CURRICULUM VITAE

Personal data

Sara Pasquali, born in Mantova, 05/06/1971, living in Castellucchio (MN).

Current position

Researcher in Probability and Mathematical Statistics at the Milano branch of CNR-IMATI (Institute of Applied Mathematics and Information Technology).

Competencies

- Stochastic models in population dynamics.
- Stochastic stability in biological models.
- Parameter estimation in stochastic differential equations.
- Option pricing.

Education

- April 26, 1995: B.Sc. in Mathematics, University of Parma (Italy), grades: 108/110. Thesis: "Stochastic differential equations as a model for an ecological problem", supervisor: Prof. Carla Calvi Parisetti.
- February 12, 1999: Ph.D. in Computational Mathematics, University of Padova (Italy). Thesis: "A stochastic control problem for renewable resource exploitation", supervisor: Prof. Wolfgang J. Runggaldier.

Professional experience

- March 2012 – now: included in the EFSA (European Food Safety Authority) expert database (selection with curriculum evaluation), as expert in population dynamics spatio-temporal models with reference to pests and invasive species.
- January 2013 – March 2014: member of the WG on ERA Pomacea as EFSA external expert. She contributed to the editing of "Scientific Opinion on the environmental risk assessment of the apple snail for the EU" (published in EFSA Journal 2014;12(4):3641 [97 pp.]) and "Scientific Opinion on the assessment of the potential establishment of the apple snail in the EU" (published in EFSA Journal 2013;11(12):3487 [49 pp.]).
- March 2012 – March 2013: member of the WG on *Bemisia tabaci* as EFSA external expert. She contributed to the editing of the "Scientific Opinion on the risk to plant health of *Bemisia tabaci* for the EU territory" (published in EFSA Journal 2013;11(4):3162 [302 pp.]).
- Moreover, she contributed to the editing of the EFSA Scientific Opinion "Risk assessment of the oriental chestnut gall wasp, Dryocosmus kuriphilus for the EU territory

and identification and evaluation of risk management options" in year 2010.

- December 31, 2001 - now: Researcher in Probability and Mathematical Statistics at the Milano branch of CNR-IMATI (Institute of Applied Mathematics and Information Technology).
- July 30, 1999 – December 30, 2001: Research fellowship in Probability and Mathematical Statistics, Department of Mathematics, University of Parma.
- January 01, 1999 – March 31, 1999: External consultant for the CNR - Institute for Applied Mathematics and Informatics (Milano). Subject: "Self-similar processes as a tool for the study of natural phenomena".

Projects

- January 2011 – December 2012: Member of the project "A web-based system for real-time Monitoring and Decision Making for Integrated Vineyard Management" (MODEM_IVM; FP7 reference number: 262059). (Coordinator: Prof. Vittorio Rossi – Università Cattolica di Piacenza and Horta s.r.l., Piacenza-Ravenna). She dealt with population dynamics models relative to insect pests in vineyard.
- March 1, 2011 – February 29, 2012: Principal Investigator of the project "Sustainable management strategies of agro-pastoral systems in Sub-Saharan Africa" funded by the Milano City Council (Milan Defending Biodiversity: Solidarity and International Cooperation Grants 2009). The aim of the project was to supply a useful tool for the analysis and the improvement of sustainability for agro-pastoral activities in an Ethiopian region.
- Year 2006: Principal Investigator of the CNR-IMATI project "Efficient methods to manage stochastic volatility models" – "Free topic research", funded by CNR.
- Years 2002 – 2003: Principal Investigator of the CNR-IMATI unit for the research project 5% - "Methods and systems for decisions support. Advanced applications of mathematics and artificial intelligence in the analysis of financial markets". Subject: analysis of stochastic volatility models fo the evaluation of financial derivatives, funded by CNR.
- Year 2000: Principal Investigator of the annual research "Parameter estimation procedures and analysis of the stability of the solutions in systems of stochastic differential equations describing the dynamics of interacting species" – "Young Researchers Project", funded by the University of Parma.

Teaching Activities

- Academic years 2009/2010, 2010/2011, 2011/2012 and 2013/2014: series of seminars for the course "Model Identification and Data Analysis", University of Pavia, Mantova branch (Faculty of Engineering).
- Academic year 2006/2007: course of Probability, University of Milano (special course SILSIS).
- Year 2003: business tutor for the internship of Dr. Lucia Carmela Sanasi, during the

"Master in mathematical applications in the industry", University of Milano-Bicocca. Subject: pricing of barrier options through recombining trees.

- Academic year 2000/2001: exercises for the courses Probability (I and II) and Mathematical Statistics – Department of Mathematics, University of Parma. Moreover, she gave supplementary lessons and partecipated to examination boards. She has been also assistant supervisor of some degree thesis on stability of stochastic differential equations and parameter estimation in differential equations.
- Academic year 1999/2000: exercises for the course of Probability (I and II) – Department of Mathematics, University of Parma.

Supervisor and assistant supervisor

Assistant supervisor of the following degree thesis

- Sara Bonini, "Funzioni quasi-score per la stima ottimale di parametri in equazioni differenziali stocastiche". University of Parma, academic year 2001/2002. Supervisor Prof. Carla Calvi Parisetti;
- Paola Aldrovandi, "Stima di parametri in sistemi dinamici non lineari". University of Parma, academic year 2000/2001. Supervisor Prof. Carla Calvi Parisetti;
- Claudia Mora, "Stima di parametri in modelli dinamici". University of Parma, academic year 1999/2000. Supervisor Prof. Carla Calvi Parisetti;
- Lisa Zuanazzi, "Sulla stabilità delle soluzioni di equazioni differenziali stocastiche". University of Parma, academic year 1998/1999. Supervisor Prof. Carla Calvi Parisetti.

Business tutor for the Master thesis of Dr. Lucia Carmela Sanasi, "Valutazione delle opzioni barriera attraverso il metodo degli alberi binomiali". University of Milano-Bicocca, year 2003, Master in mathematical applications in the industry.

Supervisor of research fellowship

Scientific supervisor of the research fellowship on the field "Stochastic dynamical models with application in finance", period November 1, 2006 – October 31, 2008. Position filled by Dr. Fernanda D'Ippoliti.

Conference organization

- Organizer of the Workshop "Sustainable agro-pastoral systems: concepts, approaches and tools" at CNR of Milano, via Bassini 15, March 27, 2012.
- Organizer of the Day of Mathematical Finance at CNR of Milano, Via Bassini 15, April 8, 2009.

Publications / reviews

- S. Pasquali, G. Gilioli, D. Janssen, S. Winter, ***Optimal strategies for interception, detection and eradication in plant biosecurity***, accepted by *Risk Analysis*, (2014) DOI 10.1111/risa.12278.

- L. Galbusera, S. Pasquali, G. Gilioli, ***Stability and optimal control for some classes of tritrophic systems***, *Mathematical Biosciences and Engineering*, **11**(2) (2014); 257-283.

- L. Martín-Fernández, G. Gilioli, E. Lanzarone, J. Míguez, S. Pasquali, F. Ruggeri, D.P. Ruiz, ***A Rao-Blackwellized particle filter for joint parameter estimation and biomass tracking in a stochastic predator-prey system***, *Mathematical Biosciences and Engineering*, **11**(3) (2014); 573-597.

- G. Gilioli, S. Pasquali, S. Parisi, S. Winter S., ***Modelling the potential distribution of Bemisia tabaci in Europe in light of the climate change scenario***, *Pest Management Science*, **70** (2014); 1611-1623.

- E. Lanzarone, S. Pasquali, V. Mussi, F. Ruggeri, ***Bayesian estimation of thermal conductivity and temperature profile in a homogeneous mass***, *Numerical Heat Transfer, Part B*, 66 (2014); 397-421.

- G. Gilioli, S. Pasquali, S. Tramontini, F. Riolo, ***Modelling local and long-distance dispersal of invasive chestnut gall wasp in Europe***, *Ecological Modelling*, **263** (2013), 281-290.

- G. Buffoni, S. Pasquali, ***On modeling the growth dynamics of a stage structured population***, *International Journal of Biomathematics*, **6**(5) (2013), 1350039 (24 pages).

- G. Gilioli, S. Pasquali, F. Ruggeri, ***Nonlinear functional response parameter estimation in a stochastic predator-prey model***, *Mathematical Biosciences and Engineering*, **9**(1) (2012), pagg. 75-96.

- F. D'Ippoliti, E. Moretto, S. Pasquali, B. Trivellato, ***Exact pricing with stochastic volatility and jumps***, *International Journal of Theoretical and Applied Finance*, **13**(6) (2010), pagg. 901-929.

- G. Gilioli, S. Pasquali, F. Riolo, S. Tramontini, ***Modelling approaches to determine spread potential of Dryocosmus kuriphilus***, *EFSA Journal*, **8**(6) (2010), pagg. 73-100.

- E. Moretto, S. Pasquali, B. Trivellato, ***Derivative evaluation using recombining trees under stochastic volatility***, *Advances and Applications in Statistical Sciences*, **1**(2) (2010), pagg. 453-480.

- G. Buffoni, S. Pasquali, ***Individual-based models for stage structured populations: formulation of "no regression" development equations,*** *Journal of Mathematical Biology*, **60** (2010), pagg. 831-848.

- G. Gilioli, S. Pasquali, *Stima di parametri per una risposta funzionale non lineare in un sistema preda-predatore stocastico*, *Notiziario sulla Protezione delle Piante – III Serie*, **1** (2009), pagg. 19-29.

- G. Gilioli, S. Pasquali, F. Ruggeri, *Bayesian inference for functional response in a stochastic predator-prey system*, *Bulletin of Mathematical Biology*, **70** (2008), pagg. 358-381.

- G. Buffoni, S. Pasquali, *Structured population dynamics: continuous size and discontinuous stage structures*, *Journal of Mathematical Biology* **70** (2007), pagg. 555-595.

- G. Gilioli, S. Pasquali, *Use of individual-based models for population parameters estimation,* *Ecological Modelling* **200** (2007), pagg. 109-118.

- S. Pasquali, F. Ruggeri, *Discussion on the paper "Exact and computationally efficient likelihood-based estimation for discretely observed diffusion processes" by Beskos, Papaspiliopoulos, Roberts and Fearnhead, Journal of the Royal Statistical Society: Series B,* **68** (2006), pagg. 373-374.

- M.G. Mazzocchi, G. Buffoni, Y. Carotenuto, S. Pasquali, M. Ribera d'Alcalà, *Effects of food conditions on the development of the population of* Temora stylifera*: A modelling approach,* *Journal of Marine Systems,* **62** (2006), pagg. 71-84.

- G. Buffoni, S. Pasquali, G. Gilioli, *A stochastic model for the dynamics of a stage structured population*, *Discrete and Continuous Dynamical Systems – Series B*, **4**(3) (2004), pagg. 517-525.

- G. Buffoni, S. Pasquali, *Structured population dynamics: Eulerian and Lagrangian approaches*, *Differential Equations and Control Processes (Electronic Journal)*, Proceedings of the Fourth International Conference "Tools for Mathematical Modelling" – June 23-28, 2003, vol. 9, pagg. 74-86.

- S. Pasquali, *The stocastic logistic equation: stationary solutions and their stability*, *Rendiconti del Seminario Matematico dell'Università di Padova*, Vol. 106 (II semestre 2001), pagg. 165-183.

- C. Chiarella, S. Pasquali, W.J. Runggaldier, *On Filtering in Markovian Term Structure Models (an approximation approach)*, *Advances in Applied Probability*, **33** (2001), pagg. 794-809.

- C. Calvi Parisetti, S. Pasquali, *Stability of a stochastic predator-prey system*, *Rivista di Matematica dell'Università di Parma* (6) **3** (2000), pagg. 245-258.

- S. Pasquali, *Un problema di controllo stocastico per lo sfruttamento di una risorsa rinnovabile*, *Bollettino U.M.I. – La Matematica nella Società e nella Cultura –*

Supplemento tesi di dottorato, Serie VIII, vol. III-A, Supplemento ad Aprile 2000, pagg. 161-164.

- C. Calvi Parisetti, S. Pasquali, L. Zuanazzi, ***Studio della variabilità stocastica di un sistema preda-predatore in un modello acarino***, *Frustula Entomologica – XXII*, 1999.

Publications / book chapters

- L. Martín-Fernández, G. Gilioli, E. Lanzarone, J. Míguez, S. Pasquali, F. Ruggeri, D.P. Ruiz, ***Joint parameter estimation and biomass tracking in a stochastic predator-prey system***, *in "The Contribution of Young Researchers to Bayesian Statistics - Proceedings of BAYSM2013" edited by E. Lanzarone and F. Ieva, Springer Proceedings in Mathematics & Statistics, vol. 63,* (2014), 23-27.

- F. D'Ippoliti, E. Moretto, S. Pasquali, B. Trivellato, ***Exact and approximated option pricing in a stochastic volatility jump-diffusion model***, *in "Mathematical and Statistical Methods for Actuarial Sciences and Finance" edited by M. Corazza and C. Pizzi, Springer* (2010), pagg. 103-112.

- G. Buffoni, M.G. Mazzocchi, S. Pasquali, ***A Lagrangian stochastic model for the dynamics of a stage structured population. Application to a copepod population,*** *in "Lagrangian Analysis and Prediction of Coastal and Ocean Dynamics" edited by A. Griffa, A. D. Kirwan, A. J. Mariano, T. Özgökmen, and T. Rossby, Cambridge University Press* (2007), pagg. 401-422.

- C. Chiarella, S. Pasquali, W.J. Runggaldier, ***On Filtering in Markovian Term Structure Models***, in: *Recent Developments in Mathematical Finance* (J. Yong, ed.), World Scientific Publishing Co.Pte.Ltd, 2002, pagg. 139-150.

- S. Pasquali, W.J. Runggaldier, ***Approximations of a Controlled Diffusion Model for Renewable Resource Exploitation***, in: *Markov Processes and Controlled Markov Chains*, Z. Hou, J.A. Filar, A. Chen eds., Kluwer Academic Publishers (2002), pagg. 287-302.

Publications / proceedings

- G. Gilioli, S. Pasquali, G. Buffoni, L. Galbusera, S. Parisi, ***Analisi della sostenibilità in comunità agro-pastorali dell'Etiopia***, *in Atti del Convegno "Tecnologie appropriate per l'ambiente nei paesi a risorse limitate", L. Morselli ed.* Convegno Ecomondo 2011, 15° Fiera Internazionale del Recupero di Materia ed Energia e dello Sviluppo Sostenibile, Rimini 9-12 novembre 2011. Maggioli Editore, pagg. 677-682.

- Gilioli G., Sorbara M., Pasquali S., Vacante V., ***Stima dei tassi di sviluppo sulla base di***

dati meteorologici di campo [Estimating development rate function using field meteorological data], 9° Convegno nazionale di Agrometeorologia: "Agrometeorologia e gestione delle colture Agrarie", Torino 6-8 giugno 2006. *Rivista Italiana di Agrometeorologia*, 11(1 suppl.) (2006): 109-111.

- E. Moretto, S. Pasquali, B. Trivellato, *An alternative model for evaluating exchange rate derivatives with stochastic volatility*, *Atti del 7° Convengo Italo-Spagnolo di Matematica Finanziaria*, Cuenca (Spagna), Luglio 2004.

- S. Pasquali, *Un modello di controllo stocastico per lo sfruttamento di una risorsa rinnovabile*, *Atti del convegno AIRO98 – Logistica, Trasporti e Qualità*, Treviso 23-25 settembre 1998, pagg. 157-159.

Technical reports

- G. Buffoni, S. Pasquali, *Individual-based models for stage structured populations: formulation of development equations*, *CNR-IMATI Technical Report 2008 – MI/6*.

- F. D'Ippoliti, E. Moretto, S. Pasquali, B. Trivellato, *Option valuation in a stochastic volatility jump-diffusion model*, *CNR-IMATI Technical Report 2007 – MI/4*.

- G. Gilioli, S. Pasquali, F. Ruggeri, *Bayesian inference for functional response in a stochastic predator-prey system*, *CNR-IMATI Technical Report 2005 - MI/8*.

- G. Buffoni, S. Pasquali, *Structured population dynamics: an analysis of Eulerian discrete equations*, *CNR-IMATI Technical Report 2005 - MI/9*.

- E. Moretto, S. Pasquali, B. Trivellato, *An alternative model for evaluating exchange rate derivatives with stochastic volatility*, *Rapporto interno n. 34, dicembre 2005, Politecnico di Torino*.

- E. Moretto, S. Pasquali, B. Trivellato, *A stochastic volatility model for exchange rate derivatives*, *CNR-IMATI Technical Report 2004 – MI/9*.

- E. Moretto, S. Pasquali, B. Trivellato, C. Corvasce, *Application of a stochastic volatility model to options on exchange rate*, *CNR-IMATI Technical Report 2004 – MI/10*.

- S. Pasquali, C. Calvi Parisetti, *Parameter estimation in a predator-prey system*, *CNR-IMATI Technical Report 2003 – MI/6*.

- G. Gilioli, S. Pasquali, *A parameter estimation method for arthropod populations*, *CNR-IMATI Technical Report 2003 – MI/7*.

- G. Buffoni, G. Gilioli, S. Pasquali, *Population dynamics: a stochastic model based on individual life history data*, *Quaderno IAMI 02.7, dicembre 2002*.

- C. Chiarella, S. Pasquali, W.J. Runggaldier, *On Filtering in Markovian Term Structure Models (An Approximation Approach)*, Research Paper Series, 65, Quantitative Finance Research Centre, University of Technology, Sydeny, Dicembre 2001.
   Versione integrale dei due lavori "On Filtering in Markovina Term Structure Models".

- S. Pasquali, Stochastic stability for the logistic equation, Quaderno del Dipartimento di Matematica dell'Università di Parma n. 224, aprile 2000.

- S. Pasquali, *Analisi di processi auto-similari nell'ambito dello studio di fenomeni naturali, Quaderno IAMI 99.10, ottobre 1999.*

Submitted

- L. Galbusera, S. Pasquali, *Analysis and constrained optimal impulsive control of a Holling-II type trophic system with two sources*, submitted to *Journal of the Franklin Institute*.
- E. Moretto, S. Pasquali, B. Trivellato, *Option pricing under deformed Gaussian distribution*, submitted to *European Journal of Operational Research*.

Attendance to conferences and courses

Invited speaker

- From July 8 to July 10, 2013, Symposium on "Games and Decisions in Reliability and Risk", held in Kinsale (Ireland). Title of invited talk: "A Probabilistic Approach for Risk Assessment in Food Chain and Application to Plant Biosecurity".
- From July 16 to July 20, 2007, Conference "Stochastic processes: theory and applications – on the occasion of the 65th birthday of Wolfgang Runggaldier", held in Bressanone (BZ). Title of invited talk: "Bayesian inference in a stochastic predator-prey system".
- From June 2 to June 4, 2005, Workshop "BISP4 – 4th Workshop on Bayesian Inference in Stochastic Processes", held in Varenna (LC). Title of invited talk: "Bayesian and classical inference for a stochastic predator-prey system".

Conference with presentation

- From June 4 to June 8, 2012, "BIOCOMP2012 - Mathematical Modeling and Computational Topics in Biosciences", held in Vietri sul Mare. Title of the talk: "Stage-Structured Population: Residence Times of an Individual in a Stage".
- From July 6 to July 9, 2010, "International Statistical Ecology Conference 2010", held in Canterbury (UK). Title of the talk: "A modelling framework for stratified dispersal in

biological invasions".

- From September 7 to September 11, 2009, "Lagrangian Analysis and Prediction of Costal and Ocean Dynamics", held in La Londe-les-Maures (France). Title of the talk: "Lagrangian models for the dynamics of a multistage population: effects of different development models".
- May 27, 2009, "V Giornate di Studio sui modelli per la Protezione delle Piante", held in Piacenza. Title of the talk: "Stima di parametri per una risposta funzionale non lineare in un sistema preda-predatore stocastico".
- From July 9 to July 11, 2008, "International Statistical Ecology Conference 2008", held in St. Andrews (Scotland). Title of the talk: "Parameter estimation for a nonlinear functional response in a stochastic predator-prey system".
- From June 13 to June 17, 2005, "Lagrangian Analysis and Prediction of Costal and Ocean Dynamics", held in Lerici (SP). Title of the talk: "Individual-based models: formulation of development equations and computational aspects".
- From July 26 to July 31, 2004, "6th BS-IMSC – 6th World Congress of the Bernoulli Society for Mathematical Statistics and Probability", held in Barcelona. Title of the talk: "Parameter estimation in a stochastic predator-prey system".
- From September 17 to September 20, 2001, "Metodi e Modelli Matematici nello Studio dei Fenomeni Biologici", held in Roma. Title of the talk: "Stability of a stochastic predator-prey system".
- From July 12 to July 16, 1999, "IFIP TC7 Conference on System Modelling and Optimization", held in Cambridge. Title of the talk: "A stochastic control model for renewable resource exploitation".
- From September 23 to September 25, 1998, "AIRO 98" held in Treviso. Title of the talk: "Un modello di controllo stocastico per lo sfruttamento di una risorsa rinnovabile".
- From September 15 to September 17, 1998, "Convegno Nazionale di Processi Stocastici e Applicazioni" held in Padova. Title of the talk: "A stochastic control model for renewable resource exploitation".
- From September 4 to September 8, 1998, "First International Conference on Mathematical Ecology", held in Alcalà de Henares (Madrid). Title of the talk: "A stochastic control model for renewable resource exploitation".

Other conferences and courses

- From September 3 to September 7, 2012, "2012 Applied Bayesian Statistics School – Stochastic Modelling for Systems Biology", held in Pavia, lecturer Darren Wilkinson.
- From June 20 to June 24, 2011, "2011 Applied Bayesian Statistics School – Hierachical Modeling for Environmental Processes", held in Bolzano, lecturer Alan Gelfand.
- From April 7 to April 9, 2010, "Mathematical and Statistical Methods for Actuarial Sciences and Finance", held in Ravello.
- From June 18 to June 20, 2009, "Sixth Workshop on Bayesian Inference in Stochastic Processes", held Bressanone.
- From March 7 to March 9, 2007, "Jump processes and finance", held by Prof. Jean Jacod at the University of Firenze.
- From September 19 to September 20, 2002, "Stochastic processes, stochastic calculus and applications", held in Roma.

- From June 6 to June 7, 2002, "Invito alla finanza matematica", held in Pescara.
- From June 12 to June 15, 2001, "Tenth International Symposium on Applied Stochastic Models and Data Analysis", held in Compiègne (France).
- From May 31 to June 2, 2001, "Second Workshop on Bayesian Inference in Stochastic Processes", held in Varenna.
- From October 12 to October 14, 2000, "Workshop on Theory and Applications of Stochastic Control and Optimization", held in Milano (Politecnico).
- From May 19 to May 22, 1999, Giornate di Studio su "Metodi numerici, statistici ed informatici nella difesa delle colture agrarie e delle foreste", held in Sassari.
- From January 14 to January 15, 1999, "Nonlinear filtering: uniqueness and approximation techniques for solutions of filtering equations", held in L'Aquila.
- From February to March 1997, lezioni della Cattedra Galileiana "Probabilistic Methods in finance", held by Prof. Hans Föllmer at Scuola Normale Superiore di Pisa.

Milano, 13 febbraio 2015