Extreme Events in Small-Scale Minority Games

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Abstract
We investigated whether it is possible to study large collective phenomena in model markets experimentally with moderately sized groups of participants. We found, that many approaches towards understanding price fluctuations can be mapped in a mathematically precise way to a particularly simple and visually appealing game. Strong herding behavior robustly emerged even with just 10 to 15 players. This effect was found to be caused by collective market efficiency.

Rules of the Seesaw Game
A Minority Game (1) is visualized by a seesaw upon which players place their bets. The winning side goes up. As a modification, we balance the next round are placed.

Game Variations
- Binary choices and payoff or variable risk
- Linear scale: seesaw angle = sum over choices (excess demand)
- Logarithmic scale: angle = real log price ratios (log returns)
- Virtual Players (AI)
- Coupling to external information

Logarithmic Game with variable Risk (Large Movements I)
- Variable risks increase the range of results
- For a zero-sum game, the bets of the majority are given to the minority

Further Extensions
- More complex information efficiency (oscillations, etc.)
- Analyze individual player behavior
- How to make players feel the significance of a crash – return dependent losses?
- Optimal ways to manage money influx – simulate an economy?

Summary
- Minority games can be used to investigate herding theoretically and in group experiments.
- Herding is caused by efficiency, not irrationality.
- Deviations from Gaussian returns arise in moderately sized groups after few rounds.
- Online experiments promise large datasets

References