

Some Statistical Applications In The Financial Services Industry

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May 30, 2008

Introduction

- Examples of consumer financial services
 - credit card services
 - mortgage loan services
 - auto finance services
- Statistical applications
 - Direct marketing
 - Pricing
 - Risk management

Credit Bureau Data

- Credit Bureaus
 - Equifax
 - Experian
 - Trans Union
- Data collected at Bureaus
 - Application of credit, inquiries (hard and soft)
 - Opening of trade line, credit available
 - Credit performance, on-time payment, utilization of available credit, derogatory,
 - Closing of trades, charge off, foreclosure
 - bankruptcy

Direct Marketing

- Several purposes
 - acquisition of new customers
 - Cross-sell or up-sell
 - Retention
- The objective is targeting the right customers who will respond to the direct marketing message.

Response Model and Creative Testing

- Response model
 - To separate responders from non-responders
 - Statistical methods
 - Logistic regress
 - Classification tree
 - Neural networks
 - It seems all modeling methodologies work equally well. The difference often lies in the input to model
- Creative testing
 - To get the right direct marketing message
 - Statistical methods
 - Hypothesis testing / sample size
 - Design of experiment

Success and Potential Pitfall

- Response model
 - Can double or triple the direct marketing business
- Creative testing
 - Significantly improve the direct marketing business
- Interaction between response model and creative testing
 - Response model built on consumer responses to specific marketing message
 - Marketing message appealing to other consumers will not work well with the response model
 - Marketing possibly optimized for only one segment of consumers
 - Missing out on other segments of consumer

Consumer Segmentation

- **Consumer Segmentation**
 - Demographic
 - Age, gender, marital status, ethnicity, education, household size
 - Behavioral
 - Buy used cars, TV programs watched, revolvers vs transactors
 - Backward looking
 - Attitudinal
 - Attitudes, needs, behaviors
 - More complex, in-depth insight into consumer motivation
 - Forward looking
- **Some syndicated sources for market segmentation**
 - Prizm Clusters by Claritus
 - Knowledgebase Marketing
- **Develop customized segmentation**
 - High level executive support required
 - Can easily be a multi-year cross-functional project
 - Attitudinal study very subjective
 - Potential reward substantial, but with risk of failure

Consumer segmentation and direct marketing

- Direct marketing strategy based on Segmentation
 - Tailor response model and marketing message for each segment
 - Marketing efforts optimized all consumer segment
- Statistical methods for segmentation
 - Sample survey
 - Cluster analysis
 - Multivariate discriminant analysis

Pricing

- Risk based pricing
 - Adverse selection
 - Internal view
- Market based pricing
 - Pricing competitively
 - External view
- Price optimization
 - Price impacts the probability of acquiring new customer
 - Price impacts the profitability
 - The optimal price is obtained when the expected profitability is maximized under some constraint of risk based pricing

Risk Management – Generic Score

- FICO score
 - History of credit
 - Types of credit
 - Performance of credit
 - Utilization of credit
 - Inquiries
- NextGen Score
 - Better differentiation on both extremes
 - Logistic regression
 - 3 bad credit lines out of 10 credit lines vs 0 or 1
- Fraud model
 - Statistical model can be used to detect fraud in credit card and telecommunications industry.
 - Detect credit card fraud examine the velocity of credit card usage.
 - Detect medical insurance claims fraud by examining the statistical distance

Risk Management – Custom Score

- Customized risk scorecard
 - Each company have a different population
 - Each industry is different
 - Companies have internal data
 - Logistic regression
 - Need to wait for the data to mature to observe defaults
 - The dominating method in the industry
 - survival model
 - Generalized type I censoring (Klein & Moeschberger, 1997, pp58-59)
 - Cox proportional hazard model
- Severity model
 - How much will the lender loss if the customer default
 - Include lost interest, loss on collateral, admin etc.
 - Linear model

Challenges in Risk Management

- Reject inference (Hand, 1998)
 - No outcome from the applications that were rejected by the previous risk scorecard.
- Severity model
 - Built on account with loss.
 - Applied to all the new accounts
- Combining default and severity models
 - Expected loss = $P(\text{default}) * (\text{Loss Severity} | \text{default})$
 - Not accurate theoretically since models built on different populations
 - Not working very well
 - Needs a third model using default and severity model outputs as predictors

Current Credit Crisis

- Fair Isaac study (Fair Isaac & Co, 2008)
 - Consumer risk rising across lending products and FICO score range
 - FICO continues to rank order risk
 - More frequent score refreshes
 - Enhanced need to evaluate portfolios by vintage and local economic factors
 - More closely track and monitor performance
- Building models for the whole economic cycle
 - The same population behaves different in 2008 than in 2005
 - Incorporate leading economical indicators in the risk models (Zandi, 1998)
 - Related industry level and company level indicators
 - Survival model allows fresh default data enter the model immediately

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