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Spontaneous Time Symmetry Breaking in System with Mixed Strategy Nash Equilibrium: Evidences in Experimental Economics Data

ZHIJIAN WANG, BIN XU, Experimental social science laboratory, Zhejiang University, ZHEJIANG UNIVERSITY COLLABORATION — In social science, laboratory experiment with human subjects' interaction is a standard test-bed for studying social processes in micro level. Usually, as in physics, the processes near equilibrium are suggested as stochastic processes with time-reversal symmetry (TRS). To the best of our knowledge, near equilibrium, the breaking time symmetry, as well as the existence of robust time anti-symmetry processes, has not been reported clearly in experimental economics till now. By employing Markov transition method to analysis the data from human subject 2x2 Games with wide parameters and mixed Nash equilibrium, we study the time symmetry of the social interaction process near Nash equilibrium. We find that, the time symmetry is broken, and there exists a robust time anti-symmetry processes. We also report the weight of the time anti-symmetry processes in the total processes of each the games. Evidences in laboratory marketing experiments, at the same time, are provided as one-dimension cases. In these cases, time anti-symmetry cycles can also be captured. The proposition of time anti-symmetry processes is small, but the cycles are distinguishable.

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