March 17, 2022

Personal Information

Name :	Giulia Livieri, Italian
Date of birth :	February, 4, 1988.
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Current Position

3 Feb. 2020 – present

Position: Fixed Term Assistant Professor, rtd-A, Research Fellow.
Organization: Scuola Normale Superiore of Pisa, Faculty of Science, Pisa, Italy.
Scientific Director: Prof. Stefano Marmi (Full professor in Dynamical Systems).

Previous Positions

15 Jan. 2017 – 3 Feb. 2020

Position: Post-doc Research Fellow.

Organization: Scuola Normale Superiore of Pisa, Faculty of Science, Pisa, Italy.

Education

04 Nov. 2013 – 13 Oct. 2017

Qualification: Ph.D in Mathematical Finance.

Organization: Scuola Normale Superiore of Pisa, Faculty of Science, Pisa, Italy.
Thesis: Stochastic modelling for financial time series: modelling, estimation and option pricing
Supervisors: Prof. Giacomo Bormetti (Univ. of Bologna, Italy) and Prof. Stefano Marmi (Scuola Normale Superiore of Pisa, Italy).
Committee: Prof. Monica Billio (Univ. Ca' Foscari of Venice, Italy), Prof. Giacomo Bormetti, Prof. Giuseppe Da Prato (Scuola Normale Superiore of Pisa), Prof. Stefano Marmi, Prof. Peter Tankov (Ecole Polytechnique, Paris)
Score: 70/70 with Laude.

Oct. 2012 – Apr. 2013

Qualification: Post-graduate course in Mathematical Finance.
Organization: University of Bologna, Department of Mathematics, Italy.
Outline of the course: The primary objective of the course is to provide a rigorous preparation in Economic Theory and mathematical modelling of financial markets. It also provides expertise in Numerical Analysis, Statistics and Programming in MATLAB.
Score: 30/30 with Laude.

Oct.r 2007 – Oct. 2012

Qualification: M.Sc. in Mathematics
Organization: University of Padova, Department of Mathematics, Italy.
Thesis: A Mean Field Approach to the Multi-period Mean Variance Portfolio Optimization.
Supervisors: Prof. Markus Fischer and Prof. Paolo Dai Pra.
Score: 110/110.

April 2021, April 2030

Italian qualification for Associate Professorship. **SECS-S/06**, Mathematical Methods of Economics, Actuarial and Financial Sciences.

Work Experience

Apr. 2013 – Nov. 2013

Organization: Mediobanca S.p.A, Milano. Equity Quants Team, Financial Engineering
Objectives:
- Development of the proprietary pricing models for derivative products to support financial transactions carried out by the operating rooms in Milan and London.
- Expansion of the proprietary C++ pricing library: new contract, models implementation

tion, maintenance and reinforcement.

Teaching Experience

LC: Leader Course. **EN**: Thought in English .

2021 - 2022

Scuola Normale Superiore: "Quantitative Finance" (20 h) Ph.D course (**LC**, **EN**), "Statistical and Machine Learning models for Time Series Analysis" (20 h) Ph.D course (**EN**), "Complements of mathematics for chemists and biologists" (20 h) Undergraduate course (**LC**, **EN**), "Introduction to Dynamical Systems I" (15 h) Undergraduate course. **Università Cattolica del Santo Cuore:** "Introduction to Mean Field Games" (10 h) (**LC**, **EN**). **University of Pisa**: Teaching Assistant of the course "Statistical Methods for Data Science" (20 h) Master in Big-Data (**EN**).

2020 - 2021

Scuola Normale Superiore: "Quantitative Finance" (20 h) Ph.D course (**LC**, **EN**), "Complements of mathematics for chemists and biologists" (20 h) Undergraduate course (**LC**, **EN**), "Introduction to Dynamical Systems I and II" (10 h + 10 h) Undergraduate course. **University of Pisa**: Teaching Assistant of the course "Statistical Methods for Data Science" (20 h) Master in Big-Data (**EN**). **University Cà Foscari of Venice**: Support activity for the platform ARPM for the study of Quantitative Finance themes (30 h) (**EN**).

2019 - 2020

Scuola Normale Superiore: "Quantitative Finance" (20 h) Ph.D course (**LC**, **EN**), "Element of Probability Theory and Mathematical Statistics" (20 h) Ph.D course (**EN**), "Introduction to Dynamical Systems II" (10 h) Undergraduate course. **University of Pisa**: Teaching Assistant of the course "Statistical Methods for Data Science" (20 h) Master in Big-Data (**EN**).

2019

Scuola Normale Superiore: "Financial Analysis" (10 h) Ph.D course, (**LC**, **EN**). **University of Pisa**: Teaching Assistant of the course "Statistical Methods for Data Science" (20 h) Master in Big-Data (**EN**). **University of Firenze:**"Portfolio Choice and Optimization" (24 h) Undergraduate Course (**LC**, **EN**). **Hokkaido University:** "Information Theory and Portfolio Theory" (14 h) Phd Course, (**LC**, **EN**)

2016 - 2018

University of Bologna: "Crash course in Mathematics" (34h) Undergraduate Course. (**LC**, **EN**)**University of Firenze:** "Portfolio Choice and Optimization" (24 h) Undergraduate Course (**LC**, **EN**).

Awards, Grants, Roles

► **Member** of the project DM n. 289/2021 PRO3, "Teorie e strumenti per la transizione ecologica: profili filosofici, matematici, etici e giuridici relativi alla sfida di sostenibilità del carbon budget", 3 years, 90KEur. Together with: Sant' Anna, IUSS.

► **Member** of the project DM n. 289/2021 PRO3, "Network analysis of economic and financial resilience", 3 years, 65KEur. Together with: Sant' Anna, IMT.

► December 2021. "Dynamic models for a fast changing world: An observation-driven approach to time-varying parameters". Granted by Italian Ministry of Education, Universities and Research under the program PRIN 2020. **Coordinator** of the local unit of Scuola Normale Superiore. Total funding: $\approx$ 580KEur.

► Travel and lodging expenses for the participation at the workshop "Applications to Financial Engineering" and "Mathematical Advances in Mean Field Games", and as a participant in the Long Program Distributed Solutions to Complex Societal Problems by the University of Chicago, 4.5KUsd. (2021)

► **Principal Investigator** of the project "Mean Field Games aspects of training Residual Network", funded by the Scuola Normale Superiore, 38kEur (2021).

► **Principal Investigator** of the project "The impact of information on financial markets: Detecting, analysing and modelling abrupt changes in prices resulting from news arrivals", funded by the Europlace Institute of Finance, Louis Bachelier Grant, 10kEur (2020), with Dr. Sergio Pulido (ENSIIE) and Dr. Simone Scotti (Paris Diderot).

► Travel grant by the Society of Financial Econometrics, 500Eur (2019).

► **Member** of the EU project H2020 SoBigData++: European Integrated Infrastructure for Social Mining and Big Data Analytics (Jannuary 2020 – December 2023).

► **Member** of the project "Prediction of the global economy recovery after the great lockdown using spatial dynamic models", 45kEur (2020), P.I. Dr. Mauro Bernardi (University of Padova, Department of Statistics)

► Seal of Excellence certificate for the Marie Skłodowska-Curie actions (MSCA) in Horizon 2020 (score 88.91%).
► **Member** of the teaching committee of the Ph.D program "Computational Methods and Mathematical Models for Sciences and Finance", Scuola Normale Superiore of Pisa.
► Representative of Researchers at Scuola Normale Superiore (Dec 2020-)
► Visiting Researcher at FIM - Institute for Mathematical Research, ETH Zurich (working with Prof. Josef Teichmann on the project "Mean-fields games aspects of training Residual Networks"). June 23, 2021 – September 17, 2021.
► Visiting Researcher at London School of Economics, Department of Statistics (working with Prof. Luciano Campi on the project "Mean-fields games with absorption and applications to finance"). October 21, 2019 – November 24, 2019.
► Temporary Assistant Professor at Scuola Normale Superiore of Pisa financed by the Ministry of Education, University and Research – MIUR (February 2020 – February 2023).
► Research Fellowship at Scuola Normale Superiore funded by Unicredit S.p.a (January 2017–February 2020).
► Ph.D. scholarship at Scuola Normale Superiore of Pisa financed by the Ministry of Education, University and Research – MIUR (November 2013 – October 2017).

Research Interest

Mean Field Games, Stochastic Optimal Control, Mathematical Finance, Machine Learning, Financial Econometrics, High-Frequency Finance, Dynamical Systems.

Schools and Courses

► Online Workshop Mean Field Games in Economics, Luiss University, Rome (2020).
►13th European Summer School in Financial Mathematics, Vienna (2020)
► Theory and Practice of Optimal Stopping and Free Boundary Problems, Leeds (2020)
► Stochastic PDEs and Mean Field Games, Bologna (2019)
►12th European Summer School in Financial Mathematics, Padova (2019)
►12th European Summer School in Financial Mathematics, Padova (2015)
► Advanced Risk and Portfolio Management (ARPM) bootcamp by Attilio Meucci, New York University (2014).

Students Supervision

Supervision of master students

► Alessio Brini, LM in Finance and Risk Management, University of Florence, with M. E. Mancino, C. Martini and D. Tantari Sept 2017–Feb 2018. "Beyond the parameters estimation burden: a Bayesian framework for option pricing". 110/110 with Laude (First Employment: Phd student in Mathematical Finance at Scuola Normale Superiore, Pisa).
► Leonardo Leoncini, LM in Finance and Risk Management, University of Florence, Jul 2018–Dec 2018. "Theory and Practice of the Entropy Pooling Approach in Portfolio Optimization". 110/110 with Laude (First Employment: Junior Financial Analyst in REA - Reliable Energy Advisors, Milan).
► Tommaso dell'Olmo, LM in Finance and Risk Management, University of Florence, Jul 2018–Dec 2018. "Application of the Kelly Criterion on Asset Allocation". 110/110 with Laude (First Employment: ICT- Risk management presso UniCredit, Milan).
► Dalila Gjyrezi, LM in Finance and Risk Management, University of Florence, Jul 2019–Dec 2019. "Multilevel Monte Carlo for Option Pricing - Comparison between the Euler-Maruyama method and the Milstein scheme". 106/110 (First Employment: Trainee in European Central Bank, Frankfurth).
► Dario Rancati, LM in Mathematics, Scuola Normale Superiore, Mathematics, jointly with Prof. Josef Teichmann (ETH Zurich), Jan 2020-Jan 2021. "Reservoir Computing for Time Series Forecasting". 110/110 with Laude. (First Employment: Applied Scientist Intern at Amazon Web Services (AWS)).

► Riccardo Ceccon, LM in Mathematics, Scuola Normale Superiore, Mathematics, jointly with Prof. Stefano Marmi, Jan 2020-Jan 2021. " Randomization and Discretization of a Population-Market Model". 110/110 with Laude. (First Employment: Junior Quantitative Researcher at SquarePoint Capital, Paris)

Supervision of Ph.D students

► Maddalena Ghio, PhD in Mathematical Finance, Scuola Normale Superiore, with Prof. Luciano Campi and Prof. Stefano Marmi, Nov 2017–Sept 2021. "Mean-Field Games with Absorption and Singular Controls". 70/70 cum Laude. (First Employment: Financial Engineering Consultant at Exprivia, Milan).

► Francesco Cordoni, PhD in Mathematical Finance, Scuola Normale Superiore, with Prof. Fulvio Corsi and Prof. Stefano Marmi Nov 2018–June 2021. "From Macro to Micro: Causal Inference, Firm Valuation and Trading Conditions". 70/70 cum Laude. (First Employment: Research Fellow at University of Pisa).

► Alessandro Bondi, PhD in Computational Methods and Mathematical Models for Sciences and Finance, Scuola Normale Superiore, with Prof. Franco Flandoli Nov 2020–.

Workshops Organizer

► "School in Machine Learning of Dynamic Processes and Time Series Analysis, Nov 26-27, 2020, Scuola Normale Superiore of Pisa". Co-organized with Prof. Fabrizio Lillo, Dr. Piero Mazzarisi, Prof. Stefano Marmi.

►"HFFE 2018: Frontiers in High-Frequency Financial Econometrics", Sept. 28-29, 2018, Scuola Normale Superiore di Pisa. In collaboration with Dr. Giuseppe Buccheri, Dr. Daniele Tantari and Dr. Luca Trapin.

Publications

Submitted

►**BONDI, A.**, LIVIERI, G, PULIDO, S., "Affine Volterra Processes with Jumps".

►**LIVIERI, G.**, MANCINO, M. E., MARMI, S., TOSCANO, G., "Volatility of volatility estimation: central limit theorems for the Fourier transform estimator and empirical study of the daily time series stylized facts"

► LILLO, F., **LIVIERI, G.**, MARMI, S., SOLOMKO, A., VAIENTI, S., "Analysis of bank leverage via dynamical systems and deep neural networks".

► BOTAZZI, G., CORDONI, F., **LIVIERI, G.**, MARMI, S., "Uncertainty in Firm Valuation and a Cross-Sectional Misvaluation Measure". SSRN.3614988.

► DARCY, M., HAMZI, B., **LIVIERI, G.**, OWHADI, H., TAVALLALI, P., "One-Shot Learning of Stochastic Differential Equations with Computational Graph Completion". DOI:10.13140/RG.2.2.32262.65604.

Publications

► FLANDOLI, F., GHIO, M., **LIVIERI, G.**, "N-player games and MFGs of intermediate interaction.", Applied Mathematics and Optimization. (Just Accepted: November 2021)

►CAMPI, L., DE ANGELIS, T., GHIO, M., **LIVIERI, G.**,"Mean-Field Games of Finite-Fuel Capacity Expansion with Singular Controls.", Annals of Applied Probability. (Just Accepted: November 2021)

►TIRONE, S., GHIO, M., **LIVIERI, G.**, MARMI, S., GIOVANETTI, V.,"Kelly Betting with Quantum Payoff: a continuous variable approach.", Quantum. (Just Accepted: July 2021)

► MERTENS, L., CIACCI, A., LILLO, F., **LIVIERI, G.**, "Liquidity Fluctuations and the latent dynamic of price impact.", Quantitative Finance. (Just Accepted: June 2021).

► CAMPI, L., GHIO, M., **LIVIERI, G.**,"N-player games and mean-field games with smooth dependence on past absorptions", Annales de l'Institut Henri Poincaré (b) Probabilités et Statistiques. (Just Accepted: December 2020).

►BUCCHERI, G., CORSI, F., FLANDOLI, F., **LIVIERI, G.**, "The Continuous-Time Limit of Score-Driven Volatility Models", Journal of Econometrics. (https://doi.org/10.1016/j.jeconom.2020.07.042).

►KOLOKOLOV, A., **LIVIERI, G.**, PIRINO, D., "Statistical inference for price staleness", Journal of Econometrics (https://doi.org/10.1016/j.jeconom.2020.01.021).
►BUCCHERI, G., **LIVIERI, G.**, PIRINO, D., POLLASTRI, A., "A Closed-Formula Characterization of the Epps Effect", Quantitative Finance (https://doi.org/10.1080/14697688.2019.1659992).
►BILLIO, M., DONADELLI, M., PARADISO, A., **LIVIERI, G.**, "On the role of domestic and international financial cyclical factors in driving economic growth", Applied Economics, (https://doi.org/10.1080/00036846.2019.1659934)
►**LIVIERI, G.**, MANCINO, M. E., MARMI, S., "Asymptotic results for the Fourier estimator of the integrated quarticity", Decision in Economics & Finance (https://doi.org/10.1007/s10203-019-00259-6).
►BORMETTI, G., CASARIN, R., CORSI, F., **LIVIERI, G.**, "A stochastic volatility model with realized measures for option pricing", Journal of Business & Economic Statistics (https://doi.org/10.1080/07350015.2019.1604371).
►DONADELLI, M., PARADISO, A., **LIVIERI, G.**, "Adding cycles into the neoclassical growth model", Economic Modelling (https://doi.org/10.1016/j.econmod.2018.09.018).
►**LIVIERI, G.**, MOUTI, S., PALLAVICINI, A., ROSENBAUM, M., "Rough Volatility: Evidence from Option Prices", IISE Transactions (https://doi.org/10.1080/24725854.2018.1444297).
►BORMETTI, C, CALLEGARO, G., **LIVIERI, G.**, PALLAVICINI, A., "A backward Monte Carlo approach to exotic option pricing", European Journal of Applied Mathematics (https://doi.org/10.1017/S0956792517000079).
► FISCHER, M., **LIVIERI, G.**, "Continuous time mean-variance portfolio optimization through the mean field approach", ESAIM: Probability and Statistics, (https://doi.org/10.1051/ps/2016001).

Visiting Period

University Pierre and Marie CURIE, Paris (June 2016, one week); University Ritsumeikan, Japan (April 2018, two weeks); London School of Economics (21 October 2019- 24 November 2019). FIM - Forschungsinstitut für Mathematik, Zürich (23 June 2021 – 17 Sept 2021).

Invited Seminars

► (7-Ott-2016) *Smile at errors: A discrete-time stochastic volatility framework for pricing options with realized measures*, Rough Volatility Meeting, Imperial College London.
► (28-Ott-2016) *Smile at errors: A discrete-time stochastic volatility framework for pricing options with realized measures*, University of Padova, Department of Mathematics.
► (01-Dic-2017) *Introduction to rough volatility and evidence of rough volatility from option prices*, University of Tor Vergata of Rome, Department of Economics.
►(21-Feb-2018) *Statistical Inference for price staleness*, University Cá Foscari of Venice, Department of Economics.
►(08-May-2018) *Statistical Inference for price staleness*, Politecnico di Milano, Department of Mathematics.
►(15-Oct-2019) *Asymptotic results for the Fourier estimator of the integrated quarticity*, Ritsumeikan Workshop, Kyoto.
►(31-Oct-2019) *Statistical Inference for price staleness*, Cass Business School, London.
► (Postponed due to COVID-19) *Mean-Field Games of Finite-Fuel Capacity Expansion with Singular Control*, Columbia University, New York.
► (11-Mar-2021) *Mean-Field Games of Finite-Fuel Capacity Expansion with Singular Control*, held on-line, LaMME Paris.
► (05-Nov-2021) *Analysis of bank leverage via dynamical systems and deep neural networks*, UZH.

Talks

► 4-6 April 2022, Doctoral Workshop in Big Data Analytics in Finance at Haus Wiese-neck (https://www.wiesneck.de/), Invited for Prof. Roxana Halbleib as ex-perts in the field to participate to the discussions, give feedback and give a talk on the topic.
► 17-19 Jan 2022, Ergodicity Economics 2022 (EE2022), Invited Speaker.
► 27–29 Oct 2021, University of Florence, Florence, *First Florence-Paris Workshop on Mathematical Finance*, Invited Speaker.
► 7–8 Oct 2021, Swiss National Bank, Zurich, *16th Central Bank Conference on the Microstructure of Financial Markets 2021*, Discussant of the paper: The Conduits of Price Discovery: A Machine Learning Approach.
► 13-15 Sept 2021, Università Cattolica del Santo Cuore, Milano, *Nonlinear Economic Dynamics Conference*.
► 12–14 Jun 2019, Shanghai, *Sofie 2019*, School of Economics and School of Data Science at Fudan University, Poster Session.
► 26–29 Jan 2019, Zurich, *XX Workshop in Quantitative Finance*, ETH Zurich, Invited Speaker and co-author of other two presented works.
►15–16 Jan 2019, Bologna, *"Stochastic PDEs and Mean-Field Games"*, University of Bologna, Co-author of a presenting talk.
► 14–16 Dec 2017, Pisa, *CMStatistic 2017*, Universitá di Pisa, Invited Speaker
► 12–14 Jun 2018, Lugano, *SoFiE 2018*, Universitá della Svizzera Italiana, Co-author of an Invited Speaker
► 16–18 Dec 2017, London, *CMStatistic 2017*, University of London, Invited Speaker.
►31 Ago–2 Sept 2017, London, *MMF Conference*, Imperial College London, Invited Speaker.
►9–11 Mar 2017, Vienna, *Vienna Copenhagen Conference on Financial Econometrics*, University of Vienna, Poster Session
►9–11 Dec 2016, Seville, *CMStatistic 2016*, University of Seville, Invited Speaker.
► 27–28 Oct 2016, Venice, *European Seminar on Bayesian Econometrics*, University Ca' Foscari of Venezia, Invited Speaker.
►28–29 Jan 2016, Pisa, *XVII Workshop in Quantitative Finance*, Scuola Normale Su-periore, Invited Speaker.
►22–23 Oct 2015, Berlino, *Junior Female Researchers in Probability*, TU University, Invited Speaker.
► 14–16 Sept 2015, Prague, *Econophysics Colloquium 2015*, Charles University.
► 27 Feb, Milan 2015, *The development of securities markets. Trends, risk and policies*, Bocconi University
► 29–30 Jan 2015, Parma, *XVI Workshop in Quantitative Finance*, Department of Eco-nomics.
►7–9 Lug 2014, Pisa, *Games and Decision 2*, Scuola Normale Superiore.
►6 Giu 2014, Pisa, *Symposium on Return Predictability in Stock and Real Estate Mar-ket*, Scuola Normale Superiore.
►23–24 Jan 2014, Firenze, *XV Workshop in Quantitative Finance*, Department of Eco-nomics and Management.

PhD Committees

Dr. Giorgio Stefani, PhD in Mathematics, Scuola Normale Superiore (2020); Dr. Fred-eric Bucci, PhD in Mathematical Finance, Scuola Normale Superiore (2020); Dr Gael Mboussa Anga, PhD in Mathematical Finance, Scuola Normale Superiore (2020); Dr Daniele Semola, PhD in Mathematics, Scuola Normale Superiore (2020); Dr Francesco Grotto, PhD in Mathematics, Scuola Normale Superiore (2020). Dr Clemente De Rosa, PhD in Mathematical Finance, Scuola Normale Superiore (2020); Dr Carlo Campa-jola, PhD in Mathematical Finance, Scuola Normale Superiore (2020); Dr Francesco Cordoni, PhD in Mathematical Finance, Scuola Normale Superiore (2021); Dr Danilo Vassallo, PhD in Mathematical Finance, Scuola Normale Superiore (2022); Dr Matteo Ottaviani, PhD in Mathematical Finance, Scuola Normale Superiore (2022);

Appointment Boards One post-doc at the Scuola Normale Superiore, 2022; "Algorithmic trading nei mercati dell'energia attraverso l'analisi della microstruttura" (Winner: Dr. Ayoub Mounim) Committee: Prof. Giacomo Bormetti, Prof. Fabrizio Lillo, Dr. Giulia Livieri.
Two post-docs at the Scuola Normale Superiore, 2020; "Portfolio construction and optimization of Multi-Asset Portfolios with a target volatility level, creation and optimization of "smart" Multi-Factor Portfolios in the Equity and Fixed Income asset classes" (Winners: Gael Mboussa Anga and Federico Maglione. Committee: Dr. Giulia Livieri, Prof. Stefano Marmi, Dr. Lorenzo Di Pietrantonio (Fineco Asset Management).
One post-doc at the Scuola Normale Superiore, 2021; "Modelli stocastici di interesse per la meccanica dei fluidi" (Winner: Leonardo di Carlo) Commitee: Prof. Franco Flandoli, Dr. Giulia Livieri, Prof. Stefano Marmi.
One post-doc at the Scuola Normale Superiore, 2021; "Gradient flows, optimal transport and metric measure structures" (Winner: Francesco Palmurella) Commitee: Prof. Luigi Ambrosio, Dr. Giulia Livieri, Prof. Andrea Malchiodi.

Special Skills **Computer Skills:** Matlab/Octave, Python, R. **Languages:** English (fluent), French (basic).

Editorial Activities ► (March 2022–) I am a Guest Editor for the Special Issue *Machine Learning Methods and Models for Financial Stability* for the *AIMS Journal - Reputable & Affordable Open Access Journals* together with Prof. Stefano Marmi (Scuola Normale Superiore).
► (March 2021–) I am a Topic Editor for the *Frontiers in Artificial Intelligence* with the topic proposal *Smart Data and Machine Learning for Volatility Measuring and Forecasting* together Prof. Francesco Audrino (University of St Gallen) and Prof. Massimiliano Caporin (University of Padova).
► Referee for Mathematical Finance, Neural Networks, Decision and Economics in Finance, Journal of Business & Economic Statistics.