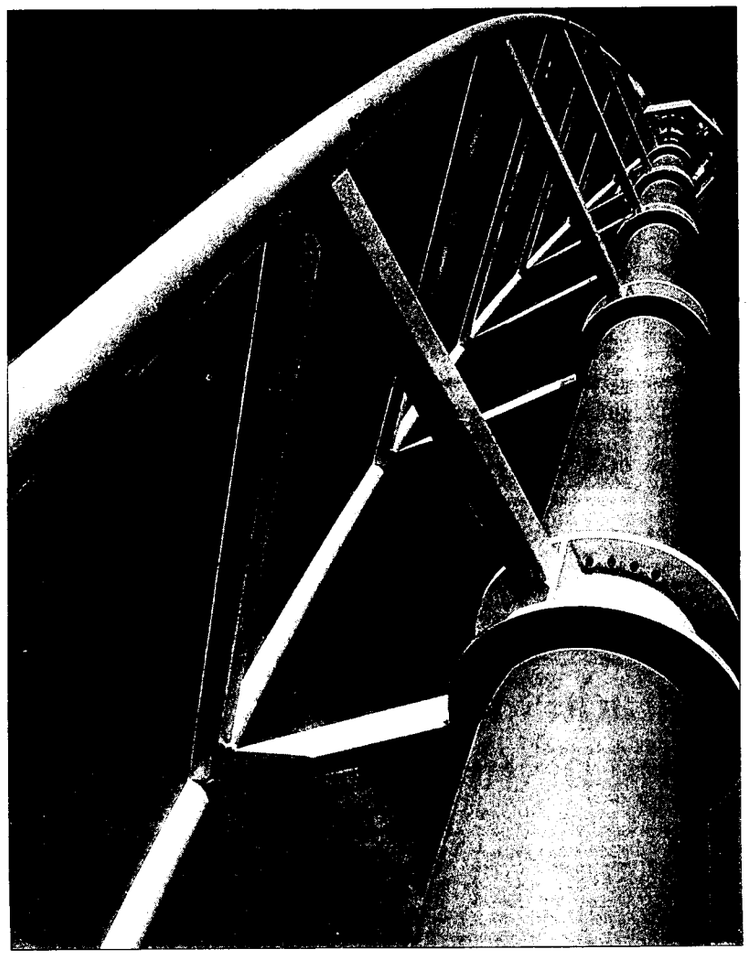
Sold to the slyest bidder

The Observer, Sunday April 23, 2000 Business Section, page 2.

Game theory is being tested out in telecom and TV rights auctions as bidders try to beat the system, says **Faisal Islam**



A BT Cellnet mast in the Midlands. Bidding in the auction for the next generation of mobile phone licences reached a total of £22 billion. PA

SOTHEBY'S must be casting envious eyes over two lots currently up for auction. Neither lot number one, licences for third-generation mobile phone services, nor lot number two, the rights to televise Premiership football, could be described as antique, fine art, or rock star memorabilia.

The commissions from these multi-billion pound deals could, however, warrant the two lots a place under the hammer at the New Bond Street auction house.

But auctions like these, rather than lining the pockets of traditional auction houses, are providing work for an army of mathematical economists and game theorists.

Auction theory, as this complex amalgam of microeconomics is known, has a wide application. It is relevant to the £22 billion battle for control of mobile phones. BSkyB's bid to take control of Manchester United was blocked, in part, because of the insights of auction theory. Sales of gold and electricity, and the increasing use of the Internet for procurement of business supplies, have also brought the theory back to the fore.

Essentially auctions are an efficient method of distributing a scarce resource: by collecting all the possible bidders, an auction should get the maximum price from the most eager bidder. In a commercial auction, bids indicate the amount of profit each bidder expects to make.

So, although much is said about the £22bn mobile phone auction amounting to a tax on technology, access to this portion of the airwaves offers a licence to print money. Auction theory says it would be 'economically inefficient' to hand these licences – or, more specifically, these tranches of the electromagnetic spectrum – over to selected companies for a low price in a beauty contest.

'Well-run auctions assign rights to the bidders who are willing to pay most – not the party with the most political influence,' says Professor Paul Milgrom of Stanford University. He designed the mechanism used by the Federal Communications Commission for the first 'spectrum auction' in America in 1994. The auction of next-generation mobile phone licences in Britain is a modified version of those auctions.

The essentials remain the same regardless of the auction: bids are the lowest a firm believes will secure the lot. A bidder has to make a careful analysis of what the other bidders may do, which in turn will be dependent to some degree on what they think he may bid. This is the realm of game theory.

It has identified two main problems with the auction process. When all the bidders for a licence can only secure the same profits, any victor in an auction faces the 'winner's curse'. The winner is likely to be the bidder most optimistic about potential profits. In many circumstances it will have paid over the odds and is really a loser. At worst this can lead to bankruptcy.

In an ascending bid auction this problem is lessened. Throughout the auction, bidders reveal more and more information about how they value a contract or licence, and learn from each other's reactions. Game theorists employed by telecoms companies will have played out this high-stakes poker game already. Using advanced computer models they will have worked through every possible permutation of response from each bidder.

However, these auctions leave the door open to a second problem – collusion between bidders.

Professor Paul Klemperer of Oxford University, the economic theorist behind the current next-generation mobile auctions, says auctions in Germany last year offering extra capacity for conventional mobile phones illustrate this point.

Mannesmann bid a low price for half the licences and an even lower price for the other half. Though no discussions had taken place, the structure of their bid meant the other bidder, T-mobil, only needed to raise the bid on half the licences slightly. The result was that after two rounds of bidding each of the bidders had half the licences for the same low price.

> Any victor in an auction faces the 'winner's curse'

A 'second-price' auction in New Zealand in 1990 (see box) enabled one bidder to pick up the rights to a tranche of the mobile phone spectrum for just NZ$6.

In America there have been instances of bidders using the final four numbers of their multi-million dollar bids to signal to each other which telephone code area they want to buy.

In a separate case, the US Justice Department was brought in to investigate possible collusion in a 1997 auction expected to raise almost $2bn that raised less than $14 million.

The use of these auctions has clearly not been an unmitigated success. 'It's a case of horses for courses,' says Klemperer. 'There are many different methods of auctioning and which is best is sensitive to the specific details of the market.'

But his theories have also been applied to other, seemingly unrelated areas. In Britain a report by the Competition Commission recommending that BSkyB's takeover of Man Utd should be blocked was rooted in Klemperer's analysis of 'toehold effects' in bidding situations.

Put simply, if BSkyB bought Man Utd, any TV rights deal would offer the same potential profit to both companies. Imagine that BSkyB owned United and was bidding against Ondigital for Premiership rights. If Ondigital were to win, 7 per cent of its bid would go to BSkyB. Thus, whether it wins the rights or not, BSkyB has an incentive to push up the bidding that much more aggressively. This exaggerates the winner's curse for OnDigital; in effect, it has to back off the bidding more than BSkyB.

The 'toehold' affects both sides of the bidding equation, setting off a vicious circle for OnDigital and a virtuous circle for BSkyB. Ondigital, knowing that BSkyB can bid more aggressively, will scale back its bidding. BSkyB will always win the rights in an auction like this.

While BSkyB was not able to take over Man Utd, it has taken strategic 9.9 per cent stakes in four Premiership clubs. It still has a toehold, but this time one shared across several different clubs rather than concentrated on one.

The last negotiation for Premiership rights had a gaping flaw. Awarding BSkyB the right to match any rival offer may have been seen as a clever way to top any final bid for rights, but Klemperer says: 'Giving a bidder the right to match is not a costless exchange, since there is no reason to bid the price up in the first instance.' So knowing that it could always match any offer, BSkyB never pushed up the bid price.

Even the forthcoming Premiership auction seems questionable, given the insights of auction theory. The parties have been invited to lodge a sealed bid before 10 May, after which there will be an auction of the rights by July. Given that the first sealed bid appears not to be binding, it is difficult to see why potential bidders would want to give too much information away before the serious business begins.

Auction theory also shows up glaring inconsistencies in government policy.

Toehold effects, identified as a primary reason for blocking BSkyB's bid for Man Utd in the Competition Commission's report, have not been ended. BSkyB, and to a smaller extent other broadcasters, continue to collect small stakes in Premier League clubs.

Similarly, why in a climate of converging technologies are auctions designed to extract the maximum fees from bidders for mobile phone operators, when television operators need only have their licences rubber-stamped by the ITC for comparatively pitiful sums of money?

As consumers begin to get used to auctions through Internet sites such as QXL and eBay, analysis of auction behaviour will become an increasingly fertile area for research.

And given that, the Premier League might consider employing a leading game theorist to design an auction before they are going, going, gone.

Under the hammer

1. Types of auction

Ascending price (English) auction
Example: mobile phone licences. Bidders offer sequentially higher prices until there is one left. Such auctions can lead to collusion.

Descending price (Dutch) auction
Example: tulip, tobacco. Prices start high and descend until a buyer is found.

Sealed-bid auction
Example: tenders for government contracts and, to some degree, TV rights for Premiership football. Each bidder makes one bid, without knowing the others.

Second-price auctions
Example: New Zealand's spectrum auction in 1990. The licence is awarded to the highest bidder but for the second highest price, so avoiding 'winner's curse'.

2. Problems with auctions

Winner's curse
In a sealed bid auction, the winner is the optimistic bidder who most overvalues the 'prize'. Ascending price auctions get round this problem by gradually revealing information from the whole marketplace about the value of the auction. The theory assumes 'common value' – that the value of whatever is bid for is approximately the same to each bidder.

Collusion
This can happen when two or more bidders make illegal arrangements not to bid up the auction price.
But tacit collusion – where bidders signal their intentions or make 'offers' to other bidders through the bid itself which can also depress prices – is not illegal.

Business Week article on auctions 20 March 2000.

Caveat:

I may have been accidentally misrepresented. I do *not* think sealed-bid auctions are always superior to ascending auctions. In fact I believe in "horses for courses".

For example, the U.K. government took Binmore's and my advice to run their radiospectrum auctions as an ascending auction; in a previous context they also took our advice to run an Anglo-Dutch auction which is a hybrid of the sealed-bid and ascending approaches.

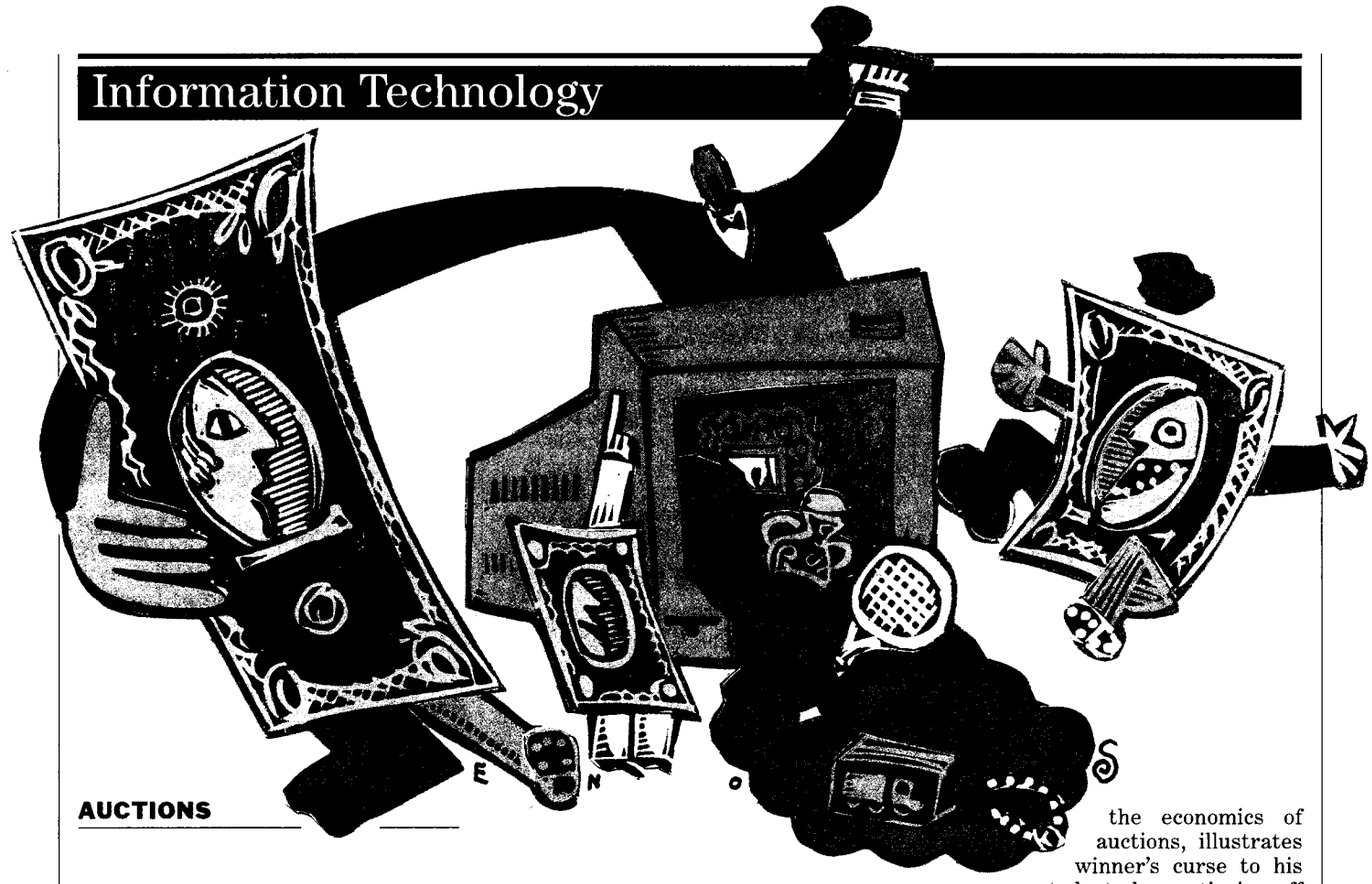
In many internet contexts an ascending auction is appropriate.

Overall, however, I think Peter Coy has done an excellent job of making complex material accessible.

Finally, although neither I nor my co-authors had any direct involvement, the official government report on the "Manchester Manoeuvre" (Monopolies and Mergers Commission report 1999, Cm 4305) was explicitly based on the analysis in the early drafts of the "Toeholds...." and "Wallet game...." papers on this web site.

Business Week article (pdf format) follows.

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AUCTIONS

GOING, GOING, GONE . . . SUCKER!

How "winner's curse" could undermine online auctions

In this age of e-commerce overdo, it's often proclaimed that online auctions are the ideal way to match buyers and sellers—fast, frictionless, and perfectly fair. The public has certainly bought that message: EBay Inc. alone has 10 million customers and a market value of $21 billion. Now, business is picking up the electronic gavel. The auto-parts auctioneer planned by General Motors, Ford, and DaimlerChrysler is expected to handle $250 billion in transactions a year.

But auctions aren't a perfect form of commerce—far from it. They're prone to two fundamental flaws: winner's curse, which hurts buyers; and collusion, which usually hurts sellers. While it's possible to minimize both flaws through clever design of auction mechanisms, it's not clear that Internet auctioneers are paying the subject much attention. For now, online auctions are so popular that almost any site can lure business. But that could change abruptly. "If this isn't done right, it will depress the size of the auction economy," says Bhaskar Chakravorti, an auctions expert at the Monitor Group, a Boston consultancy.

Winner's curse is the bane of clueless newbies on auction sites like eBay's. It's what people suffer when they win an auction by overestimating how much something is worth and therefore bidding too much. It's a sucker's game, yet it's part of daily business in online consumer auctions. Collecting money from newbies who overbid because they're ill-informed is "part of the business plan," says one message poster on AuctionWatch.com's site. "Started an item at $9 & it closed at $366+!!!" brags another.

> Collecting money from ill-informed newbies who overbid is "part of the business plan," says an online vendor

Paul Klemperer, an Oxford University economist who specializes in the economics of auctions, illustrates winner's curse to his students by auctioning off a jar with an undisclosed number of pennies. The students bid a little below their estimate of the jar's contents to leave a profit. Every time, though, the hapless winner of the jar is the student who overestimates the number of pennies by the greatest amount, and therefore overpays by the most.

FEEDBACK. Economists say there is only one situation in which winner's curse is not a problem: when there's no objective measure of a thing's value. Each bidder has his own concept of its value and isn't influenced by what others think. That's sometimes the case with tchotchkes on eBay. But most auctions—especially business auctions—are more like the one of pennies, in which the value is concrete but unknown. In those cases, the variation in bids comes about because of differences in information, not taste.

The soundest way to dodge winner's curse is to gather more information about the true value of what's being sold. That's one of eBay's strengths: Bidders can study past auctions of like items. And they can find out more about sellers by reading feedback about them. But if there's still uncertainty, bidders often

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watch the behavior of fellow bidders. That's where things get really complicated. If few others are bidding, does that mean the object isn't worth much—or are you in line for a bargain? Is your rival in a bidding war knowledgeable, or just crazy?

Second-guessing what other bidders are thinking is an especially serious problem in an English auction, such as eBay's, in which the price keeps rising until all bidders but one drop out. The trouble starts when one bidder is seen by others as being able to afford a higher bid—possibly because of a special ability to use the thing being auctioned. In an offline auction conducted by the federal government in the mid-1990s, for instance, GTE Corp. wanted wireless licenses in certain markets where it had potential synergies. To signal its presence, it ended the dollar amounts of its bids in 483, which spells GTE on the telephone keypad. When other bidders realized that they could beat GTE in those markets only by overpaying, they dropped out early, handing GTE a bargain and reducing the government's auction revenue.

MANCHESTER MANEUVER. As that case shows, auctions don't work well when bidders differ in their ability to pay and can see what each other is doing. Last year, the awareness of that was enough to persuade British regulators to stop Rupert Murdoch's British SKY Broadcasting Group from buying the Manchester United soccer club. They feared owning the club would give BSkyB an extra incentive to acquire rights to televise games of the league to which Manchester United belongs, thus frightening off other bidders and depressing the value of the rights auction.

Collusion is the other inherent flaw of auctions. Because so much price information is on public display, it's easier for either buyers or sellers to collude in an auction than when transactions are done one on one. On eBay, for instance, one illegal trick is for two bidders to team up. One enters a low bid and the other then enters a high bid that no one can top. Afterward, the high bidder withdraws his bid and the sale automatically goes to his low-bidding buddy. Sellers can cheat, too, by using shills to enter fake bids and drive up the price.

Collusion is especially easy when there are few buyers or sellers, as in many business-to-business auctions. Businesses don't even need to break the law. If a few companies are competing for a customer's business, they could tacitly agree that it's in their mutual interest to charge the same high price and share the business. If one supplier defected from the group by dropping its price, its rivals could punish it by dropping their own prices.

What to do? Auction experts are divided over which mechanism works best. Monitor's Chakravorti favors ascending-price auctions, à la eBay, because they provide the most information about bidders' feelings. People tend to underbid when they're afraid of winner's curse. They will bid more freely if they can see that other bidders are also in the game, Chakravorti says.

Oxford's Klemperer argues the opposite. He says that sealed-bid auctions—or the functionally equivalent descending-price auctions—are more likely to get people to bid what they truly think something is worth. If bids are sealed, a heavyweight couldn't scare off other bidders, so it would have to bid high or risk losing, he says. Collusion is also harder to carry off in a sealed-bid auction, Klemperer says, because a defector from the low-bidding group can't be detected until the auction is over.

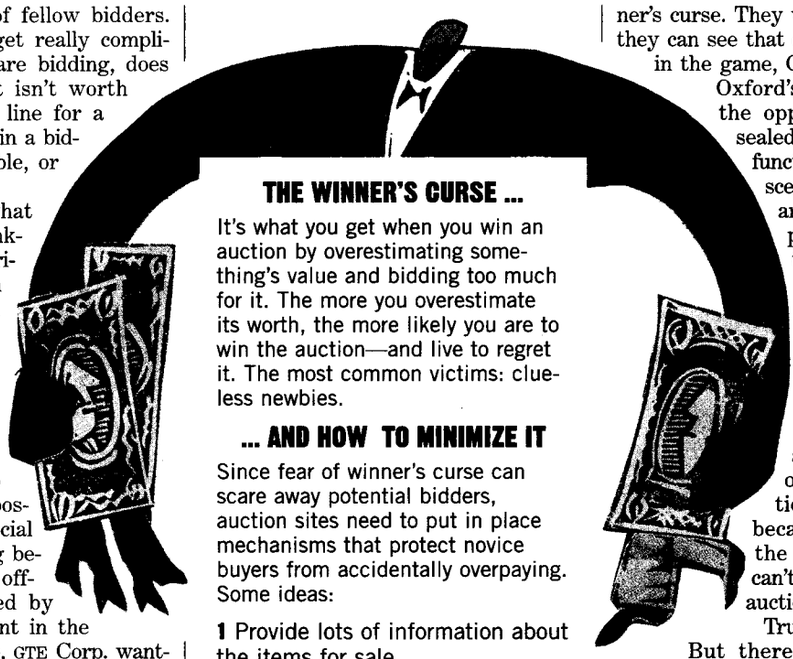
True, Chakravorti says. But there are other ways to minimize the drawbacks of an ascending-price auction. In business-to-business auctions, he argues, you could lessen the problem of heavyweight bidders' scaring off weaker rivals by creating an auction room open only to bidders that are similar to each other.

To auctioneers, this is no sterile debate. While most Net sites use ascending prices, a few—including Basement.com Inc. and OutletZoo.com—have dared to start prices high and drop them in increments until they sell out. It turns out that this induces the same bidding behavior as a sealed-bid auction. OutletZoo CEO Edward J. Samp says customers have told him his falling-price site is less vulnerable to shills.

But don't look for a wholesale change of Net auction strategies. EBay's popularity, says spokesman Kevin Pursglove, proves it's doing something right. He says that accusations of fraud of any kind—including use of shills—arise in only one of 25,000 transactions. As for critiques of ascending-bid auctions: "I apologize for laughing," Pursglove says.

It's easy to laugh when you're No. 1. But auctioneers who don't continue to work on minimizing the flaws inherent in their auction mechanisms could wind up on the losing end of winner's curse.

By Peter Coy in New York



THE WINNER'S CURSE ...

It's what you get when you win an auction by overestimating something's value and bidding too much for it. The more you overestimate its worth, the more likely you are to win the auction—and live to regret it. The most common victims: clueless newbies.

... AND HOW TO MINIMIZE IT

Since fear of winner's curse can scare away potential bidders, auction sites need to put in place mechanisms that protect novice buyers from accidentally overpaying. Some ideas:

1 Provide lots of information about the items for sale.

2 Draw as many informed bidders to your auction site as possible.

3 Share the risk. Bidders will pay more if the seller or auctioneer provides a warranty.

Collusion is especially easy when there are few buyers or sellers, as in many business-to-business transactions

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