Econophysics: an alternative to econometrics

Random Walks (unpredictable prices)
Rational Expectations
Efficient Markets Hypothesis

ECONOMETRICS
cause
Rational Expectations
Efficient Markets Hypothesis

ECONOPHYSICS
cause
N-body interactions (irrational traders)


Effect
Random Walks

prices result from responses to past prices based on other traders' reactions

その結果
- econometrics: statistical analysis of price returns
- econophysics: physical modeling of many-trader interactions

提案
- replace fitting time series models (maximum likelihood, Bayesian statistics) with energy minimisation of a 2D Ising lattice via Simulated Annealing
- assume a 2D lattice with $N$ binary nodes $S_i \in \{-1, 1\}, i = 1, \ldots, N$
- a vector of current profits/losses $p_i$ for all nodes, updated after each tick
- a custom energy function to be minimised:

$$h_i = -\alpha \sum_{j \in N_i} S_i S_j p_j - \beta \min(p_i, 0) + \gamma \max(p_i, 0)$$

where $N_i$ denotes the local neighbourhood of the $i$th node, $\alpha, \beta, \gamma > 0$ and $\beta > \gamma$.

log $V(t)$

filtered trading volume

2011/05/27 16:09:30 USDJPY 88.73 UP 345 DOWN 555 NET -210

793889 E 88.57 KST 0.10 CUMULATIVE -5.846 DE50 FLIPPED 46%