Agent-Based Models of Complex Dynamical Systems of Market Exchange

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Abstract. The standard Walrasian general equilibrium model is a static description of market clearing equilibria. Attempts over more than a century to provide a decentralized market dynamic that implements market equilibrium have failed. The reason is that a system of decentralized markets is a complex dynamical system in which the major form of learning is through experience (adaptive expectations) and imitating successful others (replicator dynamics).

I will present a model of decentralized market exchange where each individual produces one good and consumes many. I will show that an agent-based model of this economy converges to market equilibrium and is highly impervious to shocks. I will also present a model in which agents are firms and households, as in the standard Walrasian model. I will show that an agent-based model in this case converges strongly to market equilibrium, but with considerable excess volatility and large excursions from equilibrium. This is characteristic of error terms with "fat tails" as characterized in the complexity literature, and is due to the tendency of agents to imitate the successful, which leads to strongly correlated error distributions.