

EXAM ASSIGNMENT

Study Programme and level	MSc Business Intelligence				
Term	S16o				
Course name and exam code(s)	Advanced Market Research			460152E039 + 4621020064	
Exam form and duration	Written exam, WOAI			3 hours	
Date and time	8 April 2016			15:00-18:00	
Supplementary material allowed	PC necessary, open book, internet allowed				
Other relevant information					
Hand-in of hand-written material allowed	Yes		No	X	Comments:
Number of pages (incl. front page)	3				

Practical Information

Your exam paper must comply with the following format requirements:

- Your **student ID number** must appear on every page.
- Write **page numbers and total number of pages** on all pages of your paper (e.g. 1 of 15, 2 of 15 and so on).
- Your exam paper **MUST** be handed in as one **PDF** file, but additional material/appendices may be uploaded in other file formats.
- **The file name** must be your student ID number **AND** the name of the exam.

EXERCISE 1 (40%)

You are asked to evaluate a planned retention campaign. The campaign will focus on a selection of 5% of the customers in the existing database consisting of 100.000 customers. The customers for the retention campaign are chosen based upon a prediction model for churn, where the average probability of churning in the selected group of customers is estimated to be 20%.

The company plans to offer an incentive to stay as a customer. The value of the incentive is 20\$. All customers without plans of churning will accept the incentive. Among the customers who plan to churn the company expects that 20% will take the incentive and consequently stay as customers. The costs of contacting a customer is estimated to be 1\$, and the lifetime value of a customer is estimated to be 200\$. The retention campaign is not expected to lead to an increase in lifetime value for the existing customers.

- 1) Is the planned retention campaign a profitable marketing investment?

Assume that it is possible to change the churn rate without changing any of the other factors influencing the profitability of the campaign

- 2) What should be the minimum churn rate in the selected group of customers for the campaign in order to make the campaign profitable? Discuss whether the assumption is questionable?

EXERCISE 2 (40%)

Once a year since 2005 a given conference is held, and the managers of the conference have registered for each of 1975 participants when they attended the conference for the first time, and when they attended in the following years until 2015.

- 1) Why is the BG/BB model an obvious choice for an analysis of a dataset like this? Discuss the assumptions for the BG/BB model.

Based upon the cohort of participants attending the conference for the first time in 2010, we use the BG/BB model to estimate the probability that a conference participant will turn up for the 2016 conference.

The result is shown in the table 1 below:

Number of purchases	Year of last purchase					
	2015	2014	2013	2012	2011	2010
5	0,681					
4	0,681	0,2				
3	0,681	0,304	0,069			
2	0,681	0,371	0,152	0,04		
1	0,681	0,418	0,229	0,108	0,039	
0						0,063

2) Discuss the probability structure in table 1.

Based upon the same cohort, it is also calculated what the number of purchases (conferences to be attended) will be over the customer's lifetime. Results are shown in table 2 below:

Number of purchases	Year of last purchase					
	2015	2014	2013	2012	2011	2010
5	1,362					
4	1,11	0,326				
3	0,857	0,383	0,087			
2	0,604	0,329	0,135	0,035		
1	0,352	0,216	0,118	0,056	0,02	
0						0,009

Expected number of remaining transactions is discounted with an annual rate of 10%

3) Discuss the pattern in table 2.

EXERCISE 3 (20%)

1) You have been asked to comment on the following calculation of Customer Lifetime Value (CLV).

"The acquisition costs for a customer are assumed to be 500\$. The average profit per year is estimated to be 1000\$ for each customer, and the retention rate is estimated to be 75%. Hence, the churn rate is 25%, and the average lifetime is then estimated to be 4 years. CLV is then equal to $1000\$ \times 4 - 500\$ = 3500 \$$ ".

2) Suggest an alternative calculation. State and discuss your assumptions.

Question 1:

We have to use the model for analyzing the economics of a retention campaign (I will use the slide of 9 p 11) (book page 634)

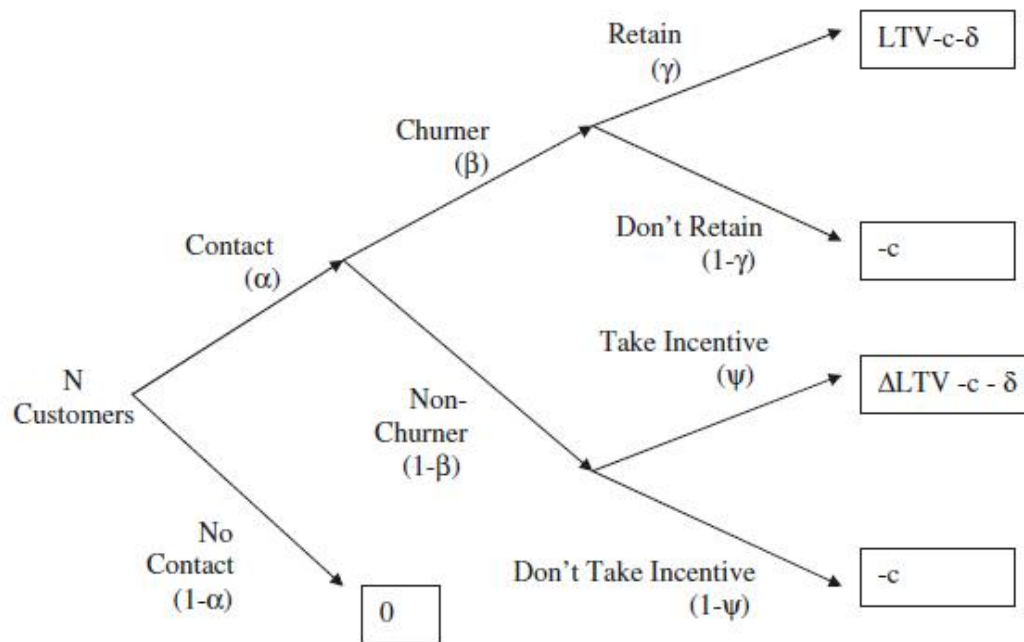


Fig. 24.6 Profitability framework for proactive targeted churn management program.

So the information we have are:

Contact rate = $\alpha = 0.05$

The number of customers with a specific churn rate (predicted churn rate) = $N = 100000$

Churn rate = $\beta = 0.2$

Value of incentive = $\delta = 20 \$$

Take incentive = $\psi = 1$

Retain = $\gamma = 0.2$

Contact cost = $c = 1 \$$

Lifetime Value = $LTV = 200 \$$

Because the retention campaign is not expected to lead to an increase in lifetime value for the existing customers, we have:

$$\Delta = 0$$

1) We can easily calculate the Total Profit for the program (campaign):

Page 635 of book:

$$\begin{aligned}
\Pi &= N\{\alpha\beta\gamma(LVC - c - \delta) + \alpha\beta(1 - \gamma)(-c) + \alpha(1 - \beta)\psi(\Delta LVC - c - \delta) \\
&\quad + \alpha(1 - \beta)(1 - \psi)(-c)\} \\
&= N\alpha\{(\beta\gamma + (1 - \beta)\psi\Delta)LVC - \delta(\beta\gamma + (1 - \beta)\psi) - c\} \quad (24.8)
\end{aligned}$$

So $\Pi = 100000 * 0.05 * \{(0.2 * 0.2 + 0) * 200 - 20(0.2 * 0.2 + (1 - 0.2) * 1) - 1\}$

$= 100000 * 0.05 * \{(0.04) * 200 - 20 * (0.04 + 0.8) - 1\}$

$= 5000 * \{8 - 20 * 0.84 - 1\} = 5000 * (8 - 16.8 - 1) < 0$ (Negative)

So the total profit is negative and the campaign is not profitable.

2) for making the campaign profitable, we can easily calculate the minimum churn rate (β) having the total profit < 0 :

We have to solve the equation :

$$0 > 40 * \beta - 20 + 16 * \beta - 1$$

$$56 * \beta - 21 > 0$$

$B > 3 / 8 = 0.375 \Rightarrow$ we have a β (churn rate) $> 37.5 \%$, instead of 20%

In fact in the above formula (24.8), we have assumed that all customers without plans of churning will accept the incentive ($\Psi = 1$) and also $\Delta = 0$. If we accept that these two assumption are met, we have also must have other assumptions:

For calculating the β , we had: $\beta\gamma LVC - \delta(\beta\gamma + (1 - \beta)) - c > 0$

This leads us to have $\beta * \gamma * (LVC - \delta) > c$

But in reality, increasing the β , decreases the LVC.

Question 2:

1) We can assess the assumptions of BG/BB model for comparison with our case:

1. In BG/BB model, we do not have a contractual settings, so taking a transaction can interpret as a purchase (or hear participating in the conference). What make sense for being active as a customer is participating in the conference.
2. Being active or not active for a customer (attendant) means if she has attended to the conference or not. And we can find it immediately after the attendance (so we have the end of periods as points the customer is dead or still is alive).
3. We have discrete data (at the specific points at the end (or start) a period, and data is participating or not participating, so 0 or 1 (alive or dead).
4. P(alive) for the next period depends only on the recency (if the recency has been occurred at the immediately last period), but expected number of transactions in the next period, depends on both recency (when the last purchase has been occurred) and the number of transactions in the calibration period.

2) We have a five years calibration period (2011 - 2015), for assessing the probabilities of being alive at the end of this calibration period (2016).

The table shows regardless of the number of purchases, the chance of being alive at the start of new period (2016) is the same for all people, given this condition that in the last year of calibration period (2015) the last purchase has been occurred, so in this case, the probability of being alive is not related to the number of transactions in previous years, and it is just related to the recency (with the given condition).

But if we assess the columns (of years) before the last year (of calibration period), we see that with increasing the number of purchases, the probability of being alive at the end of calibration period, decreases (the reason is that we know we do not have any purchase in the next years in the calibration period). So when we have more purchases before the column year (the last year of purchase), and after that we do not have any purchase, it means we already have shown that if we are alive, then we purchase more, so having not purchases in next years (in the period), decreases more the chance of being alive (in comparison with individuals with lower rate of purchases).

The last point is in each row, with increasing the recency, the chance of being alive grows (with making the number of purchases constant).

So we can concluded overall, the most important factor here in the table 1, is recency !!

3) We have a five years calibration period (2011 - 2015), for assessing the expected number of transactions in the customer's lifetime.

At the last year (2015), by increasing the number of transactions in the calibration period, the expected number of transaction for lifetime increases. It is because the last year means the highest recency regardless the number of previous transactions. It means given the condition that we have just recently purchased, then the number of our purchases in the calibration periods is important and then more former purchases, more probability of purchases in the future.

But in the other columns (that we know the last purchase has not occurred in the last year of period), we see by increasing the number of former purchases, at the first the expected number of future purchases increases and then decreases (e.g. 2014). It is because in the high levels of purchase numbers, for a customer that has more purchases in a period, purchases becomes a sign of being alive, and when she does not purchase at the next year(s) of period, the probability of being alive and therefore making more purchases decreases. But in the low levels of number of purchases, purchasing more, shows the increasing in the expected number of purchases in the future.

Also we can see with increasing the recency, the expected number of future purchase grows.

Question 3:

1) First of all here we have assumed that churn rate is constant, while we can assume that "Retention rates will be increasing over time due to the fact that high-churners drop out early in the period". It means churn rate is a function of recency and the number of renewal (contractual) or former transactions, and individuals that have higher churn rates, will be moved sooner, so we have higher churn rates for remained groups. (It means we have heterogeneity in our cohorts regarding the churn rate - referring to article: "Customer Lifetime Valuation to support marketing decision making", F. Robert DWYER).

Furthermore, when we have the churn rate is 0.25, means that 0.25 of current customers will be removed, and we cannot multiply 0.25 into our initial number of customers. So the accuracy of calculations are questionable.

After that we have assumed here that our customers will not come back by repeating their transactions. In fact we have assumed here that we have a contractual setting that our customers will die after not renewing their contracts.

Also we have assumed here that the acquisition cost for all individuals is the same. But the question is if we want to acquire a customer that have purchased already is the same with acquiring a completely new one?

Another point is the discount rate for calculating both the costs of marketing (contacting, acquiring ...) and margins. So we have to notice when (in which period) we have expended the acquisition costs, and when we are supposed to receive the margins. Also receiving margins in the start of periods or at the end of them makes calculations different.

2) We assume that the churn rate is constant. Also we assume that acquisition cost is marketing cost or contract cost for each customer and still is 500 \$ (annually). So the profit margin is 50 %. Also we set the discount rate = 10 %.

According to file "CLV Example", I have calculated the sum of net profit for each customer in her lifetime.

year	survival rate	expected profit	net discounted profit					
1	1.000	500	500			retention rate		0.75
2	0.750	375	341			Revenue if still a customer		1000
3	0.563	281	232			profit margin		0.5
4	0.422	211	158			Gross profit if still a customer		500
5	0.316	158	108			marketin cost		0
6	0.237	119	74			Net Annula Profit		500
7	0.178	89	50			discount rate		0.1
8	0.133	67	34			LTV		2483
-	-	-	-					

So the lifetime value for each customer = LTV = 2483 \$

Note: the book mentioned in the first question is: Database Marketing Analyzing and managing customers (Blattberg)