Marketing Science no.5

In the case of using material, you need to register as an instructor in the following URL: http://www.mktgeng.com/instructor/account/register.cfm

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Price Sensitivity/ Pain of Expenditure (Importance)



Need for Premium Service/Differentiation (Importance)

Targeting

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Which Segments to Serve? -Segment Attractiveness Criteria

Criterion	Examples of Considerations
I. Size and Growth	
1. Size	 Market potential, current market penetration
2. Growth	Past growth forecasts of technology change
II. Structural Characterist	ics
3. Competition	 Barriers to entry, barriers to exit, position of competitors, ability to retaliate
4. Segment saturation	Gaps in the market
5. Protectability	 Patentability of products, barriers to entry
6. Environmental risk	Economic, political, and technological change
III. Product-Market Fit	
7. Fit	Coherence with company's strengths and image
8. Relationships with segments	 Synergy, cost interactions, image transfers, cannibalization
9. Profitability	 Entry costs, margin levels,

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Choice Models for Individual Customer Targeting



Contexts in Which Choice Models are Appropriate

Binary Choice Buy or Not Buy

Multinomial Choice

- Tide, Cheer, Yes, or Wisk
- Yes or No
- Own or Don't ownBush or Kerry
- Bus, Train, or PlaneYes, No, Don't Know
- res, No, Don't know

Choices are mutually exclusive. The customer chooses only one of the options at a given choice occasion.

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Using Choice Models

• Choice Model Inputs

- Past purchases
- Market conditions (prices, etc.)
- Customer attitudes (surveys)
- Etc.

Choice Model Outputs

 Purchase probability or share of requirements BY CUSTOMER

Choice Models vs Surveys

With standard survey methods . . .

preference/		importance		
choice	¢	weights	1	perceptions
Û		Û		Û
predict		observe/ask		observe/ask

Choice models give us...

choice 1 observe	¢	importance weights înfer	perceptions ♪ observe/ask	
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Why Choice Models in Marketing?

- · Ever more data available about choices customers/prospects make. Much of this data is automatically collected (e.g., scanners, web logs).
- · Such data are useful for:
 - Predictive modeling: Usually, an individual's past behavior (choices) is a better predictor of his/her future actions than stated attitudes or intentions. - Generating diagnostics: Identifying the important drivers of customer
 - choices. - Segmenting customers: Grouping customers on the basis of similarities in their choice drivers/process.

Database for BookBinders

Book Club Case

Predict response to a mailing for the book, Art History of Florence, based on the following variables accumulated in the database and the

responses to a test mailing:

Gender
 Amount purchased
 Months since first purchase
 Months since last purchase
 Frequency of purchase
 Past purchases of art books
 Past purchases of children's books
 Past purchases of Children's books
 Past purchases of Divoks

Past purchases of DIY books Past purchases of youth books

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Using Choice Models for Customer Targeting

Step 1	Create database of customer responses (choices) based either on test mailing to a sample of prospects/customers, or historical data of past customer purchases.
Step 2	Use models such as regression , RFM , and Logit to assess the impact of independent variables (drivers) of customer response.
Step 3	Score each customer/prospect based on the drivers identified inStep 2 - the higher the score, the more likely is the predicted response.
Step 4	Classify customers into deciles (or smaller groupings) based on their scores.
Step 5	Based on profitability analyses, determine the top deciles to which a marketing action (e.g., mailing of brochure) will be targeted.

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Drivers of the RFM Model (independent variables)





Step 1

Computing Scores Using RFM Model

Assign score to R, F, and M based on past experience.

Recency		
Last purchased in the past 3 months		25 points
Last purchased in the past 3 - 6 months		20
Last purchased in the past 6 - 9 months		10
Last purchased in the past 12 - 18 months	5	
Last purchased in the past 18 months		0

Come up with similar "scoring rules" for Frequency and Monetary (Implement as Nested If Statements in Excel).

<u>RFM score for a customer = R score + F score + M score</u>



Computing Scores Based on Regression

 $\begin{array}{l} \mbox{Regression model to predict probability of purchase:} \\ \mbox{P}_{ij} = w_o + \Sigma w_k b_{ijk} + \epsilon_{ij} \qquad ...(1) \end{array}$

where \textbf{P}_{ij} is the probability that individual i will choose alternative j,

 \bm{w}_k is the regression coefficient for the k^{th} variable (e.g., Gender) and

 \bm{b}_{ijk} are values of the kth variable for the ith individual and jth choice alternative.

(Note that P_{ij} computed in this manner need not necessarily lie between 0 and 1.)

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The Logit Model

The objective of the model is

to <u>predict **the probabilities**</u> that the individual will choose each of several choice alternatives. The model has the following properties:

- The probabilities lie between 0 and 1, and sum to 1.
- The model is consistent with the proposition that customers pick the choice alternative that offers them the highest utility on a purchase occasion, but the utility has a random component that varies from one purchase occasion to the next.
- The model has the proportional draw property -- each choice alternative draws from other choice alternatives in proportion to their utility.

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Logit Model of Response to Direct Mail

Probability of behavior

= responding to

function of (past response, marketing effort, direct mail, characteristics of customers) Step 2

Technical Specification of the Multinomial Logit Model

Individual i's probability of choosing brand 1 or choice alternative 1 (P_{i1}) is given by:

$$\mathbf{P_{i1}} = \frac{\mathbf{e}^{\mathbf{A}_{i1}}}{\sum_{j} \mathbf{e}^{\mathbf{A}_{ij}}} \dots (2)$$

where A_{ij} is the "attractiveness" of alternative j to customer i = $\sum w_k b_{ijk}$

 ${\bf b}_{jk}$ is the value (observed or measured) of variable k (e.g., Gender) for alternative j when customer i made a purchase.

 \bm{w}_k is the importance weight associated with variable k (estimated by the model). Similar equations can be specified for the probabilities that customer i will choose other alternatives.

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Technical Specification of the Multinomial Logit Model

On each purchase occasion, the **(unobserved) utility** that customer i gets from alternative j is given by:

$$\mathbf{U}_{ij} = \mathbf{A}_{ij} + \boldsymbol{\varepsilon}_{ij} \qquad \dots (3)$$

<u>where</u> ε_{ii} is an error term.

Notice that utility is the sum of an observable term (A_{ii}) and an unobservable term (ϵ_{ii}) .

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Example: Choosing Among Three Brands

Brand	Performance	b _{ijk} Quality	Variety	Value	
Α	0.7	0.5	0.7	0.7	
в	0.3	0.4	0.2	0.	
С	0.6	0.8	0.7	0.4	
D (new)	0.6	0.4	0.8	0.5	
Estimated Importand Weight (w	ce / _k) 2.0	1.7	1.3	2.2	



Step 2

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Basic Idea:

belongs.

Example Computations

	(a)	(b)	(c)	(d)	(e)
Brand	$A_{ij} = w_k b_{ijk}$	e ^A ij	Share estimate without new brand	Share estimate with new brand	Draw (c)–(d)
Α	4.70	109.9	0.512	0.407	0.105
в	3.30	27.1	0.126	0.100	0.026
с	4.35	77.5	0.362	0.287	0.075
D	4.02	55.7		0.206	

Segmentation in Choice Models

Using Latent Class Analysis

The population of customers consists of several segments, and the

values of the variables of interest (e.g., Gender, Amount purchase)

 $\sum_{k} w_{ks} b_{ijk}$

...(5)

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are imperfect indicators of the segment to which a customer

Operationally, this means that the weights (w's) of the choice

 $(P_{ij} / i \text{ belongs to segment } s) = \frac{e^{\sum_{k}^{k} \sum_{j \in \mathcal{N}} y_{k}}}{\sum_{k} e^{\sum_{k}^{k} w_{k} h_{ijk}}}$

model in (2) differ across segments, but $\underline{\text{the segments}}$ are

unknown (latent) and have to inferred from the data.

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Step 2

Segmentation in Choice Models Using Latent Class Analysis

- The latent class segmentation model is implemented in the Marketing Engineering software using the EM (Expectation Maximization) algorithm.
- As in the traditional cluster analysis model, specify a different number of segments, and see which specification makes the most sense. Use the AIC or BIC criterion to help statistically determine the number of segments in the data set.
- For the BookBinders case, only the one-segment solution makes sense.

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Compute Choice Scores (Probability of Purchase)

RFM Model:

Step 3

Use computed score as an index of the probability of purchase.

- Regression: Score (for respondent i) = $\hat{w}_0 + \sum_k \hat{w}_k b_{ijk}$
- Logit: Customer i's score (probabili ty) = $\frac{e^{\hat{w}_0 + \sum \hat{w}_k b_{ijk}}}{1 + e^{\hat{w}_0 + \sum \hat{w}_k b_{ijk}}}$

 $\hat{\psi}$'s are weights estimated by the Regression or Logit models. RFM and Regression models can be implemented in Excel. Also, all three scoring procedures for "probability of purchase" can be implemented in Excel.

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Score Customers for their Potential Profitability (Example)

	A	В	с	D
Customer	Score (Purchase Probability)	Average Purchase Volume	Margin	Customer Expected \$ = A ´ B ´ C
1	30%	\$31.00	0.70	6.51
2	2%	\$143.00	0.60	1.72
3	10%	\$54.00	0.67	3.62
4	5%	\$88.00	0.62	2.73
5	60%	\$20.00	0.58	6.96
6	22%	\$60.00	0.47	6.20
7	11%	\$77.00	0.38	3.22
8	13%	\$39.00	0.66	3.35
9	1%	\$184.00	0.56	1.03
10	4%	\$72.00	0.65	1.87

Average expected purchase per customer = \$3.72



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Decile Classification

- Standard Assessment Method
 - Apply the results of approach and calculate the "score" of each individual (calibration vs test sample)
 - Order the customers based on "score" from the highest to the lowest
 - Divide into deciles
 - _ Calculate/graph hit rate and profit

	Decile1	Customer 1 Customer 2 Customer 230	Score 1.00 Score 0.99 Score 0.92
[Decile10	Customer 2300	Score 0.00

Step 4

Step 5

100%

80%

40%

2 3 4 5 6 7 8 9 10

1

lative Hit Rate 60%

Ē 20%

Decile Classification Example

Decile	Customer(s)	\$
1	5	6.96
2	1	6.51
3	6	6.20
4	3	3.62
5	8	3.35
6	7	3.22
7	4	2.73
8	10	1.87
9	2	1.72
10	9	1.03

If the marketing cost to reach a customer is \$3, at what decile will you will stop your targeting effort? How is this targeting plan different from one based on average purchases of customers (\$3.72)?

Choosing the Model and Rule

📥 Hit Rate

- Profit

Decile

25,000

20,000 😙

15,000

10.000

5,000

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Random Hi

Random Prot



Determine Targeting Plan

(Example shows potential profitability of mailing to the top 6 deciles)

Model	Number of hits (favorable responses at 60 th percentile of ordered scores)	Expected response rate by mailing the top 60% of customers in the ordered list	% of favorable respondents recovered at 60 th percentile
RFM			
Regression			
MNL			

Compute profit/ROI for the models based on the number of mailings recommended by each model and compare that to mailing to the entire list (equivalently to a randomly selected list of the same size).

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Attributes in ABB's **Choice-Segmentation Model**

. Invoice price

- Energy losses
- . Overall product quality
- Availability of spare parts
- Clarity of bid document
- Knowledgeable salespeople .
- Maintenance requirement
- Ease of installation
- Warranty .

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Applying Choice Models in **Customer Targeting at ABB**

Key idea: Segment on the basis of probability of choice-

- 1. Loyal to us
- 2. Loyal to competitor—BZ customers
- 3. Switchables: loseable/winnable customers

Switchability Segmentation

Loyal to Us	Losable
Winnable Customers (business to gain)	Loyal to Competitor

Current Product-Market by Switchability (ABB Procedure)

Questions: Where should your marketing efforts be focused? How can you segment the market this way? MESegmentation and Targeting 2006 - 31