

## **MATS Seminar**

**15 May 2024**

Collège de France, 11 place Marcelin Berthelot, Paris

### **Program**

8:45 am: Welcoming of participants

9 am: *Welcome Address* by **Pierre-Louis Lions** (Collège de France)

9 - 9:45 am: **Jean-Michel Lasry** (Université Paris Dauphine - PSL) **Some Mathematical Tools for Modeling Water Management**

Water has always been a limited resource in certain regions and at certain times. The management of this resource, both in time and space, represents a major and complex challenge for the players involved. This complexity is currently exacerbated by a number of factors that are worsening the situation day by day, making the problem increasingly complicated and a source of tension. These factors include: the increase in consumption; the diversification of uses; the decrease in available resources; and the increase in the uncertainty of water supplies. We will present how mathematical models derived from mean-field game theory (MFG) can contribute to the regulation and organization of water markets in this new context.

9:45 - 10:30 am: **Delphine Lautier** (Université Paris Dauphine - PSL), **Julien Ling** (MATS / Collège de France), **Frank Raynaud** (Université de Genève) **A Time Frequency Decomposition of Systemic Risk in Agricultural Commodity Markets : a Graph Theory Analysis**

We analyze empirically the propagation of shocks between different categories of commodities: agricultural products (grains, softs and livestock), energy, and metals. Indeed, the automation of transaction methods and the growing importance of financial investors in commodity derivatives markets (a phenomenon referred to as financialization) have led to greater integration between these markets, as well as between paper and physical markets. Moreover, biofuels, via increased demand and substitution, reinforce the connection between energy and agricultural markets. Such an analysis implies to rely on large databases. Given the dimension of the database and the number of connections we want to study, the issues of visualization and filtration become critical. We rely on the method developed by Barunik and Krehlik (2018) to perform a preliminary analysis. This method allows to decompose a shock in several frequencies (short- and long-term horizons, in our case). It can be coupled with an investigation of the connectedness between the markets.

10:30 – 11 am: Coffee Break

11 - 12 am: **Raja Chakir** (Université Paris-Saclay, INRAE, AgroParisTech) **Climate Change Impacts and Adaptation in Agriculture: Some Econometric Insights**

There is a large body of econometric literature analyzing the impact of climate change on agriculture. In particular, the vast majority of work is based on two main econometric approaches. The first, known as the 'Ricardian approach', explains cross-sectional variations in land prices by climatic differences, while the second, known as the 'panel approach', assesses the impact of weather shocks on agricultural yields/profits. Several extensions have been proposed in the literature to address some of their limitations. We propose methodological contributions to each of the two approaches that offer new quantitative perspectives on the impacts of climate change on agriculture. Further efforts in this direction are needed, in particular to better understand the mechanisms underlying adaptation in the short term and to better capture adaptation in the long term.

12 am – 1:30 pm: Buffet Lunch

1:30 – 2:30 pm: **Jason Franken** (Western Illinois University) **Hedging Behavior of Agribusiness Cooperatives and Investor-owned Firms in Germany**

While agriculture is unique with respect to the prevalence of producer owned cooperatives (coops) operating alongside and investor owned firms (IOFs), little is known about their relative reliance on futures markets to hedge commodity price risk. This study investigates factors influencing the hedging behavior of both business forms and finds that each are significantly impacted by the perspective of key influencers of their decision making units (e.g., employees, members, shareholders, board of directors, advisors, consultants, bankers). Notably, coops are found to be more likely to hedge using futures but do so more sparingly (i.e., lower hedging ratios), which may reflect an ability to conduct natural hedges internally and/or less speculative positions taken in futures markets.

2:30 – 3:30 pm: **Michel Robe** (University of Richmond) **Canary in the Coal Mine: COVID-19 and Soybean Futures Market Liquidity**

We document the impact of the early stages of the COVID-19 pandemic on liquidity in U.S. agricultural markets. Notably, we show that soybean futures-market depth collapses weeks before the U.S. financial markets' crash of March 2020. Soybean futures liquidity is affected the earliest, the most, and the longest. Soybean depth drops by half for outright futures and by over 90 percent for calendar spreads, and soybean bid-ask spreads increase significantly. This liquidity pullback starts on the night of February 12 to 13, 2020—a full two weeks before (i) liquidity evaporates in U.S. bond and equity markets and (ii) soybean prices start to fall sharply. The start of the soybean liquidity pullback coincides with overnight news of bleak COVID-19 developments in China (a dominant source of world demand for oilseeds). Following a series of emergency interventions by the U.S. Federal Reserve in March and April 2020, liquidity recovers in the soybean outright futures market—but depth remains abnormally low for calendar spreads. These patterns cannot be explained by other factors, such as seasonalities or changes in soybean futures trading volume and price volatility: the COVID-19 shock was novel, and it destroyed soybean-market liquidity in a way that foretold financial-market developments two weeks later. In contrast to soybeans, we find little evidence of a drop in corn or wheat futures liquidity until U.S. financial and crude oil markets sink in early March. Soybeans were truly the canary in the coal mine.

A joint work with Kun Peng (S&P Global), Zhepeng Hu (China Agricultural U.), Michael Adjemian (U. of Georgia)

3:30 - 4 pm: Coffee Break

4 - 5 pm: **Céline Grislain-Letrémy** (Banque de France), **Bertrand Villeneuve** (Université Paris Dauphine - PSL), **Marc Yétérian** (Université Paris Dauphine - PSL)

**Don't bet the Farm on Crop Insurance Subsidies**

Crop insurance is one of the most important tools that farmers have to protect themselves against climate-related risks. Yet and despite being heavily subsidized, insurance uptake in France remains extremely low. The goal of this paper is twofold; first, we explain this paradox by analyzing the heterogeneous benefits and adverse effects of taking up crop insurance, and second, we provide concrete policy recommendations to increase insurance uptake in a welfare-maximizing way. Using an original micro-level panel of 17 000 French farmers over 20 years, we first use a moments-based regression to identify the local average treatment effects (LATE) of insurance on expected revenues and variance, before investigating the factors that might cause heterogeneity in these effects, both observables through interaction terms and unobservables through a marginal treatment effect design. We conclude that insurance subsidies have very little impact on crop insurance demand, especially for those who would benefit the most, such as smaller farms. Finally, we suggest other less costly and more efficient ways to increase insurance uptake such as information campaigns.

5 pm: End of the Seminar

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