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# Introduction to the special issue in honor of Professor Elyès Jouini

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It is a privilege to introduce this Special Issue of *Mathematics and Financial Economics* dedicated to **Professor Elyès Jouini**. This tribute is especially meaningful, as Elyès was the founder and first editor-in-chief of this journal. From its inception, *MAFE* has sought to build a bridge between rigorous mathematical methods and pressing questions in economics and finance – an intellectual vision that perfectly reflects Elyès' own scholarly path. It is therefore most fitting that the journal he created now celebrates his achievements and influence.

## Elyès' scientific contributions

Elyès Jouini's scientific contributions lie at the crossroads of *mathematical economics, decision theory, and financial mathematics*. His work is distinguished by a rare ability to combine rigorous mathematical formalism with economic intuition, opening new lines of research that have since become central in the literature.

Throughout his career, Elyès has drawn on tools from probability theory, functional analysis, convex analysis, and nonsmooth analysis to address economic questions of broad significance. His research illustrates the deep links between abstract mathematical ideas and real-world concerns from financial stability and market efficiency to collective decision-making under uncertainty. By building bridges between mathematics and economics, he has set a standard for interdisciplinary rigor that continues to inspire both communities.

**General Equilibrium.** In his thesis and subsequent papers, Elyès studied general equilibrium models with nonconvexities in production. His first paper (1988) [1] deals with Clarke's normal cone to the nonconvex production set of a firm under the marginal pricing rule.

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He also made profound contributions to the existence, uniqueness, and structure of general equilibria in nonconvex production economies, including an index theorem (see, e.g., [2]).

**Decision Theory and Ambiguity.** From the start of his career, Elyès has been a leading figure in the analysis of decision-making under ambiguity and nonadditive probabilities. His joint work with Clotilde Napp [5, 7] developed tractable models of decision-making when agents face uncertainty about the probabilities themselves and showed how such ambiguity can generate non-classical behavior in markets and investment. These contributions helped integrate insights from Choquet expected utility and nonadditive measures into mainstream finance and economics.

**Markets with Frictions.** Together with Hédi Kallal, Elyès provided some of the most influential results on arbitrage pricing under transaction costs and constraints [3, 4]. Their characterizations of martingale measures in markets with bid-ask spreads remain fundamental references for anyone working on incomplete markets, transaction costs, or liquidity effects. These papers were both mathematically elegant and economically significant, showing how realistic frictions reshape no-arbitrage pricing bounds.

**Risk Measures and Financial Regulation.** With Moncef Meddeb and Nizar Touzi, Elyès introduced the notion of vector-valued coherent risk measures [6], providing a general and flexible framework for evaluating risk across multiple assets or dimensions. This line of research, which he further developed with Walter Schachermayer and Nizar Touzi [9], has had far-reaching implications not only in mathematical finance but also in banking regulation and risk management practices. The concept of coherent risk measures is now a cornerstone of both academic theory and financial regulation.

**Heterogeneous Beliefs and Asset Pricing.** Another recurring theme in his work is the role of heterogeneous expectations. His paper with Clotilde Napp [8] demonstrated how differences in beliefs across agents shape market equilibria, asset pricing, and welfare. By integrating heterogeneity into intertemporal models, he showed that consensus pricing rules may emerge endogenously, even when agents fundamentally disagree. This perspective has been highly influential in macro-finance and in the study of bubbles, risk premia, and belief-driven fluctuations.

**Advancing Gender Equality in Science.** Beyond his academic research, Elyès has been a staunch advocate for gender equality in science. Since 2021, he has served as the Director of the UNESCO Chair "Women and Science" at Université Paris-Dauphine. This chair promotes interdisciplinary research on the underrepresentation of women in scientific careers, examining factors such as stereotypes, career trajectories, and the impact of gender on academic performance. Under his leadership, the chair has become a hub for innovative research and policy dialogue on gender equality in science [10].

## Leadership and service

Beyond his scholarly contributions, Elyès has been a dedicated institution builder and academic leader. A graduate of the École Normale Supérieure and first-ranked in the *agrégation* in mathematics, he defended his Ph.D. in General Equilibrium Theory under the supervision of Bernard Cornet in 1989 and, at the age of 27, became Professor at Université Paris 1 Panthéon-Sorbonne and at the École Nationale de la Statistique et de l'Administration Économique (ENSAE). Later, he joined Université Paris-Dauphine, where he served as Vice-President

for Research and Vice-Chairman of the Board. He has held prestigious chairs, including the Risk Foundation, endowed by Groupama, and has also been a senior member of the Institut Universitaire de France and a member of the Académie des Sciences morales et politiques (Institut de France). Among many other important roles, he also served as a member of the Tunisian Transition Government as Minister for Economic and Social Reforms.

His scientific leadership extends to the broader community: he co-founded the Bachelier Finance Society, served as Scientific Director of the Europlace Institute of Finance, and was instrumental in creating the Louis Bachelier Institute. For his contributions, he has been honored as a Knight of the Légion d'honneur (France), Commander of the Order of Merit (Tunisia), and recipient of the Best Young French Economist Prize. He has also been elected Fellow of the Econometric Society and Economic Theory Fellow of SAET (the Society for the Advancement of Economic Theory).

## Contributions in honor of Elyès Jouini

This Special Issue brings together contributions from colleagues, students, and collaborators whose work reflects Elyès' enduring influence. The papers extend and revisit themes central to his intellectual journey: ambiguity and robustness, dynamic decision-making, equilibria in markets with frictions, and the mathematical foundations of financial economics.

That they appear in *Mathematics and Financial Economics* – the journal he founded to serve precisely these domains – makes this tribute all the more resonant.

The paper by Herskovits, Muhle-Karbe, and Tse studies a one-period model in which a firm chooses how to distribute equity to maximize shareholder utility. Comparing dividends and share buybacks, they find a Modigliani-Miller style equivalence: both deliver the same shareholder welfare, payout ratio, and investment level. However, buybacks raise the firm's equilibrium value. This result holds under variations such as differing investor beliefs and changing risk-free rates.

The contribution by Doldi, Frittelli, and Maggis provides a new proof of the first fundamental theorem of asset pricing for the recent notion of collective arbitrage, where agents can cooperate by exchanging risks. They also propose a version of the second fundamental theorem of asset pricing based on a collaborative notion of market completeness.

A theoretical question motivated by robust finance and model calibration is at the center of the paper by Backhoff, Pammer, and Schachermayer. A Bass martingale, which is essentially a monotone transformation of a Brownian motion, is known to be equivalent to a "stretched" Brownian motion. The latter is a Brownian martingale (with pre-specified marginals $\mu$, $\nu$ at the endpoints of the interval $[0, 1]$) that is closest to a Brownian motion in an $L^2$ sense. The paper proposes a new resolution method that works in any dimension, based on the idea of minimizing the so-called Bass functional by following its direction of maximal descent.

The paper by Riess, Backhoff, Beiglböck, Temme, and Wolf focuses on a concrete problem faced by regulators: how to condense diverse and often highly granular data from financial institutions to capture similarities or differences among institutions and identify clusters or outliers. The authors use techniques from optimal transport to adapt Lloyd's algorithm, reconstructing the Austrian banking landscape in a way that could be highly useful for regulators.

The contribution by Bernard Cornet characterizes arbitrage-free Choquet pricing rules in a setting where neither subadditivity nor monotonicity is imposed. The arbitrage-free market pricing rules are characterized through two equivalent conditions: the existence of a linear

stochastic discount factor lying below the pricing rule, and the non-emptiness of the core of the associated risk-neutral nonadditive probability.

The paper by Milo Bianchi analyzes bubbles and crashes in a model in which some investors are only partially sophisticated. It highlights how such investors may endogenously switch from euphoria to panic, leading to equilibrium bubbles and crashes – even in a purely speculative market where information is complete and it is commonly understood that the bubble cannot grow forever.

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