

## Initiative de recherche «Laboratoire de Finance des marchés d'énergies » (FiME)

**Academic partner(s)** : Université Paris Dauphine - PSL, École Polytechnique, ENSAE

**Financial partner(s)** : EDF

**Scientific director(s)** : Olivier Féron, EDF R&D

**Website** : [www.fime-lab.org](http://www.fime-lab.org)

### RESEARCH PROGRAM DESCRIPTION

The “Finance for Energy Markets Laboratory” Research Initiative (henceforth FiME Lab) was created in 2006 thanks to the partnership of Université Paris-Dauphine, Ecole Polytechnique, CREST (ENSAE) and EDF R&D, under the aegis of the “Institut Europlace de Finance” Foundation. The FiME Lab is scientifically sponsored by the “Finance and sustainable development” Chair.

The activity of the Energy Markets Finance Laboratory is organised into three main themes: (1) consumers, (2) production, (3) the financial environment. These three research themes are based on two transversal methodological axes: stochastic numerical methods and statistics.

Research themes

#### 1 - Consumers

This research theme aims to understand the interaction between the centralised production system and the customers (private/industrial/local producer) and to provide new methods of steering/coordinating the latter.

1. Pricing: pricing and customer behaviour taking into account the information asymmetry between supplier and customer; social pricing; taking into account competition between suppliers.
2. Consumption steering: incentive mechanisms for consumption steering to control the average level and variability of consumption.
3. Development/management of local production: assistance in the analysis of tariff regulations; optimal subsidy policy for technological transition.

#### 2 - Production

The objective of this research theme is to provide decision support tools in the long term, for investment and disinvestment choices, and in the short term, for the optimisation of existing production capacities.

1. In the long term, the aim is to develop production/consumption models that take into account the specific uncertainties for an energy company caused by market changes: among other things, the development of renewable energies, the introduction of capacity markets, the arrival of new competitors, the introduction of auction systems, etc. These models could be developed by integrating behavioural phenomena such as the differentiated weight assigned to gains and losses.
2. In the shorter term, the aim is to set up methods for optimising adapted production and distribution assets. These methods will have to take into account the characteristics of the new systems as well as the appearance of new services for network management: modelling of local photovoltaic/wind production (for micro-grids), management of multi-energy and micro-grid systems, management of several storage facilities, joint price/alias models, stress test scenarios, etc.

### 3 - The financial environment

The aim of this research theme is to better understand and apprehend the functioning of commodity markets, their interactions with their environment and the very long-term financial risks.

1. Functioning of the electricity market and related markets: study of price formation in energy markets; role of fundamentals (production, storage) in the value of assets; study of market power and its impact on price formation; study of new or maturing markets such as the CO2 market and the capacity market; study of markets with high-frequency data such as the intraday market for electricity
2. Interaction of commodity markets with their environment: study of transmissions or contagions between paper and physical markets for the same commodity, between different commodity markets, and finally between commodities and financial markets (financialization of commodities); study of market regulation, link between environmental policy and competition policy
3. Long-term risk, in particular for the portfolio dedicated to the decommissioning of nuclear power plants: adapted diffusion models and application of robustness techniques; portfolio management and allocation strategy adapted to the long term; quantification of uncertainties adapted to long-term models.

#### Methodological axes

The general objective is to provide models that focus on fundamental phenomena in order to understand the mechanisms at work and to be able to study the sensitivity of the results obtained to the model parameters. This prioritisation of problems is part of the research work, in order to avoid models that are hyper-realistic in intent but incomprehensible and unsolvable in reality. Resolutions can be exact or numerical. In some cases, the methodological innovation lies in the numerical part, which makes it possible to inform the optimal decisions of the actors. In other cases, statistical techniques are essential for estimating and analysing the impact of model inputs and outputs and the interactions between different effects.

#### 1 - Numerical methods :

The problems addressed are often optimisation problems in an uncertain universe and may take into account several actors. In this context, the solutions are typically characterised by non-linear partial differential equations.

Some examples of techniques developed: uncertainty quantification methods (e.g. for models with partially observable variables); branching techniques; variance reduction techniques; parallelization and high-dimensional management; data-driven algorithms (with self-calibration); development of numerical method libraries (free software) and test banks (application benchmarks to quantify the progress of numerical tools and to allow for the reproducibility of tests)

#### 2 - Statistical methods :

The objectives of this axis are to estimate and analyse the impact of model inputs and outputs and the interactions between different effects. More precisely, this concerns problems of estimation, taking into account modelling errors and information extraction. Some examples of techniques developed: dependence of extreme events on explanatory variables; high frequency data processing; model errors and uncertainty propagation; simulation of rare events and stress test scenarios; models with unobservable variables.

Part of the FiME Lab research work is conducted jointly with the “Finance and sustainable development” Chair. As a result, redundancies may appear between the work of these two projects.

## RESEARCH TEAM

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### Researchers

- René Aïd, professeur à l'Université Paris Dauphine et au CREST David Benatia, maître de conférence, ENSAE
- Paul Doukhan, professeur à l'Université de Cergy
- Roxana Dumitrescu, Associate professor à Kings' College
- Marc Hoffmann, professeur à l'Université Paris Dauphine et au CREST Delphine Lautier, professeur à l'Université Paris Dauphine, DRM Finance Huyên Pham, professeur à l'Université Paris-Diderot
- Peter Tankov, professeur à l'ENSAE Nizar Touzi, professeur à NYU
- Bertrand Villeneuve, professeur à l'Université Paris Dauphine et CREST Zhen-Jie Ren, maître de conférence à l'Université Paris Dauphine
  
- Clémence Alasseur, ingénieure-chercheuse EDF R&D OSIRIS Corinne Chaton, ingénieure-chercheuse EDF R&D SEQUOIA Enzo Cogneville, ingénieur-chercheur EDF R&D OSIRIS Thomas Deschatre, ingénieur-chercheur EDF R&D OSIRIS Olivier Féron, ingénieur-chercheur EDF R&D OSIRIS
- Pierre Gruet, ingénieur-chercheur EDF R&D OSIRIS Joseph Mikael, ingénieur-chercheur EDF R&D OSIRIS Nadia Oudjane, ingénieure-chercheuse EDF R&D OSIRIS Quentin Petit, ingénieur-chercheur EDF R&D OSIRIS Adrien Séguret, ingénieur-chercheur EDF R&D OSIRIS Cheng Wan, ingénieure-chercheuse EDF R&D OSIRIS Xavier Warin, ingénieur-chercheur EDF R&D OSIRIS

### PhD Students

- Adrien Séguret\*, doctorant CIFRE EDF UPD, Dir. P. Cardaliaguet et C. Wang
- Mohamed Bahlali, doctorant Université Paris-Dauphine / ANR EcoRees), dir. R. Aid et A. Creti
- Lorenzo Croissant\*, doctorant Université Paris-Dauphine, dir. B. Bouchard
- Alicia Bassière, doctorante CREST / ANR EcoREES), dir. P. Tankov et D. Benatia
- Songbo Wang, doctorant X, dir. N. Touzi et Z. Ren
- Assil Fadle, doctorant X, dir. N. Touzi et R. Aïd
- Fanny Cartellier, doctorante CREST, dir. P. Tankov et C.-Y. Robert
- Thibaut Bourdais, doctorant ENSTA, dir. F. Russo
- Kang Liu, doctorant X, dir. J.-F. Bonnans
- Renzhi Liu (doctorant UPD), dir. R. Aïd et S. Benoit
- Nathan Sauldubois, doctorant X, dir. Nizar Touzi.

- Antoine Lotz, doctorant Université Paris Dauphine, dir. Marc Hoffmann, Pierre Gruet, Thomas Deschatre.
- Redouane Silvente, doctorant CREST (ENSAE), dir. Peter Tankov.
- Marc Yeterian doctorant Université Paris-Dauphine, dir. Bertrand Villeneuve.
- Xuanye Song, doctorant Université Paris-Cité, dir. Huyên Pham et Noufel Frikha.
- Mohamed Hamdouche, doctorant Université Paris-Cité, dir. Huyên Pham.
- Anna De Crescenzo, doctorant Université Paris-Cité, dir. Huyên Pham.
- Thibault Bourdais, doctorant X, dir. F. Russo et N. Oudjane
- Bianca Marin Moreno, doctorante CIFRE (EDF R&D / INRIA), dir. Margaux Brégère (EDF) et Pierre Gaillard (INRIA)
- Ruihua Ruan\*, doctorante, Université Paris Dauphine, dir. E. Bacry
- Kang Liu\*, doctorant IPP, dir. L. Pfeiffer & F. Bonnans.
- Shaun (Xiaoyuan) Li, doctorant Université Paris 1, dir. B. de Meyer et E. Abi Jaber
- Marius Potfer, doctorant IPP, dir. V. Perchet, P. Gruet et C. Wan

\* PhD defended in 2023

### Interns

- Zakaria Bensaid carried out an internship on “Deep learning techniques applied to MFG model for smart grids” under the supervision of Roxana Dumitrescu (Kings College).
- *Arsène Ponsin carried out an internship under the supervision of Olivier Féron (EDF R&D) on the subject of "Statistical analysis and multidimensional forecasts: applications to climate and market data" (Nov 2023 - March 2024).*
- *Lucie Carlier carried out an internship under the supervision of Pierre Gruet (EDF R&D) on seasonal adjustment methods, specifically for electricity markets. followed up on a previous internship on seasonal adjustment methods, specifically for electricity markets (June - Sept 2023).*
- *Grégoire Dutot completed an internship under the supervision of Olivier Féron on the subject of "Comparison of probabilistic forecasting methods. Application to electricity price data on the French spot market".*
- *Michele Penza completed an internship under the supervision of Quentin Petit, René Aïd, Théo Deladerrière and Henri UPTON on the subject of "Development of a structural model with the aim of linking a market and physical view of the probabilities of marginality of electricity production facilities (and also a probability of failure*

## PUBLICATIONS OF THE YEAR DIRECTLY RELATED TO THE RESEARCH PROGRAM

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### Published

- Achdou, Y., Carlier, G., Petit, Q., & Tonon, D. (2023). A mean field model for the interactions between firms on the markets of their inputs. *Mathematics and Financial Economics*, 1-35.
- Achdou, Y., Carlier, G., Petit, Q., & Tonon, D. (2023). A simple city equilibrium model with an application to teleworking. *Applied Mathematics & Optimization*, 88(2), 1-30.
- Aïd, R., & Biagini, S. (2023). Optimal dynamic regulation of carbon emissions market. *Mathematical Finance*, 33(1), 80-115.
- Aïd, R., Bahlali, M., & Creti, A. (2023). Green innovation downturn: the role of imperfect competition. *Energy Economics*, 123, 106754.
- Aïd, R., Possamai, D., & Touzi, N. (2022). Optimal electricity demand response contracting with responsiveness incentives. *Mathematics of Operations Research*, 47(3), 2112-2137.
- Alasseur, C., Campi, L., Dumitrescu, R., & Zeng, J. (2023). MFG model with a long-lived penalty at random jump times: application to demand side management for electricity contracts. *Annals of Operations Research*, 1-29.
- Bahlali, M., & Petit, Q. (2023). An equilibrium model of city with atmospheric pollution dispersion. *Accepté dans Journal of Mathematical Economics*.
- Barrasso, A., & Touzi, N. (2022). Controlled Diffusion Mean Field Games with Common Noise and McKean-Vlasov Second Order Backward SDEs. *Theory of Probability & Its Applications*, 66(4), 613-639.
- Benatia, D., & Gingras, S. (2023). Reaching new lows? The pandemic's consequences for electricity markets. *The Energy Journal*, 44(4), 195-221.
- Bokanowski, O., Prost, A., & Warin, X. (2023). Neural networks for first order HJB equations and application to front propagation with obstacle terms. *Partial Differential Equations and Applications*, 4(5), 45.
- Bonnans, J. F., Liu, K., Oudjane, N., Pfeiffer, L., & Wan, C. (2023). Large-scale nonconvex optimization: randomization, gap estimation, and numerical resolution. *SIAM Journal on Optimization*, 33(4), 3083-3113.
- Bonnans, J. F., Gianatti, J., & Pfeiffer, L. (2023). A Lagrangian approach for aggregative mean field games of controls with mixed and final constraints. *SIAM Journal on Control and Optimization*, 61(1), 105-134.
- Chaton, C., & Metta-Versmessen, C. (2023). Les CCfDs au service du développement de l'hydrogène bas-carbone en Europe. A paraître dans la *Revue économique*.
- Chen, F., Ren, Z., & Wang, S. (2023). Entropic fictitious play for mean field optimization problem. *Journal of Machine Learning Research*, 24(211), 1-36.
- Claisse, J., Ren, Z., & Tan, X. (2023). Mean field games with branching. *The Annals of Applied Probability*, 33(2), 1034-1075.
- Cosso, A., Gozzi, F., Kharroubi, I., Pham, H., & Rosestolato, M. (2023). Optimal control of path-dependent McKean-Vlasov SDEs in infinite-dimension. *The Annals of Applied Probability*, 33(4), 2863-2918.
- Cosso, A., Gozzi, F., Kharroubi, I., Pham, H., & Rosestolato, M. (2023). Master Bellman equation in the Wasserstein space: Uniqueness of viscosity solutions. *Transactions of the American Mathematical Society*.
- Deschatre, T. Adaptive estimation of intensity in a doubly stochastic Poisson Process. *Scandinavian Journal of Statistics*.
- Deschatre, T., & Gruet, P. (2022). Electricity Intraday Price Modelling with Marked Hawkes Processes. *Applied Mathematical Finance*, 29(4), 227-260.
- Djete, M. F., & Touzi, N. (2021). Mean Field Game of Mutual Holding. A paraître dans *The Annals of Applied*

Probability. arXiv preprint arXiv:2104.03884.

Dumitrescu, R., Leutscher, M., & Tankov, P. (2023). Linear programming fictitious play algorithm for mean field games with optimal stopping and absorption. *ESAIM: Mathematical Modelling and Numerical Analysis*, 57(2), 953-990.

Feron, O., & Gruet, P. (2023). Estimation of the number of factors in a multi-factorial Heath-Jarrow-Morton model in electricity markets. à paraître dans *The springer quant energy finance book, 2nd edition*.

Flora, M., & Tankov, P. (2023). Green investment and asset stranding under transition scenario uncertainty. *Energy Economics*, 106773.

Germain, M., Pham, H., & Warin, X. (2023). A level-set approach to the control of state-constrained McKean-Vlasov equations: application to renewable energy storage and portfolio selection. *Numerical Algebra, Control and Optimization*, 13(3&4): 555-582. doi: [10.3934/naco.2022033](https://doi.org/10.3934/naco.2022033)

Germain, M., Pham, H., & Warin, X. (2023). Neural networks-based algorithms for stochastic control and PDEs in finance. in *"Machine Learning for Financial Markets: a guide to contemporary practices"*. Editors: Agostino Capponi and Charles-Albert Lehalle. Cambridge University Press.

Guo, X., Pham, H., & Wei, X. (2023). Itô's formula for flows of measures on semimartingales. *Stochastic Processes and their Applications*, 159, 350-390.

Hamdouche, M., Henry-Labordere, P., & Pham, H. (2022). Policy gradient learning methods for stochastic control with exit time and applications to share repurchase pricing. *Applied Mathematical Finance*, 29(6), 439-456.

Hu, K., Ren, Z., & Touzi, N. (2022). On path-dependent multidimensional forward-backward SDEs. *Numerical Algebra, Control and Optimization*, Volume 13, Issue 3&4 : 413-430 (2023). Doi : [10.3934/naco.2022010](https://doi.org/10.3934/naco.2022010).

Jacquet, Q., van Ackooij, W., Alasseur, C., & Gaubert, S. (2023). Quadratic regularization of bilevel pricing problems and application to electricity retail markets. *European Journal of Operational Research*.

Keppo, J., Touzi, N., & Zuo, R. (2023). Dynamic Contracting in Asset Management under Worker- Manager- Owner Relationship. A paraître dans *Management Science*. Available at SSRN [3761499](https://ssrn.com/abstract=3761499).

Lefebvre, W., Loeper, G., & Pham, H. (2023). Differential learning methods for solving fully nonlinear PDEs. *Digital Finance*, 5(1), 183-229.

Liu, K., Oudjane, N., & Wan, C. (2023). Approximate Nash equilibria in large nonconvex aggregative games. *Mathematics of Operations Research*, 48(3), 1791-1809.

Motte, M., & Pham, H. (2023). Quantitative propagation of chaos for mean field Markov decision process with common noise. *Electronic Journal of Probability*, 28, 1-24.

Pham, Huyên, and Xavier Warin. "Mean-field neural networks: learning mappings on Wasserstein space." *Neural Networks* 168 (2023): 380-393.

Ren, Z., Tan, X., Touzi, N., & Yang, J. (2023). Entropic optimal planning for path-dependent mean field games. *SIAM Journal on Control and Optimization*, 61(3), 1415-1437.

Ren, Z., Touzi, N., & Yang, J. (2022, May). Nonlinear predictable representation and L<sup>1</sup>-solutions of backward SDEs and second-order backward SDEs. In *Annales de l'Institut Henri Poincaré (B) Probabilités et statistiques* (Vol. 58, No. 2, pp. 639-666). Institut Henri Poincaré.

Seguret, A., Alasseur, C., Bonnans, J. F., De Paola, A., Oudjane, N., & Trovato, V. (2023). Decomposition of convex high dimensional aggregative stochastic control problems. *Applied Mathematics & Optimization*, 88(1), 8.

Talbi, M., Touzi, N., & Zhang, J. (2023). Viscosity solutions for obstacle problems on Wasserstein space. *SIAM Journal on Control and Optimization*, 61(3), 1712-1736.

Talbi, M., Touzi, N., & Zhang, J. (2023). Dynamic programming equation for the mean field optimal stopping problem. *SIAM Journal on Control and Optimization*, 61(4), 2140-2164.

Zaffran M., Féron, O., Goude, Y., Josse, J. & Dieuleveut, A. (2022). Conformal Predictions for Time Series. International Conference on Machine Learning.

- Zaffran, M., Dieuleveut, A., Josse, J., & Romano, Y. (2023). Conformal Prediction with Missing Values". International Conference on Machine Learning.
- Warin, X. (2023). The GroupMax neural network approximation of convex functions. *IEEE Transactions on Neural Networks and Learning Systems*.
- Warin, X. (2023). Reservoir optimization and Machine Learning methods. *EURO Journal on Computational Optimization*, 100068.

## Under review

- Aïd, R., Basei, M., & Ferrari, G. (2023). A Stationary Mean-Field Equilibrium Model of Irreversible Investment in a Two-Regime Economy. *arXiv preprint arXiv:2305.00541*.
- Aïd, R., Kemper, A., & Touzi, N. (2023). A Principal-Agent Framework for Optimal Incentives in Renewable Investments. *arXiv preprint arXiv:2302.12167*.
- Aid, R., Kowli, A., & Kulkarni, A. A. (2023). Signalling for Electricity Demand Response: When is Truth Telling Optimal?. *arXiv preprint arXiv:2302.12770*.
- Aïd, R., Ajmia, L. B., & Mnif, M. (2021). Nonzero-sum stochastic impulse games with an application in competitive retail energy markets. *arXiv preprint arXiv:2112.10213*.
- Alasseur, C., Basei, M., Bertucci, C., & Cecchin, A. (2022). A mean field model for the development of renewable capacities. *arXiv preprint arXiv:2210.15023*.
- Bourdais, T., Oudjane, N., & Russo, F. (2023). An entropy penalized approach for stochastic control problems. Complete version. *arXiv preprint arXiv:2309.01534*.
- Brière, M., Alasseur, C., Mikael, J., & Remlinger, C. (2021). Expert Aggregation for Financial Forecasting. *arXiv preprint arXiv:2111.15365*. En revision pour *The Journal of Finance and Data Science*.
- Chang, Y., Firoozi, D., & Benatia, D. (2023). Large Banks and Systemic Risk: Insights from a Mean-Field Game Model. *arXiv preprint arXiv:2305.17830*.
- Chaton, C., & Creti, A. (2023). Trading electricity under different carbon pricing constraints: the French-German case. Article soumis. <https://www.researchsquare.com/article/rs-2832199/latest.pdf>
- Chaton, C., & Guillerminet, M. L. (2023). Coverage for Fuel Poverty. Article soumis. Available at SSRN 4479746.
- Chaton, C., & Zitouni, S. (2023). Is it sensible to invest in home energy renovation ?. Article soumis. Available on the FiME Lab website.
- Chen, F., Ren, Z., & Wang, S. (2022). Uniform-in-time propagation of chaos for mean field langevin dynamics. *arXiv preprint arXiv:2212.03050*.
- Chen, F., Lin, Y., Ren, Z., & Wang, S. (2023). Uniform-in-time propagation of chaos for kinetic mean field Langevin dynamics. *arXiv preprint arXiv:2307.02168*.
- Claisse, J., Conforti, G., Ren, Z., & Wang, S. (2023). Mean Field Optimization Problem Regularized by Fisher Information. *arXiv preprint arXiv:2302.05938*.
- Coculescu, D., Motte, M., & Pham, H. (2023). Opinion dynamics in communities with major influencers and implicit social influence via mean-field approximation. *arXiv preprint arXiv:2306.16553*.
- Djete, M. F., Guo, G., & Touzi, N. (2023). Mean field game of mutual holding with defaultable agents, and systemic risk. *arXiv preprint arXiv:2303.07996*.
- Dumitrescu, R., Leutscher, M., & Tankov, P. (2022). Energy transition under scenario uncertainty: a mean-field game approach. *arXiv preprint arXiv:2210.03554*.
- Frikha, N., Germain, M., Laurière, M., Pham, H., & Song, X. (2023). Actor-Critic learning for mean-field control in continuous time. *arXiv preprint arXiv:2303.06993*.



Hamdouche, M., Henry-Labordere, P., & Pham, H. (2023). Generative modeling for time series via Schrödinger bridge. *arXiv preprint arXiv:2304.05093*.

Lautier, D., Ling, J., & Villeneuve, B. (2023). Rediscovering Price Discovery. *Available at SSRN 4470521*.

Lavigne, P., & Tankov, P. (2023). Decarbonization of financial markets: a mean-field game approach. *arXiv preprint arXiv:2301.09163*.

Moreno, B. M., Brégère, M., Gaillard, P., & Oudjane, N. (2023). A mirror descent approach for Mean Field Control applied to Demande-Side management. *arXiv preprint arXiv:2302.08190*.

Pham, H., & Warin, X. (2022). Mean-field neural networks-based algorithms for McKean-Vlasov control problems. *arXiv preprint arXiv:2212.11518*.

Pham, H., & Warin, X. (2023). Actor critic learning algorithms for mean-field control with moment neural networks. *arXiv preprint arXiv:2309.04317*.

Seguret, A., Le Corre, T., & Oudjane, N. (2022). A decentralized algorithm for a Mean Field Control problem of Piecewise Deterministic Markov Processes. (hal-03910622)

Talbi, M., Touzi, N., & Zhang, J. (2022). From finite population optimal stopping to mean field optimal stopping. *arXiv preprint arXiv:2210.16004*.

Warin, X. (2023). Quantile and moment neural networks for learning functionals of distributions. *arXiv preprint arXiv:2303.11060*.

## Working paper

(available on the FiME website)

**Janvier 2023.** Huyên Pham et Xavier Warin. **Mean-field neural networks-based algorithms for McKean-Vlasov control problems**

**Août 2023.** Thomas Deschatre et Xavier Warin. **A Common Shock Model for multidimensional electricity intraday price modelling with application to battery valuation**

**Août 2023.** Clémence Alasseur, Erhan Bayraktar, Roxana Dumitrescu, Quentin Jacquet. **A Rank-Based Reward between a Principal and a Field of Agents: Application to Energy Savings**

**Septembre 2023.** Huyên Pham, Xavier Warin. **Actor critic learning algorithms for mean-field control with moment neural networks**

**Septembre 2023.** Corinne Chaton, Samy Zitouni. **Is it sensible to invest in home energy renovation?**

**Novembre 2023.** Corinne Chaton. **Impact of public policies on the dynamics of energy retrofit and fuel poverty in mainland France**

## Reports, books, press articles, etc.

2 videos have been made in 2023:

- a video on probabilistic price forecasting on energy markets as part of the "ILB Methods" series: the aim was to present in a simple way the main principles of probabilistic forecasting and the means of comparing and validating methods (speaker : Olivier Féron).
- a video presenting the FiME laboratory as a Dauphine EDF R&D partnership (speakers: Olivier Féron and René Aïd).

René Aïd took part in the panel Tackling the Climate Change and the Just Transition to Renewable Energy, as part of the French-Ameri-Can Climate Panels (FACTS) on climate change, at the University of British



Columbia, July 2023.

As for the dissemination of knowledge, Peter Tankov has written an article on the history of the Black-Scholes formula.

<https://www.polytechnique-insights.com/en/columns/economy/black-scholes-the-formula-at-the-origin-of-wall-street/>

## MAJOR COMMUNICATIONS RELATED TO THE RESEARCH PROGRAM

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### Major academic conferences, invited speaker, etc.

#### **René Aïd**

- [1] Public panel on Tackling Climate Change and the Just Transition to Renewable Energy, University of British Columbia, July 26th-28th, 2023.
- [2] Workshop on Mathematical Modelling and Forecasting of Renewables, Pacific Institute of Mathematical Sciences, July 26th-28th, 2023.
- [3] MATS Seminar, Collège de France, July 19th, 2023.
- [4] Volatility Conference, Singapore Management University, June 20th-21st, 2023.
- [5] Seminar of Economics and Finance, LUISS University, Roma, May 18th, 2023.
- [6] Applications of Stochastic Control to Finance and Economics, Banff International Research Station for Mathematical Innovation and Discovery, April 30th- May 5th, 2023.
- [7] Conference on Risk and Uncertainty in Finance and Economics, School of Economics at the University of Johannesburg, 4th-7th April, 2023.
- [8] Visiting at the Indian Institute of Technology of Mumbai, February 18th-25th, 2023.
- [9] Workshop in Financial Mathematics, National University of Singapore, January, 13th-14th 2023.

#### **Clémence Alasseur**

- Plenary speaker to Energy Finance Italia 8, Milan, February 2023.

#### **Corinne Chaton**

- L'article « Coverage for fuel poverty » a été présenté
  - à la 61ème séance du Séminaire PSL de recherches en économie de l'énergie organisé par Mines Paris et Dauphine, 5 avril 2023, Ecole des mines, Paris ;
  - au séminaire FDD-FiME, janvier 2023 ;
  - à la Conférence annuelle de la fédération de recherche "Théorie et Evaluation des Politiques Publiques" (TEPP), 12-13 octobre 2023, Poitiers.
- L'article "To invest or not in the energy renovation of one's home ?" a été présenté (par Samy Zitouni)
  - aux 39èmes Journées de Microéconomie Appliquée (JMA) , 8-3 juin 2023, Strasbourg ;
  - à l'AFSE Annual Congress 2023 - 14-16 June 2023, SciencesPo, Paris ;
  - à Economics of Climate Change and Environmental Policy, 5-6 octobre 2023, Orléans.

#### **Olivier Féron**

- "Short-term power price forecasting", in 2<sup>nd</sup> Power price forecasting Summit, Winter Edition, Amsterdam 2023
- "Comparison of Adaptive probabilistic forecasting methods on French electricity spot prices ", in 12th INREC 2023 - Uncertainties in Energy - Markets, Systems & Decisions, Essen, Allemagne, 2023

#### **Pierre Gruet**

- Modeling intraday prices on electricity markets: capturing market liquidity at the microscopic scale, Tenth Electricity Price Forecasting and Advanced Modeling Conference, online event, February 2022.
- A survey of electricity spot and futures price models for risk management applications, Eleventh International Ruhr Energy Conference, Essen (Germany), September 2022.
- Risk management on energy markets: past, present and future, Eleventh Electricity Price Forecasting and Advanced Modeling Conference, Berlin (Germany), March 2023.

#### **Quentin Petit**

- Participation et présentation au workshop « Stochastic control & Risk ».
- Participation aux journées du FiME.

- Participation et présentation aux PGMODAYS.

### **Zhenjie Ren** (présentations 2022-2023)

Séminaire Probabilité, Rennes, Octobre 2022

- One World Probability Seminar, en ligne, Novembre 2022
- PGMODAYS, EDF Lab, Novembre 2022
- Colloque Bachelier, Metabief, Janvier 2023
- Séminaire Bachelier, Paris, Janvier 2023
- Seminar ML & MFG, Deepmind Paris, Janvier 2023
- INRIA Colloquium, Paris, Février 2023
- Mathematics of Machine Learning Seminar at UMass Amherst, en ligne, Février 2023
- HK-Singapore joint Seminar Series in Financial, Mathematics/Engineering, en ligne, Mars 2023
- Applications of Stochastic Control to Finance and Economics, BIRS, Banff Canada, Mai 2023
- AI, Stochastic Controls and Related Topics in Mathematical Finance, Jiaotong University, Shanghai Chine, Juin 2023
- Seminar at Fudan University, Shanghai Chine, Juillet 2023

### **Huyên Pham**

- 15ème Colloque Bachelier en mathématiques financières et calcul stochastique, Metabief, 16-20 janvier
- Seminar Probability and Statistics, KTH Stockholm (Suède), 21 février
- Colloquium online MATH-IMS Chinese University of Hong Kong, 24 février
- Seminar London Mathematical Finance, 2 mars
- AI for good talk online, New York, 11 avril
- Workshop Applications of Stochastic control in finance and economics, Banff (Canada), 1-5 mai
- Workshop Stochastic modeling and control, Bedlewo (Pologne), 8-12 mai
- SIAM conference Financial Mathematics and Engineering, Philadelphie (USA), 6-9 juin
- FoCM Stochastic Computation workshop, Paris, 12-19 juin
- Conference in honor of Martin Schweizer, Zurich (Suisse), 12-16 juin
- Congrès INFORMS, Nancy, 28-30 juin
- Workshop Mathematical modeling and forecasting of renewables, PIMS, Vancouver, 26-28 juillet
- ICIAM conference, Tokyo, 21-25 août
- Workshop Recent advances in quantitative finance, Hong Kong, 27-30 août
- Seminar INRIA Stochastic approaches, Rungis, 5 octobre
- Workshop on recent advances in stochastic control theory, KTH Stockholm, 25-26 octobre
- Seminar Mathematical Finance, Columbia University, New York, 2 novembre
- Quant Europe Summit, London, 6 décembre

### **Peter Tankov**

- P. Lavigne and P. Tankov, "Decarbonization of large financial markets", Oberwolfach workshop, New Challenges in the Interplay between Finance and Insurance", Oberwolfach, Germany, October 2023.
- M. Flora, P. Tankov "Asset pricing under transition scenario uncertainty", Journées Atelier FIME, EDF, September 2023.
- P. Lavigne and P. Tankov, "Conference on Stochastics, Statistics, Machine Learning and their Applications of Sustainable Finance and Energy Markets", Vienna, Austria, September 2023.
- P. Lavigne and P. Tankov "Decarbonization of large financial markets", Conference Junior Researchers in Stochastic Optimal Control, Berlin, August-September 2023 (keynote speech by senior researcher).
- P. Tankov, "Mean field games: the linear programming approach", minicourse at the Vega Institute summer school, August 2023.
- M. Flora, T. Le Guenedal and P. Tankov, "Asset pricing under transition scenario uncertainty" Climate Risk Management and Analytics Workshop, London, UK, July 2023.
- P. Tankov and P. Lavigne "Decarbonization of large financial markets", 11th General Amamef Conference, Bielefeld, Germany, June 2023

- P. Tankov and T. Le Guenedal, "Corporate debt value under transition scenario uncertainty", MathRisk Conference on Numerical Methods in Finance, Udine, Italy, June 2023 (keynote).
- P. Tankov and P. Lavigne "Decarbonization of large financial markets", Conference Stochastic optimal control in Economics, Finance, and Learning theory", Zurich, Switzerland, June 2023.
- T. De Angelis, P. Tankov and O. D. Zerbib, "Climate Impact Investing", Mathematics for Complex Challenges workshop, Fields Institute, Canada, May 2023.
- P. Tankov and P. Lavigne "Decarbonization of large financial markets", Workshop Stochastic Control and Risk, Hammamet, Tunisia, April 2023.

### **Nizar Touzi**

- The German Probability and Statistics Days Conference, University of Duisburg-Essen (Germany), 7-10 March 2023.
- Advances and perspectives in Mathematics, Hassan II Academy of Sciences and Technology, Rabat (Morocco) 7-8 September 2022.
- Stochastic Control and Fractional Dynamics, Newton Institute, University of Cambridge, 18-22 April 2022.
- Control and optimisation Pisa 2023, 8-10 May 2023.
- Distributed Solutions to Complex Societal Problems ReunionWorkshop, IMSI, University of Chicago, 20-22 February 2023.
- Miniworkshop at the department of mathematics of the Chinese University of Hong Kong, 17-20 January 2023.
- Meeting of the ANR Dreames, Nantes (France), 12-14 September, 2022.
- Recent Developments in Stochastics with Applications in Mathematical Physics and Finance, Hammamet, 12-16 September, 2022.
- Advances in Stochastic Control and Optimal Stopping with Applications in Economics and Finance, CIRM Luminy (France), 12-16 September, 2022
- Minicourse on Optimal martingale transport, NUS Singapore, 24 May 2023.
- Mathematical Finance seminar at the Luis University, Rome (Italy), 16 February 2023.
- Probability and Finance Seminar, Hong Kong Polytechnic University, 19 January 2023.
- Bielefeld Stochastic Afternoon : Mathematical Finance session", 21 December 2022, University of Bielefeld (Germany).

### **Bertrand Villeneuve**

- Impacts, determinants and risks of crop insurance adoption for farmers in France. Céline Grislain-Letrémy, Bertrand Villeneuve, Marc Yeterian. Document de travail non finalisé. Présenté aux conférences :
- Association Française de Sciences Economiques (AFSE), Paris, juin 2023.
- Journées de microéconomie appliquée (JMA), Strasbourg, juin 2023.
- European Association of Environmental and Resource Economics (EAERE), Limassol, Chypre, juin 2023.

### **Cheng Wan**

- 24/05/2023 : présentation sur la tarification d'une station des véhicules électriques dans le « Séminaire Optimisation VE » à EDF Lab Paris-Saclay
- 29/06/2023 : présentation sur l'algorithme de de Frank-Wolfe stochastique et son application à la participation au marché de réserve électrique par une flotte de véhicules électriques dans la « 11th General AMAMEF (Advanced Mathematical Methods for Finance) conference » à Bielfeld, Allemagne

### **Events organized by the program**

In 2023, the following events have been organized :

- Summer school « Big data and finance », Aussois, 12-16 June (around 35 participants). <https://fimeschool.sciencesconf.org>.
- « Journées-Ateliers » of the FiME Lab, 13-14 September, Palaiseau.
- FDD-FiME Seminar at Institut Henri Poincaré (18 talks)

## OTHER HIGHLIGHTS

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**Awards, scientific recognition, organization of calls for projects, involvement in master's courses, PhD program visiting researchers, etc...**

PhD student Margaux Zaffran has been named one of the "French Young Talents" in the #ForWomeninScience2023 programme run by the L'Oréal-UNESCO Foundation.