SOE 4: Financial Markets and Risk Management

Time: Monday 10:45–12:15 Location: MA 001

SOE 4.1 Mon 10:45 MA 001

Markets, herding and response to external information — •Adrián Carro, Raúl Toral, and Maxi San Miguel — Instituto de Física Interdisciplinar y Sistemas Complejos, IFISC (UIB-CSIC), Universitat de les Illes Balears, Palma de Mallorca, Spain

We focus on the influence of external sources of information upon financial markets. In particular, we develop a stochastic agent-based market model characterized by a certain herding behavior as well as allowing traders to be influenced by an external dynamic signal of information. This signal can be interpreted as a time-varying advertising, public perception or rumor, in favor or against one of two possible trading behaviors, thus breaking the symmetry of the system and acting as a continuously varying exogenous shock. As an illustration, we use a well-known German *Indicator of Economic Sentiment* as information input and compare our results with Germany's leading stock market index, the DAX, in order to calibrate some of the model parameters. We study the conditions for the ensemble of agents to more accurately follow the information input signal. The response of the system to the external information is maximal for an intermediate range of values of a market parameter, suggesting the existence of three different market regimes: amplification, precise assimilation and undervaluation of incoming information.

SOE 4.2 Mon 11:00 MA 001

Stylized Dynamics from Efficient Pricing — •Felix Patzelt and Klaus Pawelzik — Institute for Theoretical Physics, University of Bremen, Germany

Mainstream economic theories describe financial markets as systems that transform available information into prices. This view is consistent with the finding that price changes are hard to predict. It has, however, proven difficult to reconcile with the excessive movements of real prices.

The origins of empirical "stylized facts" of price time series, on the other hand, are often investigated using multi-agent models. Difficulties to coordinate the agent's strategies can lead to slowly shifting market imbalances that modulate the market's volatility due to nonlinearities.

Here we combine these seemingly opposing views in a minimal and analytically fully tractable model. We first show that simple efficient bidding processes where prices follow a martingale inevitably form "bubbles". We furthermore consider a simple non-linearity for the generation of prices that arises naturally from the imbalance of supply and demand. It amplifies the modulation the price volatility similar to much more complicated models. This model quantitatively reproduces the empirical scaling laws of the distributions and temporal correlations of (logarithmic) price-change magnitudes independent of parameters. It can be mapped to an equivalent diffusion process which might be used to estimate market imbalances underlying real price time series and more complex models.

SOE 4.3 Mon 11:15 MA 001

Influence of response time on traders' performances: a double-auction model analysis — •Guanghao Liu[1], Yu Chen[2], Fujio Toriumi[1], and Hirotada Ohashi[1] — [1]Department of Systems Innovation, the University of Tokyo, Japan — [2]Department of Human and Engineered Environmental Studies, the University of Tokyo, Japan

The influence of the response time of traders on their performances is investigated by using a multi-agent continuous double auction model. In this model, every agent can access the same information. They make decisions with the same type of strategy, but the decisions are not identical because of the random coefficients in the strategy at every time step. A time delay, referred to in this study as "the response time", is used to describe the time interval between the time one agents accesses the information and the time he sends an order. Orders will be executed on their arrival according to their price. We check the model by obtaining several stylized facts of financial markets such as the so-called fat-tail distributions and volatility clustering. The simulation results show that the agents with the shortest response time could not always get the highest wealth. To clarify the influence of the response time of an agent on his wealth in different conditions, several investment strategies and market rules are investigated.

SOE 4.4 Mon 11:30 MA 001

Analysis of German Interest Rates according to Standard Models and beyond. — •Magda Schiegl — Hochschule Landshut, Am Lurzenhof 1, D-84036 Landshut

Over the last years interest rates decreased continuously in Germany. The short period interest rates even decline to negative values. This development is very crucial and especially demanding for companies dealing with long term investments.

For the risk management of interest-rate-sensitive investments stochastic models are used. The standard interest rate models, the CIR (Cox, Ingersoll, Ross) and the Vasicek model (Ornstein-Uhlenbeck-Process) are Langevin type models. They consist of a mean reverting drift part and a volatility part. The models differ in this second part concerning the volatility dependence on the interest rate's size. The mean reverting ansatz reflects the idea of an "equilibrium" interest rate to be achieved as a stable state in the long run attracting the fluctuating interest rate.

We analyse the German interest data according to these standard models and ask for their relevance. Various methods are applied to analyse for instance: The time series, the interest rate cdfs and the time scaling behaviour of the volatility. We compare the results of the empirical data with theoretical and Monte Carlo results of the standard models.

SOE 4.5 Mon 11:45 MA 001

Solcency II directive and stability of financial markets — •Daniil Osipov and Zere Toleuberdi — KBTU, Almaty, Kazakhstan

We propose a model of financial instability based on the Lotka-Volterra equations with specific attention given to the international regulatory accords (Basel II, Basel III for banks, and Solvency II Directive for insurance companies). The model describes the relationship between industry and financial sector, and it helps to understand and to measure the counter-cyclicality effect of Solvency II regulation.

SOE 4.6 Mon 12:00 MA 001

Dynamics of multi-asset artificial markets considering inter-market transactions of two types of traders: risk-seekers and risk avoiders — •Hidenori Mabe[1], Yu Chen[2], Fujio Toriumi[1], and Hirotada Ohashi[1] — [1]Department of Systems Innovation, the University of Tokyo, Japan — [2]Department of Human and Engineered Environmental Studies, the University of Tokyo, Japan

Most studies of artificial financial markets focused on dynamics of a single asset in a single market. However, there is no independent market in reality, and all markets all over the world are connected in some ways. Market participants move repeatedly their investment capitals from one asset to another crossing various markets. We construct a multi-asset artificial market model to investigate dynamics of interacting markets. The model is composed of several assets and two types of agents. One type corresponds to risk-avoiders who invest based on values of fundamentals, which depend on a time series of exchange rates. The other corresponds to risk-seekers who tend to invest in highly volatile assets. The resulting dynamics becomes complex because of the interactions between agents' behavior and price changes of assets. Some stylized facts such as fat-tail distributions and volatility clustering are observed. We investigate the spread of influences of price changes among assets. Price fluctuations of an asset caused by risk-seekers lead to those of others in which risk-avoiders mainly participate. Negative correlations between returns and volatility are observed and, we think, this represents a phenomenon called volatility anomaly, which is contrary to the conventional wisdom in financial engineering.