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Merger simulation models: Part 2

This CCR is the second one out of a series of four and focuses on merger simulation models based on **auction models** used by the Commission so far. The first CCR described demand models applied by the Commission in merger modeling.

Introduction

Generally, merger simulations use a standard competition model calibrated to monitor prices and quantities after the merger. When oligopolistic market structures can be identified, three basic theories are in addition applied: Cournot competition (quantity competition), Bertrand competition (price competition) and auction theory.

Merger simulation with an auction model is much like that in a Cournot or Bertrand market. However, instead of specifying functional forms for demand and cost, valuation or cost distributions for competing bidders are specified. This represents the distinction to the merger simulation models discussed in the first CCR.

Auction Models

In some markets products are traded in an auction-like manner. Next to suppliers that actually auction their products, these markets approximate the following characteristics: products are mostly sold on a low-frequency basis and customers specify their needs by calling for tenders. Then suppliers propose offerings leading to a multiple-round selection procedure and finally to a transaction.

Typical auction-like markets are markets for business software, user-specific technical equipment and services for the public sector. If mergers occur on such auction-like markets, auction models represent the first choice to simulate the competitive effects.

Different auction models

Auction models vary depending on the detailed specifications of the bidding process. Game-theoretic models of auctions and strategic bidding generally fall into either of the following two categories:

- In a **private value model**, each participant (bidder) assumes that each of the competing bidders obtains a random *private value* from a probability distribution.
The standard textbook example associated with his model is the selling of a painting; buyers' valuations for the painting may differ but are assumed to be independent.
- **Common value auctions** pertain to situations in which the object for sale is worth the same to everyone, but bidders have different private information about its true value.
A well known example where the common value setup applies is the auctioning of oil drilling rights, which, to a first approximation, are worth the same to all competing bidders. In a common value model, each participant assumes that any other participant obtains a random signal from a probability distribution common to all bidders.

Based on these distinctions, two types of auction models are used for merger simulation: the first-price and second-price auction models.

First-price Auctions

In this type of auction all bidders simultaneously submit sealed bids so that no bidder knows the bid of any other participant. The highest bidder pays the price they submitted.

First-price auction models are used for the simulation of merger effects in markets of asymmetric first-price, sealed-bid, and private-value auctions. The lowest price each bidder is able to bid corresponds to its costs. Using this model, the merger effects are calibrated using pre-merger information on market shares and the range of density function of costs.

Second-price Auctions

This is identical to the sealed first-price auction except that the winning bidder pays the second-highest bid rather than his or her own.

The second-price auction is built on a set of assumptions; first of all, valuations of bidders are comprised of two independent components: the idiosyncratic component and the common component. The winning probabilities of each bidder (corresponding to the expected market share), the prices (corresponding to the second highest value) and the merger effects can be calculated using simplifying properties of the idiosyncratic components.

By using differences between losing bids, one can estimate distribution parameters. This is possible when employing a two-step, limited-information maximum-likelihood (LIML) estimator. For that estimation, data on bidder identities and bidder shares, bidder characteristics (also

losing bidders' characteristics) and values of bids (again, including losing bids) across the sample of auction, have to be available. The estimation consists of three steps.

1. First of all, firm– or bidder specific characteristics are used to estimate the logit probability of winning, and simultaneously, the expected values of the winning bids. Here, shares are used as proxies for the probabilities of winning.
2. Secondly, the fitted probabilities are used to construct the difference between the second and third highest bids.
3. And thirdly, the merger price effect is calculated using estimated distribution parameters and the changed winning probability of the merger firm. The new winning probability equals the sum of the shares of each merging partner, as the merged firm will win each auction that either of the original firms would have won. The price effect of the merger mainly depends on the variance of the idiosyncratic component in two ways; a great variance indicates the increase of the amount and variance of the price effect.

Use of auction models by the European Commission

Cases in which auction models have been used include: Oracle/PeopleSoft (COMP/M.3216) and Vattenfall/Elsam and E2 assets (COMP/M.3867).

Oracle/PeopleSoft – 2004

The Commission was concerned that the merger would lead to a reduction in the number of viable contenders in a bidding contest from three to two, which could lead to significant harm to customers due to a combination of reduced choice and increased prices.

In order to assess the merger's impact, the European Commission itself, i.e. its in-house economic experts developed a simulation model.

The in-house experts designed a "sealed-bid auction model where the vendors know the identity of their competitors but cannot observe the monetary value customers assign to the different competing products".

The vendors choose their bids based on a calculation of the expected profits depending on price and the probability to win the auction while not having information on their competitors. The costs were ignored in the Commission's model because most of the costs occur before the auction starts and the distribution is very cheap.

The Commission used data submitted by Oracle itself. Oracle submitted data for 728 bids between 2001 and 2003 with an average licence value of € 708,851. These data contain a number of bids for niche products and best-of breed solutions not falling into the product market and having a much lower licence value (for example, 235 bids with licence values between € 2,000 and € 100,000). As Oracle was not able to specify the modules contained in these bids, the Commission could not verify whether or not they fell within the markets for high-function FMS and HR solutions.

The outcomes of the merger simulation varied: potential price increases ranging from 6.8% to 30% clarified that a merger would harm customers both through the loss of choice options and the price increase. However, the results also clarified that the outcome of the sealed-bid auction model were unreliable in its results and that false market definitions were used, which is why the Commission had to abandon the model.

The Commission cleared the transaction.

Vattenfall/Elsam and E2 assets - 2005

MARS, a market simulation model of the Nordic electricity market, was used in this case. The MARS model sought to emulate the market conditions under which each electricity producer is operating on Nord Pool. Based on these conditions the model tried to predict what the optimal bidding strategy of each electricity producer would be for each hour of a hypothetical year.

The strategies of the producers were calculated on the basis of a number of exogenous factors, which described the hypothetical year; this calculation included electricity prices in the Kontek area (the German equivalent to Nord Pool), the prices of production inputs as well as the amount of rain and thus the water levels in the reservoirs. Based on this information, as well as information about the transmission capacity between the different price areas and the production facilities available for each producer, the model predicted the bid that each bidder would submit to Nord Pool. The model then calculated the resulting prices in each price area for each hour of the year based on the bids and assumed consumption patterns as well as transmission capacity.

The transfer of assets to Vattenfall was predicted by MARS to lead to a small fall in average prices in Denmark of less than 1% while the effect in other price areas would be de minimis.

The Commission cleared the transaction.