**ASSIGNMENT-1**

**Week 1 –week 4**

**QUANTITATIVE METHODS**

**(STAT-201)**

**Student Full Name**:

**Student ID**:

**CRN No**.:

**Note**: 1. All the questions are compulsory.

2. Due date:

3. Points: Section-I 1×6=6

Section-II 1×6=6

Section-III 6×3=18

Total 30

**Section-I**

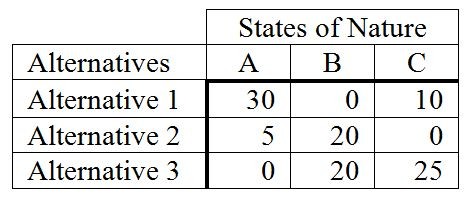
***State whether the following statements are True or False.* (1×6 = 6)**

1. Develop a model is the first step in quantitative analysis. False
2. Quantitative factors are data that can be accurately calculated. True
3. Minimum EOL will always equal EVwPI. False
4. When using the EOL as a decision criterion, the best decision is the alternative with the largest EOL value. False
5. A medium-term forecast typically covers a two- to four-year time horizon. False
6. Daily demand for newspapers for the last 10 days has been as follows: 12, 13, 16, 15, 12, 18, 14, 12, 13, 15 (listed from oldest to most recent), then the Forecast sales for the next day using a two-day moving average is 14. True

**Section-II**

***Circle/tick the right answer from the answers given below.* (1×6 = 6)**

1. Which of the following is not a quantitative factor:
2. Inventory levels
3. Technological breakthroughs
4. Demand
5. Labor cost.
6. Expressing profits through the relationship among unit price, fixed costs, and variable costs is an example of
7. a sensitivity analysis model.
8. a quantitative analysis model.
9. a post-optimality relationship.
10. a parameter specification model.
11. A pessimistic decision-making criterion is
12. maximax.
13. maximin.
14. decision making under certainty.
15. minimax regret.
16. The following is an opportunity loss table.



What decision should be made based on the minimax regret criterion?

1. Alternative 1
2. Alternative 2
3. Alternative 3
4. State of Nature C
5. Which of the following is not considered to be one of the components of a time series?
6. Trend
7. Seasonality
8. Cycles
9. variance
10. A tracking signal was calculated for a particular set of demand forecasts. This tracking signal was positive. This would indicate that
11. demand is greater than the forecast.
12. demand is less than the forecast.
13. demand is equal to the forecast.
14. the MAD is negative.

**Section-III**

**Answer the following Essay Type Questions (6**×3=18)

1. A manufacturing company manufactures T-Shirts. The fixed cost for a year is 8100 SAR. Each T-Shirt carries on average a variable cost of 30 SAR and the selling price of 120 SAR.
2. Determine the number of T-Shirts that the company must sell to reach its break-even point.
3. What will be its profit if Company sells 120 T-Shirt per year?

Answer:

f=8100 SAR v=30 SAR s=120 SAR

1. BEP = f/(s-v)

=8100/(120-30) =90 T-Shirt

1. Profit = Revenue – Expenses

= s. X – (f + v. X)

= 120. 120 – (8100 + 30. 120)

=14400-(8100+3600) = 2700 SAR

1. The following payoff table provides profits based on various possible decision alternatives and various levels of demand.

|  |  |  |  |
| --- | --- | --- | --- |
|  | States of Nature | | |
|  | Demand | | |
| Alternatives | Low | Medium | High |
| Alternative 1 | 50 | 80 | 130 |
| Alternative 2 | 60 | 70 | 80 |

1. What decision would be taken using Maximax method?
2. What decision would be taken using Maximin method?
3. What decision would be taken using equally likely method?

Answer:

1. maximax:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | States of Nature | | |  |
|  | Demand | | |  |
| Alternatives | Low | Medium | High | Max |
| Alternative 1 | 50 | 80 | 130 | 130 |
| Alternative 2 | 60 | 70 | 80 | 80 |

→ Alternative 1

1. maximin

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | States of Nature | | |  |
|  | Demand | | |  |
| Alternatives | Low | Medium | High | Min |
| Alternative 1 | 50 | 80 | 130 | 50 |
| Alternative 2 | 60 | 70 | 80 | 60 |

→ Alternative 2

1. Equally likely (Laplace) Method

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | States of Nature | | |  |
|  | Demand | | |  |
| Alternatives | Low | Medium | High | ROW AVERAGE |
| Alternative 1 | 50 | 80 | 130 | (50+80+130)/3 = 86.67 |
| Alternative 2 | 60 | 70 | 80 | (60+70+80)/3 = 70 |

→ Alternative 1

1. From the following payoff table

|  |  |  |  |
| --- | --- | --- | --- |
|  | State of nature | | |
| Action | 1 | 2 | 3 |
| A | 10 | 200 | 300 |
| B | 50 | 100 | 500 |
| Probability | 0.8 | 0.1 | 0.1 |

1. Compute the expected opportunity loss (EOL) for actions A and B.
2. What decision will you take based on Minimax opportunity loss method?
3. What will be the expected Value for perfect information?
   1. Opportunity loss table:

|  |  |  |  |
| --- | --- | --- | --- |
|  | State of nature | | |
| Action | 1 | 2 | 3 |
| A | 40 | 0 | 200 |
| B | 0 | 100 | 0 |

EOL(A) =40(.8)+0(.1)+200(.1) = 52

EOL(B) =0(.8)+100(.1)+0(.1) = 10

* 1. Using Minimax opportunity loss method, action B will be the best decision.
  2. Since Minimum EOL will always equal EVPI (expected Value for perfect information), therefore EVPI is 10.

1. Demand for your companies’ product is growing and has now outpaced their production capacity. With further growth in demand anticipated for next year, the company must find some way to expand capacity or risk losing customers when demand cannot be met. Your boss came to you and announced that three options were being considered: to expand the existing plant, to build a whole new plant from the ground up, or simply to subcontract with another company based on the following data in tree diagram. What decision would you suggest?

Expand

Build

Subcont

1200

500

High (.4)

Mod (.4)

Low (.2)

-100

2500

1200

High (.4)

Mod (.4)

Low (.2)

-500

1500

800

High (.4)

Mod (.4)

Low (.2)

-50

Answer: To find out the best decision, we will first find the EVM for each alternative. Calculated EVM is given in Circles in the following diagram

Expand

Build

Subcont

1200

500

High (.4)

Mod (.4)

Low (.2)

-100

2500

1200

High (.4)

Mod (.4)

Low (.2)

-500

1500

800

High (.4)

Mod (.4)

Low (.2)

-50

Best decision will be with highest EVM i.e. 1380, so build a new plant.

1. Following table represents the sales data from January to April for certain company:

|  |  |
| --- | --- |
| Month | Automobile Battery Sales |
| January | 28 |
| February | 21 |
| March | 39 |
| April | 34 |

* 1. Use 2 period moving averages to forecast the automobile batteries sales for march through April
  2. Find MAD (Mean Absolute Deviation)

Answer:

|  |  |  |  |
| --- | --- | --- | --- |
| Month | Automobile Battery Sales | Forecast | Forecast Error |
| January | 28 |  |  |
| February | 21 |  |  |
| March | 39 | (28+21)/2= 24.5 | 39-24.5= 14.5 |
| April | 34 | (39+21)/2 = 30.0 | 34 – 30 = 4 |

* + - * 1. == 9.25

1. Given an actual demand of 125 for current period when forecast of 129 was anticipated.
   * + - 1. What is forecast error for current period?
         2. For given alpha of 0.5 what would the forecast for the next period by using simple exponential smoothing?

Solution:

1. Forecast error = Actual Value – Forecast Value

=125-129

= -4

1. Here α=0.5

Ft+1 = Ft+ α ( Yt - Ft )

F = (129) +0.5(-4) = 127