Market Response Models
and
Demand Creation

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UCLA Anderson School of Management and
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Overview

- What is marketing?
- Research traditions
- Building brands
- Growing customer equity
Natural Evolution of Business

- Production orientation
- Sales orientation
- Market orientation: new challenges
- **STP**
  - segmentation
  - targeting
  - positioning

- **Marketing Mix**
  - product
  - pricing
  - distribution
  - communications

- **Building customer equity & brand equity**
Academic Research Support

- **Customer Behavior**
  - Cognitive, social psychology
  - Behavioral decision theory

- **Marketing Science**
  - Analytical models (economics, mgmt science)
  - Empirical models (econometrics, stochastic models)
How important is marketing?

- PIMS studies:
  - \[ \text{ROI} = f(\text{marketing}, \text{cost factors}) \]
  - \[ R^2 = 85 \% \]

- From US and UK focus to global focus
Performance Improvement is called for

- Half of advertising does not work
- 85% of promotions lose money
- Up to 80% of new products fail
- Clio award winners do not perform better
- Spending escalations prevail
- Cost plus pricing still rules
The New Marketing Strategy

- Importance of Marketing Investments
- Need for a Market Response focus
- Digital data enriched, 1-on-1 marketing
- Marketing Science approach
  - statistics, econometrics, data mining
  - resource allocation prescriptions
  - long-term strategic view
Serving a dual purpose

- Building brand equity
  - difference between products and brands
  - give customers a reason *not* to shop

- Growing customer equity
  - difference between first-time and repeat buying
  - asymmetry between acquisition and retention costs

- In both cases, long-term effects are essential
I. Focus on the brand
Market Response Principles

- Sales response curves are concave or S-shaped
- Elasticities are good response metrics
- Most models are short run or cross-sectional
- VAR models offer systems approach, with long-term effects
Short-term Empirical Generalizations

- Price elasticity is -2.5
- Distribution response is S-shaped, elasticities are high
- Sales force elasticity is 0.5
- Quality elasticity is 0.4
- Promotion elasticity is 4 to 12
- Advertising elasticity is 0.1
- Life cycles: $p=0.01$, $q=0.5$
Sources of long-term marketing effects

- Immediate effect
- Carry-over effects
- Feedback effects
- Purchase reinforcement effects
- Decision rules in the firm
- Competitive reactions
Long-term Effects?

- Unlikely for price and sales force due to competitive matching
- Distribution: yes
- Quality: yes, except in high-technology
- LR Promotion elasticity is 0
- LR Advertising elasticity = 2 * SR
Illustration:
Short and Long-Term Sales Effects of Price Promotions
(VAR methodology)

- average SR elasticity: 3.944
- average LR elasticity: 0.046
Conclusions

- Most marketing-mix effects are realized in the short run
- Little evidence of hysteresis
- Brand building opportunity resides mostly in sustained quality, innovation, distribution and advertising (weaker)
- Thus brand building is expensive
Are brands worth the sustained marketing investment?

- Research opportunity: compare branded and generic products across various categories (Ailawadi et al., JM, October 2003)
- Branded products enjoy a positive revenue premium: \( \text{premium} = \text{vol}_b \cdot \text{price}_b - \text{vol}_g \cdot \text{price}_g \)
- Source of premium: higher market share, lower price elasticity
II. Focus on the customer

based on joint research with Shijin Yoo,

*Singapore Management University*
Contrasting Domains and Metrics

- **Product marketing (PM):** sales volume and revenue, market share, brand equity, product prices and margins, marketing mix spending, profitability
- Comes from the world of mass marketing
- **Relationship marketing (RM):** customer acquisition, retention rates, cross-selling, lifetime value, customer equity, offer
- Comes from the world of direct marketing
PM/RM focus differs by industry

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Contractual</th>
<th>Non-Contractual</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marketing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>Time magazine subscription renewals from promotion calls</td>
<td>Dell computer purchases from email promotions</td>
</tr>
<tr>
<td>Mass</td>
<td>Netflix.com new membership purchases from banner ads</td>
<td>Toyota car purchases from TV ads</td>
</tr>
</tbody>
</table>

\[ CE_t(a_t, r_t) = f(\text{marketing mix}^t) \]
CE: why hard to measure in PM environment?

\[ CE = am - A + a \left( m - \frac{R}{r} \right) \frac{r}{1 + \delta - r} \]

(Blattberg and Deighton 1996)

Acquisition spending \((A)\)
Retention spending \((R)\)
Contribution margin \((m)\)
Discount factor \((\delta)\)

Acquisition rate \((a)\) \(\equiv\) \(\frac{\# \text{ prospects acquired}}{\# \text{ prospects}}\)
Retention rate \((r)\) \(\equiv\) \(\frac{\# \text{ customers retained}}{\# \text{ customers}}\)
How do marketing mix efforts influence acquisition and retention rates, and thereby CE in product marketing environment?

Is marketing mix impact on CE different from its impact on sales?

Is there any difference between these effects in the short-run vs. the long-run?
What is CE for a product marketer?

- The trick is to distinguish sales to existing customers vs. sales to new customers.
- Also, competitor sales come from either lost customers or lost prospects.
- These distinctions map product sales into acquisition and retention.
Acquisition rate vs. Retention rate

\[ a_t = \frac{N_t^{AP}}{N_{t-1}^P} = \frac{N_t^{AP}}{N_t^{PRO}} \cdot \frac{N_t^{PRO}}{N_t^P} = \frac{S_t^{AP}}{S_t^{PRO}} \cdot \frac{q_t^{AP}}{q_t^{PRO}} \cdot \frac{N_t^{PRO}}{N_t^P} \]

\[ r_t = \frac{N_t^{RC}}{N_{t-1}^C} = \frac{N_t^{RC}}{N_t^{CUS}} \cdot \frac{N_t^{CUS}}{N_t^C} = \frac{S_t^{RC}}{S_t^{CUS}} \cdot \frac{q_t^{RC}}{q_t^{CUS}} \cdot \frac{N_t^{CUS}}{N_t^C} \]
Switching Matrix

<table>
<thead>
<tr>
<th>Customers</th>
<th>t</th>
<th>Prospects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained customers $S_{t}^{RC}$</td>
<td>Lost customers $S_{t}^{LC}$</td>
<td></td>
</tr>
<tr>
<td>Acquired prospects ($= \text{New customers}$) $S_{t}^{AP}$</td>
<td>Lost Prospects $S_{t}^{LP}$</td>
<td></td>
</tr>
</tbody>
</table>

→ Retention $\frac{S^{RC}}{S^{RC} + S^{LC}}$

→ Acquisition $\frac{S^{AP}}{S^{AP} + S^{LP}}$
Now include marketing spending

Marketing mix impacts on...

- retention
- acquisition

Own Sales
- Sales from existing customers
- Sales from new customers

Competitors’ Sales
- Sales from lost customers
- Sales from lost prospects
Model

\[
\begin{pmatrix}
    a_t \\
    r_t \\
    x_t^o \\
    x_t^c
\end{pmatrix} =
\begin{pmatrix}
    C^a \\
    C^r \\
    C^x^o \\
    C^x^c
\end{pmatrix} + \sum_{l=1}^{p} \begin{pmatrix}
    \phi_{11}^l \\
    \phi_{21}^l \\
    \phi_{31}^l \\
    \phi_{41}^l
\end{pmatrix} + \sum_{k=0}^{q} \Theta^q Z_{t-k} + \begin{pmatrix}
    \varepsilon_t^a \\
    \varepsilon_t^r \\
    \varepsilon_t^{x^o} \\
    \varepsilon_t^{x^c}
\end{pmatrix}
\]

- **WOM effect**
- **Direct effect**
- **Competitive effect**
- **Feedback effect**
- **Competitive reaction & Company’s decision rules**

\[
IRF(j \mid x \rightarrow y) = E\left[y_{t+j} \mid x_t = E(x_t) + \delta\right] - E\left[y_{t+j} \mid x_t = E(x_t)\right]
\]
Automobile Data Example

- Weekly transaction and marketing mix data of luxury segment in automobile industry from JDPA
  - Observation period: 1/10/99~6/30/02 (182 weeks)
  - 26 PIN markets
  - 9 of 12 brands (93% of 500K transactions): Acura, Audi, Benz, BMW, Cadillac, Infiniti, Lexus, Lincoln, Volvo
  - Trade-in model information
  - Vehicle price, consumer rebates, and APR

- Monthly advertising data from CMR
  - Virtually all media including print, TV, radio, and outdoor
  - Manufacturer ad + dealer ad
## Sample Data

<table>
<thead>
<tr>
<th>Trade-in Brands</th>
<th>wk1</th>
<th>wk2</th>
<th>wk3</th>
<th>...</th>
<th>wk182</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acura</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>...</td>
<td>40</td>
</tr>
<tr>
<td>Audi</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>...</td>
<td>2</td>
</tr>
<tr>
<td>BMW</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>...</td>
<td>4</td>
</tr>
<tr>
<td>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ford</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>...</td>
<td>4</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td>35,100</td>
<td>35,100</td>
<td>36,200</td>
<td>...</td>
<td>38,400</td>
</tr>
<tr>
<td><strong>Rebate</strong></td>
<td>2,000</td>
<td>0</td>
<td>1,000</td>
<td>...</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>APR</strong></td>
<td>7.5%</td>
<td>4.6%</td>
<td>8.5%</td>
<td>...</td>
<td>7.1%</td>
</tr>
<tr>
<td><strong>AD spending</strong></td>
<td>3,500K</td>
<td>3,500K</td>
<td>3,800K</td>
<td>...</td>
<td>4,000K</td>
</tr>
</tbody>
</table>
Variables

- **Endogenous Variables**
  - Retention rate and acquisition rate
  - Discount index \( f(\text{price, rebate, APR}) \)
  - Advertising spending
  - Competitive discounting / advertising

- **Exogenous Variables**
  - Constant and Trend
  - Seasonal Dummy: Labor Day, Memorial Day, End of each quarter (Pauwels et al. 2003)
  - **New product introduction**: step dummy
  - Product quality and customer satisfaction
    - APEAL (Automotive Performance Execution And Layout)
    - IQS (Initial Quality Study)
    - VDI (Vehicle Durability Index)
Case study: Acura vs. Lincoln

Total Sales

- **Acura**
- **Lincoln**
Sales Decomposition

Sales from existing customers

Sales from prospects

Acura
Lincoln
CE Metrics

Retention rate

Acquisition rate

Acura
Lincoln
## Impact of Marketing Mix on CE

<table>
<thead>
<tr>
<th>Discounting</th>
<th>Sales</th>
<th>Retention Rate</th>
<th>Acquisition Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ST</td>
<td>LT</td>
<td>ST</td>
</tr>
<tr>
<td>Acura</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Lincoln</td>
<td>2.10</td>
<td>0.00</td>
<td>-0.91</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advertising</th>
<th>Sales</th>
<th>Retention Rate</th>
<th>Acquisition Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ST</td>
<td>LT</td>
<td>ST</td>
</tr>
<tr>
<td>Acura</td>
<td>0.17</td>
<td>0.00</td>
<td>-0.48</td>
</tr>
<tr>
<td>Lincoln</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
</tr>
</tbody>
</table>
Acura (Hysteresis)

### Status Quo

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>4 Weeks later</th>
<th>1 Year later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Customers</td>
<td>87,000</td>
<td>87,209</td>
<td>89,554</td>
</tr>
<tr>
<td>Profit</td>
<td>1,265,162</td>
<td>1,266,776</td>
<td>1,281,190</td>
</tr>
<tr>
<td>Customer Equity</td>
<td>561,735,680</td>
<td>562,207,732</td>
<td>567,483,558</td>
</tr>
</tbody>
</table>

### Marketing Intervention ($2,000 extra discount)

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>4 Weeks later</th>
<th>1 Year later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Customers</td>
<td>86,982</td>
<td>87,169</td>
<td>89,755</td>
</tr>
<tr>
<td>% of Status Quo</td>
<td>99.98%</td>
<td>99.95%</td>
<td>100.22%</td>
</tr>
<tr>
<td>Profit</td>
<td>277,732</td>
<td>1,280,712</td>
<td>1,296,524</td>
</tr>
<tr>
<td>% of Status Quo</td>
<td>21.95%</td>
<td>101.10%</td>
<td>101.20%</td>
</tr>
<tr>
<td>Customer Equity</td>
<td>567,916,404</td>
<td>568,982,982</td>
<td>574,470,488</td>
</tr>
<tr>
<td>% of Status Quo</td>
<td>101.10%</td>
<td>101.21%</td>
<td>101.23%</td>
</tr>
</tbody>
</table>
### Numerical Illustration

**Lincoln (Escalation)**

<table>
<thead>
<tr>
<th>Status Quo</th>
<th>Current</th>
<th>4 Weeks later</th>
<th>1 Year later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Customers</td>
<td>50,762</td>
<td>50,452</td>
<td>47,081</td>
</tr>
<tr>
<td>Profit</td>
<td>473,532</td>
<td>472,119</td>
<td>459,842</td>
</tr>
<tr>
<td>Customer Equity</td>
<td>193,131,746</td>
<td>192,833,691</td>
<td>189,591,654</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marketing Intervention ($2,000 extra discount)</th>
<th>Current</th>
<th>4 Weeks later</th>
<th>1 Year later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Customers</td>
<td>50,762</td>
<td>50,512</td>
<td>47,087</td>
</tr>
<tr>
<td>% of Status Quo</td>
<td>100.00%</td>
<td>100.12%</td>
<td>100.01%</td>
</tr>
<tr>
<td>Profit</td>
<td>121,454</td>
<td>272,211</td>
<td>218,799</td>
</tr>
<tr>
<td>% of Status Quo</td>
<td>25.65%</td>
<td>57.66%</td>
<td>47.58%</td>
</tr>
<tr>
<td>Customer Equity</td>
<td>75,835,987</td>
<td>75,565,550</td>
<td>87,516,407</td>
</tr>
<tr>
<td>% of Status Quo</td>
<td>39.27%</td>
<td>39.19%</td>
<td>46.16%</td>
</tr>
</tbody>
</table>
Conclusions

- Marketing mix effects are different in the sales domain and the CE domain, both in the short run and in the long run.

- On average,
  - Advertising and discounting affect sales.
  - Discounting does not increase customer equity in the long-run.
  - Advertising does not affect retention rate, but it has a positive impact on acquisition rate in the long-run.

- Higher-quality brands are more acquisition effective in their marketing, and lower-quality brands are more retention effective.
III. Overall Conclusions
As economies develop, a market orientation becomes more important for firms.

Marketing is about building brand equity and customer equity.

A good academic resource base is already in place, and growing.

Marketing practice is being challenged.

Rigorous research on good data can be managerially relevant.

and, of course,

The internet changes everything.
References


- [www.anderson.ucla.edu/faculty/dominique.hanssens](http://www.anderson.ucla.edu/faculty/dominique.hanssens)