

# Abstract for GR-TR Conference on Statistical Mechanics and Dynamical Systems

Plenary Invited

Invited Talk

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## Physical View of Market Prices: Random Walks in Complex Potential Functions

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Market prices sometimes show quite dynamical behaviors such as bubbles or crashes, while in most of ordinary situations they are well approximated by random walks. These two types of behaviors are now described by a unified physical model called PUCK model [1, 2]. We consider a random walk in a deforming potential function which moves with its center given by the moving average of the market price. The model's parameters can be determined from market price data and basic empirical statistics can be reproduced in this frame work. Typical conventional models in financial technology such as the Nobel prize laurelled ARCH model can be derived as a special limit case of our potential model [3], namely, our formulation is more general. Not only stochastic properties our model can properly describe dynamical behaviors of markets such as bubbles and crashes, while conventional models can only describe stochastic behaviors. Further, our formulation can be extended to macro-economic behaviors such as inflation or even hyper-inflations. In this talk I will review our formulation from derivation to frontier applications. The most advanced version of PUCK model is now used in a major bank's foreign exchange divisions in Tokyo and London.

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- [1] Misako Takayasu, Takayuki Mizuno, Takaaki Ohnishi, and Hideki Takayasu, in *Practical Fruits of Econophysics* (edited by H.Takayasu, Tokyo, Springer), 29 (2005).
  - [2] M.Takayasu, T.Mizuno and H.Takayasu, *Physica A* **370**, 91-97 (2006).
  - [3] Misako Takayasu, Takayuki Mizuno and Hideki Takayasu, *Physica A* **383**, 115-119 (2007).