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The Use of Random Dynamical Systems in Computational Agent-Based Modeling.

In this paper the author will show how a common continuous time description of stock prices – the Ornstein-Uhlenbeck process – can be modified so it exhibits the bifurcations, chaotic activity and other properties seen in stock prices when modeled via discrete time agent-based systems.

In particular this paper will use infinitesimal generators (IG) of diffusion processes to show that the onset of the initial observed bifurcation comes about from the addition of additive noise to the Ornstein-Uhlenbeck process. This additive noise is shown to be caused by the increasing number of non-fundamentalist traders in a market.

The different types of bifurcations seen in agent-based models are shown to be related to the type of noise added. And the appearance of chaos is hypothesized to arise due to the type of noise in the system.

Multiplicative noise processes are shown to give rise a mix of risk-aversion parameters, an important feature in both real world financial activity and agent-based modeling.

The paper will also recommend ways its various conjectures can be proven (or disproven) empirically. (Received September 01, 2009)