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Measuring the impact of information aggregation mechanisms: An experimental investigation☆

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ABSTRACT

This paper measures the effectiveness of market-based and cheap-talk information aggregation. Both information aggregation mechanisms (IAMs) are frequently used prior to IPOs and sales of Treasury bonds – it is largely acknowledged that they provide agents with useful information for subsequent bidding. In a laboratory experiment, we study how information provided by IAMs interacts with private and public information and how agents integrate it in their strategic behavior in a multi-unit common-value uniform-price auction. In market-based IAMs, information gathering prevails and subsequent bidding shows that subjects acknowledge the precision of information. However, in cheap-talk IAMs, there is almost no transmitted information.

1. Introduction

Information aggregation mechanisms (IAMs hereafter) are intended to enhance information transmission between market participants, or to provide predictions about future events. They may be used as decision or predictive mechanisms.[1] Many mechanisms have been designed in practice and in academia to achieve these goals with a particular interest in market-based mechanism (Wolfers and Zitzewitz, 2004; Plott, 2000). The Iowa Electronic Market (IEM) designed different market-based IAMs by offering betting contracts on the issue of different U.S. presidential elections. After analyzing markets for the U.S. 1996 presidential election, Berg and Rietz (2003) argue that these prediction markets may be good decision-support tools. Berg et al. (2009) implement a prediction market before the Google IPO in order to predict the post-IPO value

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[1] See Berg et al. (2008) and Hanson (1999).

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of the firm. They suggest that these markets can help managers to set IPO prices with lower underpricing. Chen and Plott (2002) report on the use of a market-based IAM in a business environment to forecast sales at Hewlett–Packard. Companies around the world now offer a "prediction market" based on financial, political or similar current events. These include the Hollywood Stock Exchange (US), Intrade (IRL), NewsFuture (US) and Pro:Kons (AT).[2]

Initial public offerings (IPOs) of new equity and sales of treasury bonds are real-world examples in which different types of IAMs are used to aggregate information about the valuation of new shares. The book-building process in IPOs (Sherman, 2005), the German pre-IPO market (Aussenegg et al., 2006; Löffler et al., 2005), the when-issued markets for treasury securities (Nyborg and Sundaresan, 1996), the U.K. introduction procedure of new listings (Derrien and Kecskés, 2007) and the IEM organized prediction market that preceded the Google IPO (Berg et al., 2009), are all examples of IAMs designed in these markets.[3]

It is generally acknowledged that IAMs, in particular those that are market-based, provide agents with accurate predictions (Wolfers and Zitzewitz, 2004). However, to the best of our knowledge, no study addresses the impact of the existence of these mechanisms on the subsequent strategic behavior of agents, or on the way in which the information provided by IAMs interacts with agents' private information. This paper addresses these issues. We design a laboratory experiment in which we study the way the information provided by IAMs is integrated into agents' bidding behavior in a multi-unit common value uniform-price auction. The experiment contains three different treatments: (1) a simple auction treatment in which subjects participate in a series of multi-unit common value uniform-price auctions; (2) the same auction preceded by a cheap-talk IAM in which subjects can share their private information within a cheap-talk game; and (3) the auction preceded by a market-based IAM in which subjects can trade a risky asset, the value of which is highly correlated with the auctioned asset. Participants' strategies in each treatment will depend on their information about the value of the asset and their behavior will reflect the way in which they appreciate the information they have acquired prior to the auction.

The contributions of this paper are threefold. First, the paper offers an experimental investigation of the role of information in pure common value multi-unit auctions. In these games, the strategic behavior of bidders is dictated by a trade-off between the winner's curse and the desire to make profits by winning a large share of the auctioned good at the lowest price. While the existence of the winner's curse will lead to less aggressive bidding, bidders will be tempted to outbid their competitors in order to increase profits. The outcome of this trade-off is directly affected by the level of uncertainty (Bennouri et al., 2010). In our experiments, we manipulate the level of uncertainty by setting two different levels for the private and public signals that the subjects receive. Thus we can measure the impact of information on bidding behavior. Second, our paper is related to the existing debate about selling mechanisms in IPOs. A common feature of newly issued securities is that their valuation is subject to a great uncertainty leading to well-documented underpricing. Several existing and suggested mechanisms aim to reduce uncertainty and consequently to lessen the level of underpricing.[4] With respect to this literature, our methodology allows a comparison of the effectiveness of different IAMs in different conditions. Interestingly, while the literature focuses on the sales' outcomes (prices and allocations), we study the way the extracted information, if any, is integrated into the subjects' subsequent strategic behavior. Finally, we offer an experimental comparison between market-based and cheap-talk mechanisms. We show the effectiveness of the former regarding aggregate information. For auction outcomes we find that prices in cheap-talk auctions are higher than the expected value conditional on all available information reflecting the fact that the cheap-talk rounds increased the perceived level of uncertainty and led to a higher level of the winner's curse problem. The higher the (exogenous) level of uncertainty in the game the more important this problem becomes. Subjects in market-based auctions are least affected by the winner's curse, and this confirms the effectiveness of this IAM in transmitting information.

The paper is organized as follows. In the next section, we describe our experimental design. Basically, subjects are invited to participate in multi-unit common value uniform-price auctions under different information settings. In Section 3, we present the theoretical background to our experimental environment and provide testable hypotheses. Section 4 contains the analysis of the subjects' behavior in the IAM stages. In Section 5, auction outcomes (prices and allocations) and the bidding behavior of the subjects in different treatments are analyzed and compared. Some concluding remarks and political issues are provided in Section 6.

2. Experimental design

We ran a series of lab experiments in which subjects participate in sealed-bid multi-unit auctions for a common value asset. Our experiment contains three treatments that differ with respect to the quantity of information (about the final value of the asset) that subjects may observe before they submit their bids. These treatments are simple auctions (SA treatment hereafter), cheap-talk treatment (CT treatment hereafter) and market-based IAM treatment (MB treatment hereafter).

[2] In October 2007, the Prediction Market Business Association was launched (http://www.pmindustry.org).

[3] In some sense the bookbuilding process in IPOs may be described by a cheap-talk IAM in which the underwriter gathers information by asking for indications of interest from institutional investors. However, because of the existence of long-term relationships between institutional investors and underwriters these indications of interest are not so "cheap" (Benveniste and Spindt, 1989).

[4] See for example Ausubel and Cramton (1998), Löffler et al. (2005), and Berg et al. (2009) for IPOs and Nyborg and Sundaresan (1996) for sales of treasury bonds.