AUCTIONALYSIS

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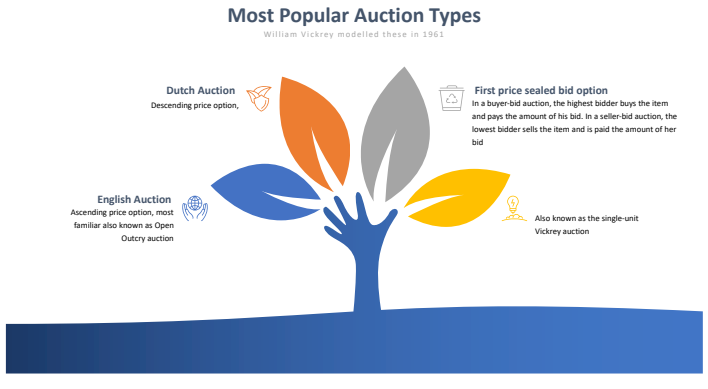
- *Paul Milgrom and Robert Wilson won 2020 Noble Prize for economics for their work in Auction theory.*



Auctions are one of the oldest economic methodology for the price determination which is surviving from the centuries. In fact the first auction is said to be held in 500 BC where women were auctioned off by their families as brides. Roman empire was regularly auctioneering the left out of war, slaves and assets of debtors. Auctions started proliferating for wide adoption after a bit of slump in 17th century with a rise of candle auctions meaning the auctions to finish when the candle is burnt out. The world's oldest auction house, Stockholms Auktionsverk, was founded in 1674 – also for the purpose of selling appropriated property. Sotheby started auction in 1744 followed by Christie in 1766. We all grew up seeing auctions for fine arts, old vehicles, live stocks & in nearby mandis/ markets. Auctions are gradually surging in all government procurements to ascertain the best price in a just manner.

Paul Milgrom and Robert Wilson won 2020 Noble Prize for economics for their work in Auction theory. Before that in 1996 William Vickrey was awarded Noble prize for his work in auction theory in 1960.

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- *English auction or ascending bid auction is one of the most popular auction methodology.*
- *Dutch auction is just opposite to the English auction where sellers make series of the offers of the price offers, declining over the specified time.*
- *First price sealed bid auction as the name suggests is that the bids of the individual bidders and not know to all, are sealed and placed with the bidders*
- *Second price sealed bid auction is also know as Vickrey auction as propagated by Noble Laureate William Vickrey.*
- *The winner's curse is a tendency for the winning bid in an auction to exceed the intrinsic value or true worth of an item.*
- *Common value is an important bidding concept which specifies the average value of the price at which the bidders should place the bid to avoid the Winner curse.*

English auction or ascending bid auction is one of the most popular auction methodology. A bidders' offers remain open for defined period which is long enough for the other bidders to make counter offers, so that the sellers may choose the highest offer. At time, a bottom or floor or reserve price is set and the bidders make their offers bettering their own previous offers. Pro - Bidders submits the highest bid hence sellers get the benefit. Cons - Bidder may be exposed to Winners curse.

Dutch auction is just opposite to the English auction where sellers make series of the offers of the price offers, declining over the specified time. Buyer may fix a cap or ceiling price and the bidders have to make their offer by reducing their price till it reaches to minimum bid and only one bidder remains and other bidder opt out of the race to avoid the winners curse (will explain subsequently). It is also called as Reverse auction and this is being used by various governments for their public tenders frequently. Pro - Beneficial to sellers as they keep lowering gradually but Cons is Seller may face loss as he keeps lowering the price.

First price sealed bid auction as the name suggests is that the bids of the individual bidders and not know to all, are sealed and placed with the bidders. In a buyer-bid auction, the highest bidder buys the item and pays the amount of his bid. In a seller-bid auction, the lowest bidder sells the item and is paid the amount of her bid. This form of auction is used for construction contracting, some military procurement and private-firm procurement, refinancing credit, foreign exchange, and many other goods. Pro - Good for the seller but not not so good for the bidder he may overpay.

Second price sealed bid auction is also know as Vickrey auction as propagated by Noble Laureate William Vickrey. In a buyer-bid auction, the highest bidder buys the item and pays the amount of the second highest bid. In a seller-bid auction, the lowest bidder sells the item and is paid the amount of the second lowest bid. It has been long debated for its attraction to achieve the objectives a) the bidders are encouraged to bid their highest best bids and b) to some extent avoid the winner's curse as the highest bidder is awarded the contract for second lowest bid. This is being used in E advertising platforms. Pro - Benefits the bidder & Cons - In second price if over estimating done than also bidder do not get much loss because he has to pay second highest bid amount.

The winner's curse is a tendency for the winning bid in an auction to exceed the intrinsic value or true worth of an item. The gap in auctioned vs. intrinsic value can typically be attributed to incomplete information, bidders, emotions, or a variety of other subjective factors that can influence bidders In general, subjective factors usually create a value gap because the bidder faces a difficult time determining and rationalising an item's true intrinsic value. As a result, the largest overestimation of an item's value ends up winning the auction. Originally, the term winner's curse was coined as a result of companies bidding for offshore oil drilling rights in the Gulf of Mexico.

Common value is an important bidding concept which specifies the average value of the price at which the bidders should place the bid to avoid the Winner curse. For example if there are let us say 04 bidders bidding for an oil well deposits places the bid as USD 2, 4, 6 & 10 million. Hence the common value for the for the deposit would be USD 5.5 million but the 4th bidder whose bid is the highest will be awaited the tender at USD 10 million resulting bidder over paying. This is what called as Winners curse. Let's take a concrete example. Imagine that you are a diamond dealer and that you – as well as some other dealers – are contemplating a bid on a raw diamond, so you can produce cut diamonds and sell them on. Your willingness to pay only depends on the resale value of the cut diamonds which, in turn, depends on their number and quality. Different dealers have different opinions about this common value, depending on their expertise, experience and the time they have had to examine the diamond. You could assess the value better if you had access to the estimates of all the other bidders, but each bidder prefers to keep their information secret. Bidders in auctions with common values run the risk of other participants having better information about the true value. This leads to the well-known phenomenon of low bids in real auctions, which goes by the name of the winner's curse. Say that you win the auction of the raw diamond. This means that the other bidders value the diamond less than you do, so that you may very well make a loss on the transaction. The most optimistic bidder often overestimates the common value of an auctioned object, so that 'winning' the auction turns out to cause a loss – the winner's curse. Robert Wilson was the first to create a framework for the analysis of auctions with common values, and to describe how bidders behave in such circumstances. In three classic papers from the 1960s and 1970s, he described the optimal bidding strategy for a first-price auction when the true value is uncertain. Participants will bid lower than their best estimate of the value, to avoid making a bad deal and thus be afflicted by the winner's curse. His analysis also shows that with greater uncertainty, bidders will be more cautious and the final price will be lower (*Source:* The quest for the perfect auction).

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- *SMRA (Simultaneously Multiple Round Auction) designed by Paul Milgrom & Robert Wilson and fetched USD 617 million. The FCC's auctions alone, using this format, have brought more than 120 billion dollars over twenty years (1994–2014) and, globally, this mechanism has generated more than 200 billion dollars from spectrum sales.*

- *Combinatorial Clock Auction (CCA) is a Multiple round auction allowing bids for packages of lots, rather than for individual licences.*

- *Modelling auction based on game theory are getting momentum in the last few years.*

Milgrom and Wilson (this years Noble Laureates) have not only devoted themselves to fundamental auction theory but they have also invented new and better auction formats for complex situations in which existing auction formats cannot be used. Their best-known contribution is the auction they designed the first time the US authorities sold radio frequencies to telecom operators. In 1990s, US FCC was using a beauty contest to award the telecom licenses for practically free. In 1994 , US used the SMRA (Simultaneously Multiple Round Auction) designed by Paul Milgrom & Robert Wilson and fetched USD 617 million. The first spectrum auction using an SMRA was generally regarded as a huge success. Many countries (including Finland, India, Canada, Norway, Poland, Spain, the UK, Sweden, and Germany) adopted the same format for their spectrum auctions. The FCC's auctions alone, using this format, have brought more than 120 billion dollars over twenty years (1994–2014) and, globally, this mechanism has generated more than 200 billion dollars from spectrum sales. The SMRA format has also been used in other contexts, such as sales of electricity and natural gas.

Paul Klemperer, an economics professor at Oxford University and a designer of Britain's 3G auction, explains in a new book (Auctions : Theory & Practices) that the details of auctions can make all the difference. In essence, auctions can fail in two main ways: by setting a price that is too high, or one that is too low. The latter failure has been more common recently. Collusion between bidders can reduce the price paid, as happened in one American auction of radio spectrum in the 1990s. Alternatively, the costs of entering an auction can be prohibitive, as with one British television franchise. The government had imposed such high costs by requiring detailed programming plans that only one bidder bothered (*Source: The Economist May 2004: Cursed)*.

SMRA auctions are where the lots are auctioned individually but simultaneously in discrete bidding rounds with ascending prices for each spectrum lot and the auctions continues until no new bids are submitted. The risks it has, is a) can be vulnerable to gaming (e.g. demand reduction, signaling etc.) and b) Bid strategy can be rather complex if there are many lot. Indian bidding for Telecom sector DoT is using the SMRA auction for the award of telecom licenses since 2010. Indian govt has fetched in 06 auctions from 2010 to 2016 (last one) around USD ~50 billion.

Combinatorial Clock Auction (CCA) is a Multiple round auction allowing bids for packages of lots, rather than for individual licences. An initial ascending clock phase continues for each package of generic spectrum blocks until excess demand for each group is eliminated, followed by a final round of sealed bids to determine specific assignments. The CCA is a variation of SMRA in which bidders bid on packages. It is a complex design that addresses the risks of SMRA while building on its strength. The sealed bid auction permits regulators to include non-financial criteria in the selection process but it does not permit a bidder to see how spectrum is being valued by other auction participants (*Source:* www.icrer.org-*Evaluating Spectrum Auctions in India)*.

Modelling auction based on game theory are getting momentum in the last few years. Game theory is a branch of mathematics which is often used by the economists to work out how the events may unfold. Robert Aumann, an academician received the Noble prize in 2005 for his game theory based models. Consulting firms are advising the clients to design the profitable auctions or win them less expensively. Paul Milgram's consulting firms have advised Time Warner and Comcast which paid a third less than their competitors saying almost USD 1.2 billion by teaching the pattern if 1132 licenses on offer.

Nash equilibrium (by John Nash, Noble laureate 1994) is also being used by the economists to work out how companies set their prices, how government design the auction to get the maximum value and to explain the self defeating decision companies make. In a Nash equilibrium, every person in a group makes the best decision for herself, based on what she thinks the others will do. And no-one can do better by changing strategy: every member of the group is doing as well as they possibly can. This helps predicting how companies will respond to their competitors prices. Two large companies setting pricing strategies to compete against each other will probably squeeze customers harder than they could if they each faced thousands of competitors. The Nash equilibrium helps economists understand how decisions that are good for the individual can be terrible for the group. This tragedy of the commons explains why we overfish the seas, and why we emit too much carbon into the atmosphere. Everyone would be better off if only we could agree to show some restraint. But given what everyone else is doing, fishing or gas-guzzling makes individual sense. In 2000, UK govt used economist help to use Nash equilibrium which raised billions of dollars to exchequer for their 3G licenses (*Source: The Economist Sept 2006: Nash Equilibrium)* .

Auction is still an amazing unfolding evolving theory despite being one of the oldest.

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