Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Applications of Physics and Geometry to Finance

By

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Market anomalies in finance are the most interesting topics to academics and practitioners. The chances of the systematic arbitrage are not only the counter-examples to the efficient market hypothesis but also the sources of profitable trading strategies to the practitioners. Approaches to finding, predicting, and explaining the anomalies by using ideas from physics and geometry had not been permeated.

In the first part, I develop monthly momentum and weekly contrarian strategies with stock selection rules based on various measures from risk management and analogy of momentum in physics. The better performance and risk profile are achieved by the alternative strategies implemented in diverse asset classes and markets.

The concept of spontaneous symmetry breaking is suggested for modeling the arbitrage dynamics. In the model, the arbitrage strategy is considered as being in the symmetry breaking phase and the phase transition between arbitrage mode and no-arbitrage mode is triggered by a control parameter. It is also tested with the contrarian strategies in various markets.

In the last part, I prove the correspondence between Kähler manifold and information geometry of signal processing models under conditions on transfer function. The various advantages of introducing the Kähler manifold are visited. Several implications to time series models are also given in the Kählerian information geometry.

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