

# Stefano Pagliarani\*- Curriculum Vitae

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## Personal data

- Stefano Pagliarani, born in Rimini (Italy), June 22nd, 1985. Married to Carolina, one son: Francesco

## 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

- from 2017, December: associate professor (II fascia) 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);
- 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;

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- 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.

### Grants and qualifications

- 28/03/2017 - 28/03/2023: Italian National Scientific Qualification for associate professor in Probability (ASN, II fascia, settore concorsuale 01/A3);
- 28/03/2017 - 28/03/2023: Italian National Scientific Qualification for associate professor in Applied Mathematics (ASN, II fascia, settore concorsuale 13/D4);
- 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] Lanconelli A., Pagliarani S., Pascucci A., *Local densities for a class of degenerate diffusions*, to appear in **Annales de l'Institut Henri Poincaré, Probability and Statistics**, 2019
- [2] 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
- [3] 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

- [4] Pagliarani S., Pascucci A., *The exact Taylor formula of implied volatility*, **Finance and Stochastics**, 21(3), 661–718, 2017
- [5] Pagliarani S., Pascucci A., Pignotti M., *Intrinsic expansions for averaged diffusion processes*, **Stochastic processes and their applications**, 127(8), 2560–2585, 2017
- [6] 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
- [7] Lorig M., Pagliarani S., Pascucci A., *Explicit Implied Vols for Multifactor Local-Stochastic Vol Models*, **Mathematical Finance**, 27(3), 926–960, 2015
- [8] Gobet E., Pagliarani S., *Analytical approximations of BSDEs with non-smooth driver*, **SIAM Journal Finan. Math.**, 6(1), 919–958, 2015
- [9] Lorig M., Pagliarani S., Pascucci A., *Analytical expansions for parabolic equations*, **SIAM J. Appl. Math.**, 75(2), 468–491, 2015
- [10] Lorig M., Pagliarani S., Pascucci A., *A family of density expansions for Lévy-type processes*, **Annals of Applied Probability**, 25(1), 235–267, 2015
- [11] 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
- [12] Capponi A., Pagliarani S., Vargiolu T., *Pricing vulnerable claims in a Lévy driven model*, **Finance and Stochastics**, 18(4), 755–789, 2014
- [13] Pagliarani S., Vargiolu T., *Portfolio optimization in a defaultable Lévy driven market model*, **OR Spectrum**, August 2014
- [14] Pagliarani S., Pascucci A., *Asymptotic expansions for degenerate parabolic equations*, **C. R. Math. Acad. Sci. Paris**, 352(12), 1011–1016, 2014
- [15] 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
- [16] Pagliarani S., Pascucci A., Riga C., *Adjoint expansions in local Lévy models*, **SIAM J. Finan. Math.**, 4(1), pp. 265-296, 2013
- [17] 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
- [18] Pagliarani S., Pascucci A., *Local stochastic volatility with jumps: analytical approximations*, **Int. J. Theor. Appl. Finance**, 16(8), 2013

- [19] 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:

- [20] Agarwal A., Pagliarani S., *A Fourier-based Picard-iteration approach for a class of McKean-Vlasov SDEs with Lévy jumps*, submitted to *Stochastics: An International Journal of Probability and Stochastic Processes*, Preprint 2019 - ArXiv
- [21] Pagliarani S., Pignotti M., *Intrinsic Taylor formula for non-homogeneous Kolmogorov-type Lie groups*, submitted to *Comptes Rendus Mathématique*, Preprint 2017 - ArXiv

Proceeding papers and book chapters:

- [22] 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, workshps and seminars**

Invited talks:

- 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: Séminaire de probabilités et mathématiques financières, Université 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 - Fakultät für Mathematik, Technische Universität München *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*

#### 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

#### 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 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 Lévy driven market model*
- September 2012: XXXVI Convegno AMASES, Vieste (FG). *Portfolio optimization in a defaultable Lévy 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**

- Mathematical Finance
- SIAM Journal on Financial Mathematics
- Stochastic Processes and their Applications
- European Journal of Applied Mathematics
- Journal of Computational Finance
- International Journal of Theoretical and Applied Finance
- International Review of Economics and Finance
- Applied Mathematical Finance
- Digital Finance

#### **Other scientific responsibilities**

- 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

- 2016, September - 2017, June: co-organizer and founder (together with Chiara Corsato and Roberta Pappadà) of the cycle of seminars *Symposia on Mathematics, Statistics and applications to Economics, Finance and Insurance* at DEAMS, University of Trieste
- 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

### Lecturing activity:

- A.Y. 2018-2019  
*Stochastic Differential Equations*. Course of the master degree in *Mathematics* at University of Udine
- A.Y. 2018-2019  
*General Mathematics*. Course of the bachelor degree in *Economics* at University of Udine
- A.Y. 2017-2018 (language: English)  
*Financial Mathematics of Uncertainty* (option pricing theory). Course of the master degree in *Banca e finanza* at University of Udine
- A.Y. 2017-2018  
*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
- A.Y. 2016-2017  
*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 (language: English)  
Assistantship for the course of *Calibration* of the *Master 2 Probabilités et Finance* at University Pierre et Marie Curie (Paris 6)



- A.Y. 2015-2016 (language: English)  
Assistantship for the course of *Numerical analysis of PDEs in mathematical finance* of the *Master 2 Probabilités et Finance* at University Pierre et Marie Curie (Paris 6)
- A.Y. 2014-2015 (language: English)  
Assistantship for the course of *Calibration* of the *Master 2 Probabilités et Finance* at University Pierre et Marie Curie (Paris 6)
- A.Y. 2014-2015 (language: English)  
Assistantship for the course of *Numerical analysis of PDEs in mathematical finance* of the *Master 2 Probabilités et Finance* at University Pierre et Marie Curie (Paris 6)
- A.Y. 2011-2012  
Assistantship for the course of *Statistics* of the *Bachelor in Biotechnology* at University of Padova

Supervising activity:

- A.Y. 2015-2016  
Master thesis co-advisor of Mariella Parussini, Università degli studi di Trieste, Corso di Laurea Magistrale in Scienze Statistiche ed Attuariali
- A.Y. 2018-2019  
Midterm thesis advisor of Arianna Mingone, Scuola Superiore dell'Università degli studi di Udine