

CarBestBuy Inventory Management

You received the following letter from Layla Nassar

Dear OR consultant,

I am the CEO of CarBestBuy—the leading car dealership in Hamra. Recently we are facing a serious problem. Our inventory runs out so often that we are losing many customers. I am suspicious that we do not have an effective inventory control policy, but have no idea how we can improve it. Professor Bacel Maddah told me that you are one of the top operations researchers in town, so I am writing to ask you to help us analyze our inventory system.

Currently our parking lot holds up to 5 cars. At the end of each day, we make a call to our supplier, CarSupplier at Tyre, if our inventory drops to 2 or lower. The truck CarSupplier uses to ship the cars has a maximum capacity of 5. They charge a handling fee \$100 for each car we order, and a fixed round-trip fee \$300 for the truck. For example, if we order 2 cars, the total order fee is $\$100 \times 2 + \$300 = \$500$. Because of the fixed cost \$300, we always make an order that brings our inventory back up to 5. CarSupplier is a very good company with excellent reputation; their driver always delivers our order by the next morning.

We were doing a good job last year and seldom have complaints from the customers about inventory shortage. The market, however, is getting better the last few months, and we are losing many customers because quite often we do not have enough cars in inventory. Thus, customers are not willing to accept a late delivery; instead, they buy cars from our competitors. I decided that I have to do something to rectify this situation.

To give you an idea about our market, I have compiled a log that gives the number of customers we had on each day—that is, the potential number of cars we can sell if we have sufficient inventory—for the past 50 days:

3, 4, 3, 2, 4, 1, 2, 3, 4, 2, 5, 2, 1, 4, 1, 3, 3, 3, 4, 5, 4, 4, 3, 2, 5, 2, 4, 4, 3, 4, 4, 3, 5, 4,
3, 2, 3, 4, 2, 3, 1, 2, 4, 3, 4, 5, 3, 3, 2, 1

As you can see, on some days we have 5 customers. If we start with 3 cars in the inventory on that day, then we lose 2 customers, which translates into a loss of \$1000 as we are making a profit of \$500 for each sale. We believe the market will stay the same way for at least another year.

I have two proposals in my mind that may increase the profit:

1. Proposal 1: a new policy. Make an order to CarSupplier as long as the parking lot is not full.
2. Proposal 2: a larger space. Currently we are paying \$20 per day to rent our parking lot, which has 5 parking spaces. The landlord agrees that we can pay an additional \$15 to rent another 4 parking spaces that are right next to our office. If we go with this proposal, we will have a total number of 9 parking spaces at an expense of \$35 per day. In this case, I will also change my inventory control policy to the following:

If the inventory is 4 or lower at the end of a day, order 5 cars.

The rationale of this policy is that I will always have at least 5 cars available in the beginning of a day. Therefore, I will never lose a customer unless 6 or more customers show up in a day, which rarely happens.

Please evaluate these two proposals and the current practice for us. I want to know whether we are in a good position with our current practice, or we need change. In addition, if a change is needed, which proposal should we go for? Or, can you propose better alternatives?

Sincerely yours,

Layla Nassar, CEO at CarBestBuy

What you should do.

Write a response letter to Ms. Nassar with a short cover letter (not exceeding few lines) and a detailed report. The report should contain (i) an abstract (not exceeding 200 words); (ii) an introduction section describing CarBestBuy problem, your analysis methodology, assumptions, and recommendations for Ms. Nassar in plain English (with no equations, tables or figures), and (iii) various sections showing the details of your analysis (with plenty of equations, tables or figures if necessary). Your report should be double-spaced, font 12, with ample margins, and should not exceed 6 pages. Don't forget page numbers.

Remember: Less is more. Avoid complicated statements that Ms. Nassar is not interested in. Having learned a little about OR at the business school, she's looking for an objective and straightforward answer based on quantitative analysis.

Hints

Daily Demand pmf; Markov chains; Expected daily profit; OR modeling principles and steps; Verification/validation; Hidden costs.

