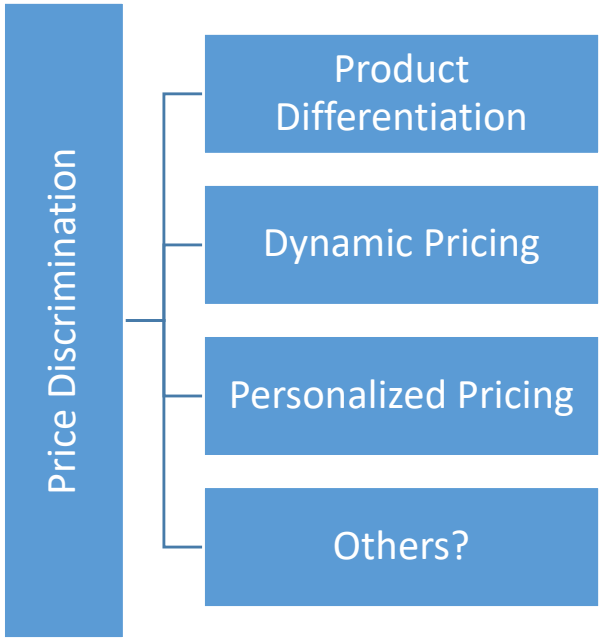
Revenue Management: Price Discrimination

BUAD 311: Prof. Vishal Gupta

USC Marshall
School of Business

Price Discrimination

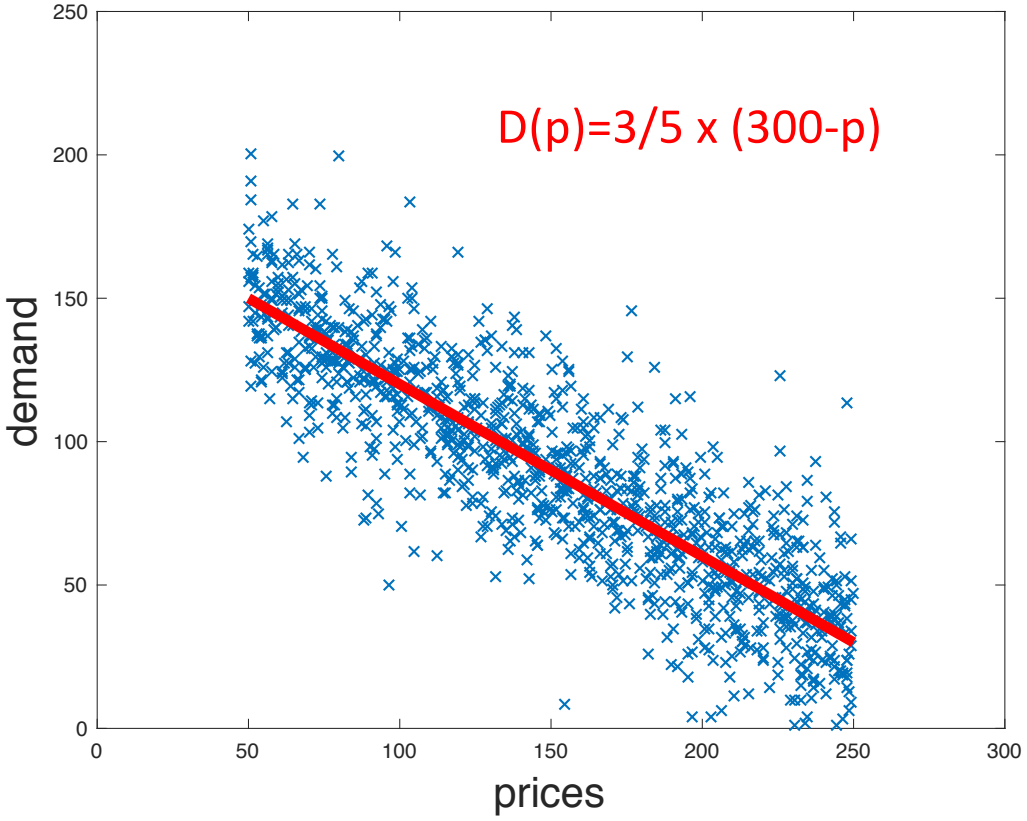
- How can we charge different customers different prices?
  - Million-dollar question (literally)!
  - Price discrimination (in various forms) is everywhere
- Motivation: Comedy Club
  - Really big venue, empty seats.
  - Seems wasteful… Why can't we lower price to sell more?
- Price discrimination strategies try to charge each customer (close to) their willingness to pay



What are **pros/cons** of charging different customers different prices for same product?

Thought Experiment: Pros of Price Discrimination (I)

- Comedy Club Example: Selling tickets



- Revenue: R(p) = p * D(p)
- Took derivative, set to zero…

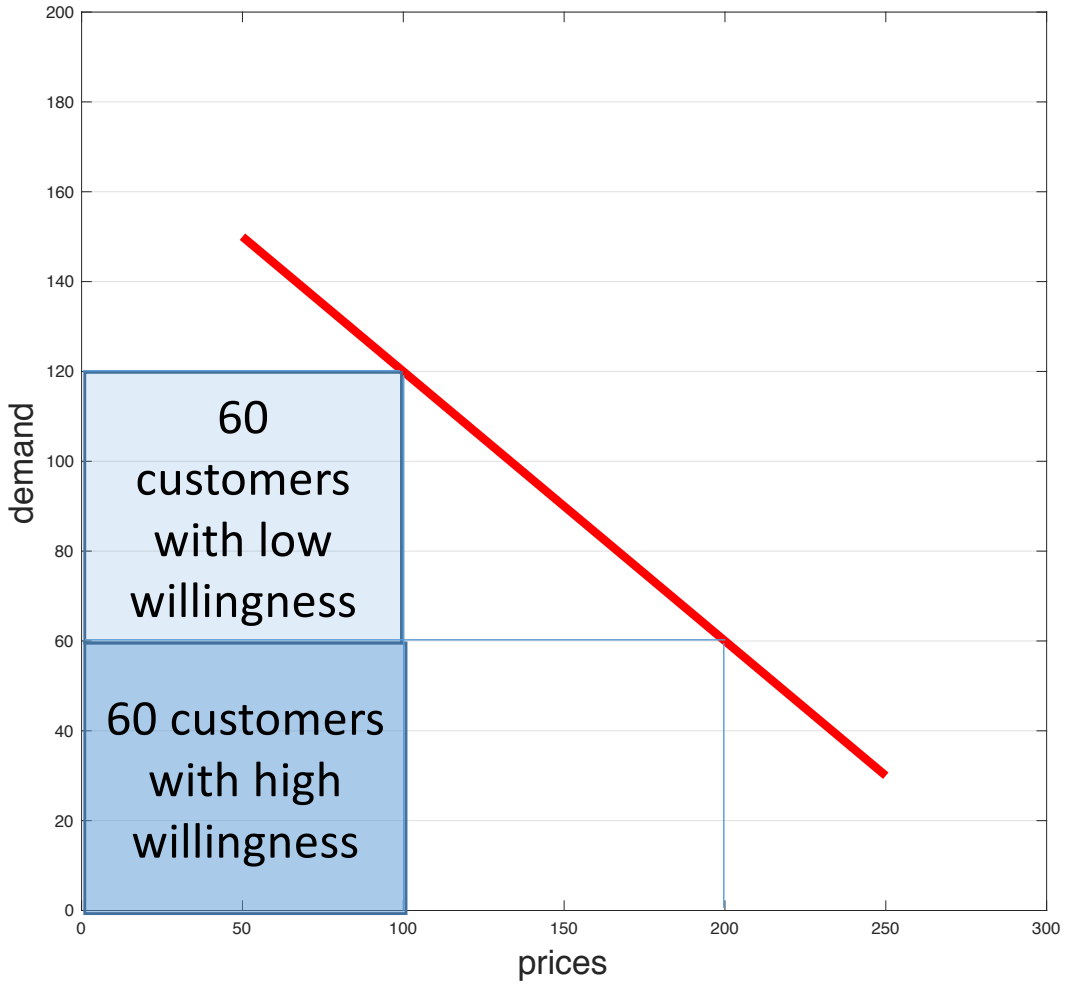
- Optimal Price: $150
- D(150) = 90
- R(150) = $13,500

- If you don't remember this, review your notes!

Thought Experiment: Pros of Price Discrimination (II)

Suppose we could charge two prices: $100 or $200.

- How many customers are willing to pay a price of $100?
  - D(100) = 120
- How many customers are willing to pay a price of $200?
  - D(200) = 60
- How many customers are willing to pay a price of $100 but **not** a price of $200?
  - D(100)-D(200)=60



Thought Experiment: Pros of Price Discrimination (III)

- Suppose we could tell the difference between customers
  - "Crystall Ball"
  - **We KNOW** whether they have **H**igh or **L**ow willingness to pay

- How much would you charge an **H** customer?
  - $200
- How much would you charge a **L** customer?
  - $100

- What is your revenue?
  - $200 x 60 + $100 x 60 = $18,000
- What was your revenue with a single price?
  - $13,500

Price Discrimination Risk: Cannibalization

- Back to our thought experiment
  - We assumed we could tell the difference between H/L willingness to pay customers

- What happens if we're wrong?
  - Everyone buys low price tickets (cannibalization).
  - Total revenue = 100*120 = $12,000 (why?)
  - Remember: Single Price was $13,500

Summary

- Price Discrimination : Attempting to charge each customer as close to their willingness to pay as possible

- Thought experiment suggests there is a significant benefit but also risks….

- But how do we **practically** do this?

Ingredients for Successful Price-Discrimination

So what do we need to make this work?

- Be able to **learn** each person's willingness to pay
  - Can't just ask them.
- Be able to **charge** each customer their willingness to pay
  - (without people complaining)

A First Price Discrimination Strategy: Product Differentiation

- Can we charge two different prices for the ***exact*** same product? (No.)

- Need (at least a little) product differentiation
  - A small change in the service (that doesn't cost you a lot)
  - but that matters to customers

- Possibilities
  - Quality, Time, Bundling, etc.

Product Differentiation Examples

- An example of product differentiation:
  - Iphones with different memory (64GB, 128 GB)

- Other examples of industries/differences?

Challenges with product differentiation

- Complexity
  - More products, more complicated operations
- Product can't be differentiated (legally or fairly)
  - EX. Healthcare services
- Brand impact
  - Absurdities of airline pricing
- Differentiating on the "right" feature?
  - Ex: Razors and the "Pink Tax"

A Second Example of Price Discrimination: Dynamic Pricing

- Dynamic Pricing:
  - Changing the price of a product over time in response to changes in demand, inventory, or other effects

Airlines: Dynamic pricing

- Shuttle flight from LAX-> NY departing in 5 weeks.

- You have historical data on the valuations of customers for every week until the flight

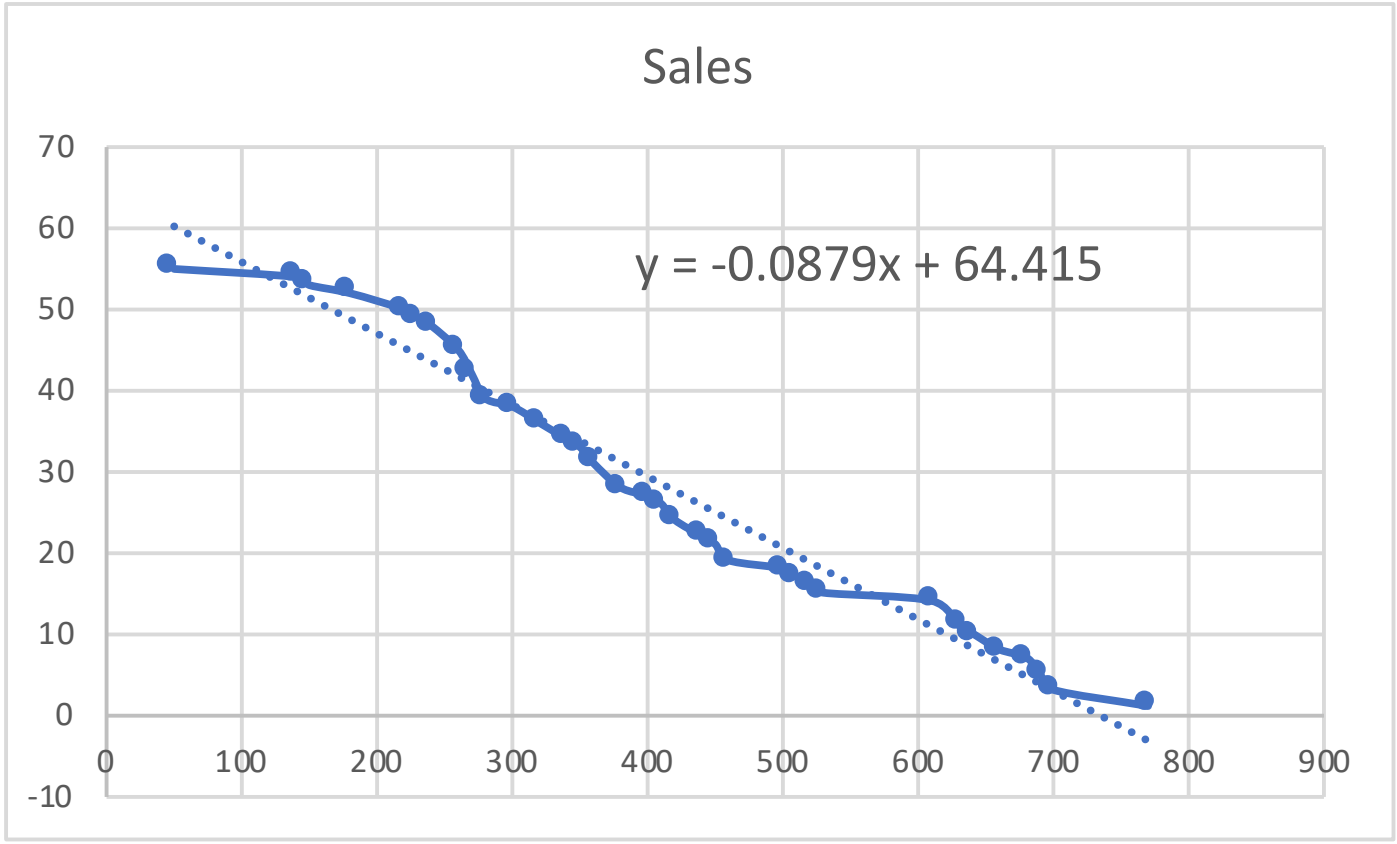
- **Go to the "dso.uscmarshall.cool" Link**
  - Look at the Plot
  - Try to deduce what you're seeing. Then we will chat.

Group Work

- Work in groups
- If you were only going to charge one price to everyone, what would it be?
- Determine revenue-maximizing price and corresponding revenue.

First things first…. Using a single price

- What would the revenue-maximizing single-price be?



What is the optimal price?

- **Weeks 1-5:**

- Demand D(p) = -0.0879 p + 64.415
- Revenue R(p) = p * (64.415 -0.0879*p)
- Take the derivative, set to zero, solve…

- Optimal price: $366
- Revenue: $11,795

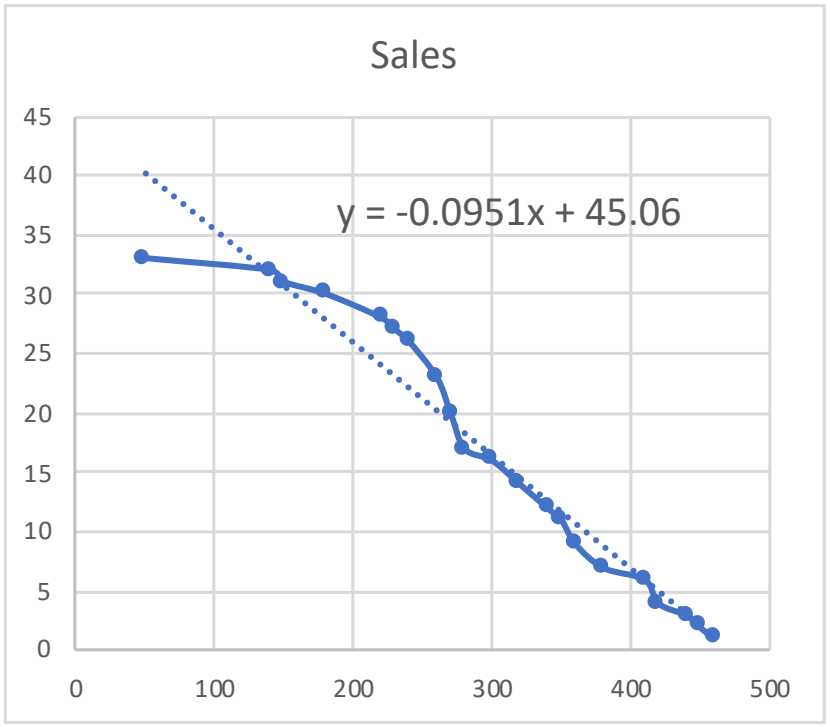
Don’t worry if your numbers are slightly different because of rounding!

Group work: Two prices

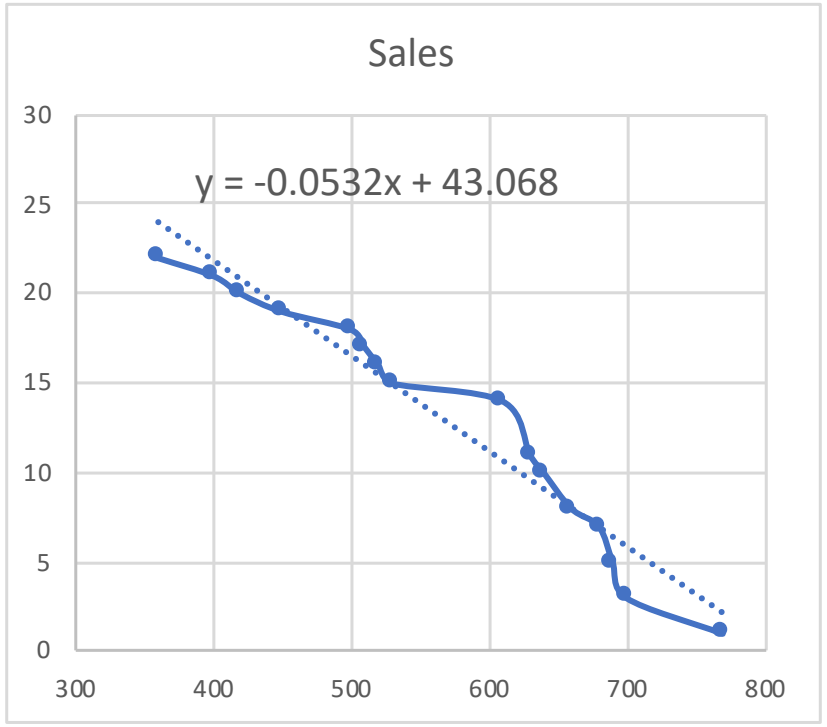
- Work in groups.
- Determine the best pair of prices to maximize revenue
- You can choose
  - Early prices,
  - Last minute prices
  - When to switch
- What are prices and total revenue?

Demand Functions

Weeks 1-3



Weeks 4-5



What are the optimal prices?

- **Weeks 1-3:**
- Demand D(p) = -0.0951 p + 45.06
- Revenue R(p) = p x (-0.951 p + 45.06)
- Take the derivative, set to zero, solve:

- Optimal price: $237
- Revenue: $5,339

What are the optimal prices?

- **Weeks 4-5:**

- Demand D(p) = -0.0532 p + 43.068
- Revenue R(p)=p x (-0.0532 p + 43.068)
- Take the derivative, set to zero, solve…

- Optimal price: $405
- Revenue: $8,724

Total Revenue

- **Weeks 1-3:**
  - Price: $237
  - Revenue: $5,339
- **Weeks 4-5:**
  - Price: $405
  - Revenue: $8,724

- Total Revenue = $5,339 + $8,724 = $14,063
  - Single Price Revenue: $11,795
  - Dynamic pricing gives a 19% improvement!

Will this work in practice?

- Can we tell who is high WTP and who is low?
  - Observe from the data that **High WTP** buyers book later (last minute, business travelers).
  - **Goal** of **learning** WTP achieved.

- Can we charge them different prices without complaining?
  - People perceive that being charged more for booking late is “fair”
  - **Goal** of charging a price close to WTP achieved.

- What about strategic customers?

One slide on Capacity Control

- So far, we talked about dynamic pricing where prices change in response to changes in demand

- We could also change prices in response to changes in inventory!
  - Especially important when inventory (capacity) is limited
  - This idea is called “Capacity Control”

- We **won’t** cover capacity control in class this year, but if you’re curious, come find me in office hours.

Wrap-up

- Price Discrimination
  - Charge customers (close to) their WTP
  - Pros and Cons
  - Two Key Things Every Strategy Must Do….

- Product differentiation
- Dynamic Pricing
  - Charge higher prices later in response to demand

- Next Time: Midterm Review
  - Send me questions you want to discuss before Sunday!
  - Otherwise I will just go through latest sample midterm