normale Superiore (2022), Dr. Danilo Vassallo, Ph.D. in Financial Mathematics, Scuola Normale Superiore (2022)
- ▶ **Ms.C. exam committees:** Federico Paltrinieri, Ms.C. in Physics, Physics Department of the University of Bologna (Sep. 2019)
- ▶ **Representative** of Post-Doc Researchers at Scuola Normale Superiore (May 2021 - Dec. 2021)

EDITORIAL ACTIVITIES

- ▶ **Referee** for Journal of Economic Dynamics and Control, AIMS Mathematics, Stat, Quantitative finance, Chaos, Solitons and Fractals, Scientific Reports, Journal of Complex Networks, Journal of Statistical Mechanics: Theory and Experiment, Journal of Economic Interaction and Coordination, Computational Economics, Computational Statistics, Journal of Risk.

PUBLICATIONS

In preparation

- ▶ **Mazzarisi, P.**, Corsi, F., and Lillo, F. (2022). Simulation-based estimation of dynamic models with reservoir computers.

Working papers

- ▶ **Mazzarisi, P.**, Ravagnani, A., Deriu, P., Lillo, F., Medda, F., & Russo, A. (2022). A machine learning approach to support decision in insider trading detection. Available at SSRN.
- ▶ Shternshis, A., & **Mazzarisi, P.** (2022). Variance of entropy for testing time-varying regimes with an application to meme stocks. arXiv preprint arXiv:2211.05415.
- ▶ Deriu, P., Lillo, F., **Mazzarisi, P.**, Medda, F., Ravagnani, A., & Russo, A. (2022). How Covid mobility restrictions modified the population of investors in Italian stock markets. arXiv preprint arXiv:2208.00181.
- ▶ Buccheri, G., & **Mazzarisi, P.** (2022). Realized Random Graphs, with an Application to the Interbank Network. Available at SSRN.

Peer-reviewed Publications

- ▶ Shternshis A., **Mazzarisi, P.**, and Marmi, S. (2022). Efficiency of the Moscow Stock Exchange before 2022. *Entropy* 2022,24,1184.
DOI: 10.3390/e24091184
ISSN: 1099-4300
- ▶ Shternshis A., **Mazzarisi, P.**, and Marmi, S. (2022). Sources of inefficiency in financial time series. *Chaos, Solitons & Fractals*, 162, 112403.
DOI: 10.1016/j.chaos.2022.112403
ISSN: 0960-0779
- ▶ Williams, O.E., **Mazzarisi, P.**, Lillo, F., and Latora, V. (2022). Non-Markovian temporal networks with auto- and cross-correlated link dynamics. *Physical Review E*, 105(3), 034301.
DOI: 10.1103/PhysRevE.105.034301
ISSN: 2470-0053
- ▶ Delgado, L., Gurtner, G., **Mazzarisi, P.**, Zaoli, S., Valput, D., Cook, A., and Lillo, F. (2021). Network-wide assessment of ATM mechanisms using an agent-based model. *Journal of Air Transport Management*, 95, 102108.
DOI: 10.1016/j.jairtraman.2021.102108
ISSN: 0969-6997
- ▶ Campajola, C., Lillo, F., **Mazzarisi, P.**, and Tantari, D. (2021). On the equivalence between the Kinetic Ising Model and discrete autoregressive processes. *Journal of Statistical Mechanics: Theory and Experiment*, 2021(3), 033412.
DOI: 10.1088/1742-5468/abe946
ISSN: 1742-5468
- ▶ Zaoli, S., **Mazzarisi, P.**, and Lillo, F. (2021). Betweenness centrality for temporal multiplexes. *Scientific reports*, 11(1), 4919, 1-9.
DOI: 10.1038/s41598-021-84418-z
ISSN: 2045-2322
- ▶ **Mazzarisi, P.**, Zaoli, S., Campajola, C., and Lillo, F. (2020). Tail granger causalities and where to find them: Extreme risk spillovers vs spurious linkages. *Journal of Economic Dynamics and Control*, 121, 104022.
DOI: 10.1016/j.jedc.2020.104022
ISSN: 0165-1889
- ▶ **Mazzarisi, P.**, Barucca, P., Lillo, F., and Tantari, D. (2020). A dynamic network model with persistent links and node-specific latent variables, with an application to the interbank market. *European Journal of Operational Research*, 281(1), 50–65.
DOI: 10.1016/j.ejor.2019.07.024
ISSN: 0377-2217
- ▶ **Mazzarisi, P.**, Zaoli, S., Lillo, F., Delgado, L., and Gurtner, G. (2020). New centrality and causality metrics assessing air traffic network interactions. *Journal of Air Transport Management*, 85, 101801.
DOI: 10.1016/j.jairtraman.2020.101801
ISSN: 0969-6997
- ▶ Zaoli, S., **Mazzarisi, P.**, and Lillo, F. (2019). Trip centrality: Walking on a temporal multiplex with non-instantaneous link travel time. *Scientific reports*, 9(1), 10570, 1–11.
DOI: 10.1038/s41598-019-47115-6
ISSN: 2045-2322
- ▶ Wilinski, M., **Mazzarisi, P.**, Tantari, D., and Lillo, F. (2019). Detectability of macroscopic structures in directed asymmetric stochastic block model. *Physical Review E*, 99(4), 042310.

DOI: 10.1103/PhysRevE.99.042310

ISSN: 2470-0053

- ▶ **Mazzarisi, P.**, Lillo, F., and Marmi, S. (2019). When panic makes you blind: A chaotic route to systemic risk. *Journal of Economic Dynamics and Control*, 100, 176–199.

DOI: 10.1016/j.jedc.2018.12.009

ISSN: 0165-1889

- ▶ Barucca, P., Lillo, F., **Mazzarisi, P.**, and Tantari, D. (2018). Disentangling group and link persistence in dynamic stochastic block models. *Journal of Statistical Mechanics: Theory and Experiment*, 2018(12), 123407.

DOI: 10.1088/1742-5468/aaeb44

ISSN: 1742-5468

Conference Proceedings

- ▶ **Mazzarisi, P.**, Zaoli, S., Delgado, L., Gurtner, G., Cook, A., and Lillo, F. (2019). Network-wide assessment of 4d trajectory adjustments using an agent-based model, *SESAR*.

<https://westminsterresearch.westminster.ac.uk/sesar1>

- ▶ **Mazzarisi, P.**, Zaoli, S., Lillo, F., Delgado, L., and Gurtner, G. (2018). Towards new metrics assessing air traffic network interactions. *SESAR*.

<https://westminsterresearch.westminster.ac.uk/sesar2>

Books and Chapters

- ▶ **Mazzarisi, P.**, and Lillo, F. (2017). Methods for reconstructing interbank networks from limited information: A comparison, In *Econophysics and sociophysics: Recent progress and future directions*. Springer.

DOI: 10.1007/978-3-319-47705-3_15

ISBN: 978-3-319-47705-3

SEMINARS, INVITED AND CONTRIBUTED TALKS

- ▶ Invited speaker at the plenary meeting of “SoBigData++” H2020 research infrastructure, University of Amsterdam, Amsterdam, Netherlands, June 28-29, 2022.
- ▶ Accepted contribution the 28th International Conference on “Computing in Economics and Finance” (CEF2022) by the Society for Computation Economics, Southern Methodist University, Dallas, Texas, USA, June 17-19, 2022.
- ▶ Accepted contribution to the XXIII Workshop on Quantitative Finance (QFW2022), School of Economics of the University of Rome Tor Vergata, Mar. 2022.
- ▶ Accepted contribution to the 10th International Conference on Complex Networks and their Applications, INEF-UPM Universidad Politécnica de Madrid, Nov. 2021 (online).
- ▶ Invited speaker at the cycle of “Research Seminars”, IMT School for Advanced Studies, Lucca, 8th Nov. 2021.
- ▶ Accepted contribution to the session “Networks, Big Data, and Artificial Intelligence in Economics, Finance, and Social Sciences” of the AMASES Annual Conference 2021, online, Sep. 2021.
- ▶ Invited speaker at the Summer School of Mathematics for Economic and Social Sciences “An introduction to random dynamical systems and their perturbations”, Centro De Giorgi and Scuola Normale Superiore, Pisa, Sep. 2019.

- ▶ Accepted contribution to the Italian satellite of the “Conference on Complex Systems” CSS/Italy, at Fondazione Bruno Kessler, Trento, Jul. 2019.
- ▶ Accepted contribution to the “Workshop on Economic Science with Heterogeneous Interacting Agents” (WEHIA), at City University of London, Jun. 2019.
- ▶ Accepted contribution to the 29th annual conference of the European Association for Evolutionary Political Economy (EAEPE), at the Corvinous University, Budapest, Oct. 2017.
- ▶ Accepted contribution to the 41st Annual Meeting of the Association for Mathematics Applied to Social and Economic Sciences (AMASES), at the University of Cagliari, Sep. 2017.
- ▶ Accepted contribution to the XVIII Workshop on Quantitative Finance “QFW2017”, at the University of Milano-Bicocca, Milano, Jan. 2017.
- ▶ Accepted contribution to the satellite meeting of STATPHYS26, “Statistical Physics of Financial and Economic Networks”, at the Paris 1 Panthéon-Sorbonne University, Paris, Jul. 2016.

SPECIAL SKILLS

- ▶ **Computer skills:** Matlab, Python, C, Mathematica, L^AT_EX, MySQL.
- ▶ **Languages:** English (fluent), French (basic), Aramaic (grammar).

RESEARCH INTERESTS

- ▶ **Network models:** Exponential Random Graphs, Discrete Autoregressive processes, State-space models, Stochastic Block Models, Dynamic Factor Network Models.
- ▶ **Statistical Inference:** Likelihood methods, Iterative Proportional Fitting methods, Expectation-Maximization algorithms, Indirect inference, Simulation-based estimations.
- ▶ **Time Series Analysis:** Granger causality, Statistical hypothesis testing, PCA, Kalman filter.
- ▶ **Systemic risk:** Financial contagion on interbank networks, Value at Risk.
- ▶ **Machine Learning:** Recurrent Neural Networks, Reservoir Computing, and Statistical learning methods applied to inferential and prediction problems.

February 10, 2023

