1. National Foods’ ad agency has constructed the following payoff table giving its estimate of the expected profit resulting from purchasing one, two, or three advertising sports. (Another possible decision is for National Foods not to advertise at all during the Super Bowl.) The states of nature correspond to the game being “dull”, “average”, above average”, or “exciting”.
   1. **What is the optimal decision if the National Foods advertising manager is optimistic?**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of 30-second Commercials Purchased | Perceived Game Excitement | | |  |  |
|  | Dull | Average | Above average | Exciting | Optimism |
| One | -2 | 3 | 7 | 13 | 13 |
| Two | -5 | 6 | 12 | 18 | 18 |
| Three | -9 | 5 | 13 | 22 | **22\*\*** |

The optimal decision (the maximum) if the national foods advertising manager is optimistic is 22. In the best case scenario, **managers will purchase 3 thirty-second commercials.**

* 1. **What is the optimal decision if the National Foods advertising manager is pessimistic?**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of 30-second Commercials Purchased | Perceived Game Excitement | | |  |  |
|  | Dull | Average | Above average | Exciting | Pessimistic |
| One | -2 | 3 | 7 | 13 | **-2\*\*** |
| Two | -5 | 6 | 12 | 18 | -5 |
| Three | -9 | 5 | 13 | 22 | -9 |

The optimal decision (the minimum) if the National Food advertising manager is pessimistic is -2. In the worst case scenario, **Managers will purchase 1 thirty-second commercial.** They can also purchase 0 commercials, but that will lead to 0 profits.

* 1. **What is the optimal decision if the National Foods advertising manager wishes to minimize the firm’s maximum regret?**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of 30-second Commercials Purchased | Perceived Game Excitement | | |  |  |
|  | Dull | Average | Above average | Exciting | Maximum  regret |
| One | -2+2= **0** | 6-3=**3** | 13-7=**6** | 22-13=**9** | 9 |
| Two | -2+5=**3** | 6-6=**0** | 13-12=**1** | 22-18=**4** | **4\*\*** |
| Three | -2+9=**7** | 6-5=**1** | 13-13=**0** | 22-22=**0** | 7 |

If the manager wishes to minimize the firm’s maximum regret, **then they much purchase 2 thirty-second commercials**; the minimum of these maximum regret is 4.

1. Consider the data given in problem 1 for National Foods. Based on past Super Bowl games, suppose the decision maker believes that the following probabilities hold for the states of nature:

P(Dull game) = .20

P(Average Game) = .40

P(Above Average Game) = .30

P(Exciting Game) = .10

1. **Using the expected value criterion, determine how many commercials National Foods should purchase.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of 30-second Commercials Purchased | Perceived Game Excitement | | |  |  |
|  | Dull  (0.20) | Average  (0.40) | Above average  (0.30) | Exciting  (0.10) | Expected value |
| One | -2(.20)=  -.4 | 3(.40)= 1.2 | 7(.30)= 2.1 | 13(.10)= 1.3 | 4.2 |
| Two | -5(.20)=  -1 | 6(.40)= 2.4 | 12(.30)=  3.6 | 18(.10)= 1.8 | **6.8\*\*** |
| Three | -9(.20)=  -1.8 | 5(.40)= 2 | 13(.30)= 3.9 | 22(.10)= 2.2 | 6.3 |

Commercials nation foods should **purchase two 30-second commercials**. This decision will be optimal over the long run.

1. **Based on the probabilities given here, determine the expected value of perfect information.**

The expected return with perfect information is .20(-2) + .40(6) + .30(13) + .10(22) = 8.1. So **the expected return with perfect information is EVIP= 8.1 – 6.8 = 1.3.** This represents the gain in expected return resulting by knowing the probabilities of the ratings of the Super Bowl games. Therefore, if the information costs more than 1.3% of the commercial, don’t buy it.

