

Question 1 (39 points).

1. (12) You received data containing pizza sales at 4,368 different. You want to estimate the optimal pizza price and find out the expected profit. You spend 2\$ to produce each pizza.
 - a. (3) Using the data provided, how would you learn the dependence of store sales on price?
 - b. (3) How does sales depend on the price of pizza?
 - c. (3) What would be your optimal pizza price?
Hint: It should be close to what we had in class
 - d. (3) What is the total expected profit?
Hint: Total means in all 4,368 stores
2. (18) After looking at the data you realized that you have two types of pizzas. Each store sells only one type of pizza. You want to improve the profit by setting two different prices for Margherita and Pepperoni pizzas.
 - a. (3) How would you change the model to account for this? You have a strong belief that customers are NOT equally price-sensitive to the price of Margherita and Pepperoni pizzas
 - b. (3) What is your equation for the sales of pizza depending on the price and pizza type?
 - c. (3) How does increasing the price by \$1 for Margherita and Pepperoni would impact their corresponding sales?
 - d. (3) What would be your optimal pizza prices for Margherita and Pepperoni?
 - e. (3) Are the prices identical? Why?
Hint: You can check yourself by splitting the data into two parts: only Margherita and only Pepperoni sales. Then repeat 1-3 for each data separately.
 - f. (3) What is the total expected profit?
Hint: Stores sell EITHER Margherita OR Pepperoni pizza
3. (9) Lastly, you noticed that all the stores where your pizza is sold have your competitor's pizza available. You collected all the prices and want to understand how your sales depend on the competitor's price.
 - a. (3) How would you update the model to estimate the impact of the competitor's price on your sales in the store?
 - b. (3) Does the result make intuitive sense? Why?
 - c. (3) How would your total expected profit change if your competitor decrease price by \$0.5?
Hint: Use the optimal price from (2d)

Question 2 (30 points).

You are working at a fashion retailer and obtained the data about all the products which were launched last year. You noticed that despite sales in the online and offline channels being the same your profit online is substantially lower.

1. (6) You have “Profit Per Product” variables – this is how much on average each sale in an offline channel earns you:
 - a. (3) Are there any unprofitable products? What %?
 - b. (3) For simplicity assume each product has equal sales, what is the average profit per product?
2. (9) Upon examining the data you realize that online a lot of products are getting returned. Your firm spends \$1 to process each returned product (delivery fee, dry cleaning, etc)
 - a. (3) Compute the profit per product in online channel. Assume you are an omnichannel retailer (prices online and offline are the same)
 - b. (3) Are there any unprofitable products? What %?
 - c. (3) What is the average profit per product?
Hint: sales in online and offline are the same
3. (15) You think that next year you may not put some products in online channel to mitigate the losses:
 - a. (3) Construct variable “Bad Product” – a product whose profitability in online channel is less than zero
 - b. (3) Use additional variables to identify “risk” factors – product characteristics that increase the chance of making the product unprofitable
Hint: the outcome is binary in this case
 - c. (9) What would be your recommendation for next year’s online assortment?
Hint: considering one recommendation is enough: for example, which colors or categories should be examined thoroughly before putting them in an online channel?