

Game theory in practice: Designing auctions

The breakthrough of game theory came with the auction of radio frequencies in the USA. Frequencies are also often publicly auctioned in Germany. The most well-known was the digital auction of UMTS licences in 2000, which, after 224 rounds, generated revenue of over 50 billion euro. Seven telecommunications companies initially participated; but only four bids were accepted. Another auction in the same year generated the disappointing sum of just 4 billion euro for the state, i.e. for the German Federal Network Agency. Only four companies bid for licences.

Similar auctions are conducted by the European Central Bank (ECB) every week when it offers banks in the Eurozone the transfer of funds in the millions. Banks can submit bids for this purpose. Bidders with the most favourable (= highest) interest rate for the ECB were accepted.

There are two so-called processes in this “interest rate procedure”: In the “American” procedure, all bidders who receive funds must pay the interest rate they have offered. In the “Dutch procedures”, all bidders who receive funds must only pay the interest rate offered by the last bidder, who still receives an allocation.

Example:

The ECB would be prepared to make 500 million euro available to banks. The minimum interest rate is 1.0% (so-called “base rate”). The banks that have offered the highest interest rate receive the allotment.

a) American procedure

Bidder	Bid amount in millions (€)	Bid interest rate in % p.a.	Allotment in millions (€)	Allotment in % p.a.
Bank A	200	2.50%	200	2.50%
Bank B	200	2.00%	200	2.00%
Bank C	100	1.50%	100	1.50%
Bank D	200	1.00%	0	
Bank E	100	0.50%	0	
Total	800		500	

b) Dutch procedure

Bidder	Bid amount in millions (€)	Bid interest rate in % p.a.	Allotment in millions (€)	Allotment in % p.a.
Bank A	200	2.50%	200	1.50%
Bank B	200	2.00%	200	1.50%
Bank C	100	1.50%	100	1.50%
Bank D	200	1.00%	0	
Bank E	100	0.50%	0	
Total	800		500	

Exercises:

1. Watch the “Game theory” video again. How was the auction of radio frequencies in the USA conducted to ultimately increase the auction proceeds from 50 to 617 million US dollars? How can the additional proceeds be explained?
www.mediatheque.lindau-nobel.org/videos/34653/2015-mini-lecture-game-theory-en
2. How do you explain that the first auction of UMTS licenses in Germany amounted to over 50 billion euro but only 4 billion euro in the second auction?
3. In the case of the auctioning of loans, the ECB’s predecessor, the Deutsche Bundesbank, quickly switched to the Dutch procedure following a number of attempts with the American interest rate procedure. Try to find out why the “Dutch” rule led to more interest income than the “American” auction rule.

Note:

The ECB interest rate procedure has been suspended as part of the current low interest rate policy. However, as the level of interest rates rise, the current fixed rate tender procedure is being replaced by variable rate tender procedure.