

Price Formation on the Networked Ising Spin System

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The Ising spin system is a very simple mathematical model which state is described by the accumulation of binary variables, and has been frequently used for discovering the universality behind various complex collective phenomena observed in social and economic systems.

The Sznajd model is one of the successful Ising spin systems characterized by the rule of time evolution so-called the "outward" and "asynchronous" one and has been shown to reproduce well the statistical behavior of market price observed in the actual market.

We develop the model on networks with different topologies, modifying the update-rule into the "inward" and "synchronous" one for decreasing the arbitrariness of spin selection, and study the effect of network topologies on statistical properties of price fluctuations.

We investigate the spatial distribution of spin states and the frequency of state changes of each spin, finding that the existence of a hub spin has a great influence on both the size of a deviation of price returns and the effective duration of auto-correlation function of price volatility.