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Do traders strategically time their pledges during real-world Walrasian auctions?

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ABSTRACT

Experimental research suggests the Walrasian tâtonnement auction encourages traders to under-reveal preferences, even encouraging initial pledges contrary to true desires, because pledges are not binding. We analyze the timing and characteristics of individual pledges and trades during 9604 auctions for redbeans conducted by the Tokyo Grain Exchange. We find no evidence of contrarian pledging and little evidence of under-revelation – as many traders over-reveal as under-reveal. Most traders pledge seriously from the beginning. Despite the considerable heterogeneity in pledging behavior across individual traders, these differences appear to have no relationship with traders' profits, nor do they appear to affect the achievement of equilibrium.

1. Introduction

Do traders act deceptively if their pledges are non-binding? Answering this question is an essential part of understanding how equilibrium is reached in financial markets. With the advance of high-speed algorithms, some traders "spoof" the market with a large buy offer just below the most recent price, a moment before reversing the offer to a sell at a slightly higher price. Such spoofing has emerged (or has been noted at least) in continuous double auction markets. The Walrasian tâtonnement auction (WTA), owing to its simplicity, has long been considered the abstraction of a market achieving equilibrium (Samuelson, 1941). Some researchers in finance and economics, however, suspect that traders can manipulate such a style of market because pledges in a WTA are not binding; a pledge, like talk, is cheap.

In their view, the WTA, rather than a straightforward mechanism for expressing desires to buy or to sell, represents a complex multi-player game in which each player plans to mislead others while anticipating what others intend through their pledges (Dubey et al., 1980; Amir et al., 1990). Traders seemingly have an incentive to under-reveal early, in an attempt to improve their ultimate terms of trade (Hurwicz, 1972; Otani and Sicilian, 1990; Stoll and Whaley, 1990). Especially if they are large, traders may enter pledges early in an auction contrary to their true intentions (Medrano and Vives, 2001). If either the under-revelation or the contrarian strategy is widespread, prices achieved using WTAs will be inefficient, if equilibrium can even be reached at all.[4]

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[4] A large financial literature exists on trading mechanisms. Among related work, Madhavan (1992) analyzes two important trading mechanisms, quote-driven and order-driven systems. Dhillon et al. (1997) contrast Walrasian discrete trading in futures in Japan (until April 1991) with continuous double-auction trading in US futures. Pagano and Roëll (1996) study different types of auction markets and conclude that uninformed traders generally benefit from lower trading costs when the market is more transparent. Martens (1998) examines the impact of the trading mechanism on price discovery and informational efficiency, examining financial securities that are simultaneously traded on more than one market, through different mechanisms. Kavajecz and Keim (2005) show how innovations in liquidity provision made possible by certain trading mechanisms lead to lower transaction costs.

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Table 1
Descriptive statistics for redbean auctions.

Position		Duration	Traders[a]	$ value	Buyers	Sellers	HHI
1	Mean	80.5	12.0	174,690	5.3	5.4	1749.0
	Median	69.0	11.0	98,909	5.0	5.0	1523.5
	s.d.	52.5	5.8	295,123	3.0	3.3	894.9
2	Mean	78.7	15.6	236,979	6.9	6.8	1359.6
	Median	71.0	15.0	188,262	7.0	6.0	1197.5
	s.d.	43.8	5.7	186,339	3.2	3.1	636.8
3	Mean	76.2	18.6	354,161	8.3	8.2	1144.3
	Median	69.0	19.0	291,360	8.0	8.0	1008.5
	s.d.	40.2	5.8	256,840	3.4	3.3	506.0
4	Mean	78.1	21.6	531,971	9.7	9.9	1001.0
	Median	70.0	22.0	457,694	9.0	10.0	889.7
	s.d.	40.7	5.7	359,232	3.6	3.7	422.4
5	Mean	82.6	24.7	808,013	11.4	11.1	924.7
	Median	75.0	25.0	659,985	11.0	11.0	823.9
	s.d.	43.1	5.6	557,825	3.8	3.8	395.3
6	Mean	87.2	27.1	1,046,678	12.7	12.2	805.1
	Median	79.0	28.0	883,636	13.0	12.0	721.1
	s.d.	45.3	4.7	683,610	3.6	3.7	314.0

[a] Note: This table reports descriptive statistics for FCMs 1–35, omitting small traders.

Walrasian tâtonnement auctions begin when the auctioneer indicates a provisional price to traders. The traders, who include multiple sellers as well as multiple buyers,[5] respond with non-binding pledges to sell or buy the commodity, usually in multiple units,[6] but no transactions occur until a market-clearing price is achieved. If pledges to buy do not balance pledges to sell at the initial provisional price, the auctioneer adjusts the provisional price in the direction of excess demand, possibly inducing traders to adjust their pledges. This iterative process continues as long as necessary – there is no deadline – until excess demand equals zero, at which moment the auction ends and all outstanding pledges are transformed into trades.[7] Because these trades all occur at the same price, the WTA is a uniform price auction.[8]

Even though there have been a few field studies of mechanisms similar to a WTA (Goldberg and Tenario, 1997; Biais et al., 1999),[9] the primary source of evidence supporting the hypothesis of strategic pledging has come from experiments (Joyce, 1984, 1998; Bronfman et al., 1996; Pouget, 2007b). These experiments have involved eight to twenty local students. These experiments have divided the subjects equally between buyers and sellers, not varying the concentration towards one side of the market. The variation is instead in the information available and in the rules governing revisions of pledges. Bronfman et al. (1996), for example, have fifteen replications.[10]

Rather than using experimental data, we inspect transcripts of 9604 WTAs during 1997–1998 for redbean futures contracts conducted on the Tokyo Grain Exchange (TGE), an exchange that used an actual WTA. It should be noted that the Tokyo Grain Exchange was acquired in 2013 by the Tokyo Commodity Exchange, which created on February 12, 2013, the Agricultural Product & Sugar Market (Tokyo Commodity Exchange, 2013).[11] As a result of this acquisition, this futures market no longer uses the auction method analyzed in this paper.[12]

Eaves and Williams (2007) studied auctions on the TGE, analyzing aggregate behavior, namely the "imbalance" between total supply and total demand. This study focuses on individual traders, and specifically whether they commonly behave deceptively. We examine the behavior of house traders of separate brokerage firms, who number at least forty and whose trades are reported separately. Although the sum of the individual behavior necessarily must accord with the aggregate behavior, it does not follow that most traders behave similarly to the aggregate.

We selected redbeans among the four commodities then actively traded on the TGE because the other three commodities were also traded elsewhere, by means of the more widely studied continuous double-sided auctions. [13] Each transcript of these redbean auctions narrates the sequence of provisional prices set by a

[5] Most types of auctions, in contrast, have a single seller or a single buyer of the specific good on offer, even if at other times, perhaps even on the same general session, others offer similar goods.

[6] Bidding strategies for multiple units are far more complex than for a single unit, whether from a theoretical perspective (Engelbrecht-Wiggans and Kahn, 1998; Lengwiler, 1999; Tenorio, 1999; Chakraborty, 2006) or an experimental perspective (Manelli et al., 2006).

[7] Auctions with a fixed ending time, such as many auctions conducted over the Internet, or even with an inevitable but stochastic ending time, such as when a candle's flame flickers out, presumably evolve differently than those without a deadline.

[8] This paper also relates to the literature on call auctions and how best to structure them. For example, Pagano and Schwartz (2003) study electronic call auctions at the Paris Bourse (Euronext Paris). They find that both less liquid and more liquid stocks benefit from the introduction of closing calls and that a positive spillover effect likely explains the lower transaction costs and improved price discovery. Related work by Chakraborty et al. (2012) shows that a theoretical "open" call auction, not unlike the WTA for redbean futures, dominates alternative auction structures. In particular, allowing for multiple orders that are displayed in an open book, this auction model allows for greater gains from trade as the order revelation of large participants is no longer inhibited. Ellul et al. (2005) also find, using a natural experiment at the London Stock Exchange, that price discovery is improved. Comerton-Forde and Rydge (2006) study call auctions at the Australian Stock Exchange and find improved price discovery resulting from the dissemination of indicative auction prices and surplus volumes.

[9] A number of stock exchanges employ a tâtonnement (groping) mechanism for determining an opening price each day. In the run-up to the opening, orders are tentative in the sense that they can be revised. These mechanisms, studied by Biais et al. (1999) among others, differ from a WTA, because indicative prices are determined by the orders, rather than the other way around, and because the iterative process ends at a specified time.

[10] Pouget (2007a) has one thousand trials in a comparison of types of market mechanism, one of which is a WTA, a size made possible by the players being computers programmed to learn from previous trades.

[11] Consolidation of futures exchanges within Japan has happened as in the USA. The Tokyo Grain Exchange itself had previously absorbed the Tokyo Sugar Exchange.

[12] The Tokyo Commodity Exchange had conducted trading in rubber by a live WTA, but switched the style of trading in rubber recently, to a continuous electronic market, in line with its metals markets. Given the time involved in a WTA, an exchange has a crowded schedule with more than a few commodities. For example, when the TGE introduced coffee trading in addition to redbeans, corn, soybeans and sugar, it had to conduct simultaneous WTAs, but brokers had difficulty in paying attention to two auctions at once.

[13] On the Tokyo Commodity Exchange, volume in redbeans has fallen almost to zero.