Researchers develop method to compare pricing models

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A team of biophysicists from Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) presents a mathematically concise method for comparing different pricing models in their latest publication in *Nature Communications*. This enables researchers to predict more accurately how parameters such as the volatility of stock prices change over time.

The ups and downs of stock prices are the result of a complex interplay between traditional investors, day-traders and high-frequency hedge funds. The seemingly erratic short-term price fluctuations can be characterized by a diffusion constant—called volatility. However, volatility itself changes significantly over longer time scales. For example, unexpected Twitter announcements may trigger abrupt volatility spikes, while economic policy changes may induce gradual variations of volatility. Financial analysts notoriously struggle to estimate how volatility changes over time and often base their predictions on unsubstantiated assumptions.

Instead of evaluating the uncertainty of different model predictions analytically, Christoph Mark and colleagues from the Biophysics group at FAU developed a numerical implementation of the principle of 'Occam's razor', which favors those models that describe the data with the least number of assumptions.

The researchers use this method to show that the so-called fat-tailed distribution of stock market returns (including rare but dramatic events such as Black Fridays and market bubbles) emerges naturally from sudden volatility fluctuations. Moreover, with their method they can pinpoint the triggering events (such as news announcements) in real-time.

Volatility fluctuations or, more generally speaking, heterogeneous random walks are not exclusive to finance, however, and also describe the movements of invasive cancer cells, the timing of accidents and disasters, and climate change. Here, their method can be used to identify particularly invasive cells, to determine political measures that may reduce accidents, or to compare different climate models to forecast global warming.

More information: Christoph Mark et al, Bayesian model selection for complex dynamic systems, *Nature Communications* (2018). DOI: 10.1038/s41467-018-04241-5

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