

# Stefano Pagliarani\*- Curriculum Vitae

<http://stefanopagliarani.altervista.org>

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## Personal data

- Stefano Pagliarani, born in Rimini (Italy), June 22nd, 1985. Married to Carolina, two children: Francesco and Lorenzo

## Research interests

- Lévy driven stochastic differential equations
- parabolic and hypoelliptic P(I)DEs
- non-linear (backward, and McKean-Vlasov) stochastic differential equations
- applications to mathematical finance

## Academic track

- 2019, December onward: associate professor (II fascia) of Probability and Statistics at Università di Bologna, Dipartimento di Matematica;
- 2017, December - 2019, November: associate professor (II fascia) of Mathematical Finance at Università di Udine, Dipartimento di Scienze Economiche e Statistiche (DIES);
- 2016, September - 2017, November: assistant professor (RTDA) at Università di Trieste, Dipartimento di Scienze Economiche, Aziendali, Matematiche e Statistiche “Bruno de Finetti” (DEAMS);

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- 2016, January - 2016, August: postdoctoral researcher at École Polytechnique, Centre de Mathématiques Appliquées - Paris. Position financed by the Louis Bachelier Finance and Sustainable Growth laboratory;
- 2014, January - 2015, December: postdoctoral researcher at École Polytechnique, Centre de Mathématiques Appliquées - Paris. Position financed by the Chair Financial Risks of the Risk Foundation;
- 2011, January - 2013, December (thesis defended on March 7th, 2014): PhD in Computational Mathematics at the University of Padova, Department of Mathematics (2014, March). Thesis supervisor: Prof. Tiziano Vargiolu;
- 2008, September - 2010, October (thesis defended on October 1st, 2010): Master Degree in Mathematics cum laude from the University of Bologna (2010, October). Thesis supervisor: Prof. Andrea Pascucci.

### Qualifications

- 07/05/2021: Italian National Scientific Qualification for full professor in Probability (ASN, I fascia, settore concorsuale 01/A3);
- 20/04/2021: Italian National Scientific Qualification for full professor in Applied Mathematics (ASN, I fascia, settore concorsuale 13/D4);
- 28/03/2017 : Italian National Scientific Qualification for associate professor in Probability (ASN, II fascia, settore concorsuale 01/A3);
- 28/03/2017: Italian National Scientific Qualification for associate professor in Applied Mathematics (ASN, II fascia, settore concorsuale 13/D4).

### Grants

- 2021: project coordinator of *UNA-Random*, supported by Seed Funding grant (14965 E.) awarded by UNA Europa after competitive selection  
<https://sites.google.com/view/una-random/home>
- 2017: beneficiary of FFABR (Fondo per il finanziamento delle attività base di ricerca). Personal research-grant (3000 E.) awarded by the Italian Ministry of Education, University and Research after competitive selection;
- 2016: research grant (25000 E.) issued by *Louis Bachelier Finance and Sustainable Growth laboratory* for the project *Analytical approximations for mean field equations and their applications to finance and economics* (project number: ANR 11-LABX-0019).

### Research papers

Contributions in international journals:

- [1] Pagliarani S., Polidoro S., *A Yosida's parametrix approach to Varadhan's estimates for a degenerate diffusion under the weak Hörmander condition*, **Journal of Mathematical Analysis and Applications**, 517(1), 2022
- [2] Kamm K., Pagliarani S., Pascucci A., *On the stochastic Magnus expansion and its application to SPDEs*, **Journal of Scientific Computing**, 89(3), 56, 2021
- [3] Agarwal A., Pagliarani S., *A Fourier-based Picard-iteration approach for a class of McKean-Vlasov SDEs with Lévy jumps*, **Stochastics: An International Journal of Probability and Stochastic Processes**, 93(4), pp. 592–624, 2021
- [4] Lanconelli A., Pagliarani S., Pascucci A., *Local densities for a class of degenerate diffusions*, **Annales de l'Institut Henri Poincaré, Probability and Statistics**, 56(2), 1440–1464, 2020
- [5] Gobet E., Pagliarani S., *Analytical approximations of non-linear SDEs of McKean-Vlasov-type*, **Journal of Mathematical Analysis and Applications**, 466(1), pp. 71–106, 2018
- [6] Barletta A., Nicolato E., Pagliarani S., *The Short-time Behavior of VIX Implied Volatilities in a Multifactor Stochastic Volatility Framework*, **Mathematical Finance**, 29(3), 928–966, 2019
- [7] Pagliarani S., Pascucci A., *The exact Taylor formula of implied volatility*, **Finance and Stochastics**, 21(3), 661–718, 2017
- [8] Pagliarani S., Pascucci A., Pignotti M., *Intrinsic expansions for averaged diffusion processes*, **Stochastic processes and their applications**, 127(8), 2560–2585, 2017
- [9] Pagliarani S., Pascucci A., Pignotti M., *Intrinsic Taylor formulas for homogeneous Kolmogorov-type groups*, **Journal of Mathematical Analysis and Applications**, 435(2), 1054–1087, 2016
- [10] Lorig M., Pagliarani S., Pascucci A., *Explicit Implied Vols for Multifactor Local-Stochastic Vol Models*, **Mathematical Finance**, 27(3), 926–960, 2015
- [11] Gobet E., Pagliarani S., *Analytical approximations of BSDEs with non-smooth driver*, **SIAM Journal Finan. Math.**, 6(1), 919–958, 2015
- [12] Lorig M., Pagliarani S., Pascucci A., *Analytical expansions for parabolic equations*, **SIAM J. Appl. Math.**, 75(2), 468–491, 2015
- [13] Lorig M., Pagliarani S., Pascucci A., *A family of density expansions for Lévy-type processes*, **Annals of Applied Probability**, 25(1), 235–267, 2015
- [14] Lorig M., Pagliarani S., Pascucci A., *Pricing Approximations and Error Estimates for Local Levy-Type Models with Default*, **Computers & Mathematics with Applications**, 69(10), pp. 1189–1219, May 2015

- [15] Capponi A., Pagliarani S., Vargiolu T., *Pricing vulnerable claims in a  $L\tilde{A}\textcircled{v}$  driven model*, **Finance and Stochastics**, 18(4), 755-789, 2014
- [16] Pagliarani S., Vargiolu T., *Portfolio optimization in a defaultable  $L\tilde{A}\textcircled{v}$  driven market model*, **OR Spectrum**, August 2014
- [17] Pagliarani S., Pascucci A., *Asymptotic expansions for degenerate parabolic equations*, **C. R. Math. Acad. Sci. Paris**, 352(12), 1011–1016, 2014
- [18] Lorig M., Pagliarani S., Pascucci A., *A Taylor series approach to pricing and implied vol for LSV models*, **Journal of Risk**, 17(2), 3–19, 2014
- [19] Pagliarani S., Pascucci A., Riga C., *Adjoint expansions in local Lévy models*, **SIAM J. Finan. Math.**, 4(1), pp. 265-296, 2013
- [20] Foschi P., Pagliarani S., Pascucci A., *Black-Scholes formulae for Asian options in local volatility models*, **Journal of Computational and Applied Mathematics**, 237, pp. 442-459, 2013
- [21] Pagliarani S., Pascucci A., *Local stochastic volatility with jumps: analytical approximations*, **Int. J. Theor. Appl. Finance**, 16(8), 2013
- [22] Pagliarani S., Pascucci A., *Analytical approximation of the transition density in a local volatility model*, **Cent. Eur. J. Math.**, 10(1), pp. 250-270, 2012

Preprints:

- [23] Lucertini G., Pagliarani S., Pascucci A., *Optimal regularity for degenerate Kolmogorov equations with rough coefficients*, Preprint 2022 - ArXiv
- [24] Kamm K., Pagliarani S., Pascucci A., *Numerical solution of kinetic SPDEs via stochastic Magnus expansion*, Preprint 2022 - ArXiv
- [25] Pagliarani S., Pignotti M., *Intrinsic Taylor formula for non-homogeneous Kolmogorov-type Lie groups*, Preprint 2017 - ArXiv

Proceeding papers and book chapters:

- [26] Lorig M., Pagliarani S., Pascucci A., *Asymptotics for  $d$ -dimensional Lévy-type processes*, in Large Deviations and Asymptotic Methods in Finance, Springer Proceedings in Mathematics & Statistics, Vol. 110, Editors: Friz P., Gatheral J., Gulisashvili A., Jacquier A., Teichmann J., 2015

### Research visiting

- July 2018: Seattle University, invited by Professor Matthew Lorig

- July 2018: Columbia University, invited by Professor Agostino Capponi
- February 2018: University of Glasgow, invited by Doctor Ankush Agarwal
- April 2017: Ecole Polytechnique, invited by Professor Emmanuel Gobet
- November 2015: Aarhus University (Denmark), invited by Professor Elisa Nicolato
- January 2015: Aarhus University (Denmark), invited by Professor Elisa Nicolato
- October 2013: Princeton (New Jersey, US), invited by Professor Matthew Lorig
- April-June 2013: Purdue University (Indiana, US), invited by Professor Agostino Capponi
- June-July 2012: Purdue University (Indiana, US), invited by Professor Agostino Capponi

### **Presentations in conferences, workshops and seminars**

#### Invited lectures:

- June 25-28th, 2019: Workshop on Stochastic Analysis in Finance and Economics, Universidad de los Andes and Universidad del Rosario, Bogotá, Colombia. Mini-course on *Analytic approximations for option pricing, implied volatility, and stochastic control problems*
- November 3-4th, 2015: University of Aarhus. PhD course on *Analytical methods for PDEs in mathematical finance*. PhD course at University of Aarhus

#### Invited talks:

- June 2022: Kolmogorov Operators and their Applications, Cortona, *Yosida parametrix and Varadhan estimates for a hypoelliptic diffusion*
- January 2022: Mathematical Finance seminar at Ritsumeikan University (online), *Yosida parametrix and Varadhan estimates for a hypoelliptic diffusion*
- May 2021: Seminari del Dipartimento di Matematica (online), Università di Modena, Modena. *Yosida parametrix and Varadhan estimates for a hypoelliptic diffusion*
- March 2019: Seminari del Dipartimento di Matematica, Università di Pisa, Pisa. *Contraction methods for a class of McKean-Vlasov SDEs with jumps*
- March 2019: Seminari del Dipartimento di Matematica, Università di Modena, Modena. *Local densities for a class of degenerate diffusions*

- February 2018: Wards Finance Seminar, Adam Smith Business School, University of Glasgow, Glasgow. *The short-time behavior of VIX imp. vol. in a multifactor stochastic volatility framework*
- November 2017: Seminari del Dipartimento di Dipartimento di Scienze Statistiche, University of Bologna, Bologna. *Analytical approximations for McKean-Vlasov diffusions*
- September 2017: Seminari del Dipartimento di Scienze Economiche, University of Verona, Verona. *VIX options and short-time behavior of VIX implied volatilities*
- June 2017: First Italian Meeting on Probability and Mathematical Statistics, Politecnico di Torino, Torino. *Analytical approximations for McKean-Vlasov diffusions*
- April 2017: GT Modles Stochastiques en Finance - CMAP, Ecole Polytechnique, France. *Analytical approximations for McKean-Vlasov diffusions*
- February 2017: Department of Statistics, University of Bologna, Rimini. *VIX options and short-time behavior of VIX implied volatilities*
- February 2017: Seminari di Finanza Matematica, Department of Mathematics, University of Bologna, Bologna. *Analytical approximations for McKean-Vlasov diffusions*
- March 2016: Department of Mathematics, Politecnico di Milano, Milano. *The parabolic Taylor formula of the implied volatility*
- January 2016: Job talk at Dept. of Statistics, University of Warwick, Paris. *The parabolic Taylor formula of the implied volatility*
- December 2015: SÃ©minaire de probabilitÃ©s et mathÃ©matiques financiÃ©res, UniversitÃ© Evry Val d'Essonne, Paris. *Analytical approximations of BSDEs with non-smooth driver*
- January 2015: GT Methodes stochastiques et Finance, Marne-la-Vallee University, Paris. *Intrinsic Taylor formulas for homogeneous Kolmogorov-type groups*
- January 2015: Oberseminar Finanz- und Versicherungsmathematik - FakultÃ©t fÃ¼r Mathematik, Technische UniversitÃ©t MÃ¼nchen *Analytical approximations of BSDEs with non-smooth driver*
- December 2014: Department of Mathematics, University of Bologna *Analytical approximations of BSDEs with non-smooth driver*
- November 2014: GT Probabilites-Statistiques-Controle, ENSTA - ParisTech, Paris. *Intrinsic Taylor formulas for homogeneous Kolmogorov-type groups*
- September 2014: GT Modles Stochastiques en Finance - CMAP, Ecole Polytechnique, Paris. *Analytical approximations of BSDEs with non-smooth driver*

- March 2014: Workshop in Model Approximation and Numerical Methods - University of Paris 7, Paris. *Analytical expansions for PIDE's in option pricing*
- November 2013: University of Vienna - University of Technology FAM, Vienna. *Analytical expansions for PIDE's: a general framework*
- November 2013: School of Business and Social Sciences, Aarhus. *Asymptotic expansions for PIDE's in option pricing*
- October 2013: Rutgers University, Piscataway . *Analytical approximations in defaultable Lévy driven models with local-stochastic volatility*
- July 2013: CMAP - Ecole Polytechnique, Paris. *Analytical Approximations in Volatility Models*
- July 2013: Institute of Mathematics - TU, Berlin. *Analytical Approximations in Volatility Models*
- January 2012: Prometeia spa, Bologna. *Approximation Formulae for Asian Options in Local Volatility Models*
- April 2011: Computational Management Science, Neuchatel. *Analytical Approximation of Models with Jumps*

#### Other talks

- September 2018: Workshop on BSDEs, Information and McKean-Vlasov equations. University of Leeds, Leeds. *A Fourier fixed-point approach for a class of McKean-Vlasov SDEs with Lévy jumps*
- January 2018: XIX Workshop on Quantitative Finance, University of Roma-Tre. *The short-time behavior of VIX imp. vol. in a multifactor stochastic volatility framework*
- January 2017: XVIII Workshop on Quantitative Finance, University of Milano-Bicocca. *Analytical approximations for McKean-Vlasov diffusions*
- December 2015: Research in Options 2015 at IMPA, Rio de Janeiro. *The parabolic Taylor formula of the implied volatility*
- October 2013: AMS Fall Eastern Sectional Meeting, Philadelphia. *Integro-differential expansions for defaultable local Lévy models*
- January 2013: XIV Workshop on Quantitative Finance, Rimini. *Portfolio optimization in a defaultable  $L\tilde{A}\otimes v$  driven market model*
- September 2012: XXXVI Convegno AMASES, Vieste (FG). *Portfolio optimization in a defaultable  $L\tilde{A}\otimes v$  driven market model*

- January 2012: XIII Workshop on Quantitative Finance, L'Aquila. *Black-Scholes formulae for Asian options in local volatility models*
- September 2011: XXXV Convegno AMASES, Pisa. *Approximation Formulae for Asian Options in Local Volatility Models*
- July 2011: Summer School SMI, Cortona. *Introduction to Stochastic Processes with Jumps*

### Refereeing activity

Finance and Stochastics, Mathematical Finance, SIAM Journal on Financial Mathematics, Stochastic Processes and their Applications, Proceedings of the Royal Society A, European Journal of Applied Mathematics, Journal of Elliptic and Parabolic Equations, IMA Journal of Numerical Analysis, Communication in nonlinear sciences and numerical simulation, Mathematics in Engineering, Journal of Computational Finance, International Journal of Theoretical and Applied Finance, International Review of Economics and Finance, Applied Mathematical Finance, Digital Finance, Quantitative Finance

### Other scientific responsibilities

- 2022, Jan - 2024, Dec: scientific supervisor of the research project "*Ottimizzazione stocastica per la produzione di energia da fonti rinnovabili*", funded by the Italian Ministry of Education, University and Research within (PON) "Ricerca e Innovazione" 2014-2020
- 2022, June: organizer of the workshop "*Mathematics of random complex systems*" <https://eventi.unibo.it/una-random-workshop>
- 2022, June: co-organizer (together with Andra Cosso, Elena Bandini, Andrea Pascucci and Antonello Pesce) of the conference "*Third Italian Meeting on Probability and Mathematical Statistics*", at Università di Bologna, Dipartimento di Matematica
- from 2021 onwards: member of the faculty board of the PhD in Mathematics at University of Bologna
- 2020 - 2021: member of the faculty board of the PhD in Statistics at University of Padua
- 2019, January: co-organizer (together with Andra Cosso, Alberto Lanconelli, Andrea Pascucci and Antonello Pesce) of the *Winter School on "Stochastic PDEs and Mean-Field Games"*, at Università di Bologna, Dipartimento di Matematica
- 2015, September - 2016 June: co-organizer (together with Stefano De Marco) of the cycle of seminars *Modèles Stochastiques en Finance* (Stochastic models for finance) at CMAP, École Polytechnique



- from 2013: co-author (together with Matthew Lorig and Andrea Pascucci) of the blog *ExplicitSolutions, Analytic formulae in option pricing*, an online repository for Mathematica notebooks on analytical approximation methods in option pricing.

## Teaching

A.Y. 2021-2021:

- *Probability Theory*. Course of the doctoral program in Statistics at University of Padua
- *Probabilistic Methods for the Applications*. Course of the bachelor degree in *Mathematics* at University of Bologna
- *Stochastic Calculus*. Course of the master degree in *Advanced Mathematics for the Applications* at University of Bologna

A.Y. 2021-2021:

- *Term Structure of Interest Rates*. Course of the higher education program in Mathematical Finance at University of Bologna
- *Probability Theory*. Course of the doctoral program in Statistics at University of Padua
- *Probabilistic Methods for the Applications*. Course of the bachelor degree in *Mathematics* at University of Bologna
- *Stochastic Calculus*. Course of the master degree in *Advanced Mathematics for the Applications* at University of Bologna
- *Mathematics*. Course of the bachelor degree in *Animal production* at University of Bologna

A.Y. 2020-2021:

- *Term Structure of Interest Rates*. Course of the higher education program in Mathematical Finance at University of Bologna
- *Probability Theory*. Course of the doctoral program in Statistics at University of Padua
- *Probabilistic methods for finance*. Course of the bachelor degree in *Mathematics* at University of Bologna
- *Stochastic Differential Equations*. Course of the master degree in *Mathematics* at University of Bologna
- *Mathematics*. Course of the bachelor degree in *Animal production* at University of Bologna
- *Probability and Statistics*. Course of the master degree in *Agricultural technologies* at University of Bologna

A.Y. 2019-2020:

- *Term Structure of Interest Rates*. Course of the higher education program in Mathematical Finance at University of Bologna

- *Probability Theory*. Course of the doctoral program in Statistics at University of Padua
- *Probabilistic methods for finance*. Course of the bachelor degree in *Mathematics* at University of Bologna
- *Stochastic Differential Equations*. Course of the master degree in *Mathematics* at University of Udine
- *General Mathematics*. Course of the bachelor degree in *Economics* at University of Udine
- *Quantitative Models for Business Measurement* (option pricing and portfolio theory). Course of the master degree in *Business Economics* at University of Udine

A.Y. 2018-2019:

- *Stochastic Differential Equations*. Course of the master degree in *Mathematics* at University of Udine
- *General Mathematics*. Course of the bachelor degree in *Economics* at University of Udine

- A.Y. 2017-2018:

- *Financial Mathematics of Uncertainty* (option pricing theory) (language: English). Course of the master degree in *Banca e finanza* at University of Udine
- *Matematica per l'economia* (multi-dimension differential calculus and financial mathematics). Course of the bachelor degree *Economia internazionale e mercati finanziari* at University of Trieste

A.Y. 2016-2017:

- Assistantship for the course of *Probabilità Elementare* of the bachelor degree *Statistica e informatica per l'azienda, la finanza e l'assicurazione* at University of Trieste
- *Matematica per l'economia* (multi-dimension differential calculus and financial mathematics). Course of the bachelor degree *Economia internazionale e mercati finanziari* at University of Trieste

A.Y. 2015-2016:

- Assistantship for the course of *Calibration of the Master 2 Probabilit s et Finance* at University Pierre et Marie Curie (Paris 6) (language: English)
- Assistantship for the course of *Numerical analysis of PDEs in mathematical finance* of the *Master 2 Probabilit s et Finance* at University Pierre et Marie Curie (Paris 6) (language: English)

A.Y. 2014-2015:

- Assistantship for the course of *Calibration of the Master 2 Probabilit s et Finance* at University Pierre et Marie Curie (Paris 6) (language: English)
- Assistantship for the course of *Numerical analysis of PDEs in mathematical finance* of the *Master 2 Probabilit s et Finance* at University Pierre et Marie Curie (Paris 6) (language: English)

A.Y. 2011-2012:

- Assistantship for the course of *Statistics* of the *Bachelor in Biotechnology* at University of Padova

### **Supervising activity**

A.Y. 2020-2021:

- Master thesis advisor (or co-advisor) of: Davide Trevisani, Giacomo Lucertini, Alessandro Sforza
- Bachelor thesis advisor (or co-advisor) of: Alessandro Anecchini, Irene Balzani, Maria Vittoria Bonini, Pietro Sittoni, Mattia Suzzi, Maria Giovanna Ficcadenti, Emanuele Fioriti, Riccardo Agabiti, Nicola Pegoretti, Giorgia Rensi

A.Y. 2019-2020:

- Master thesis co-advisor of Arianna Mingone, Universit  degli studi di Udine, Corso di Laurea Magistrale in Matematica
- Bachelor thesis advisor of: Andrea Amato, Universit  di Bologna

A.Y. 2018-2019:

- Midterm thesis advisor of Arianna Mingone, Scuola Superiore dell'Universit  degli studi di Udine

A.Y. 2015-2016:

- Master thesis co-advisor of Mariella Parussini, Universit  degli studi di Trieste, Corso di Laurea Magistrale in Scienze Statistiche ed Attuariali