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Foundation of competitive equilibrium with non-transferable utility ☆

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Abstract

This paper investigates the dynamic foundation of a competitive equilibrium, studying a sequence of random matching models between ex ante heterogeneous buyers and sellers under two-sided incomplete information with no entry, where each agent is endowed with non-transferable utility. The economy is populated with two sets of infinitesimal agents, buyers and sellers, who have private information about their own valuations of the object. In each period, buyers and sellers in the pool are matched to draw randomly a pair of expected payoffs, which will realize if the long term relationship is formed. Each player decides whether or not to agree to form a long term relationship, conditioned on his private information. If both parties agree, then they leave the pool, receiving the expected payoff in each period while the long term relationship continues. The existing long term relationship is terminated either by will or by a random shock, upon which both parties return to the respective pools of agents. We quantify the amount of friction by the time span of each period. We demonstrate that as the friction vanishes, any sequence of stationary equilibrium outcomes, in which trade occurs with a positive probability, converges to the

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competitive equilibrium, under a general two sided incomplete information about the private valuation of each agent.

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1. Introduction

Let us consider a textbook example of a competitive market, in which agents have non-transferable utility and private information regarding their valuations of the object. Neither agents' entry into nor their exit from the economy is assumed. The market supply and demand curves intersect to determine a unique competitive equilibrium price. The goal of this paper is to provide a decentralized dynamic foundation of the textbook example of the Arrow Debreu economy, to understand whether or not and how the dispersed information can be aggregated through a decentralized trading process to achieve an efficient allocation.

A canonical model of decentralized dynamic trading can be described roughly as follows. The economy is populated by the two sets of infinitesimal agents, buyers and sellers, who may or may not have private information about their own valuations of the object. Time is discrete. In each period, buyers and sellers in the pool of unmatched agents are matched and negotiate over the delivery price. If the two parties agree, then the long term relationship is formed: in each period, the seller delivers one unit of the good to the buyer at the agreed price while the relationship lasts. Friction is quantified by the duration of each period. We calculate an equilibrium of this model (with various additional elements) to see whether or not the equilibrium converges to the competitive equilibrium as friction vanishes.

To capture the key features of the textbook example of the Arrow Debreu economy, we should add three basic elements to the decentralized dynamic trading model at the same time. First, the utility function of each player is non-transferable. Second, each party may have private information about the valuation of the object, and the trading can occur under two sided incomplete information. Third, the total mass of buyers and sellers is fixed, as we assume neither agents' entry into nor their exit from the economy.

Despite a vast number of papers on the decentralized dynamic foundation of competitive equilibrium, we are not aware of any model that has all three features at the same time. Existing papers drop at least one out of the three features, in order to facilitate the analysis. Let us review the consequence of assuming each individual feature, to demonstrate how we solve the issues head on, instead of assuming away the difficult problems.

First, a significant majority of decentralized dynamic trading models are built on transferable utility with respect to transfer payment. However, there are cases in which non-transferable utility is natural. In a real estate market, for example, the amount of money one spends upon a house is so large as to affect the marginal utility of money due to income effect.

With the transferable utility function of the agent, we can invoke the powerful technique of Myerson (1981) that allows us to focus without loss of generality on the equilibrium probability of trading of a revelation game (e.g., Myerson and Satterthwaite, 1983; Satterthwaite and