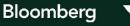


We hereby certify that, *Alberto Adrego Pinto* - **Universidade do Porto**, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "**Evolution of corruption in democratic states**".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, *Andrea Macrina* - University College London, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Term Risk".

Rio de Janeiro, December 5th, 2019.

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We hereby certify that, *Beatrice Acciaio* - London School of Economics and Political Science, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Learning Dynamic Generative Models via Causal Optimal Transport".

Rio de Janeiro, December 5th, 2019.

















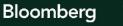


We hereby certify that, **Bruno Dupire** - **Bloomberg - NY**, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "The Perils of Parameterization".

Rio de Janeiro, December 5th, 2019.

















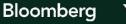


We hereby certify that, *Diogo Duarte Garcia Pires* - Florida International University, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Endogenous Asymmetric Money Illusion".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, *Ernst Eberlein* - Universitat Freiburg - Freiburg - Alemanha, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Variable annuities in a Lévy-based hybrid model with surrender risk".

Rio de Janeiro, December 5th, 2019.

















IMPA, Rio de Janeiro, Brazil - November 29th to December 5th,2019

CERTIFICATE



We hereby certify that, *Jorge P. Zubelli* - Khalifa University, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the "Opening Talk".

Rio de Janeiro, December 5th, 2019.

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Suely Lima **Organizing Committee**















IMPA, Rio de Janeiro, Brazil - November 29th to December 5th,2019

CERTIFICATE



We hereby certify that, *Julien Guyon* - **Bloomberg, Columbia University, and Nyu**, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "The Joint S\&P 500/VIX Smile Calibration Puzzle Solved: A Dispersion-Constrained Martingale Transport Approach".

Rio de Janeiro, December 5th, 2019.

















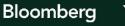


We hereby certify that, *Lane Hughston* - Goldsmiths University of London, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Lévy-Ito Models in Finance".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, *Marco Frittelli* - Unicersitá Degli Studi di Milano, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 - December 05, 2019 and presented the following plenary talk: "Multivariate Systemic Optimal Risk Transfer Equilibrium".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, *Martino Grasselli* - Padova University, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Functional and recursive quantization for a class of non markovian processes".

Rio de Janeiro, December 5th, 2019.

















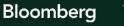


We hereby certify that, *Max Oliveira de Souza* - Universidade Federal Fluminense, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Assessing volatility and model risks in optimal execution".

Rio de Janeiro, December 5th, 2019.

















IMPA, Rio de Janeiro, Brazil - November 29th to December 5th,2019

CERTIFICATE



We hereby certify that, *Mohammad Fesanghary* - **Bloomberg - NY**, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 - December 05, 2019 and presented the following plenary talk: "Short-Term Prediction of Major Price Movements and Corporate Actions Using Data-Driven Insights".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, *Raphael Douady* - Université Paris I - Sorbonne, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 - December 05, 2019 and presented the following plenary talk: "Managing the Downside of Active and Passive Strategies: Convexity and Fragilities".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, Rene Aid - Université Paris IX - Dauphine, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 - December 05, 2019 and presented the following plenary talk: "Optimal electricity demand response contracting with responsiveness incentives".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, Ryan Donnelly - King's College London, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 December 05, 2019 and presented the following plenary talk: "Insider Trading with Activism and Residual Risk".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, Stefano De Marco - École Polytechnique, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 - December 05, 2019 and presented the following plenary talk: "Calibration of stochastic volatility models to Vanillas as a martingale Schrodinger problem".

Rio de Janeiro, December 5th, 2019.



















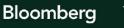
We hereby certify that, *Stéphane Crépey* - Université Evry Val d'Essonne, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Deep XVA Analysis".

Rio de Janeiro, December 5th, 2019.

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We hereby certify that, *Teemu Pennanen* - King's College London, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Convex duality in nonlinear optimal transport".

Rio de Janeiro, December 5th, 2019.



















We hereby certify that, *William Shadwick* - Omega Analysis, participated in the Mathematics & Finance: Research in Options 2019, held at IMPA, Rio de Janeiro, November 29 – December 05, 2019 and presented the following plenary talk: "Geometry, Differential Invariants and Improved Tail Risk Measurement".

Rio de Janeiro, December 5th, 2019.















