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Editorial

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The two articles in this issue of the *European Physical Journal Special Topics* cover topics in *Econophysics* and *GPU computing* in the last years. In the first article [1], the formation of market prices for financial assets is described which can be understood as superposition of individual actions of market participants, in which they provide cumulative supply and demand. This concept of macroscopic properties emerging from microscopic interactions among the various subcomponents of the overall system is also well-known in statistical physics. The distribution of price changes in financial markets is clearly non-Gaussian leading to distinct features of the price process, such as scaling behavior, non-trivial correlation functions and clustered volatility. This article focuses on the analysis of financial time series and their correlations. A method is used for quantifying pattern based correlations of a time series. With this methodology, evidence is found that typical behavioral patterns of financial market participants manifest over short time scales, i.e., that reactions to given price patterns are not entirely random, but that similar price patterns also cause similar reactions. Based on the investigation of the complex correlations in financial time series, the question arises, which properties change when switching from a positive trend to a negative trend. An empirical quantification by rescaling provides the result that new price extrema coincide with a significant increase in transaction volume and a significant decrease in the length of corresponding time intervals between transactions. These findings are independent of the time scale over 9 orders of magnitude, and they exhibit characteristics which one can also find in other complex systems in nature (and in physical systems in particular). These properties are independent of the markets analyzed. Trends that exist only for a few seconds show the same characteristics as trends on time scales of several months. Thus, it is possible to study financial bubbles and their collapses in more detail, because trend switching processes occur with higher frequency on small time scales. In addition, a Monte Carlo based simulation of financial markets is analyzed and extended in order to reproduce empirical features and to gain insight into their causes. These causes include both financial market microstructure and the risk aversion of market participants.

The topic of the second article [2] is GPU computing, which provides incredible resources for high performance computing. Recently, the graphics card producer *NVIDIA Corporation* introduced the Compute Unified Device Architecture (CUDA), which allows for implementation of algorithms using standard C with CUDA specific extensions. Thus, CUDA issues and manages computations on a GPU as a

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data-parallel computing device. A few years ago, high entry barriers prevented scientists from using GPU devices in computational physics and computational finance. Today, such resources are easily accessible. The article provides an introduction into this field. The computationally expensive applications for financial market analyses are coded on a graphics card architecture which leads to a significant reduction of computing time. In order to demonstrate the wide range of possible applications, a standard model in statistical physics – the Ising model – is ported to graphics card architectures as well, resulting in large speedup values.

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