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Simple market protocols for efficient risk sharing

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Abstract

This paper studies the performance of four market protocols with regard to allocative efficiency and other performance criteria such as volume or volatility. We examine batch auctions, continuous double auctions, specialist dealerships, and a hybrid of these last two. All protocols are practically implementable because the messages that traders need to use are simple. We test the protocols by running (computerized) experiments in an environment that controls for traders' behavior and rules out any informational effect. We find that all protocols generically converge to the efficient allocation in finite time. An extended comparison over other performance criteria produces no clear winner, but the presence of a specialist is associated with the best all-round performance.

JEL classification: G19; D61; D44; C63

Keywords: Market microstructure; Allocative efficiency; Comparison of market institutions; Performance criteria

1. Introduction

Financial markets where agents exchange risky assets serve two main purposes. First, they allocate risk among traders and improve allocative efficiency. Second, they diffuse traders' private information and facilitate information diffusion.

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The simultaneous pursuit of allocative and informational efficiency is usually impossible. Different market arrangements are more favorable to the search for different notions of efficiency. We observe that the state of knowledge in this respect is remarkably unbalanced.

There is a vast literature on market microstructure that is especially keen on the analysis of the conditions affecting the revelation (and exploitation) of private information. On the other hand, much less attention has been devoted to the functioning of financial markets with respect to allocative efficiency. This problem is the focus of our paper, which aims to provide the experimental evidence needed to ground a theoretical analysis.

We study the performance of four market protocols with regard to allocative efficiency and other performance criteria such as volume or volatility. These additional criteria are usually extolled by exchange regulators because they can be objectively measured and provide useful proxies for the evaluation of a market protocol. The four market protocols that we examine are: the batch auction, the continuous double auction, a special form of (nondiscretionary) specialist dealership, and a hybrid of these last two. Contrary to theoretical constructs such as Walrasian tâtonnement, these four protocols are practically implementable because the messages that traders need to use are simple.

We test the protocols by running (computerized) experiments in an environment that controls for traders' behavior and rules out any informational effect. The behavior of the agents span how they formulate trading strategies, how they form expectations, and how they interpret signals. Working with agent-based simulations instead of human agents permits to isolate the impact of the trading protocols from these behavioral components. In standard laboratory experiments, instead, it is not possible to extricate the interactions between protocol and behavioral effects.

The main behavioral limitation on our agents is that they exhibit limited intelligence, similar to the 'zero intelligence' traders in Gode and Sunder (1993). The price of the risky asset is the main driver for their choices; but, like real traders in real markets, they ignore the correct equilibrium price and thus lack an essential piece of information to compute the efficient allocation. This leaves the market protocol in charge of 'discovering' the right price for them. From a roaring and confused crowd of traders each trying to (guess and) achieve his preferred risk allocation, the market protocol must extract and send out price signals that point traders in the right direction. This makes convergence to the 'right' price a necessary condition for allocative efficiency. Assuming that there is sufficient liquidity in the market, we find that all protocols generically converge to the efficient allocation and to the equilibrium price in finite time. It is worth noting that our protocols share several characteristics with the general stochastic decentralized resource allocation process developed in Hurwicz et al. (1975), which gives a formal proof for its convergence in finite time.

We then turn to a dynamic analysis of the performances. For practical purposes, it is probably more important to know how protocols perform during the (perhaps long) transient period before they achieve the efficient allocation. We study how long