Cost-benefit analysis 2

1. You are planning a 1,000-mile trip to Florida. You do not mind whether you go by car or by bus, except for the cost. The bus ticket costs $260. The costs associated with your car for a typical year in which you drive 10,000 miles are as follows:

   - Insurance $1,000
   - Interest $2,000
   - Gas and oil $1,200
   - Tires $200
   - License and registration $50
   - Maintenance $1,100

   Total: $5,550

   Should you drive or take the bus?

2. Al and Jane rented a banquet hall to celebrate their wedding anniversary. They have already invited 50 guests. Given this number of guests, the catering service will charge $400 for the food and $100 for the drinks. The orchestra will charge $300 for performing during the event, and the hall rental will cost $200. Al and Jane are now considering inviting 10 more people. How much will the cost of the party increase with these additional guests?

3. You drive 10,000 kilometers per year and buy gasoline at $0.40 per liter. You do not mind driving either a 10-year-old Buick (costing $200 per year and 15 liters/100 km) or a Toyota of the same age (costing $400 per year and 8 liters/100 km), except for the differences in annual costs. Which car should you choose?

4. Bill and Joe live in Ithaca. At 2 p.m., Bill buys a ticket for $30 to attend a basketball game that will be played that night in Syracuse (50 miles north). Joe plans to attend the same game but decides not to buy a ticket in advance because, from experience, he knows he can always get an equally good ticket at the stadium. At 4 p.m., an unexpected storm hits, making the prospect of driving to Syracuse much less appealing. If both Bill and Joe have the same preferences and are rational, is it more likely that one of them will attend the game? If so, which one and why? If not, explain why.

5. There are two types of weather radar systems for detecting meteorological conditions on commercial passenger aircraft: the latest and most advanced system, and a cheaper but less effective one. The Air Navigation Agency (ANA) has hired you to determine whether all aircraft should be required to carry the most advanced radar system. After a thorough study, you recommend that the more expensive radar be required only on aircraft with more than 200 seats. How would you justify this recommendation to ANA members who argue that all passengers, regardless of the aircraft's capacity, have the right to travel with the best available radar?

Solutions

1. The information provided is for 10,000 miles, so variable expenses like gas, tires, and maintenance need to be divided per mile. Dividing: \$5550 / 10 = \$555. The cost remains higher when traveling by car (even considering fixed costs, which should not change). **Therefore, it is more convenient to take the bus.**

2. Only the costs of food and drink should be considered, as the venue and orchestra costs are fixed. We calculate the cost per person:
$$\frac{400 + 100}{50} = 10$$
We multiply this by 10:
$$10 \times 10 = 100$$
Therefore, the cost will increase by 100 monetary units.

3. The Buick consumes 15 liters per 100 km, that is:
$$\frac{15}{100} = 0.15 \text{ liters per km.}$$
For 10,000 km, it would use:
$$10,000 \times 0.15 = 1,500 \text{ liters,}$$
which costs:
$$0.4 \times 1,500 = 600.$$
In total, the Buick would cost:
$$200 + 600 = 800.$$
For the Toyota, consumption is:
$$\frac{8}{100} = 0.08 \text{ liters per km.}$$
For 10,000 km, it would use:
$$10,000 \times 0.08 = 800 \text{ liters,}$$
with a total cost of:
$$800 \times 0.4 = 320.$$
The total cost of the Toyota would be:
$$400 + 320 = 720.$$
Therefore, the Toyota is the better choice.

4. Each person's analysis is as follows: Bill compares $U(\text{game}) - U(\text{trip})$, while Joe compares: $U(\text{game}) - U(\text{ticket cost}) - U(\text{trip})$. **Therefore, Bill is more likely to attend the game than Joe,** as the ticket cost could make the net outcome negative for Joe.

5. The correct comparison requires calculating the probabilities of accidents with different types of radars. If an accident occurs with an aircraft carrying many passengers, the cost of addressing the damages will be higher than with an aircraft carrying fewer passengers. Therefore, although it may sound controversial, an aircraft with many passengers must be more cautious. Radars reduce the probability of accidents, but this reduction might not justify the cost of the radar. **Thus, a lower-quality radar, even if it leads to more accidents, might be more cost-effective for aircraft with fewer passengers.**