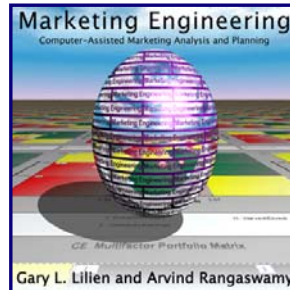


## Marketing Science no.3

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Response-1

## Marketing Science No.3 Market Response Modeling



Response  
Modeling  
Basics

Response-2

## Response Models

1. Aggregate response models(continued)
2. Individual response models
3. Shared-experience models
4. Qualitative response models

Response-3

## Aggregate Response Models: Multiple Instruments

Additive model for handling multiple marketing instruments

$$Y = af(X_1) + bg(X_2)$$

Easy to estimate using linear regression.

Response-4

## Aggregate Response Models: Multiple Instruments (cont'd)

How interactions are to be handled.

- (1) by assuming they do not exist
- (2) by assuming they are multiplicative
- (3) by assuming they are multiplicative & additive

Response-5

## Aggregate Response Models: Multiple Instruments (cont'd)

Multiplicative model for handling multiple marketing instruments

$$Y = aX_1^b X_2^c$$

$b$  and  $c$  are elasticities.

Widely used in marketing.

Can be estimated by linear regression.

Response-6

## Dynamic Effects

Response to marketing actions will continue in a **diminished way**.

For example, many customers purchase more than they can consume of a product during a short-term price promotion.

This action leads to **inventory buildup** in Carryover effects.

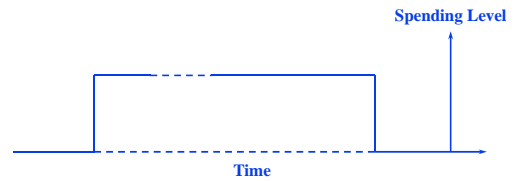
The followings are some types of dynamic marketing responses summarized by Saunders (1989).

- Delayed-response effect
- Customer-holdover effect
- Customer retention rate & customer decay rate
- Hysteresis
- New trier effects
- Stocking effects

Response-7

## Dynamic Effects

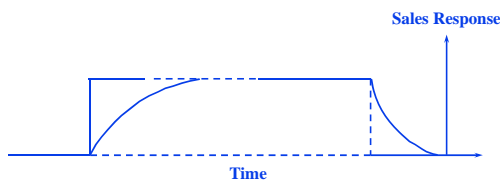
1. Marketing Effort  
eg, sales promotion



Response-8

## Dynamic Effects

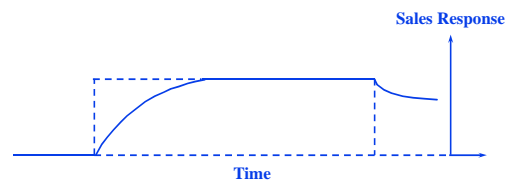
2. Conventional "delayed response" and "customer holdout" effects



Response-9

## Dynamic Effects

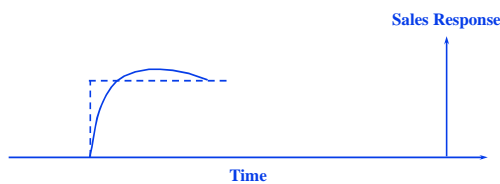
3. "Hysteresis" effect



Response-10

## Dynamic Effects

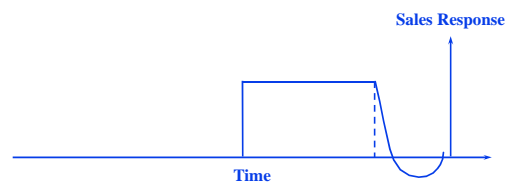
4. "New trier" "wear out" effect



Response-11

## Dynamic Effects

5. "Stocking" effect



Response-12

## Aggregate Response Models: Dynamics

Dynamic response model

$$Y_t = a_0 + a_1 X_t + \lambda Y_{t-1}$$



Easy to estimate.

Response-13

## Market-share Models and Competitive Effects

Brand sales models (Y)

Product class sales models (V)

Market-share models (M)

$$Y = M * V.$$

Response-14

## Aggregate Response Models: Market Share

Market share (attraction) models

$$M_i = \frac{A_i}{A_1 + A_2 + \dots + A_n}$$

$A_i$  = attractiveness of brand  $i$ .

It satisfies sum (market shares sum to 1.0) and range constraints (brand share is between 0.0 and 1.0)

It has “proportional draw” property.

Response-15

## “proportional draw” property

Example on page 43

Response-16

## Individual-Level Response Models: Requirements

### The Individual-Level Response Model

1. It satisfies **sum and range constraints**.
2. It is consistent with the “**random utility**” model.
3. It has the “**proportional draw**” property.
4. It **widely used in marketing**.

Response-17

## Individual-Level Response Models MNL

Multinomial logit model to represent “**probability of choice**.”  
The individual's probability of choosing brand 1 is:

$$P_{i1} = \frac{e^{A_1}}{\sum_j e^{A_j}}$$

where  $A_j = \sum_k w_k b_{jk}$

Response-18

## Derivative of $P_{il}$ as a function of $b_{ijk}$

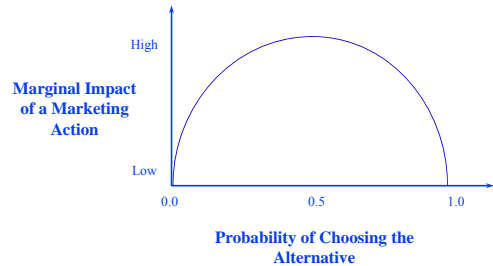
The derivative of  $P_{il}$  as a function of  $b_{ilk}$  is:

$$\frac{dP_{il}}{db_{ilk}} = w_k P_{il}^* (1 - P_{il}^*)$$

where  $P_{il}^*$  is the predicted probability of choosing brand 1 in the current choice set given the logit model.

Response-19

## Logit Model Implications . . .



Response-20

## Attribute Ratings per Store: $b_{jk}$

Store (j)	Variety	Quality	Parking for Money	Value
1	0.7	0.5	0.7	0.7
2	0.3	0.4	0.2	0.8
3	0.6	0.8	0.7	0.4
4 (new)	0.6	0.4	0.8	0.5
Importance Weight: $w_k$	2.0	1.7	1.3	2.2

Response-21

## Shares per Store

	(a)	(b)	(c) Share estimate without new store	(d) Share estimate with new store	(e) Draw (c)-(d)
Store $A_j = \sum w_k b_{jk} \exp(A_j)$					
1	4.70	109.9	0.512	0.407	0.105
2	3.30	27.1	0.126	0.100	0.026
3	4.35	77.5	0.362	0.287	0.075
4	4.02	55.7		0.206	

Response-22

## Shared Experience Models

The response model on behavior observed at other leading firms:

- Advisor model
- PIMS (Profit Impact of Marketing strategy) model

Response-23

## Qualitative Response Models

Rules to capture **qualitative response**:

The retailer will accept the trade deal, but what he does with it is based on coop advertising dollars.

If the deal includes coop money, the retailer will accept the deal and pass on all of the discount to the consumer.

If the discount is greater than 30 percent, he will put up a big display. Otherwise, the retailer leaves the item at regular price and does not use an ad feature or a display

Response-24

## Choosing and Evaluating A Marketing Response Model

The **model forms** we have described present a number of **trade-offs**.

Each is good in some situations and for some purposes. We need to consider the model's use. Although a number of **criteria** are **useful in selecting a model**, here are four **we suggest** that apply **specifically to response models**:

- Model specification
- Model calibration
- Model validity and value
- Model usability

Response-25

## Model specification

- Does the model include the right variables to represent the decision situation?
- Are the variables, as represented, **managerially actionable**?
- Does the model incorporate the expected behavior of individual variables?  
(e.g. diminishing returns, carryover effects, or threshold effects).
- Does the model incorporate the expected relationships between variables?  
(e.g. patterns of substitutability and complementarity).

Response-26

## Model calibration

Can the model be calibrated by using **data from managerial judgment**, or **historical data**, or **through experimentation**?

Response-27

## Examples of Model Selection

### 1. R-square

Definition

(Sum of squared differences between actual Y' s and estimated Y' s)

$$R^{*2} = 1 - \frac{\text{(Sum of squared differences between Y's and the average value of Y)}}{\text{(Sum of squared differences between actual Y' s and estimated Y' s)}}$$

### 2. Model selection criterion

AIC, BIC, CAIC

Response-28

## Model Validity and Value

- Does the level of detail in the model match that in the available data?
- Does the model reproduce the current market environment reasonably accurately?
- Does the model provide **value-in-use** to the user?
- Does the model represent the phenomenon of interest accurately and completely?

Response-29

## Model Usability

- Is the model **easy to use**?  
(E.g., is it simple, does it convey results in an understandable manner, and does it permit users to control its operation?)
- Is the model as implemented **easy to understand**?
- Does the model give managers guidance that makes sense?

Response-30

## SUMMARY

- A very brief **overview** of **market response** models and the toolkit for marketing engineering
- Many **concepts** and the **related vocabulary**,
- Definition, classification**, and details of some simple, **commonly used response models**
- Outline** of how you can **calibrate** them, what criteria are most appropriate to use as model objectives, and how you can **best select a model**

Response-31