CLV Assignment

This assignment is an individual assignment.

Refer to the Syllabus for the Due Date

In this assignment, we are tasked to analyze LTV for the case of a company that sells Makeup products through only online channel. We have 4 years of aggregate data of existing customers for a facial moisturizer product. Looking at the aggregate data, we have made a series of assumptions about future customers. These assumptions are for two distinct cases as follows:

Case I) in this case, customers can subscribe for the service of getting the product on a self-specified periods. The company is hoping that doing so can create a better sustainable customer base and hence increase revenues. In doing so, the company plans to offer the product at a discounted price, where the average customer pays $77.99 every six months. However, there are two types of costs for the company. First, the product itself costs on average $22.39 to supply for six months, and there will be marketing costs of $3.99 per six months for the purpose of explaining the benefits of joining the subscription models to a broader consumer base. As part of the subscription benefit, the company offers 50% discount on the delivery cost, where the original delivery cost was $5.99.

There will be, however, some attrition to the pool of subscribers. Looking at the past data, the company believes the attrition for the next 8 periods (4 years of future data where each 6 month is the time period) will follow an exponential decay with a starting value of 5% and a decline rate of $\lambda = 0.08$. This means at any time period t we have the attrition of $a(t) = 0.05 * \exp(-\lambda t)$, where $1 \leq t \leq 8$. Finally, the discount rate for each six months is $\beta = 2\%$.

Q1) Given the above assumptions, calculate the LTV for a customer in a 4-year horizon.

Case II) in this case, the customer might decide not to opt for the product and instead do a one-time purchase, where the six-months revenue for the company is $95.99. There will be no marketing cost as these customers will not be subscribed to service to get periodic marketing activities such as email marketing. Since they will not be subscribed, there is no concept of churn rate. Instead, we have historical data on the probability of re-buying by customers. This probability starts at 45% and it linearly decreases by 3% every six months. The production cost, the original delivery cost and discount rate are mentioned in the previous case.

Q2) Calculate the LTV after 4 years in this scenario where customers do not subscribe to the service.

Q3) How much can the company give discount to subscribers so that the subscription service remains profitable compared to no subscription case?

Q4) Historical data shows that 37% of customers have opted for the subscription service, while the remining have been customers who did not opt for the subscription service. Assuming this trend to follow in future, what would be the average expected LTV of customers for the focal company.

Q5) What other ways do you think the company can use to attract customers to the subscription service beyond giving them a price discount?

Q6) Is there any flaw to the assumptions we made above? Do you think a possible flaw can change the results significantly in reality? For example, a situation where offering no subscription can be the optimal option for the company from a profit standpoint. Please discuss your ideas extensively.

Q7) Can we draw any causality from this assignment? I.e., can we say the following statement: "offering subscription service leads to better profit"? Please explain your answer.

Instructions for the assignment:

You are required to do every part of the numerical analysis in R and to attach the code at the end of each question or combine them and put them at the end of the document. It is always good practice to write all the middle-steps so that a wrong answer can get partial credit based on the resemblance of the approach taken to the correct approach and the efforts made to answer the questions.

Good Luck 😊