Cairo University

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Report for problem 2 - The car dealer

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Course Name: Systems Modeling and Simulation

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Contents

Problem formulation & Objectives:

System: The car Dealer.

Objects: cars, showroom, inventory.

Purpose:

1. The average ending units in showroom and the inventory.

2. The number of days when a shortage condition occurs.

3. Does the theoretical average demand of the demand distribution match the experimental one?

4. Does the theoretical average lead time of the lead time distribution match the experimental one?

5. Is there a better value for the review period variable N to minimize the shortage?

System Components:

- **Entity**: cars.
- **Attributes**: Model.
- **Activity**: selling.
- **State variables**:
    a. The number of available cars.
    b. The number of demands.
- **Events**:
- **Exogenous event**: Demand.
- **Endogenous event**: Review of inventory.

System analysis including cumulative distribution tables, calendar table (for 10 Days).

Demand	Probability	Cumulative Probability	intervals
0	0.2	0.2	00-20
1	0.34	0.54	20-54
2	0.36	0.9	54-90
3	0.1	1	90-100

Demand

Days	Random number	Demand
1	59	2
2	100	3
3	25	1
4	60	2
5	95	3
6	91	3
7	93	3
8	56	2
9	13	1
10	17	1

Lead time distribution

Lead time	Probability	Cumulative Probability	intervals
1	0.4	0.4	00-40
2	0.35	0.75	40-75
3	0.25	1	75-100

We generate the lead time when the inventory makes an order.

Calendar

day	begin inv	begin show	demand	end inv	end show	shortage	order	lead	review	Net profit
1	3	4	1	2	4	0	5	2	2	8000
2	2	4	2	0	4	0	0	1	1	20000
3	4	5	1	3	5	0	0	0	0	7000
4	3	5	1	2	5	0	7	3	2	8000
5	2	5	3	0	7	0	0	2	1	30000
6	0	7	2	0	7	0	0	1	0	20000
7	9	5	0	9	5	0	8	3	2	-9000
8	9	5	3	6	5	0	0	2	1	24000
9	6	5	2	4	5	0	0	1	0	16000
10	10	5	2	8	5	0	6	3	2	12000

calendar from the code

Days	begin inv	begin show	demand	end inv	end show	shortage	order	lead time	Review	Daily net profit	Total profit
1	3	4	1	2	4	0	5	2	2	8000	8000
2	2	4	2	0	4	0	0	1	1	20000	28000
3	4	5	1	3	5	0	0	0	0	7000	35000
4	3	5	1	2	5	0	7	3	2	8000	43000
5	2	5	3	0	7	0	0	2	1	30000	73000
6	0	7	2	0	7	0	0	1	0	20000	93000
7	9	5	0	9	5	0	8	3	2	-9000	84000
8	9	5	3	6	5	0	0	2	1	24000	108000
9	6	5	2	4	5	0	0	1	0	16000	124000
10	10	5	2	8	5	0	6	3	2	12000	136000

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The average ending units in showroom = 5.2
The average ending units in the inventory =3.4
The number of days when a shortage condition occurs = 0
The average net profit for the car dealer =13600.0
The theoretical average demand =1.34
the experimental average demand =1.7
So we can say that it approximates match
The theoretical average lead time  =1.85
the experimental average lead time =1.8
So we can say that it approximates match
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1. The average ending units in showroom =5.2

- The average ending units in inventory =3.4

2. The number of days when a shortage condition occurs = 0
3. The average net profit =13600
4. The theoretical average demand = 1.34 and in the experimental one = 1.38
   So it's approximately match

5. The theoretical average lead time = 1.85 and in the experimental one =1.8
   So approximately match

Experimental Design Parameters

Days = 500

Review period N=3

Daily demand is random value.

Lead time is random value.

Max size in inventory = 10

Max size in showroom = 5

Justification of experiment parameters values

Days = to test every case in the problem (shortage- Ending inventory-

Ending showroom- Average Demand-Average lead time).

Lead time is a random value because there are no specific days until the order arrives.

Daily demand is random because there is no specific demand during the day.

Results Analysis

• In theoretical Average ending units in showroom = (Total cars in showroom/days)= 52/10 and the experimental one = 4.8

It's close

• In theoretical average ending units in inventory = 34/10 = 3.4 and the

experimental one = 4.16

the difference isn't big enough so we can assume that the theoretical average and

experimental matched

• In theoretical the number of days when a shortage condition occurs = 0 and

the experimental one =0

- The theoretical average demand = 1.34 and in the experimental one = 1.38

So it's approximately match

• The theoretical average lead time = 1.8 and in the experimental one = .96 the difference almost big so it's not match

When review period is 5 the net profit increases so the best value for review period is 5

Conclusion

In the simulation model we will find the experimental is with more accuracy than the theoretical because we trace with large number but in theoretical, we trace with small number so the result of experimental is the best one.