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Analysis of Foreign Exchange Interventions with an Artificial Market Approach

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Abstract

In this thesis, I discuss an analysis of foreign exchange interventions. I propose a multi-agent system which is an artificial foreign exchange market to evaluate the effect of interventions.

The governments and central banks intervened many times in foreign exchange markets since they had floated their countries' currencies. However the interventions were not always effective. It was reported that the effect and the amount of interventions are nonlinear. It is due to signal effect, effect of interventions to dealers in the markets as news. The mechanism is not explained because most existing researches are macroscopic and model the dealers in the mass.

Izumi et al. had presented a system called AGEDASI TOF to simulate artificial market, together with a support system for the government to decide foreign exchange policies. However, the system needed to fix the amount of governmental intervention prior to the simulation, and was not realistic. In addition, the interventions in the system did not affect supply and demand of currencies; thus I could not discuss the effect of intervention correctly. First, I improve the system so as to make much of the weights of influential factors. Thereafter, I introduce an intervention agent that has the role of the central bank to stabilize the market. I could show that the agent learned the effective intervention policies through the reinforcement learning, and that the exchange rate converged to a certain extent in the expected range. I could also estimate the amount of intervention, showing the efficacy of signaling. In this model, in order to investigate the aliasing of the perception of the intervention agent, I introduced a pseudo-agent who was supposed to be able to observe all the behaviors of dealer agents; with this super-agent, I discussed the adequate granularity for a market state description.

Key Words: artificial market, foreign exchange market, foreign exchange intervention, multi-agent system