# Allocative efficiency of markets with zero-intelligence traders

Through this paper the authors Dhananjay Gode and Shyam Sunder try to understand the effect of various elements such as institutional structure, market environment, and agent behaviour which effect the performance of an economy on the allocative efficiency of a double auction. Through their experiment they prove that a double auction, a non-Walrasian market mechanism, can sustain high levels of allocative efficiency even if agents do not maximize or seek profits. Since It is not possible to control the trading behavior of individuals as the human traders differ in their expectations, attitudes toward risk, preferences for money versus enjoyment of trading as a game, and many other respects. Hence in their experiment they replaced human traders by computer programs in order to separate the joint effects of those variations, unobservable to the researcher, can be mitigated by studying market outcomes with participants who follow specified rules of behavior. In order to achieve this isolation of the effect of the effect of market rules and agent behavior on market performance, they proceed in three steps.

First, they select two types of market participants: profit-motivated human traders and “ zero-intelligence” (ZI) machine traders. ‘ Second, they observe the performance of a double auction with human traders and with ZI traders. In one set of ZI markets, the traders are subject to the budget constraint; in the second set of ZI markets, the budget constraint is absent. Third, they compare these observations to isolate the performance characteristics of the markets, which can be attributed to their structure.

The experiment was conducted in 5 different kinds of markets. The 5 situations are based on the five sets of demand and supply schedules to

yield a broad range of equilibrium prices. Some of the important results of the experiment w. r. t.

ZI-C price series are as follows: ? In contrast to the human trader data in panel 3 and as in the ZI-U trader data in panel 1, this series shows no signs of learning from period to period; the series from every period are statistically identical. This is to be expected because the ZI traders cannot remember or adapt. ? The volatility of this price series is greater than the volatility of the price series from human markets, but less than the volatility of ZI-U markets. Imposing a budget constraint on ZI traders is sufficient to shift the market performance toward the human market performance. The ZI-C price series, though more volatile than the human market price series, converges slowly toward equilibrium within each period.

Markets with ZI-U traders do not converge, markets with human traders converge quickly, and markets with ZI-C traders converge slowly to the equilibrium price. By the end of a period, the price series in ZI-C trader markets converges to the equilibrium level almost as precisely as the price series from human trader markets does. Regarding the efficiency of the markets, one important result is that the efficiency of the human markets and the ZI-C markets is almost the same at 100%. This makes us conclude that imposing market discipline on random, unintelligent behavior is sufficient to raise the efficiency from the baseline level to almost 100 percent in a double auction.

All the results ascertain the point that the primary cause of the high allocative efficiency of double auctions is the market discipline imposed on

traders; learning, intelligence, or profit motivation is not necessary. The same market discipline also plays an important role in the convergence of transaction prices to equilibrium levels. This paper successfully analyses the behaviour which it aims to study. The author presented in a clear way and explained the step by step process of the experiment effectively and in a simple way. This paper was interesting because the main result that the allocative efficiency is not much dependent on the intelligence and profit motivation of the traders is very interesting and surprising.

The objective was clearly mentioned and the motivation and the background literature were clearly explained using the works of Becker (1962) and Smith (1962) and their seminal generalisations and the differences between their theories. The usage of graduation students of business as traders is not entirely a good substitution because traders are far more experienced and experts than the students. But the only drawback of using students could be that they would take a little more time to learn and attain equilibrium price. All the assumptions or implifications made by the authors regarding the double auction process are completely realistic. The usage of computer programmes for ZI machine traders in order to separate the effects of human trading behaviour is successful because the ZI traders have no memory of events within the current or past periods and hence there can be no learning, intelligence or profit orientation.

Also, difference between ZI-C traders and human traders gives us the effect of systematic attributes of the human traders and the difference between the ZI-C and ZI-U traders gives us the effect of exerted market discipline. But while framing rules for budget constraints for ZI-C traders, the constraints

are made for each transaction rather than putting constraints at the end of all transactions. The constraint should have been framed such that the total balance of account should be positive at the end of all the transactions and not at the end of each transaction. If this more realistic constraint was implemented the results would perhaps change to somewhere which is a combination of erratic ZI-U plot and smoother ZI-C plot.

The plot may start very erratic as in ZI-U case but finally converge at equilibrium price. On the whole the paper proves what it aims to prove regarding the allocative efficiency and brings out interesting implications on the rationality of traders in a double auction i. e. market environment and not the profit maximisation is important for the extraction of surplus. This also implies that in some of the cases where the basic economic models which are based on the utility-maximizing agents and achievement of market equilibrium through that are questioned for their validity and consistency.