بِسۡـــمِرِاللَّهِالرَّحۡمَنِالرَّحِيــمِ

Simulation and Modeling–Lecture: 08

Simulation of Inventory System/ the newspaper seller problem

Problem:

1. A classical Inventory problem concerns the purchase and sell of newspaper.
2. The paper seller buys papers for **33 cents** each and sells them for **50 cents** each. (the lost profit from excess demand is **17 cents** for each paper demanded that could not be provided.)
3. Newspaper not sold at the end of the day are sold as scrap for **5 cents** each. (the salvage value for scrap paper)
4. Newspaper can be purchased in bundles of 10. Thus, the paper seller can buy 50,60, so on.
5. There are three types of Newsday's, **"good", "fair"** and **"poor"** with probabilities of 0.35, 0.45 and 0.20 respectively.
6. The problem is to determine the optimal number of papers the newspaper seller should purchase.
7. This will be accomplished by simulating demands for 20 days and recordings profits from sales each day.
8. The distribution of paper demanded on each of these days is given in table-1.
9. Table 2 and 3 provide the random digit assignments for the types of Newsday's and the demand for those Newsday's.
   Random Digit for Newsday:
   94,77,49,45,43,32,49,100,16,24,31,14,41,61,85,08,15,97,52,78
   Random Digit for demand: 80,20,15,88,98,65,86,73,24,60,60,29,18,90,93,73,21,45,76,96

Table-1: Distribution newspaper demand

Demand Probability distribution			
Demand	good	fair	Poor
40	0.30	0.10	0.44
50	0.50	0.18	0.22
60	0.15	0.40	0.16
70	0.20	0.20	0.12
80	0.35	0.08	0.06
90	0.15	0.04	0.00
100	0.07	0.00	0.00

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Table-2: Random digit assignment for types of Newsday.

Types of Newsday	Probability	Cumulative Probability	Random Digit Assignment
Good	0.35	0.35	01-35
Fair	0.45	0.80	36-80
Poor	0.20	1.00	81-100

Table-3: Random Digit Assignment for newspaper demand

Cumulative Distribution Random Digit Assignment									
Demand	good	Cumulative Probability of good	Random Digit Assignment for good	fair	Cumulative Probability of fair	Random Digit Assignment for fair	Poor	Cumulative Probability of poor	Random Digit Assignment for poor
40	0.03	0.03	01-03	0.10	0.10	01-10	0.44	0.44	01-44
50	0.05	0.08	04-08	0.18	0.28	11-28	0.22	0.66	45-66
60	0.15	0.23	09-23	0.40	0.68	29-68	0.16	0.82	67-82
70	0.20	0.43	24-43	0.20	0.88	69-88	0.12	0.94	83-94
80	0.35	0.78	44-78	0.08	0.96	89-96	0.06	1.00	95-100
90	0.15	0.93	79-93	0.04	1.00	97-100	0.00	1.00	-
100	0.07	1.00	94-100	0.00	1.00	-	0.00	1.00	-

Solution:

Daily Profit= Revenue from sales- Cost of news paper -Lost profit from excess demand + Salvage from sale of scrap

Simulation Table for Purchase 70 Newspaper

Day	Random digit for types of Newsday	Types of Newsday	Random-digit for demand	Demand	Revenue from sales ($0.50 per newspaper)	Cost of Newspaper ($0.33 per newspaper)	Lost profit from excess demand ($0.17 per paper)	Salvage from sale of scrap ($0.05 per newspaper)	Daily profit
1	94	Poor	80	60	$30.00	$23.1	-	$0.50	$7.40
2	77	Fair	20	50	25.00	23.1	-	1.00	2.90
3	49	Fair	15	50	25.00	23.1	-	1.00	2.90
4	45	Fair	88	70	35.00	23.1	-	-	11.90
5	43	Fair	98	90	35.00	23.1	$3.40	-	8.50
6	32	Good	65	80	35.00	23.1	1.7	-	10.2
7	49	Fair	86	70	35.00	23.1	-	-	11.90
8	100	Poor	73	60	30.00	23.1	-	0.50	$7.40
9	16	Good	24	70	35.00	23.1	-	-	11.90
10	24	Good	60	80	35.00	23.1	1.7	-	10.2
11	31	Good	60	80	35.00	23.1	1.7	-	10.2
12	14	Good	29	70	35.00	23.1	-	-	11.90
13	41	Fair	18	50	25.00	23.1	-	1.00	2.90
14	61	Fair	90	80	35.00	23.1	1.7	-	10.2
15	85	Poor	93	70	35.00	23.1	-	-	11.90
16	08	Good	73	80	35.00	23.1	1.7	-	10.2
17	15	Good	21	60	30.00	23.1	-	0.50	7.40
18	97	Poor	45	50	25.00	23.1	-	1.00	2.90
19	52	Fair	76	70	35.00	23.1	-	-	11.90
20	78	Fair	96	60	30.00	23.1	-	0.50	7.40
Total					**$645.00**		**$13.60**	**$5.50**	**$174.90**

Profit: $645.00-(20*70*$0.33)-$13.60+$5.50 = **$174.90**

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