Kolloquium des Institutes für Mathematik

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Applications of continuum mechanics in financial markets

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Abstract:
Decisions about whether to buy or sell an asset in financial markets depend upon the history of trading. The traders do not react to price fluctuations continuously, but have differing approaches to risk-taking and market forecasting. Standard market strategies can be described by a system of rate independent variational inequalities which are well known from plasticity modeling. The price evolution is driven by an exogenous information stream which is defined by many factors such as changing production costs, transportation costs, natural catastrophes, etc. The market price, however, follows in a substantial way the overall market sentiment which depends on the actual market activities and explains rapid and/or large price movements independent of the exogenous stream due to coupling and cascading effects of the information exchange between market participants. The model thus leads to an implicit system of variational inequalities. We show that it becomes unstable if small groups of traders have a dominant influence on the market sentiment.

This may initiate a cascade and discontinuities are likely to occur. The mathematical tools for describing these phenomena include discontinuous Prandtl-Ishlinskii operators in the Kurzweil integral setting, and the main result is the well-posedness proof for the model in the space of right continuous regulated functions as a joint work with H. Lamba, S. Melnik, G. A. Monteiro, and D. Rachinskii.

About the speaker:
Dr. Pavel Krejci (born 1954 in Decin, Czech Republic) is a worldwide leading mathematical analyst in the fields of phase transitions, variational inequalities and hysteresis phenomena. In particular, he has made countless fundamental contributions to the mathematical theory of hysteresis operators. He is the author of two well-known monographs and of more than 100 papers in refereed journals. He is also the owner of a patent. Dr. Krejci was a member of the Weierstrass Institute (WIAS) for more than eight years, and the Director of the Institute of Mathematics of the Czech Academy of Sciences in Prague from 2009 to 2014.

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