بِسۡمِ اللَّهِ الرَّحۡمَٰنِ الرَّحِيمِ

Simulation and Modeling-Lecture: 09

Simulation of m, n inventory system / inventory system

Problem:

1. Suppose that the maximum **inventory level M, is 11 units** and the review period **N, is 5 days**. The problem is to estimate by simulation the average ending units in inventory and the number of days when a shortage condition occurs.
2. The distribution of the number of units demanded per day is shown in **Table-1**.
   Random digit for demand: 24, 35, 65, 81, 54, 03, 87, 27, 73, 70, 47, 45, 48, 17, 09, 42, 87, 26, 36, 40, 07, 63, 19, 88, 94.
3. In this example, lead time is a random variable as shown as in **Table-2**.
   Random digit for lead time: 5, 10, 3, 4, 8.
4. Assume that orders are placed at the close of the business and are receive for inventory at the beginning of business as determined by the lead time.
5. For the purpose of this example only five cycle will be shown.
6. The simulation has been started with the inventory level at 3 and an order of 8 units scheduled to arrive in 2 days' time.

Table-1

Demand	Probability	Cumulative Probability	Random Digit Assignment
0	0.10	0.10	01-10
1	0.25	0.35	11-35
2	0.35	0.70	36-70
3	0.21	0.91	71-91
4	0.09	1.00	92-100

Table-2

Lead Times(days)	Probability	Cumulative Probability	Random Digit Assignment
1	0.6	0.6	01-06
2	0.3	0.9	07-09
3	0.1	1.0	10

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Solution:

Simulation table for (m, n) inventory system

Cycle	Days	Beginning inventory	RD for demand	Demand	Ending inventory	Shortage quantity	Order quantity	RD for lead Time	Days until order arrival
1	1	3	24	1	2	0	-	-	1
	2	2	35	1	1	0	-	-	0
	3	8+1=9	65	2	7	0	-	-	-
	4	7	81	3	4	0	-	-	-
	5	4	54	2	2	0	9	5	1
2	1	2	03	0	2	0	-	-	0
	2	2+9=11	87	3	8	0	-	-	-
	3	8	27	1	7	0	-	-	-
	4	7	73	3	4	0	-	-	-
	5	4	70	2	2	0	9	10	3
3	1	2	47	2	0	0	-	-	2
	2	0	45	2	0	**2**	-	-	1
	3	0	48	2	0	**2+2=4**	-	-	0
	4	0+9=9	17	1	4	0	-	-	-
	5	4	09	0	4	0	7	3	1
4	1	4	42	2	2	0	-	-	0
	2	2+7=9	87	3	6	0	-	-	-
	3	6	26	1	5	0	-	-	-
	4	5	36	2	3	0	-	-	-
	5	3	40	2	1	0	10	4	1
5	1	1	07	0	1	0	-	-	0
	2	1+10=11	63	2	9	0	-	-	-
	3	9	19	1	8	0	-	-	-
	4	8	88	3	5	0	-	-	-
	5	5	94	4	1	0	10	8	2
Total					**88**				

Average ending inventory= 88/25=**3.52**

Shortage is found in **2 days** among 25 days.

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