

When Fuzzy Modeling Provides the Most Precise Answer

Cary Shaw

(203)505-3180

cshaw@carysshaw.com

At INFORMS – New York

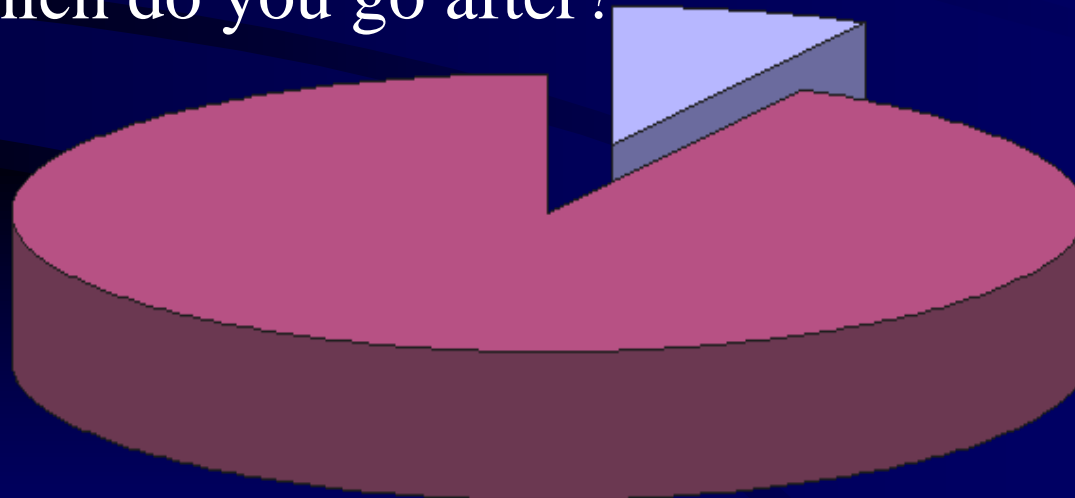
© Copyright Cary S. Shaw 2008

Find Non-Customers who will need your product



Business-to-Business World

- 13,000,000 Business Establishments
- Match your customers to the Business Universe
- Vast Majority are Non-Customers
- Which do you go after?



Customers
Non-Customers

Micro Market : Non-Customers

- What do you use when you have no other information?
 - Industry
 - Number of Employees

Definition of Status

- This shows the company's organizational status. Following are possible codes:
- 0 = Not a Headquarters or Branch (single location)
- 1 = Headquarters location
- 2 = Branch location

Micro Market : Non-Customers

- What do you use when you have no other information?
 - Industry
 - Number of Employees
 - Status (HQ, Branch, or Independent)

How to Define Micro Markets?

- Two-digit industries (83)
- Four-digit industries (1005)
- Four-digit industries times 7 employment sizes (7,035)
- Four-digit industries times 7 employment sizes times 3 (organization) status categories (21,105)

What's the Best Way to Define a Micro-Market?

Markets				Percent of Cells with	
Definition	# Possible Cells	Equals	# Populated	< 50 Estabs, Too Small	1000+ Estabs, Too Big
2 Digit Industry	83 x 1 x 1	83	81	0%	99%
2 Digit Industry by Size	83 x 7 x 1	581	568	4%	69%
2 Digit Industry by Size by Status	83 x 7 x 3	1,743	1,687	15%	39%
4 Digit Industry by Size	1005 x 7 x 1	7,035	6,893	37%	17%
4 Digit Industry by Size by Status	1005 x 7 x 3	21,105	19,549	62%	7%

Could this be a high-hit market?

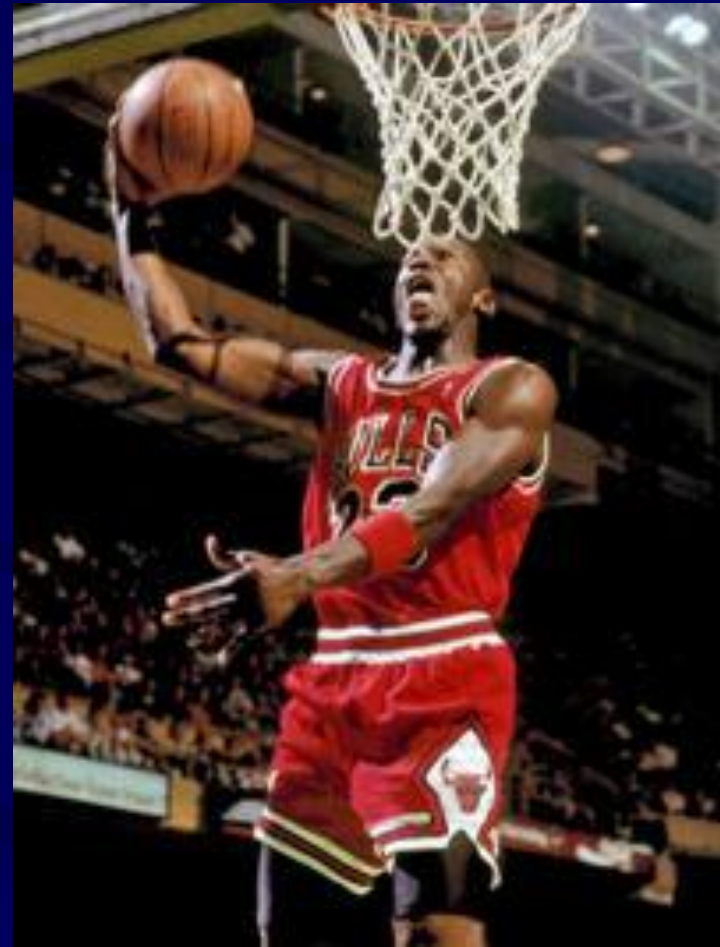
- A micro-market with only three business establishments.
- None are currently your customers.

It COULD be a high-hit market.

- A micro-market with only three business establishments.
- None are currently your customers.
- The true potential COULD be a whopping 20%, even 50%.
- And by random chance, none are your customers yet.
- How to treat small cells?

The Michael Jordan Factor

- Statistical outliers impact the mean



Available Methods don't work well for this problem.

- Too many variables for regression, classification trees, or neural nets

Available Methods don't work well for this problem.

- Too many variables for regression, classification trees, or neural nets
- Skewed, non-Normal distributions

Available Methods don't work well for this problem.

- Too many variables for regression, classification trees, or neural nets
- Skewed, non-Normal distributions
- Too many “zero” observations for minimizing standard deviations or for using median or modal values.

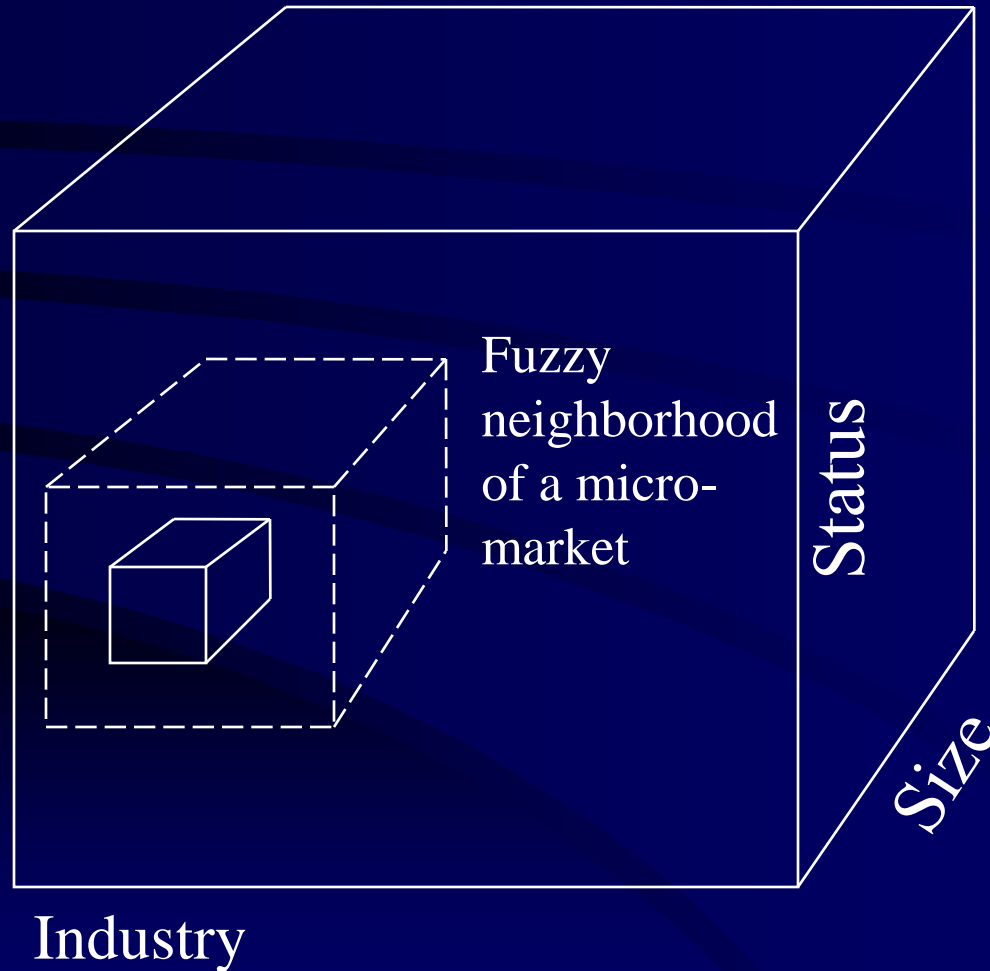
Available Methods don't work well for this problem.

- Too many variables for regression, classification trees, or neural nets
- Skewed, non-Normal distributions
- Too many “zero” observations for minimizing standard deviations or for using median or modal values.
- Discarding cells with smallest counts eliminates highest value accounts

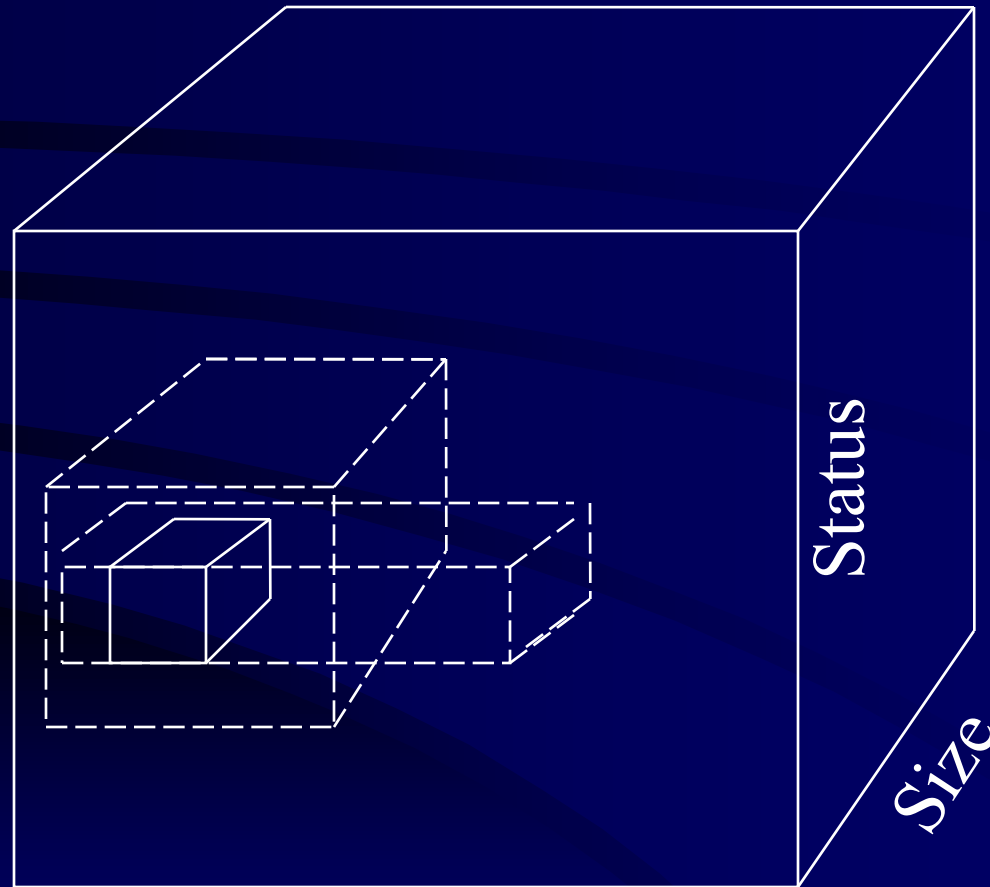
Invented Fuzzy Micro Market Model (MMM)

- Instead of 83 macro-markets, fine tunes 21,000 micro-markets
- Segments by industry, employee size, status
- Provides statistically robust score of revenue (or penetration) per Duns by micro-market

Visual Concept of Fuzzy Markets



Visual Concept of Fuzzy Markets



Fuzzy
neighborhood
of a micro-
market

Industry

“Fuzzy” Micro Market Model

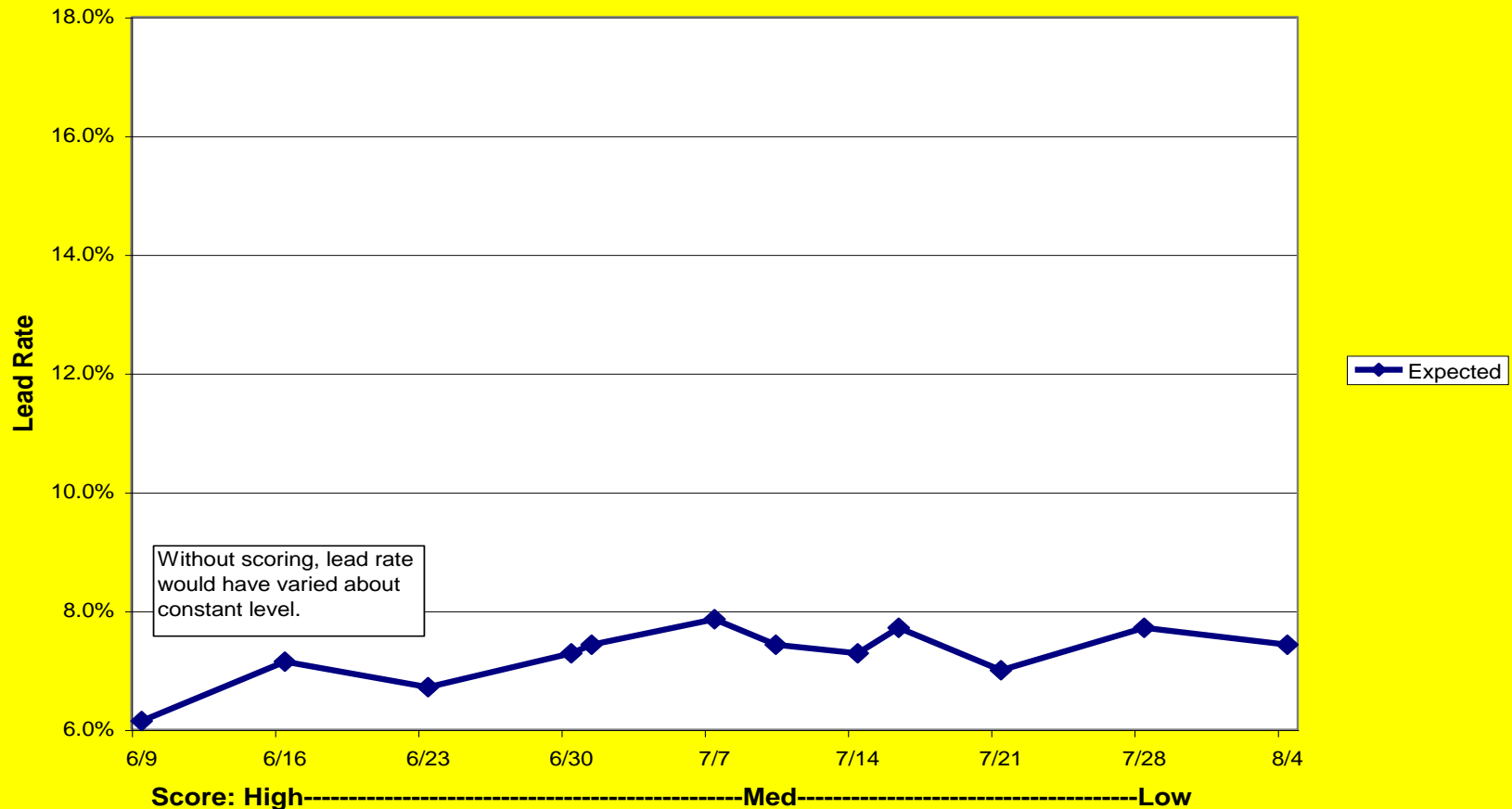
- 1. Decide upon conceptual metric, i.e. products sold per Duns establishment
- 2. Define all possible neighborhoods.
- 3. Compute most conservative estimate of metric for each neighborhood.
- 4. For each establishment, choose its best conservative estimate.

“Fuzzy Markets”

- Accounts for “fuzzy” market boundaries
- Evaluates 21,105 micro-markets
 - (1005 x 7 x 3)
- Breaks up big markets to uncover valuable segments
- Evaluates small markets at best level for robust scores
- Not available elsewhere

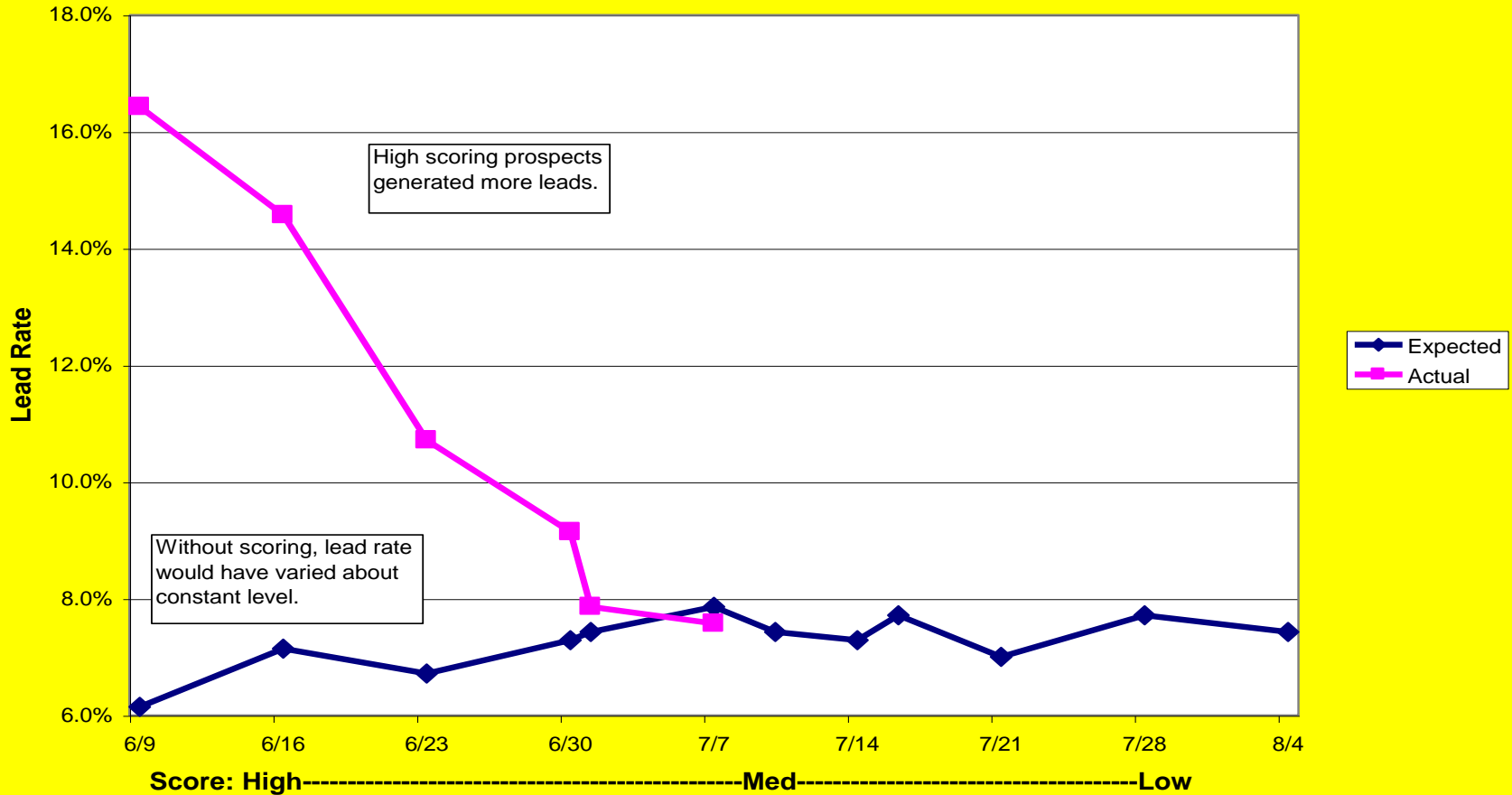
Case: Telemarketing a List

Leads Per Call, Without Effective Scoring



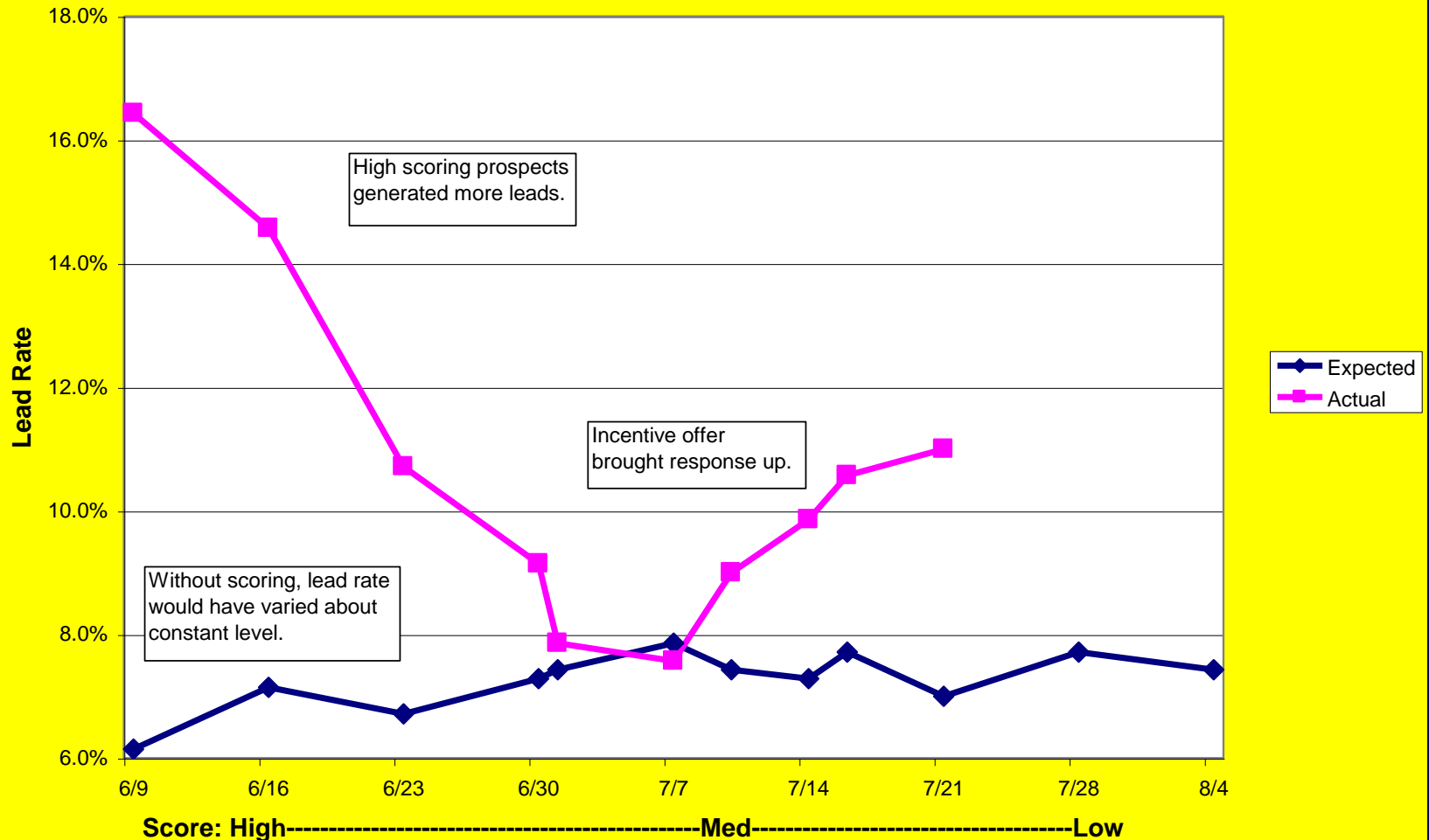
High MMM Score Worked

Actual Case: Higher MMM Score Meant More Leads Per Call



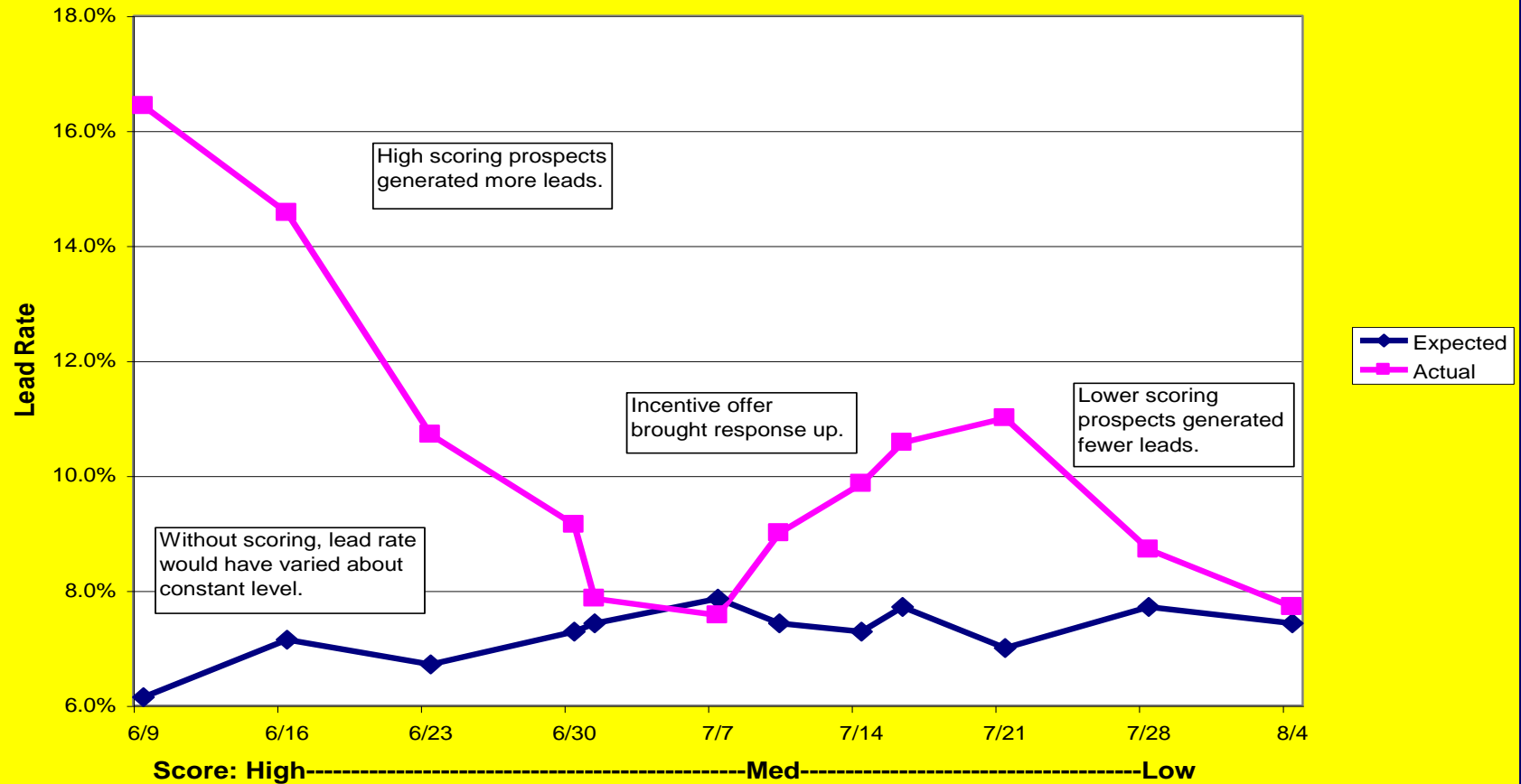
Incentives Brought Response Up

Incentive Offer Brought Response Up



Higher Score = Higher Lead Rate

Actual Case: Higher Score Means More Leads Per Call



What Sales Reps said:

- **“We got hits right off”.**
- **“They were types of accounts we want to go for.”**
- **“They have competitive locations of significant size.”**
- **“The data was good.”**

Determine a Metric

- Choose a metric, such as
- $P = \frac{\text{Sum (Revenue)}}{(\# \text{ Duns Establishments})}$

p = the penetration rate (score) for the micro market

Revenue = the sum of all your revenue in the mm

Maximum Value = the maximum establishment revenue in the mm

#Establishments = the number of Duns Establishments in the mm

Morph to a Conservative Metric

- $p^* = (\text{Sum}(\text{Rev}) - 0.9 * \text{Max}) / (D+1)$
- Why $D + 1$?
 - The denominator is increased by 1 in order to downplay the effect of sampling error
- Why $- 0.9 * \text{Max}$?
 - Deals with the “Michael Jordan” factor
 - Reduces effect of flukes due to error in market identification
 - Ex: A simple transposition of SICC digits could categorize a chemical plant as an eating establishment
 - Therefore in computing market penetration, the highest revenue is discounted 90% to account for it

For Penetration Rates

- Formula becomes

$$P^* = \text{Max}((\text{Number of customers} \cdot .9), 0) / (D+1)$$

MMM Significance

- Used in Total Opportunity Planning Process (TOPPs) for non-customers
- Provides “external” score part of Customer Grading
- Even non-customers in NEW micro-markets are scored

Successes

1. Major product line non-customers
2. Specialized product line non-customers
3. Market sizing.
4. Assigning non-customers to business units
5. Evaluating non-customer accounts for multi-business unit potential.
6. Competitive scoring

Problem: National (Enterprise) Accounts

Subsidiaries

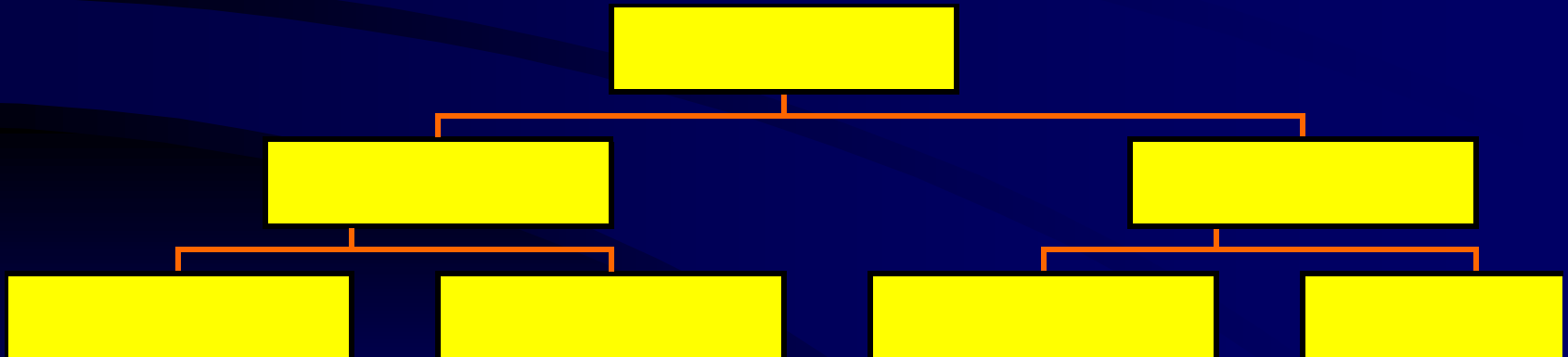
Conglomerates

Multiple types of businesses

Enterprise summary statistics don't work

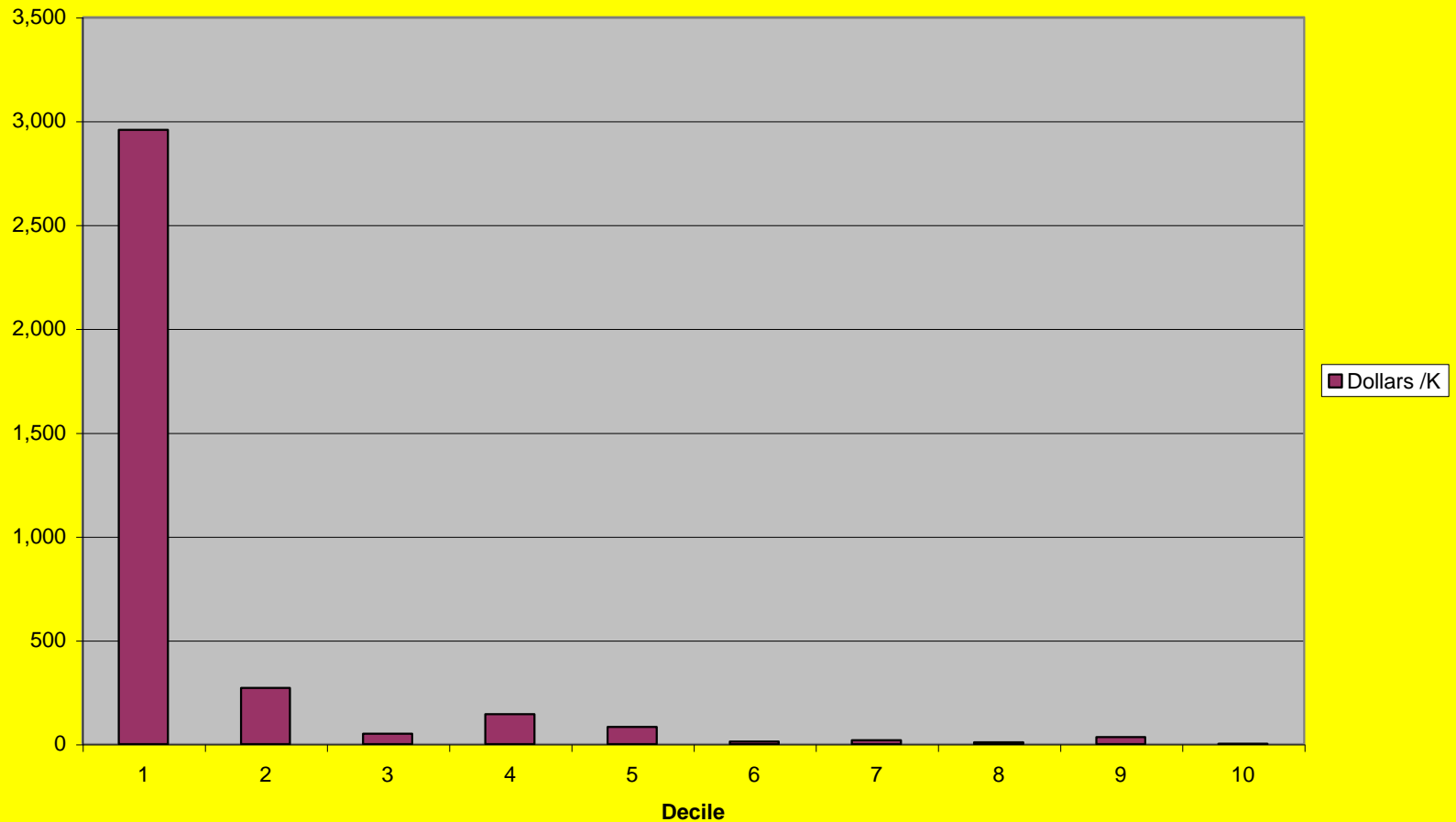
Solution: National (Enterprise) Accounts

- Component establishments of different types
- Sum the establishment scores

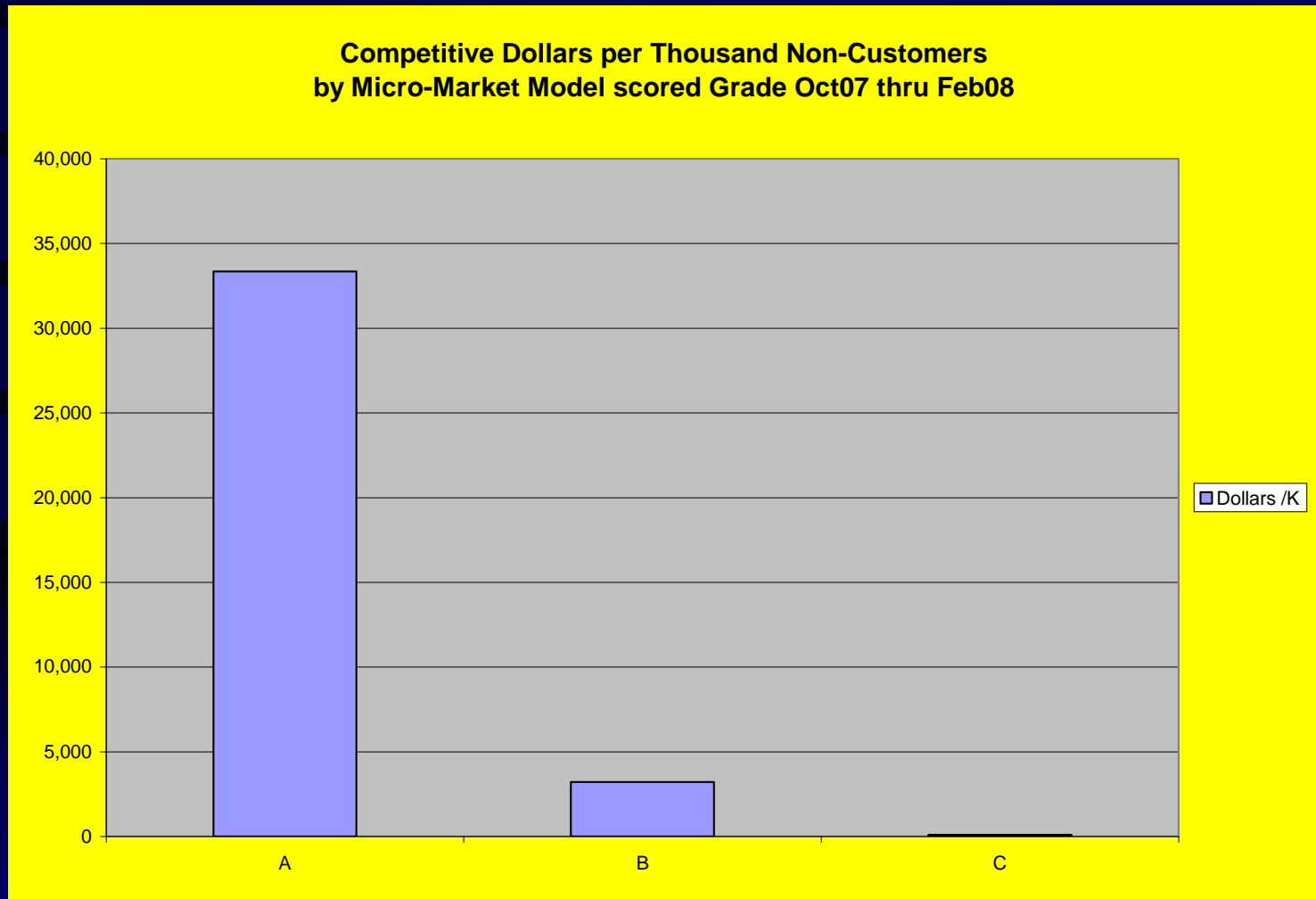


Competition by Decile

Competitive Dollars per Thousand Non-Customers
by Micro-Market Model scored Decile Oct07 thru Feb08



Competition by Grade (Intra-decile)



How the Fuzzy Micro-Market Model overcomes challenges

Micro-markets with small N , but high value

Integrates neighbor micro-markets

Outliers:

Reduces weight

Computational complexity

Uses easily computed formulas, systematic way

Many categorical variables

Bypasses techniques which don't handle them well

Non-normal distributions, many zeros

No assumption needed

Market Effectively with MMM

Find non-customers who look like current customers.

Pre-qualify by phone before a visit.

If the non-customer is not using your product, find out why.

Treat competitive situations as leads to be sold.

Go get 'em! You'll be glad you did!

Go for the Gold!

- Figure out the problem
- Use engineering thinking to design the best solution.
- Fuzzy Modelling works!

-- FIN --