Introducing the Right Financial Product to the Right Customer at the Right Time

An Empirical Analysis of Customized and Dynamic Cross-Selling Campaigns

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Outline

- Lifetime Value (LTV) in the context of CRM
  - Problem Statement and Recent Work
  - Formulating a LTV model
- Motivating the Model
- Proposed Methodology
- Dynamic Models for Computing Lifetime Value
- Discussion

Problem Statement

- Relate how current marketing actions impact future consumer behavior.
- Goal to better allocate marketing expenditures to yield the best long-term returns
- Potential Uses:
  - Identify clients that may become profitable in the future but are currently not targeted because their accounts are small
  - Measure the return on investment of marketing expenditures

LTV provides a metric for CRM

Current Cross-selling Practice

- Campaign-centric cross-selling
  - A budget, a time, a channel
  - Segmentation analysis to identify customers with highest response rates or profits
  - Send out the campaign
  - Measure its effectiveness by response rate
- The response rate is typically lower than 5%

Recent Work on Customer Lifetime Value

Customer Lifetime Value as a Metric for Customer Relationship Management

Boulding, Staelin, Ehret, and Johnston
(2005; *Journal of Marketing*,
"A Customer Relationship Management Roadmap")

What is known about CRM?

- CRM is the outcome of the continuing evolution and integration of marketing ideas and newly available data, technologies, and organizational forms
- The field of CRM has begun to converge on a common definition
- Companies have developed proven CRM practices that enhance firm performance
- Holding fixed the level of CRM investment, the effectiveness of CRM activities depends on how CRM is integrated with the firm's (a) existing processes and (b) preexisting capabilities
- Effective CRM implementation does not necessarily require sophisticated analyses, concepts, or technology
- The core of CRM is the concept of dual creation of value.

Potential Pitfalls and Unknowns in CRM Implementation

- The successful implementation of CRM requires that firms carefully consider issues of consumer trust and privacy
- The successful implementation of CRM requires that firms carefully consider issues of consumer fairness
- Inappropriate and incomplete use of CRM metrics can put the firm at risk of developing core rigidities, thus leading to long-term failure
- Successful implementation of CRM requires that firms incorporate knowledge about competition and competitive reaction into CRM processes
- Effective CRM implementation requires coordination of channels, technologies, customers, and employees

Method Issues for Further CRM Research

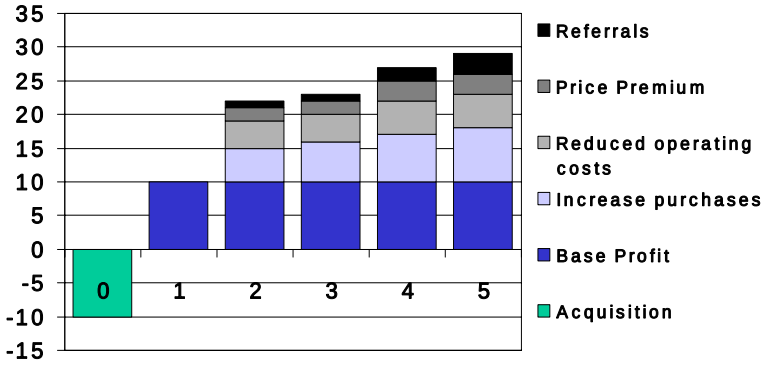
- CRM research should focus on the interaction among subprocesses or the interaction among processes, not total CRM systems
- CRM research should have the appropriate measures available for the desired insights
- Research should provide conclusive evidence with respect to the causal effects of CRM activities
- Research should acknowledge that firms do not choose CRM activities in the abstract; instead, they choose these activities on the basis of market response to these activities along with other factors, such as particular firm skills and capabilities
- CRM research should suitably address potential heterogeneity in customer behavior
- The research results should generalize rather than be idiosyncratic to the chosen research domain.

Calculating Lifetime Value

Calculating Lifetime Value

- Determining customer value involves identifying the cash flows received from a client, the cash outflows needed to establish and maintain the relationship, and the duration of the relationship.
- Inflows:
  - Number of transactions per period
  - Profit on those transactions
- Outflows
  - Acquisition costs
  - Development and retention costs
- The time horizon is long-term → cash flows are discounted.

An Idealized Example of Lifetime Value



Motivating Lifetime Value Analysis

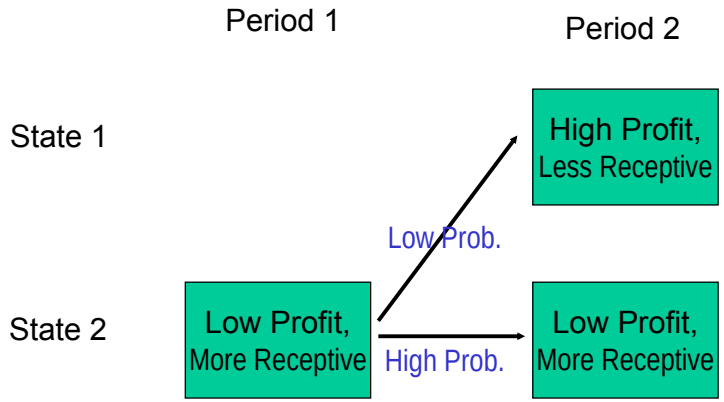
Methodology

- Develop a segmentation scheme so that the segments may reflect:
  - Life cycle status: young versus old, affluent versus mass
  - Product usage: heavy versus light, borrower or saver
  - Profit/Usage Segments: high versus low profit consumers
- Predict transitions between segments using client information and/or marketing campaign targeting

Motivation

- Acquire customers early in their lifecycles when they are more receptive and less costly to acquire
- Example
  - Consumers who have deposits are more likely to take out loans
  - Strategically target consumers who appear to be underutilized to increase long-term value
  - Problem: Avoid allocating dollars from effective promotions to less effective long-term gains. Must have a reliable method for estimating customer value.

Example



Segmentation Switching Patterns

Using Demographic/Lifestyle Patterns to Identify Changes

Segment: Lifestyle Profiles

1	The Wealth Market	15	Affluent Beginnings	29	Striving Young Metros
2	The Affluent Retired	16	Affluent Renters	30	Lower Middle Metro Owners
3	Comfortably Retired	17	High Asset Mass Market Savers	31	Lower Middle Exurban Owners
4	High Asset Preretired Investors	18	Pre-Retired Metro America	32	Lower Middle Town Blues
5	High Asset Suburban Boomers	19	Urban Boomer Builders	33	Young Urban Renters
6	High Asset Exurban Boomers	20	Sunbelt Traditionalist	34	Lower Boomer Renters
7	Elite Pre-Retired Spenders	21	Country Builders	35	Suburban Senior Owners
8	Metro Elite Boomers	22	Up and Coming Young Climbers	36	Conservative Retireds
9	Exurban-Elite Boomers	23	Urban Mass Market Owners	37	Lower Market Owners
10	Young Savy Elites	24	Rural Mass Market Owners	38	Metro Downscale
11	High Asset Affluent Climbers	25	Urban Boomer Spenders	39	Rural Downscale
12	Established Empty Nestors	26	Aspiring Young Spenders	40	Inner City Strugglers
13	Metro Achievers	27	Midscale Metro Renters	41	Downscale Sunbelt Security
14	Greenbelt Achievers	28	Midscale Rural Renters	42	Downscale Retired

How to become a "High Asset Suburban Boomer"

Probability	Segment in the Previous Year
70%	High asset suburban boomers
8%	High asset affluent climbers
5%	The wealth market
4%	High asset pre-retired investors
3%	High asset exurban boomers
2%	The affluent retired
1%	Metro Elite boomers
1%	Affluent renters
~6%	Other

How to become a "Affluent Renter"

Probability	Segment in the Previous Year
40%	Affluent Renter
7%	High Asset Exurban Boomer
6%	Young Savy Elite
5%	High Asset Affluent Climber
4%	Exurban – Elite Boomers
3%	Midscale Rural Renter
3%	High Asset Pre-Retired Investor
3%	Urban Boomer Spenders
3%	Metro Elite Boomer
25%	Other

Our Proposed Methodology

Understanding Customer-centric Cross-selling Campaigns Process

- Latent and evolving financial state is an important driver for purchase decision
- Cross-selling campaign has multiple effects to build relationship
  - Advertising
  - Educational
  - Promotional
- Take into account channel preference
- Should have future in mind and be pro-active
- Cross-selling campaigns should be multi-staged, multi-channeled and multi-segmented proactive process

Our Proposed Solution of Customer-Centric Cross-selling Campaigns

- Formulate cross-selling campaign decisions as a stochastic dynamic programming problem with the goal of maximizing long-term profit.
- An integrated framework that
  - follow the heterogeneous and dynamic evolution of financial maturity of each individual customer
  - model both the direct and indirect effects of cross-selling campaigns
  - proactively take into account future
- Solve for a sequence of optimal cross-selling interactions
- The derived customer-centric solutions
  - describe when to introduce which product to whom using which channel
  - are customized, dynamic, consistent, and proactive

Notation

Customers i=1,...I
Product j=1,...,J
Time t=1,...T
Promotion tools k=1,...K

Customer purchase of financial accounts:
Y_{ijt} = whether to purchase product j at time t for all j=1,..,J

Bank decision:
Z_{ijkt} = whether to send promotion to customer i about product j at time t using channel k

Development of Latent Financial Maturity

- Hidden Markov Model
- Each customer has
  - s states
  - a probability P_{it} to switch to another state
  - Which can be driven by consumer's demographic/lifestyle characteristics, financial status, and bank activities

Customer Purchase Decisions

Customer chooses which type of account to open based upon latent value/utility of the account. Purchase decision is driven by cross-selling campaigns, switching cost, wealth and others

Modeled with a Multivariate binary logit

$$Y_{ijt} = \begin{cases} 1 & if\ U_{ijt} > 0 \\ 0 & otherwise \end{cases}$$

$$U_{ijt}(s) = \beta_{0ij}(s) + \beta_{1i}(s)\sum_{k=1}^{K}\sum_{j=1}^{J}\sum_{\tau=1}^{t-1} Z_{ijk\tau} + \sum_{k=1}^{K}\beta_{2ijk}(s)Z_{ijkt} + \beta_{3i}\mu_{\Delta BAL_{it-1}} + \beta_{4i}\sigma_{\Delta BAL_{it-1}} + \beta_{5i}(s)COMP_{it} + \beta_{6i}(s)TENURE_{it} + \varepsilon_{ijt}(s)$$

Expected Customer Profit

$$E[PROFIT_{i\tau} \mid Z_{ijk\tau}] = \sum_{\tau=t}^{T}\delta^{\tau-t}\sum_{j=1}^{J}[PROB_{ij\tau}(Y_{ij\tau}=1) * E[BAL_{ij\tau}] * r_j - \sum_{j=1}^{J}\sum_{k=1}^{K} c_k Z_{ijk\tau}]$$

$$E[BAL_{ijt}] = \varphi_{0i} + \phi_{1i} BAL_{ijt-1} + \xi_{ijt}$$

$PROB_{it}(s)$	Probability of customer *i* in financial state *s*
$E[p_{ijt} \mid I_{ijt}, Z_{ijkt}]$	Expected profit of customer I given the bank's information on the customer and past cross-selling campaigns
	Average margin of product *j*
BAL_{ijt}	Balance of customer *i* of product *j* at time *t*
$PR(Y_{ijt}=1)$	Probability of purchasing product *j*

Firm's optimal decisions (dynamic programming problem)

$$\underset{Z_{ijkt}}{Max}\sum_{\tau=t}^{T}\delta^{\tau-t}\sum_{j=1}^{J}[PROB_{ij\tau}(Y_{ij\tau}=1) * E[BAL_{ij\tau}] * \pi_j - \sum_{j=1}^{J}\sum_{k=1}^{K} c_k Z_{ijk\tau}]$$

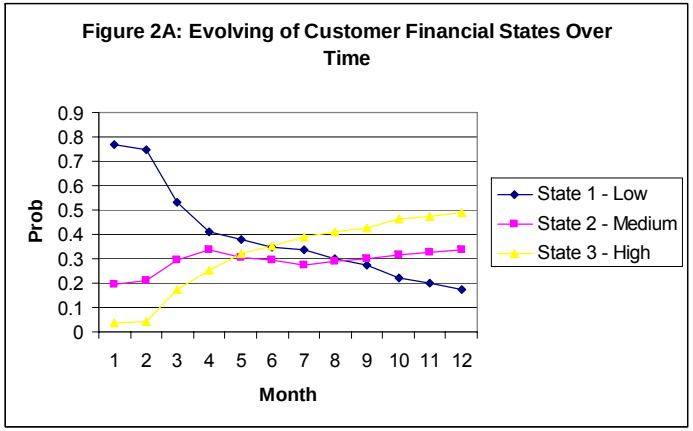
$$s.t. \quad \sum_{i=1}^{I}\sum_{j1}^{J}\sum_{k}^{K}\sum_{t}^{T} c_k Z_{ijkt} = B$$

- Decision variables: when (t) to send out solicitation to which customer (i) to cross-sell which product (j) using which channel (k).
- State variables: demand maturity, expected profit

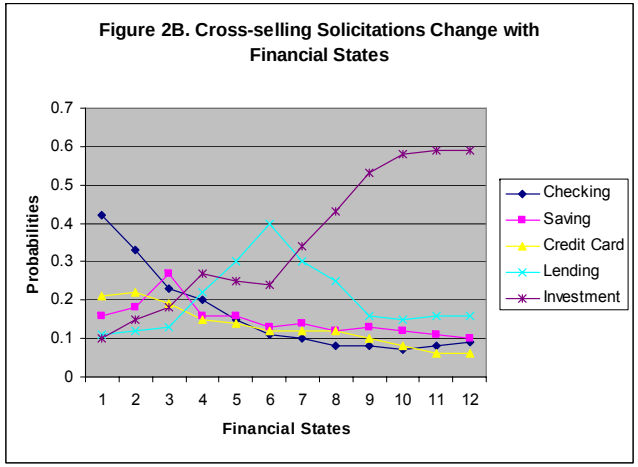
Data Description

- Large regional bank with complete banking services
  - 885 households, from November 2003 to November 2004
  - Monthly cross-selling campaigns received and monthly banking activities
  - Demographic information
- Five categories
  - Checking (C)
  - Savings (S)
  - MBNA/Credit card (M)
  - Lending (L)
  - Others (O)
- Allow for repeat purchases

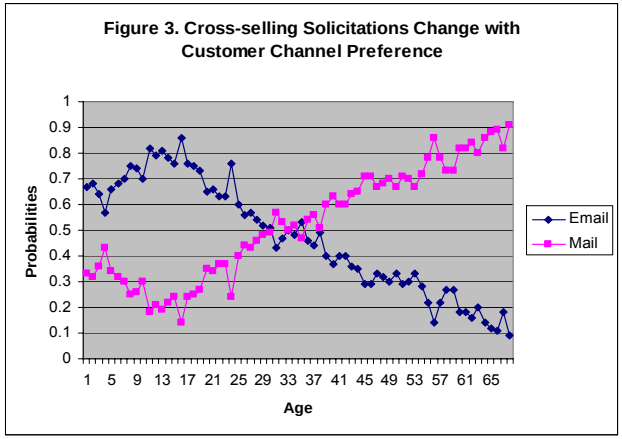
Evolving Customer States



How solicitations change with financial states



Impact of Age on Cross-Selling



Summary

- Customers demonstrate three financial states
  - convenience, borrowing, high risk/return
- Consumers migrate across the three states over time
  - They have different sensitivity to solicitations
- Consumers have preference for different products at each state
  - Convenience: checking, saving, credit card
  - Stable income: lending, credit card
  - High risk/return: investment
- Cross-selling contacts have educational roles, followed by promotion and advertising roles
- Customer-centric interaction improves over campaign-centric interactions

Managerial Implications

- Cross-selling campaigns should recognize evolution of customer demand
- Cross-selling should be tailored to channel preference
- Cross-selling campaigns have educational roles
- Explicitly derive optimal cross-selling strategies
- Cross-selling heuristic
- Customer-centric cross-selling improves over campaign-centric cross-selling

Limitations and Future Research

- Adaptive learning models can be built to allow the bank to dig into the CRM system and develop real-time customer insights
- More flexible specification on the hidden Markov transition matrix