

Salvatore Federico

Curriculum Vitae

✉ s.federico@unibo.it
Married, two sons

Current Position

Sep 2023 – **Full Professor**, *University of Bologna*, Italy.
present Chair in Probability and Mathematical Statistics.

Academic Habilitations

Italian habilitation as Full Professor of Mathematics Applied to Economics and Social Sciences.
Italian habilitation as Full Professor of Political Economics.

Research Interests

- Optimal (stochastic) control in finite and infinite dimension
- Economic and financial applications of optimal control theory
- Differential games and mean field games

Scientific Collaborations

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| ○ René Aïd, Université Paris Dauphine | ○ Huyền Pham, Université Paris 7 |
| ○ Mauro Bambi, Durham University, UK | ○ Luca Regis, Università di Torino |
| ○ Raouf Boucekkine, Université de Aix-Marseille. | ○ Frank Riedel, University of Bielefeld |
| ○ Alessandro Calvia, Politecnico di Milano | ○ Michael Röckner, University of Bielefeld |
| ○ Andrea Cosso, Università di Milano | ○ Neofytos Rodosthenous, UCL, London |
| ○ Tiziano De Angelis, Università di Torino | ○ Mauro Rosestolato, Università di Genova |
| ○ Jodi Dianetti, Università di Roma 2 | ○ Patrick Schumann, University of Bielefeld |
| ○ Marina Di Giacinto, Università di Cassino | ○ Andrzej Święch, Georgia Tech |
| ○ Cristina Di Girolami, Università di Bologna | ○ Jun Sekine, Osaka University |
| ○ Giorgio Ferrari, University of Bielefeld | ○ Elisa Tacconi, Università Bocconi |
| ○ Giorgio Fabbri, CNRS | ○ Peter Tankov, ENSAE - Paris Tech |
| ○ Davide Fiaschi, Università di Pisa | ○ Maria Laura Torrente, Università di Genova |
| ○ Paul Gassiat, Université Paris Dauphine | ○ Nizar Touzi, New York University |
| ○ Daria Ghilli, Università di Pavia | ○ Elena Vigna, Università di Torino |
| ○ Ben Goldys, University of Sydney | ○ Bertrand Villeneuve, Paris Dauphine |
| ○ Fausto Gozzi, Luiss (Roma) | ○ Bernt Øksendal, CMA - University of Oslo |

Past Academic Positions

Associate Professor at Universities of Siena and Genova (Italy).

Assistant Professor at Universities of Milan and Florence (Italy).

Post-doc, Laboratoire de Probabilités et Modèles Aléatoires, Université Paris 7.

Post-doc, LUISS University, Rome.

Education

2005–2007 **PhD in Mathematics for Finance**, *Scuola Normale Superiore*, Pisa.

2004 **MSc in Mathematics**, *University of Pisa*.

Research Visits (selected)

- 2008: University of New South Wales (Sydney), invited by Ben Goldys
- 2009: University of Oslo, invited by Bernt Øksendal (ESF grant)
- 2010: University of New South Wales, Sydney, invited by Ben Golds
- 2013: École Polytechnique (Paris), invited by Nizar Touzi
- 2013: Université Paris 7, invited by Huyen Pham
- 2014: University of York, invited by Mauro Bambi
- 2018: University of Turku (Finland), invited by Luis Alvarez
- 2012-25: University of Bielefeld, invited by Giorgio Ferrari
- 2023: University College London, invited by Neofytos Rodosthenous

Invited Talks at International Conferences

- Viennese Vintage Workshop, December 4-5, 2009, Vienna, Austria.
- Workshop "Stochastic Control in Finance", March 18-23, 2010, Roscoff, France.
- EURO XXIV, July 11-14, 2010, Lisbon, Portugal.
- Control of PDEs with Nonlocal Terms, Institut Henri Poincaré, December 16-17, 2010, Paris, France.
- 12th Viennese Workshop on Optimal Control, Dynamic Games and Nonlinear Dynamics, May 30 - June 2, 2012, TU Vienna, Austria.
- Workshop on Stochastic Analysis and Applications, Centre Interfacultaire Beroulli, EPFL, June 4-8, 2012, Lausanne, Switzerland.
- Workshop "Stochastics and Real World Models", July 15-19, 2013, University of Bielefeld, Germany.
- Conference "Stochastic Partial Differential Equations and Applications - IX", January 6-12, 2014, Levico Terme, Italy.
- Workshop "Mathematical Finance and Related Issues", March 16-20, 2015, Osaka University, Japan.
- 13th Viennese Workshop on Optimal Control and Dynamic Games, May 13-16, 2015, Vienna, Austria.
- Workshop "Strategic Aspects of Optimal Stopping and Control in Economics and Finance", July 9-11, 2015, University of Bielefeld, Germany.
- Workshop "Optimal Stopping in Complex Environments", December 18-20, 2017, University of Bielefeld, Germany.

- 14th Viennese Workshop on Optimal Control and Dynamic Games, July 3-6, 2018, Vienna, Austria.
- Viennese Vintage Workshop, December 5-6, 2019, Vienna, Austria.
- XXXI EURO Conference, July 12-14, 2021 (online), Athens, Greece.
- One-day Workshop in Mathematical Economics and Mathematical Finance, March 1, 2023, Bielefeld, Germany.
- Stochastic Control and Games for Risk and Regulation, October 28-31, 2024, Hammamet, Tunisia.
- Workshop "Mean Field Games and Applications", July 21-23, 2025, Humboldt University, Berlin, Germany.

Awards

2008/09 Luiss Prize for Research Activity
 2012 AMASES Prize for PhD studies

Advising

- PhD advisor of Elisa Tacconi (LUISS University, Rome)
- PhD advisor of Filippo De Feo (Politecnico di Milano)
- Supervisor of several MSc and BSc theses in Mathematics and Applied Mathematics

Publications

International peer-reviewed journals

- [1] S. Federico, B. Goldys, F. Gozzi, *HJB Equations for the Optimal Control of Differential Equations with Delays and State Constraints, I: Regularity of Viscosity Solutions*. SIAM Journal on Control and Optimization, Vol. 48, No. 8, pp. 4910-4937 (2010).
- [2] M. Di Giacinto, S. Federico, F. Gozzi, *A pension fund with minimum guarantee: a stochastic control approach*. Finance and Stochastics, Vol. XV, No. 2, pp. 297-342 (2011).
- [3] S. Federico, *A stochastic control problem with delay arising in a pension fund model*. Finance and Stochastics, Vol. XV, No. 3, pp. 421-459 (2011).
- [4] S. Federico, B. Goldys, F. Gozzi, *HJB equations for the optimal control of differential equations with delays and state constraints, II: Verification and optimal feedbacks*. SIAM Journal on Control and Optimization, Vol. 49, No. 6, pp. 2378-2414 (2011).
- [5] S. Federico, B. Øksendal, *Optimal stopping of stochastic differential equations with delay driven by a Lévy noise*. Potential Analysis, Vol. 34, No. 2, pp. 181-198 (2011).
- [6] M. Di Giacinto, S. Federico, F. Gozzi, E. Vigna, *Income drawdown option with minimum guarantee*. European Journal of Operational Research, Vol. 234, No. 3, pp. 610-624 (2014).
- [7] S. Federico, P. Gassiat, *Viscosity characterization of the value function of an investment consumption problem in a mixed liquid-illiquid market*. Journal of Optimization: Theory and Applications, Vol. 160, No. 3, pp. 966-991 (2014).
- [8] S. Federico, E. Tacconi, *Dynamic Programming for Optimal Control Problems with Delays in the Control Variable*. SIAM Journal on Control and Optimization, Vol. 52, No. 2, pp. 1203-1236 (2014).
- [9] S. Federico, H. Pham, *Characterization of optimal boundaries in reversible investment problems*. SIAM Journal on Control and Optimization, Vol. 52, No. 4, pp. 2180-2223 (2014).

- [10] S. Federico, P. Tankov, *Finite-dimensional Markovian representation for stochastic control problems with delay*. Applied Mathematics and Optimization, Vol. 71, No. 1, pp. 165–194 (2015).
- [11] S. Federico, P. Gassiat, F. Gozzi, *Utility maximization with current utility depending on the wealth: Regularity of solutions to the HJB equation*. Finance and Stochastics, Vol. 19, No. 2, pp. 415–448 (2015).
- [12] G. Fabbri, S. Federico, *On the infinite-dimensional representation of stochastic controlled systems with delayed control in the diffusion term*. Mathematical Economics Letters, Vol. 2, No. 3–4, pp. 33–44 (2014).
- [13] R. Aïd, S. Federico, H. Pham, B. Villeneuve, *Explicit investment rules with time-to-build and uncertainty*. Journal of Economic Dynamics and Control, Vol. 51, pp. 240–256 (2015).
- [14] S. Federico, P. Gassiat, F. Gozzi, *Impact of time illiquidity in a mixed market without full observation*. Mathematical Finance, Vol. 27, No. 2, pp. 401–437 (2017).
- [15] M. Bambi, C. Di Girolami, S. Federico, F. Gozzi, *On the Consequences of Flexible Investment Projects in an Endogenous Growth Model*. Economic Theory, Vol. 63, No. 2, pp. 521–558 (2017).
- [16] T. De Angelis, S. Federico, G. Ferrari, *Optimal Boundary Surface for Irreversible Investment with Stochastic Costs*. Mathematics of Operations Research, Vol. 42, No. 4, pp. 1135–1161 (2017).
- [17] S. Federico, F. Gozzi, *Mild solutions of semilinear elliptic equations in Hilbert spaces*. Journal of Differential Equations, Vol. 262, No. 5, pp. 3343–3389 (2017).
- [18] A. Cosso, S. Federico, F. Gozzi, M. Rosestolato, N. Touzi, *Path-dependent equations and viscosity solutions in infinite dimension*. The Annals of Probability, Vol. 46, No. 1, pp. 125–174 (2018).
- [19] S. Federico, F. Gozzi, *Verification theorems for stochastic control problems in Hilbert spaces by means of a generalized Dynkin formula*. The Annals of Applied Probability, Vol. 28, No. 6, pp. 3558–3599 (2018).
- [20] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, *Growth and Agglomeration in the Heterogeneous Space: A Generalized AK Approach*. Journal of Economic Geography, Vol. 19, No. 6, pp. 1287–1318 (2019).
- [21] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, *Geographic Environmental Kuznets Curves: the Optimal Growth Linear-Quadratic Case*. Mathematical Modelling of Natural Phenomena, Vol. 14, No. 1 (2019).
- [22] S. Federico, M. Rosestolato, E. Tacconi, *Irreversible investment with fixed adjustment costs: an impulse stochastic control approach*. Mathematics and Financial Economics, Vol. 13, No. 4, pp. 579–616 (2019).
- [23] S. Federico, M. Rosestolato, *C_0 -sequentially equicontinuous semigroups*. Kyoto Journal of Mathematics, Vol. 60, No. 3, pp. 1131–1175 (2020).
- [24] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, *Control theory in infinite dimension for the optimal location of economic activity: The role of social welfare function*. Pure and Applied Functional Analysis, Vol. 6, No. 5, pp. 871–888 (2021).
- [25] S. Federico, G. Ferrari, P. Schumann, *A Singular Stochastic Control Problem with Interconnected Dynamics*. SIAM Journal on Control and Optimization, Vol. 58, No. 5, pp. 2821–2853 (2020).
- [26] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, *From firm to global-level pollution control: the case of transboundary pollution*. European Journal of Operational Research, Vol. 290, No. 1, pp. 331–345 (2021).

- [27] S. Federico, G. Ferrari, *Taming the spread of an epidemics by lockdown policies*. Journal of Mathematical Economics, Vol. 93 (2021).
- [28] S. Federico, G. Ferrari, F. Riedel, M. Röckner, *On a Class of Infinite-Dimensional Singular Stochastic Control Problems*. SIAM Journal on Control and Optimization, Vol. 59, No. 2, pp. 1680–1704 (2021).
- [29] S. Federico, G. Ferrari, P. Schumann, *Singular control of the drift of a Brownian system*. Applied Mathematics and Optimization, Vol. 84, pp. 561–590 (2021).
- [30] A. Calvia, S. Federico, F. Gozzi, *State constrained control problems in Banach lattices and applications*. SIAM Journal on Control and Optimization, Vol. 59, No. 6, pp. 4481–4510 (2022).
- [31] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, *Managing spatial linkages and geographic heterogeneity in dynamic models with transboundary pollution*. Journal of Mathematical Economics, Vol. 98 (2022).
- [32] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, *A Dynamic Theory of Spatial Externalities*. Games and Economic Behavior, Vol. 132, pp. 133–165 (2022).
- [33] S. Federico, G. Ferrari, M.L. Torrente, *Optimal Vaccination in a SIRS Epidemic Model*. Economic Theory (2022), <https://doi.org/10.1007/s00199-022-01475-9>
- [34] G. Fabbri, S. Federico, D. Fiaschi, F. Gozzi, *Mobility decisions, economic dynamics and epidemic*. Economic Theory (2023), <https://link.springer.com/article/10.1007/s00199-023-01485-1>
- [35] S. Federico, G. Ferrari, N. Rodosthenous, *Two-sided Singular Control of an Inventory with Unknown Demand Trend*. SIAM Journal on Control and Optimization, Vol. 61(5) (2023).
- [36] S. Federico, G. Ferrari, M.L. Torrente, *Irreversible Reinsurance: Minimization of Capital Injections in Presence of a Fixed Cost*. Mathematics and Financial Economics, Vol. 18 (2024).
- [37] F. De Feo, S. Federico, A. Swiech, *Optimal control of stochastic delay differential equations and applications to path-dependent financial and economic models*. SIAM Journal on Control and Optimization, Vol. 62, No. 3, pp. 1490–1520 (2024).
- [38] J. Dianetti, S. Federico, G. Ferrari, G. Floccari, *Multiple equilibria in mean-field game models for large oligopolies with strategic complementarities*. Quantitative Finance, Vol. 25(3), pp. 343–357 (2024).
- [39] S. Federico, F. Gozzi, A. Swiech, *On Mean Field Games in Hilbert spaces*. Journal de Mathématiques Pures et Appliquées, Vol. 205, No. 9 (2026).
- [40] S. Federico, F. Gozzi, D. Ghilli, *Linear-Quadratic Mean Field Games in Hilbert spaces*. To appear in SIAM Journal on Mathematical Analysis.
- [41] S. Federico, G. Ferrari, M. Rosestolato, *Partial regularity of semiconvex viscosity supersolutions to fully nonlinear elliptic HJB equations and applications to stochastic control*. To appear in SIAM Journal on Mathematical Analysis.

Proceedings (peer-reviewed)

- [42] S. Federico, *A pension fund model in the accumulation phase: a stochastic control approach*. Banach Center Publications: Advances in Mathematics of Finance, Vol. 83 (2008).

Submitted papers

- [43] S. Federico, G. Ferrari, F. Riedel, M. Röckner, *Variational inequalities and smooth-fit principle for singular stochastic control problems in Hilbert spaces*, Arxiv preprint.
- [44] A. Calvia, S. Federico, G. Ferrari, F. Gozzi, *A mean-field model of optimal investment*, Arxiv preprint.

[45] R. Boucekkine, G. Fabbri, S. Federico, F. Gozzi, T. P. Loch-Temzelides, C. Ricci, *Differential climate games with heterogeneous players*. Submitted.

[46] G. Fabbri, S. Faggian, S. Federico, F. Gozzi, *Optimal Control in Infinite Dimensional Spaces and Economic Modeling: State of the Art and Perspectives*. Submitted.

PhD Thesis

Stochastic Optimal Control Problems for Pension Funds Management, Scuola Normale Superiore di Pisa, 2009.