SOE 3: Financial Markets and Risk Management II

Time: Monday 10:45–11:30 Location: H37

SOE 3.1 Mon 10:45 H37

Alternate entropy measure for assessing volatility in financial markets — •Kay Hamacher[1] and Ranjan Bose[2] — [1]Department of Computer Science, Department of Physics & Department of Biology, Technische Universitaet Darmstadt, Germany — [2]Department of Electrical Engineering, IIT Delhi, Hauz Khas, New Delhi, India

(Stock) market dynamics has become the ultimate challenge for our understanding of complex system dynamics. Thus, new ways to probe properties of the dynamics is an important step towards a better understanding - in particular, since simple pdfs were disregarded as the typical dynamics is governed by non-Gaussian fluctuations.

Here [1], we propose superinformation [2], which is a measure of the disorder of the entropy of general data sets. Besides obvious signals - such as the 2008 financial crisis - we were able to extract relations to volatility measures; an important quantity on which derivates are traded. In particular, we observe correlations to the VIX index.

Going on step further, we introduce the super mutual information. Signatures were observed whose exploitation might be used to mitigate idiosyncratic risk.

[1] K. Hamacher, R. Bose. "Alternate entropy measure for assessing volatility in financial markets" Phys. Rev. E, 86(5):056112, 2012.

[2] R. Bose, S. Chouhan. Phys. Rev. E 83, 051918 (2011).

SOE 3.2 Mon 11:00 H37

From linearity to nonlinearity in commodity price analysis — •Benedikt Gleich and Andreas Rathgeber — Institute of Materials Resource Management (MRM), University of Augsburg, Germany

In the field of minerals economics, the analysis of commodity prices using classical econometric approaches mostly incorporates linear models, in particular linear OLS (ordinary least squares) regressions. However, research on complex systems highly suggests nonlinear approaches and pure linearity could be a serious bias.

To compare linear and nonlinear methods, as a benchmark, we present a classical linear OLS regression analysis on price time series of 42 commodities (mostly industrial metals) and 11 common price factors like mining production or economic growth. While this linear approach frequently detects significant correlations, the effect of an independent variable in many cases is both positive as well as negative depending on the respective commodity. We argue that this variation is no result of fundamental (market) laws, but in fact comes from limitations of linearity. In contrast, we therefore evaluate and present a selection of alternative non-linear models and simulations, in particular using non-linear multi factor models and differential equation systems, which show an improved performance in explaining the real world relationship between commoditiy prices and common price factors.

Our results constitute an extension of current de facto standards in minerals economics and financial commodity price modeling, in particular by the utilization of non-linear models instead of linear OLS models. They enable a more realistic analysis of commodity price building.

SOE 3.3 Mon 11:15 H37

Triangular arbitrages in foreign exchange markets — •Kenta Yamada[1], Takatoshi Ito[2], Hideki Takayasu[3], and Misako Takayasu[4] — [1]Waseda University, Tokyo, Japan — [2]University of Tokyo, Tokyo, Japan — [3]Sony CSL, Tokyo, Japan — [4]Tokyo Institute of Technology, Tokyo, Japan

We confirm triangular arbitrages exist in foreign exchange markets by using high frequency data for 12 years from 1999 to 2010. When we make a triangular exchange such as yen to dollar, dollar to euro and then euro back to yen, usually we lose money because of the spread which is the difference between the bid price and the offer price. However sometimes we have a chance to make a profit. This arbitrage opportunity is against non-arbitrage principles in economics. These triangular arbitrage opportunities were originally identified by Aiba et. al. in 2002 [1]. They realized the triangular arbitrage opportunity existed by analyzing the foreign exchange market data for two months in 1999, and they found these triangular opportunities exist about 6.4 percent of the time. In our study we observed a consistent value in the same period, while the probability of arbitrage on January 2010 was only 0.1 percent. We calculated the number of triangular arbitrage opportunities and the disappearance probability of triangular arbitrages within one second each month for 12 years, and modeled the occurrence of the triangular arbitrage with volatility, the number of deals and the number of AI traders [2].

[1] Yukihiro Aiba, et. al., Physica A 310 (2002) 467-479.

[2] Takatoshi Ito, et. al. , NBER Working Paper No. 18541 (2012).