SOE 23: Economic Models

Time: Friday 11:00–12:00 Location: ZEU 260

SOE 23.1 Fri 11:00 ZEU 260

Stochastics in action: how to generate profit by exploiting the inefficiencies of the soccer betting market — •Ralph Stömmer — Private researcher, Ottobrunn, Germany

In economy, markets are denoted as efficient when it is impossible to systematically generate profits which outperform the average. In the past years, the concept has been tested in other domains such as the growing sports betting market. Surprisingly, despite its large size and its level of maturity, sports betting shows traits of inefficiency. The anomalies indicate the existence of strategies which slightly shift betting from a game of chance towards a game of skill.

This presentation shows an example for an inefficiency detected in the German soccer betting TOTO 13er Wette, which is operated by state-run lottery agencies. Gamblers have to guess the outcome (win, draw, loss) of 13 soccer matches listed on a lottery tip. Applying stochastic methods, a recipe is presented to determine tendencies for single match outcomes, currently resulting in hit rates $> 47{,}7\%$. More important, the recipe provides the number of lottery tips required to achieve a specific number of strikes (number of correct match forecasts per lottery tip) for a given level of safety (for instance 99,9%). As additional benefit, a useful approximation is derived with Stirling*s formula to cope with large numbers in hypergeometric distributions, valid under certain constraints.

Overall, the strategy does lead to price expectations exceeding the aggregated lottery fees, resulting in consistent profits.

SOE 23.2 Fri 11:15 ZEU 260

Assessing the impact of extreme weather events on the global market for staple food — •Nkongho Ayuketang Arreyndip[1] and Ebobenow Joseph[2] — [1]Institute of Applied Geosciences, Technical University of Darmstadt, Darmstadt, Germany — [2]Physics Department, University of Buea, Cameroon.

The impacts of increasing extreme weather events under future warming may exacerbate global food insecurity. Assessing the economic impact of these disasters in the agricultural sector is critical for early mitigation planning. We model the impacts of extreme weather events by perturbing the agricultural sectors of some breadbasket regions (USA, EU, and China) with a uniform forcing for both single and concurrent extreme weather event scenarios. We consider forcing data from the 2018 Summer European heatwave. This heatwave simultaneously affected multiple Northern-hemisphere mid-latitude locations. We compute and compare the production and consumption value losses in the corn, rice, wheat, soybean, and other agricultural sectors using the FAO data and an agent-based economic model Acclimate. We show that simultaneous extreme weather events can exacerbate the loss of value of agricultural production relative to single extreme weather events. The highest global repercussion is felt in the rice sector compared to other sectors under study for concurrent extreme events scenarios involving China. Moreover, the global commodity market is hardest hit when regions that are major producers of that commodity are affected by extreme weather events such as corn for the USA, wheat for Europe, rice for Southeast Asia, and soybean for Brazil.

SOE 23.3 Fri 11:30 ZEU 260

Forecasting power grid frequency using transformers — •Hadeer El Ashhab and Benjamin Schäfer — Institute for Automation and Applied Informatics, Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany

The power grid frequency is the central observable in power system control, as it measures the balance of electrical supply and demand. A reliable frequency forecast can facilitate rapid control actions and may thus greatly improve power system stability. Here, we develop a forecasting model based on transformers and investigate its performance on data recorded in different power grids.

SOE 23.4 Fri 11:45 ZEU 260

Measuring the Robustness of Production Networks — •Tobias Reisch[1], Georg Heiler[1,2], Christian Diem[1], Peter Klimek[1,3], and Stefan Thurner[1,3,4] — [1]Complexity Science Hub Vienna, Vienna, Austria — [2]Institute of Information Systems Engineering, TU Wien, Vienna, Austria — [3]Section for Science of Complex Systems, CEMSIIS, Medical University of Vienna, Vienna, Austria — [4]Santa Fe Institute, Santa Fe, NM, USA

In modern economies manufacturing happens typically along supply chains. These supply chains intersect and overlap, forming complex networks of production. The failure of single firms in production networks can cause large disruptions. To assess the robustness of economic networks, we develop a firm-level shock spreading model that takes node-specific production functions into account. We define the Economic Systemic Risk Index (ESRI) of a firm as the size of the production interruptions the firm's initial failure causes. First, we apply the new index to the empirical production network of Hungary based on VAT data. Second, we use mobile phone data to reconstruct the production network of a second country that cannot be disclosed. For both countries we find a core of less than 100 high-systemic risk firms that can affect more than 20% of the respective economy. The high-systemic risk core cannot be identified by firm-size. We discuss the network properties that give rise to the observed patterns of systemic risk. Our results contribute to the broader field of network resilience with the introduction of node specific shock spreading dynamics.