Louis Bachelier Prize 2020: Citation for Mathieu Rosenbaum

Professor Mathieu Rosenbaum, Professor of Financial Mathematics at École Polytechnique (Paris), is internationally recognised as one of the foremost experts in stochastic modelling in finance. Rosenbaum's research, focused on stochastic processes and their applications in finance, impresses through the breadth of topics it has covered and the depth of results obtained on each topic. His research spans theoretical topics in probability and statistics as well as market microstructure, statistical modelling of high frequency financial data, volatility modelling and quantitative financial regulation.

On the theoretical side, he has made several interesting contributions to the theory of stochastic processes, in particular the statistics of stochastic processes. His work on Besov space characterisation of stochastic processes via p-variations is often cited in the context of rough path theory and the theory of fractional processes. He developed new methodologies to prove functional limit theorems for continuous-time processes observed at random times. Furthermore, in a series of papers with Marc Yor, he obtained original properties of the pseudo-Brownian bridge. He also introduced with Alexandre Tsybakov new algorithms in order to estimate parameters for high-dimensional regressions with errors in the design.

Rosenbaum's research work in finance spans statistical and theoretical aspects of quantitative finance and emphasises the interplay between data analysis, mathematical modelling, and applications in finance, with a special attention to the modelling of high frequency data. His multiple interesting contributions to market microstructure, statistical modelling of high frequency financial data and volatility modelling have received significant attention from practitioners and academics alike.

Among his research contributions in quantitative finance are:

- the statistical modelling of market microstructure with applications to high frequency estimation of volatility and correlation and to the determination of an 'optimal tick size' for quotes
- the study of hedging errors for discrete hedging strategies
- providing microstructural foundations for the behaviour of the volatility using high frequency data modelling with self-exciting point processes (Hawkes process and related models)
- introduction and mathematical analysis of 'Rough volatility models', with associated risk management formulas.

- study of stochastic models for dynamics of limit order books.
- use of continuous-time contract theory for quantitative financial regulation.

His work covers excellent examples of mathematical modelling in finance driven by the statistical analysis of financial data. Although he has a large international network of scientific collaborators, he has been the key contributor in many of these projects and a constant source of original research ideas.

Rosenbaum is recognised, both in academia and industry, as a leading researcher in quantitative finance; his research has been published in top international journals in probability, stochastic analysis, statistics, mathematical finance and econometrics. He is also well known to the quant community and a regular speaker at industry events.

Rosenbaum is keenly interested in practical applications of his research and constantly reaches out to industry to exchange ideas with them on modelling issues. He is regularly invited to present his research at industry conferences on quantitative modelling, a sign that his research is highly appreciated by quants and practitioners. His work on rough volatility models has been impactful in industry and it been implemented by many financial institutions.

In summary, Mathieu Rosenbaum has made many interesting contributions to mathematical modelling in finance and statistical modelling of financial data; has more than 60 publications in top quality academic journals in quantitative finance, probability, statistics and econometrics; and is recognised by his peers in academia and industry for his interesting and relevant contributions to mathematical modelling in finance. The depth and breadth of Rosenbaum's research achievements in mathematical modelling in finance, their relevance to applications, his outstanding publications in top international journals and his excellent international reputation as a leading researcher in quantitative finance make him an ideal candidate for the 2020 Louis Bachelier Prize.

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