Auctions and Intro to Demand and Supply

Econ 1101

Maria Rodriguez

University of Minnesota

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Plan for today

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1. Demand and Supply in auctions
   - Example from previous class: single-sided electricity auction
   - Changes in the Auction Price
2. Bidding Strategies
3. Intro to Supply and Demand
4. Excess and Shifts in Demand and Supply

Announcements

- HW 1 due today 11:45 pm CST on (aplia.com)
- Aplia experiment (auction) today
  - Note: just go to aplia.com at the scheduled time. You can log on from anywhere on campus. (Will start at exactly at the start time . . . log on early).
- For next week:
  - HW 2 due next Tuesday 11:45 pm CST on (aplia.com)

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1. Auctions and Market Clearing

Recap: intro and types of auctions

1. What is an auction: (parties, information, prices)
   - The outcome of an auction: winners (who), quantity, price
2. Types of auctions:
   - According to parties bidding: Single-sided vs double-sided
   - According to information available: Sealed bid vs open outcry
   - According to pricing scheme: Pay as you bid, uniform pricing
3. Reservation prices (for buyers and sellers) and sellers profit
4. Three experiments to illustrate types of auctions
   - Ex 1: sealed bid, single sided (1 & 3 sellers) -take away tradeoff
   - Ex 2: single sided, open outcry (cost is public info) - t.a. competition
   - Ex 3: single sided, open outcry with collusion -take away monopoly

Recap: Auction Setting in the UK

- The independent system operator (ISO) is the auctioneer"
- He decides 1) quantity, 2) price, and 3) who gets to sell
- **Uniform price** auction (one price for all sellers), price is determined according to the **rule**:
  1. Sort bids by price (from low to high) -ranking-
  2. Set price equal to last need to meet demand
- Next:
  - determine who is in the auction (winning sellers)
  - determine the quantity

Example to illustrate market clearing

- Suppose the buyer submits a quantity of electricity **demanded, 6** megawatt per hour (MWh)
- There are 10 sellers offering the following prices for each MWh:

Seller Name	Sell Price for 1 MWh (£ per MWh)
S1	30
S2	5
S3	50
S4	10
S5	20
S6	25
S7	5
S8	10
S9	50
S10	15

1. First task of ISO: Sort Bids (lowest to highest)

- ISO will rank the sellers by price (from the lowest to the highest, recall as buyers we prefer to pay as little as possible)

Rank	Seller Name	Sell Price for 1 MWh (£ per MWh)
1	S2	5
2	S7	5
3	S4	10
4	S8	10
5	S10	15
6	S5	20
7	S6	25
8	S1	30
9	S3	50
10	S9	50

2. Who will be chosen in the auction?

- Recall our simplifying assumption, each seller provides one unit of energy
- Which firms will be chosen in the auction?

Rank	Seller Name	Sell Price for 1 MWh (£ per MWh)	In the auction?
1	S2	5	Yes
2	S7	5	Yes
3	S4	10	Yes
4	S8	10	Yes
5	S10	15	Yes
6	S5	20	Yes
7	S6	25	No
8	S1	30	..
9	S3	50	..
10	S9	50	..

3. Auction Outcome

- Recall the auction outcome is : quantity, price and who gets to sell
- **Who?** According to our previous table we have:
  - Sellers S2, S7, S4, S8, S10, and S5

What is the **price?**

- The price will be £20
- The ISO wants to choose the lowest price that will still satisfy all demand

Auction Outcome: the ISO has determined **the who (S2, S7, S4, S8, S10, and S5), the quantity (6), and the price (£20)**

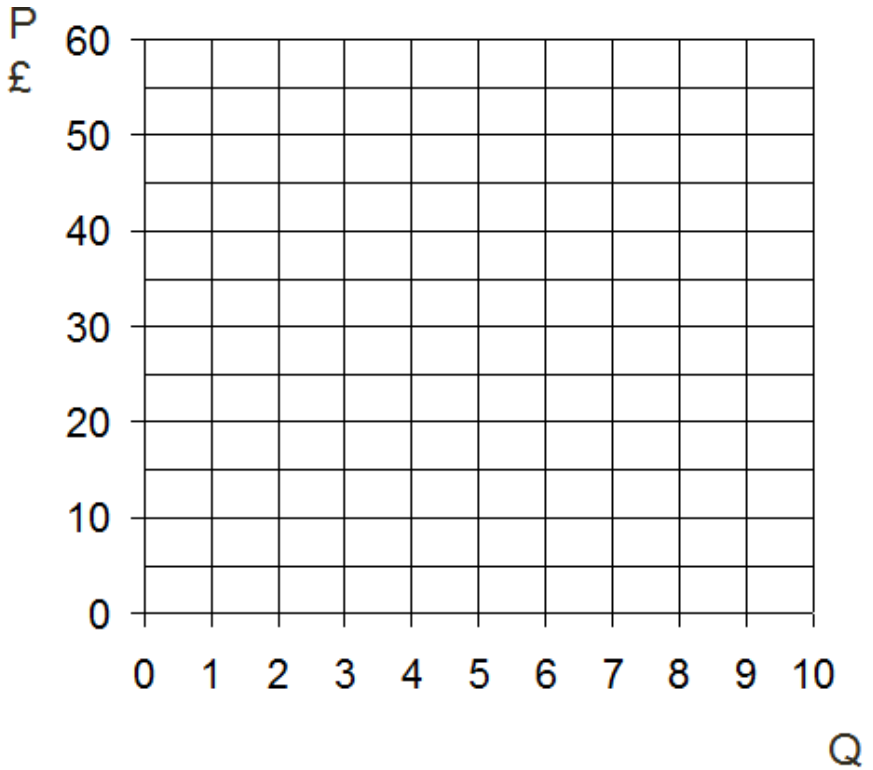
Graphical Representation

- The previous chart is also known as a supply schedule:
  - it will tell us total megawatt hours supplied for each price
- We can graph this chart (prices and quantities supplied) to visual our auction more easily
- We will plot the price in the vertical axis and the quantity in the horizontal axis

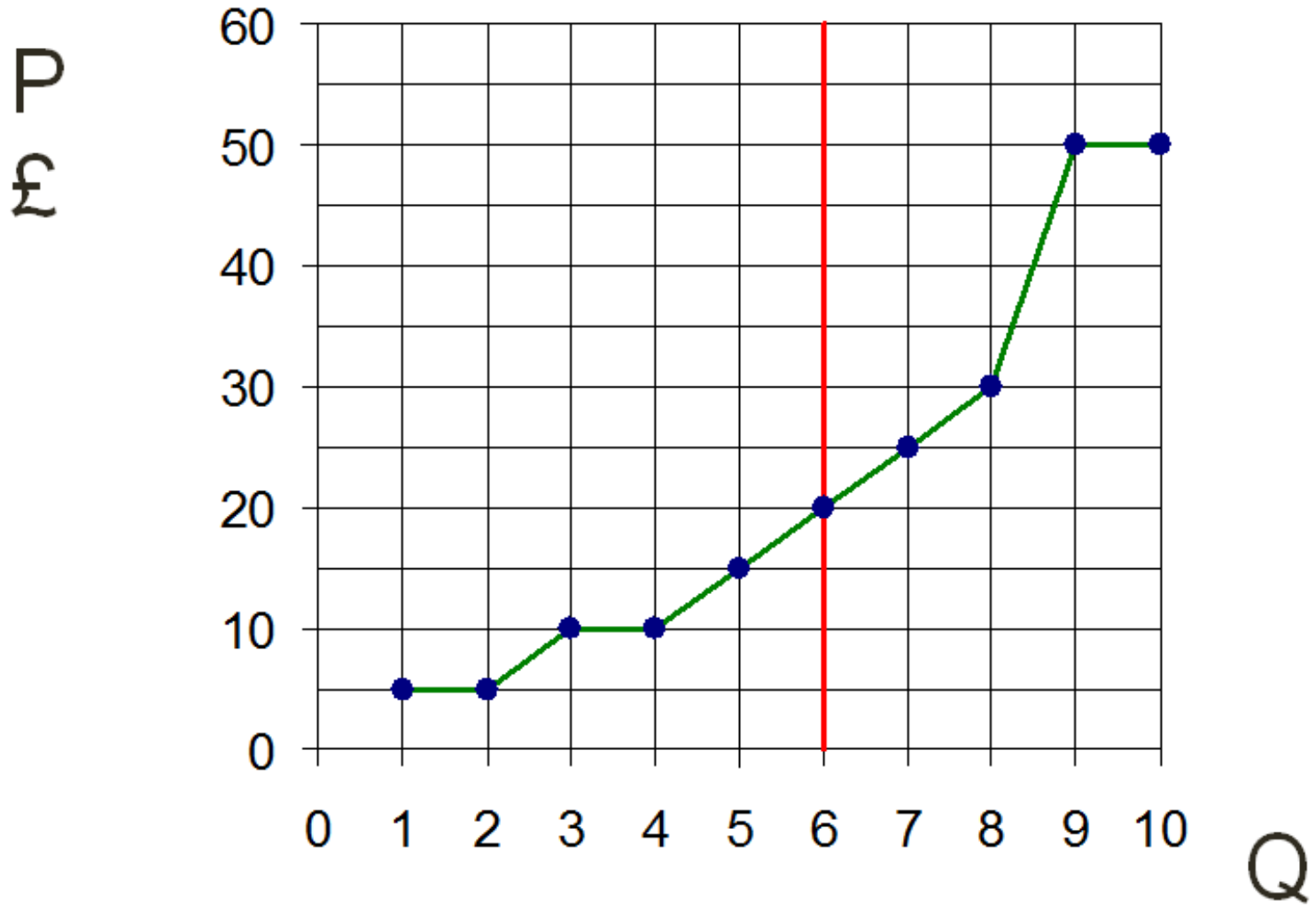
Graphical Representation

- Use the ordered bids to make the graph: first the supply curve then the demand curve

Rank	Seller Name	Sell Price	In?
1	S2	5	X
2	S7	5	X
3	S4	10	X
4	S8	10	X
5	S10	15	X
6	S5	20	X
7	S6	25	
8	S1	30	
9	S3	50	
10	S9	50	

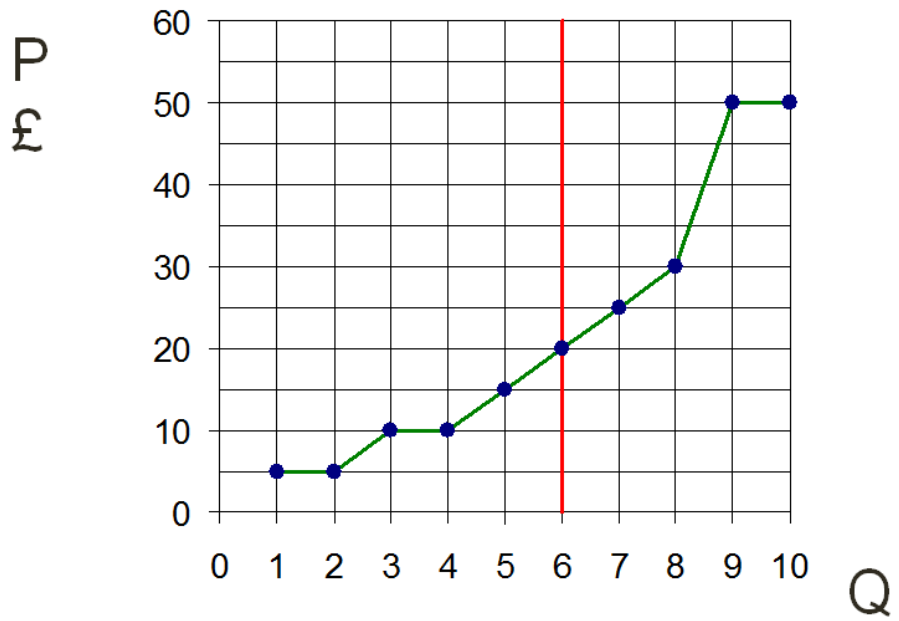


Electricity Auction in the UK



The Market

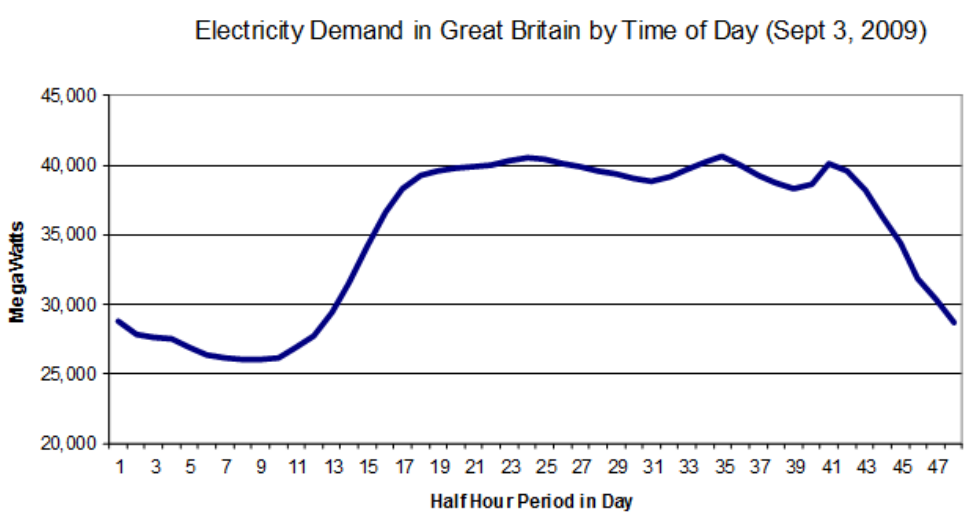
- This type of auction gives an introduction to supply and demand
- Notice the ISO chooses the price (20) such that the quantity demanded is the same as the quantity supplied
- A price that clears the market guarantees supply is same as demand
  - def: **Market Clearing**- quantity supplied is equal to quantity demanded

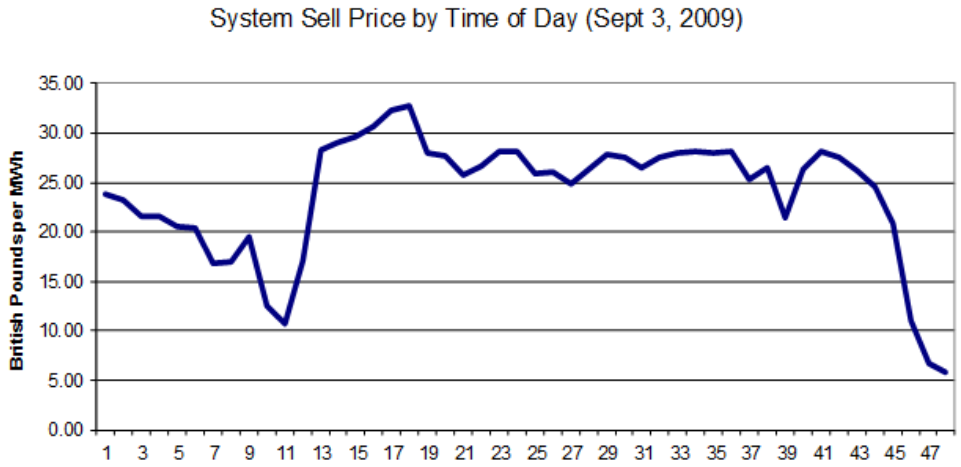


- These terms will be used when we talk about equilibrium

Recall the UK electricity market

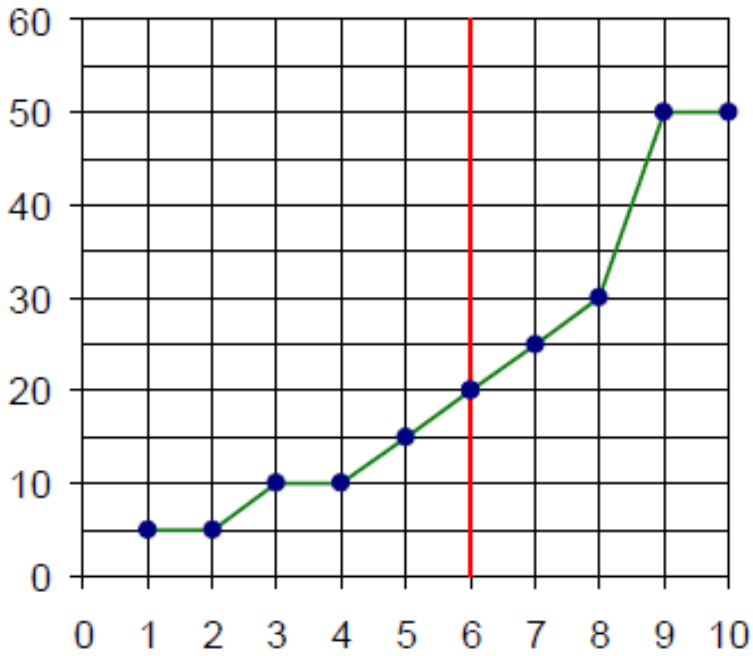
- The first graph shows how the demand fluctuates throughout the day
- In the 2nd one we see prices are higher when the demand is the highest





From our graph

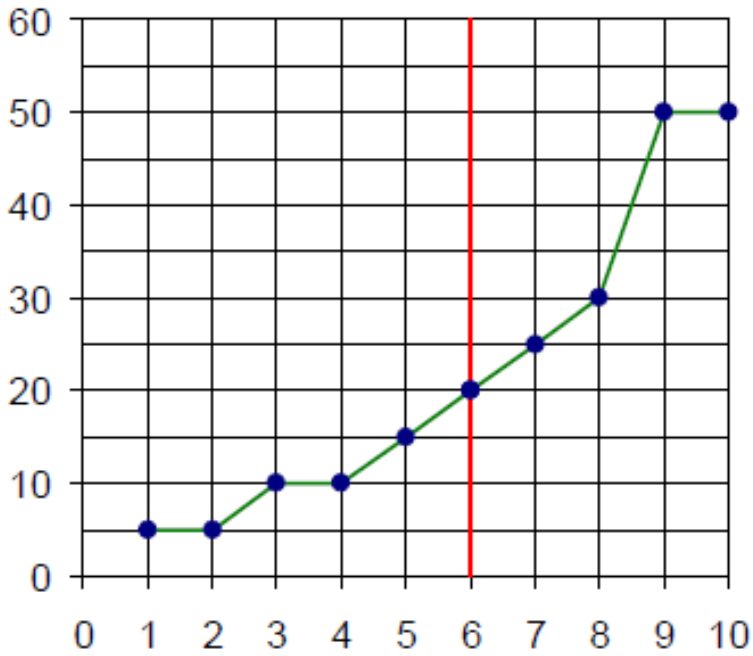
- What happens to price as the day progresses?



Time	Demand	Price
4:00 (off-peak)	2	
10:00	4	
16:00 (peak)	6	

From our graph

- What happens to price as the day progresses?



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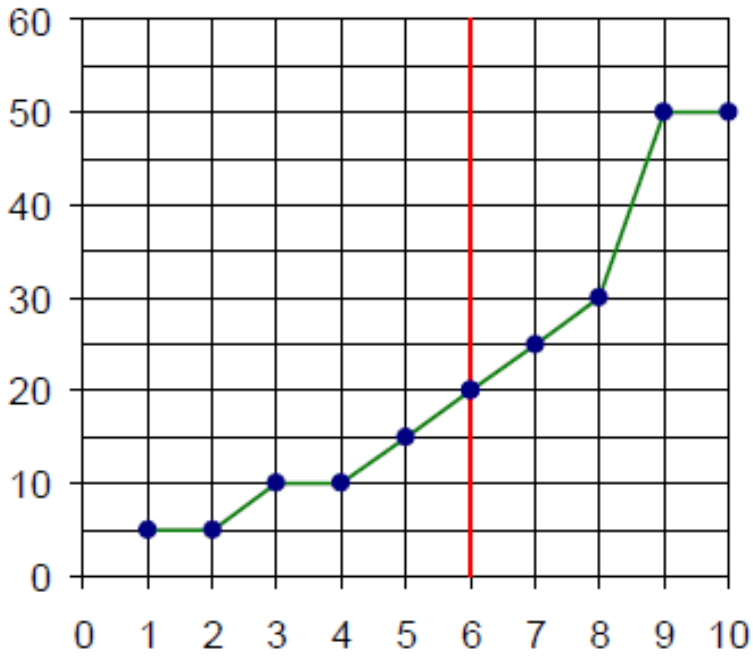

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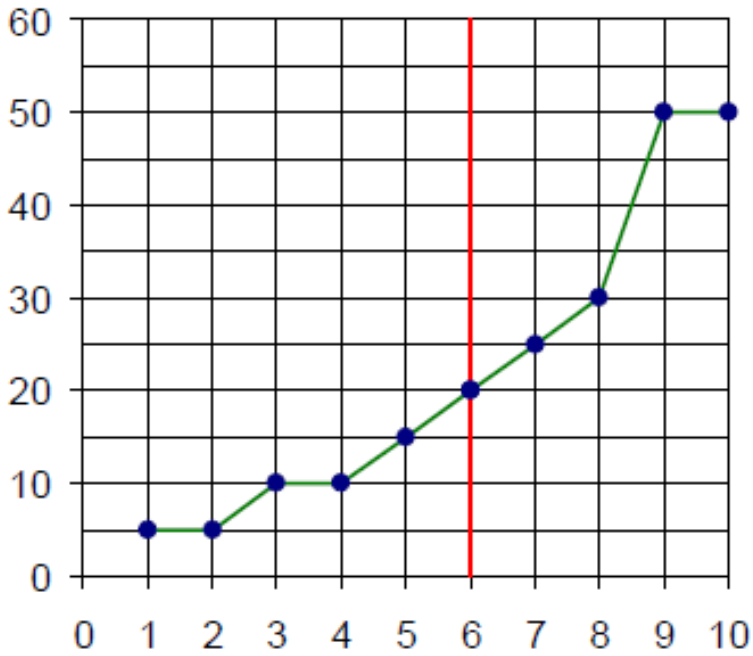

Time	Demand	Price
4:00 (off-peak)	2	5
10:00	4	10
16:00 (peak)	6	20

Relation between prices and demand

- What happens to price throughout the day?
- We can expect that costs won't change much throughout the day. If there are many bidders and they are not colluding, the bids won't change much during the day.
- However, demand changes substantially throughout the day and this will lead to changes throughout the day in price.

BIG IDEA: Price is high when the demand is high

- Confirming common sense

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2. Auctions and Bidding Strategies

Bidding Strategies: uniform price

- Suppose you are bidding in a uniform price auction. If there are many bidders and if you are not working together as a cartel (no collusion), the best strategy is for you to bid close to cost (or your breakeven level - reservation price).

Reasons

1. With many bidders, the chance that you will be exactly the last one in who determines the system price is small. Mainly, your choice of bid determines whether you are in (your bid to sell is below the system price) or out (your bid to sell is above the system price.)

Bidding Strategies: uniform price

...Reasons (to bid close to your cost in uniform pricing)

2. *If you bid more than your cost,* and the system price turns out to be higher than your cost, but lower than your bid, then you are out, even though you could have made a profit selling at that system price.
    - Example: Your cost: \$10, your bid: \$15, system price: \$12. You can't sell, but if you bid closer to cost you could have made profit.

2. *If you bid less than your cost,* and the system price turns out to be below your cost but above your bid, then you are in. But the system price is below your cost so you lose money! .
    - Example: Your cost: \$10, your bid: \$5, system price: \$8 – You get to sell! But you lose \$2 selling at \$8.

Bottom Line: Bidding Strategies (uniform price)

With uniform price auction and many bidders, bids are close to the cost:

1. With many bidders, there is a small chance to determine the price. Your bid determines whether you are in or out, but probably not what you get paid when you are in.

2. If you bid more than your cost you could be prevented from selling if the system price is below your bid

2. If you bid less than cost, and the system price is below your bid, you will be losing (making negative profit)

UK auction: Bidding Strategies

- When we talk about the market, we have (typically) a uniform price

In the UK electricity auctions, is it a good idea to bid at cost (suppose that the bid prices are actually their costs)?

- Example: you see S5's bid and think that he could have perhaps bid \$24.99. He'd still get to sell, and plus make \$4.99 of profit!
- If we look at situations with a lot more bidders – there will be more bidders with costs between \$20 and \$25, such that it will no longer make sense for S5 to bid \$24.99 (he risks not selling) so he will bid closer to his cost: \$20

Rank	Seller Name	Sell Price for 1 MWh (£ per MWh)	In the auction?
5	S10	15	Yes
6	S5	20	Yes
7	S6	25	No

Bidding Strategies: Pay as you bid

Experimental auctions this week are Pay as Bid format, not Uniform Price. Incentives are different here! Should you bid at cost?

- With a pay-as-you-bid strategy (like in our aplia auction today and auctions of last class), bidding strategies are different
- Your bid has a significant impact on your own payout now, unlike in the uniform payment
- One drawback of uniform price auctions is that firms (sellers/bidders) have the incentive to collude (cartel) and try to set the system price
  - In this sense uniform price are more vulnerable to manipulation because all you need is manipulate prices of the last unit in, which determines the price. (the price of the cheapest unit that fills the demand)
  - Comparing to pay as bid where to act as a cartel , all the prices need to be manipulated, not just the last one in, and this can lead to suspicious behavior that may be likely to be caught by regulators.

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3. Introduction to Supply and Demand

- Market clearing without an ISO
- Factors that affect the market demand and market supply
- Shifts IN demand and supply vs shifts IN QUANTITY demanded and supplied

Intro to Supply and Demand

- From our UK analysis, we realized that the higher the demand, the higher the price.

In what we have been discussing, there is an ISO running things. You can see it as a Visible Hand that achieves market clearing (supply=demand)

- Now we will develop Demand and Supply analysis and apply it to markets without the equivalent of ISO
- For certain markets will argue that that market behaves as though there is an ISO picking P, Q, and Who to clear the market.
- These competitive markets work as if guided by an Invisible Hand (Adam Smith's term)
  - by directing that industry in such a manner..., he intends only his own gain, and he led by an invisible hand to promote an end which was no part of his intention... By pursuing his own interest he frequently promotes that of the society more effectually than when he intends to.

The Competitive Market

Definition of a competitive market: a market in which there are:

- many buyers and
- many sellers
- so that the behavior of an individual buyer or seller has a negligible impact on the market price

- Would the market for iPads be a competitive market?
- How about corn?
  - it satisfies the conditions of competitive market: many consumers, assume many firms as well

Intro to supply and demand: competitive market

Application: Market for Corn

Market for Corn: Supply

- **Quantity Supplied**: is the amount sellers are willing and able to sell.

What factors affect the quantity supplied?

- Mainly we will focus on the price of corn:
  - Higher price: more farmers willing to plant corn
  - (Go back to UK auction market and look at supply. At higher price...)
- Quantity Supplied depends on other things like inputs that we will discuss later.
  - (Go back to "supply" in the UK auction. What happens if oil prices increase....)

- **Quantity Demanded**: amount buyers are willing and able to purchase.
- Depends upon the price of corn (and other factors we will discuss later.)
  - Higher price: quantity demanded is less. (think about your own shopping behavior)

Numerical Example

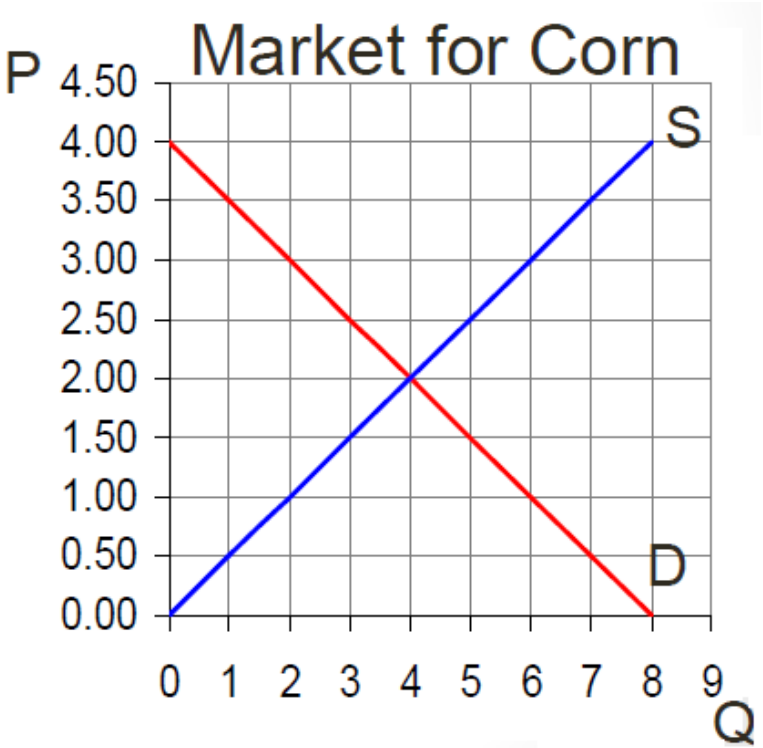
- Suppose we have 8 sellers and 8 buyers, each willing to buy and sell 1 unit of corn (assume its enough to make it a competitive market)
- Every buyer and seller has his/ her own reservation price
- Recall: lowest a seller will go, highest a buyer will go

Seller	Buyer	Res Price
S1	D1	1.50
S2	D2	1.00
S3	D3	3.50
S4		4.00
S5	D5	3.00
S6	D6	2.00
S7	D7	2.50
S8	D8	0.50
	D4	0.00

Numerical Example

- As in the UK example first step to determine the market clearing price is to rank sellers from low to high and buyers from high to low
- Using this ranking (as we did in class) we do a table of quantity demanded / supplied vs price and graph our supply/demand schedule
- Notice as the ISO did before we can pick the price such that quantity supplied = quantity demanded and report (P, Q, who)

Q(S)	Q(D)	Res Price
0	8	0
1	7	0.50
2	6	1.00
3	5	1.50
4	4	2.00
5	3	2.50
6	2	3.00
7	1	3.50
8	0	4.00

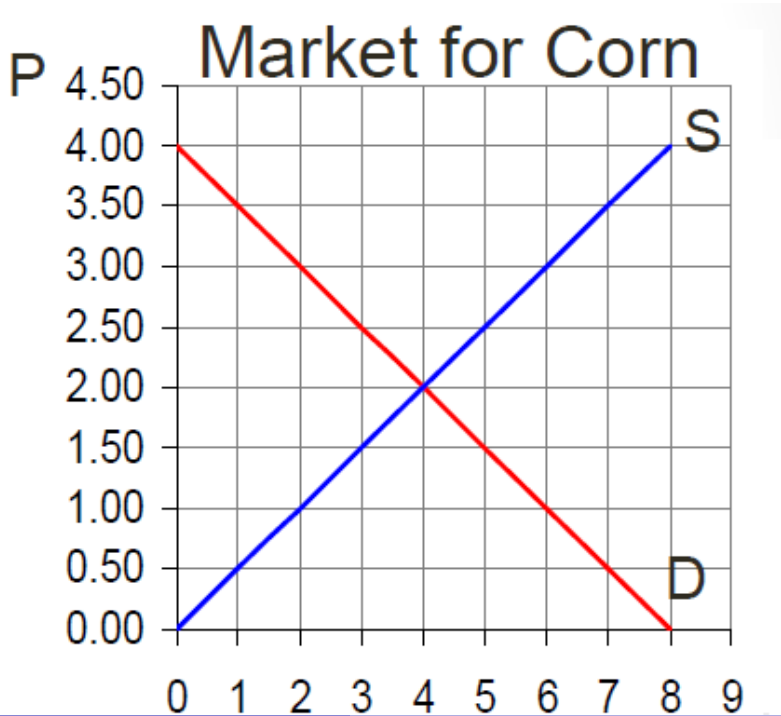


Numerical Example: Market Equilibrium

Equilibrium is the situation where the price guarantees quantity demanded equals quantity supplied (this is the price clears the market)

- What is the equilibrium price (P^E) here? \$2
- What is the equil. quantity supplied and demanded ($Q^E(D)$ $Q^E(S)$)? 4
- Just as the ISO can pick price and the quantity, the market can achieve by itself the same outcome, we will see this when we analyze excess

Q(S)	Q(D)	Res Price
0	8	0
1	7	0.50
2	6	1.00
3	5	1.50
4	4	2.00
5	3	2.50
6	2	3.00
7	1	3.50
8	0	4.00



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4. Excess Supply, Excess Demand and Shifters