RBE 595 — FAIR-AV
Assignment #1

Arjan Gupta

Problem 1

Use your favorite auto OEM as an example to compute the PCDM using its average ROI or last year's ROI. (2pt)

Solution

I have chosen Honda as an example. The ROI for Honda in 2023 is the average of the data points from 2023, per the data available on Macrotrends. These data points are 4.85%, 5.85%, 6.15%, and 6.53% respectively for the quarters of 2023. The average ROI for Honda in 2023 is given by,

$$\begin{aligned}\text{Average ROI} &= \frac{4.85 + 5.85 + 6.15 + 6.53}{4} \\ &= 5.845\%\end{aligned}$$

The PCDM is the profit per customer driven mile. In 2023, Honda recorded an operating profit of approximately 781 billion Japanese yen. With around 4.5 million cars sold, this translates to an average profit of about 173,555 yen (roughly $1,200 USD) per car. The source for this data is Statista.
On average, Honda cars have a mileage lifespan of about 200,000 miles. The source for this data is Brickell Honda.
Therefore, we can calculate the PCDM for Honda in 2023 as follows,

$$\begin{aligned}\text{PCDM} &= \frac{\text{Average profit per car}}{\text{Average mileage per car}} \\ &= \frac{\$1,200}{200,000} \\ &= \$0.006 \text{ per mile}\end{aligned}$$

Let us compound the PCDM with the average ROI for Honda in 2023,

$$\begin{aligned}\text{PCDM} \times (1 + \text{ROI})^{10} &= \$0.006 \times (1 + 0.05845)^{10} \\ &= \$0.006 \times 1.765 \\ &= \$0.01 \text{ per mile}\end{aligned}$$

Therefore, the PCDM for Honda in 2023, compounded with the average ROI, is $0.01 per mile.

Problem 2

If an Uber or Lyft driver uses his or her own self-driving car for the car-sharing service (if it is allowed by the car-sharing company), what are the implications for the 4 agents discussed in lecture #2? (2pt)

Solution

The four agents discussed in lecture #2 are:

1. The car owner
2. The customer using the car-sharing service
3. The car-sharing company (Uber or Lyft)
4. The car manufacturer

If an Uber or Lyft driver uses his or her own self-driving car for the car-sharing service, the implications for the four agents are as follows:

1. **The car owner:** The car owner is the Uber or Lyft driver in this case. The car owner will benefit from the car-sharing service by earning money from the rides given by the self-driving car. The car owner will also save on the cost of hiring a driver, as the self-driving car can operate without human intervention. The car owner will also save on the cost of fuel, as the self-driving car can be programmed to drive efficiently.
2. **The customer using the car-sharing service:** The customer will benefit from the car-sharing service by being able to book a ride from the self-driving car. The customer will also benefit from the convenience of being able to book a ride at any time, as the self-driving car can operate 24/7.
3. **The car-sharing company (Uber or Lyft):** The car-sharing company will benefit from the self-driving car by being able to offer rides to customers without having to pay a driver. The car-sharing company will also benefit from the increased efficiency of the self-driving car, as it can operate continuously without breaks.
4. **The car manufacturer:** The car manufacturer will benefit from the self-driving car by being able to sell more cars to Uber or Lyft drivers who want to use their own self-driving cars for the car-sharing service. The car manufacturer will also benefit from the increased demand for self-driving cars, as more people will want to use self-driving cars for the car-sharing service. However, some car manufacturers may not have self-driving cars in their product lineup, so they may lose out on sales to car manufacturers that do have self-driving cars, or those that have better self-driving technology.

In conclusion, the implications of an Uber or Lyft driver using his or her own self-driving car for the car-sharing service are positive for all four agents discussed in lecture #2, with the last agent having a potential downside if they do not have self-driving cars in their product lineup.