Information acquisition during a Dutch auction ☆

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Abstract

In this paper we consider equilibrium behavior in a Dutch (descending price) auction when the bidders are uninformed of their valuations with probability q and can acquire information about their valuation with a positive cost *during the auction*. We assume that the information acquisition activity is covert. We characterize the equilibrium behavior in the setting where bidders are ex-ante symmetric and have independent private values. We show that when the number of bidders is large the Dutch auction produces more revenue than the first price auction.

1. Introduction

The theory of auctions usually assumes that the bidders know their valuations for the object to be auctioned. However, there are many instances where this may not be the case: When a venture capitalist is trying to sell a business that he owns it is not immediately clear how much the company is worth for a potential buyer. In addition, if the venture capitalist is unable to sell the company to some set of firms with a given price, he is pushed to lower the price that he asks

(or refrain from selling). A lower price may attract the interest of some additional firms. Firms that were not initially interested in the company may want to assess how much the company is worth for them as the price is lowered. Similarly a company that contemplates entering into a takeover battle for one of its rivals must first evaluate how much the rival firm is worth.

Levin and Smith [5] take up the question of endogenous entry in auctions. In their model the bidders have to incur a positive cost in order to participate into the auction. By paying the participation cost the bidders also learn their valuations for the object. After the bidders have decided about participation the number of participants is made common knowledge. The object is then auctioned to the participating bidders. In a symmetric equilibrium the bidders mix with respect to their decision to participate into the auction. Once the number of participants is known bidding follows the regular equilibrium behavior in the corresponding auction.

When a static auction is in question this approach is fine, as there is only one round of bidding. In a dynamic auction, such as a Dutch or an English auction, the decision to participate can also be made *during* the auction. That is, if the bidders are allowed to participate into the auction after it has started. The example involving a venture capitalist above fits into this kind of a situation. Another example, that shares the descending nature of prices, is the After-Christmas sales. The sales typically start with a specific discount percentage. The discount percentage is then increased as the sales proceeds.[1] These examples suggest that participation decisions during the auction deserve attention for reasons that are not purely theoretical.

In this paper we study the bidding and information acquisition behavior in the following setting: There are N bidders that can be active in the auction. Each bidder knows his valuation with probability q. Each initially uninformed bidder may become informed by incurring a cost of $c > 0$. We assume that every bidder, informed or not, is allowed to participate into the auction. That is, a bidder may bid for the object even if he is not informed.[2] We study the Dutch auction where we assume that each uninformed bidder can decide the price at which he acquires information. If the object is not sold before the "information acquisition price" the bidder becomes informed about his valuation and incurs the cost c. The bidder may then end the auction immediately, or wait for the price to descend further.

We assume that the bidders' decision to acquire information is covert. Hence each bidder only knows the number of potential competitors. At any given time a bidder does not know how many other bidders have already acquired information or how many other bidders were initially informed.

We consider the case where the bidders have independent private values. We solve for the symmetric equilibrium in the Dutch auction. In equilibrium the uninformed bidders mix with respect to the price at which the information is acquired. The bidding is determined by a pure strategy (conditional on the acquired information). We then compare the revenues that the first price auction and the Dutch auction produce when the number of bidders grows large. We show that in this case the Dutch auction produces larger revenue than the first price auction.

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[1] This year the sales after Christmas in some of Finland's department stores started with 40 percent discount. The discount increased up to 70 percent towards the end of January. The sales for clothing for example, typically involve many items and are not an exact match to the model presented here unless only one item remains in store. However, two features are in common: (1) the price for the goods in the sale descends; (2) the buyers must incur the cost of inspecting if their size is left in the store.

[2] The analysis remains the same when c is interpreted as the cost of participating and becoming informed if it is assumed that the seller does not disclose any information about the number of participants and no uninformed bidding takes place in the equilibrium. If in equilibrium there are uninformed bidders who bid without information acquisition c cannot be interpreted as the participation cost.