Some Statistical Applications In The Financial Services Industry

Wenqing Lu

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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(default) * (Loss Severity | 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
References


