Question 1:

Nachos elasticity: 1.48

Model: $\ln(demand) = 1.2348 + 1.4766 * \ln(actual\_price) + 0.0151 * discount\_hotdog + -0.4022 * discount\_souvcup + 0.4635 * discount\_btlwater + 1.1199 * discount\_peanuts + -0.0115 * discount\_pretzel + 0.0576 * discount\_popcorn + 1.1199 * Game\ 2 + 0.5196 * Game\ 3 + -0.4014 * Game\ 4 + 0.1112 * Game\ 5 + -0.5311 * Game\ 6 + -0.9794 * Game\ 7 + -0.0536 * Game\ 8$

Popcorn elasticity: 0.53

Model: $\ln(demand) = 0.9619 + 0.5315 * \ln(actual\_price) + -0.4191 * discount\_hotdog + 1.2720 * discount\_souvcup + 0.7947 * discount\_btlwater + -0.1899 * discount\_peanuts + -0.1899 * discount\_nachos + -0.3887 * discount\_pretzel + -0.1899 * Game\ 2 + -0.5056 * Game\ 3 + 0.2719 * Game\ 4 + 1.9596 * Game\ 5 + 0.1170 * Game\ 6 + -1.0969 * Game\ 7 + 0.9149 * Game\ 8$

Hotdog elasticity: 1.85

Model: $\ln(demand) = 2.0972 + 1.8538 * \ln(actual\_price) + 0.4078 * discount\_souvcup + 1.8004 * discount\_btlwater + -0.2363 * discount\_peanuts + -0.2363 * discount\_nachos + -1.0247 * discount\_pretzel + -0.5019 * discount\_popcorn + -0.2363 * Game\ 2 + 0.2196 * Game\ 3 + -0.1208 * Game\ 4 + -0.3766 * Game\ 5 + -1.2443 * Game\ 6 + 0.6900 * Game\ 7 + -0.1253 * Game\ 8$

Peanuts elasticity: 1.73

Model: $\ln(demand) = 1.4819 + 1.7319 * \ln(actual\_price) + 0.1575 * discount\_hotdog + -0.1240 * discount\_souvcup + 0.3178 * discount\_btlwater + 0.9656 * discount\_nachos + 0.1119 * discount\_pretzel + -0.0756 * discount\_popcorn + 0.9656 * Game\ 2 + 0.4155 * Game\ 3 + 0.0259 * Game\ 4 + 0.2469 * Game\ 5 + -0.3036 * Game\ 6 + -0.4639 * Game\ 7 + -0.3224 * Game\ 8$

Pretzel elasticity: 1.75

Model: $\ln(demand) = 1.9363 + 1.7532 * \ln(actual\_price) + -0.7743 * discount\_hotdog + 0.7015 * discount\_souvcup + 0.9528 * discount\_btlwater + -0.0699 * discount\_peanuts + -0.0699 * discount\_nachos + -0.5771 * discount\_popcorn + -0.0699 * Game\ 2 + 1.9071 * Game\ 3 + -0.0375 * Game\ 4 + -0.2252 * Game\ 5 + 1.0987 * Game\ 6 + -0.6285 * Game\ 7 + -0.3519 * Game\ 8$

Btlwater elasticity: 1.94

Model: $\ln(demand) = 2.8672 + 1.9423 * \ln(actual\_price) + 1.8650 * discount\_hotdog + -1.1566 * discount\_souvcup + -0.1126 * discount\_peanuts + -0.1126 * discount\_nachos + 0.9343 * discount\_pretzel + 0.3920 * discount\_popcorn + -0.1126 * Game\ 2 + 0.1365 * Game\ 3 + -0.0542 * Game\ 4 + 0.1805 * Game\ 5 + 0.7979 * Game\ 6 + -1.6850 * Game\ 7 + 0.2115 * Game\ 8$

Souvcup elasticity: 1.89

Model: $\ln(demand) = 1.8702 + 1.8889 * \ln(actual\_price) + 0.5588 * discount\_hotdog + -0.5918 * discount\_btlwater + -0.0526 * discount\_peanuts + -0.0526 * discount\_nachos + 0.8777 * discount\_pretzel + 1.0980 * discount\_popcorn + -0.0526 * Game\ 2 + 1.2469 * Game\ 3 + 0.1753 * Game\ 4 + 0.4863 * Game\ 5 + -0.3691 * Game\ 6 + 0.7814 * Game\ 7 + 0.6117 * Game\ 8$

Question 2:

Effect of other sales on demand for nachos

- discount_hotdog: -7.1927
- discount_souvcup: -25.8023
- discount_btlwater: 0.9216
- discount_peanuts: 59.5230
- discount_pretzel: -13.1473
- discount_popcorn: -4.5407

Effect of other sales on demand for hotdog

- discount_souvcup: -13.8277
- discount_btlwater: 269.1363
- discount_peanuts: -62.6661
- discount_nachos: -62.6661
- discount_pretzel: -186.5145
- discount_popcorn: -81.8694

Effect of other sales on demand for peanuts

- discount_hotdog: -7.0672
- discount_souvcup: -25.8737
- discount_btlwater: -0.5449
- discount_nachos: 45.1412
- discount_pretzel: -8.5514
- discount_popcorn: -10.8000

Effect of other sales on demand for pretzel

- discount_hotdog: -160.3757
- discount_souvcup: 135.2601
- discount_btlwater: 99.5015
- discount_peanuts: -39.9962
- discount_nachos: -39.9962
- discount_popcorn: -139.0904

Effect of other sales on demand for btlwater

- discount_hotdog: 302.8205
- discount_souvcup: -339.0334
- discount_peanuts: -92.9051
- discount_nachos: -92.9051
- discount_pretzel: 113.6100
- discount_popcorn: 0.8520

Effect of other sales on demand for souvcup

- discount_hotdog: 48.4171
- discount_btlwater: -112.4560
- discount_peanuts: -32.7634
- discount_nachos: -32.7634
- discount_pretzel: 170.6187
- discount_popcorn: 146.5222

Question 3:

The Bears can leverage these models to better understand the effects of discounting one item on the others. For example, we observe that putting hotdogs on sale supposedly cause the demand for bottles of water to increase on average by 302.82 units. They can then use this information to attempt to "cause" an increase or decrease in demand for other items. They can also use this information to better predict demand, lowering inventory cost.

Moreover, the information obtained from the models can be used to identify items that are relatively insensitive to price changes. For instance, we find that popcorn has a low price elasticity, meaning that a small increase in price would not significantly affect its demand. This knowledge can enable the Bears to increase the price of popcorn, leading to higher revenue while experiencing only a slight reduction in demand.

Question 4:

One significant limitation of my models is the small amount of data available for this analysis. For each model only eight data points exist which could cause the coefficients to be inaccurate.

Another weakness of my models is not taking into account some of the other cofounds that are possibly present. For instance, weather conditions could have a significant impact on the number of items sold, with poor weather leading to a decrease in demand as fans may be less inclined to attend the game. Future research could explore the effects of other potential confounding factors on item demand to develop a more comprehensive understanding of the relationships between different variables.

Looking ahead, the Bears could take steps to improve the quality of their data. One option is to collect data from multiple seasons, which would increase the amount of data available for analysis and improve the accuracy of the coefficients. Additionally, the Bears could improve the quality of their data by adding variables that control for possible confounds, such as total attendance of a game and weather conditions on the specific day. This would help to account for external factors that could affect demand for each item, and would lead to more reliable insights for the team to use in their decision-making processes.