Uplift Modeling – Direct Marketing Case Studies

Predictive Analytics World
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50 million customers entrust us with their data and expect us to be responsible stewards of their data and we take that responsibility seriously.
Which of these respondents would have purchased anyway?
The method: Net Lift Model

<table>
<thead>
<tr>
<th>Buy if do receive an offer</th>
<th>No</th>
<th>Do-Not-Disturbs</th>
<th>Lost Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Sure Things</td>
<td>Persuadables</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conceptual response segments. The lower-right segment is targeted with uplift modeling. Table derived from Vittal (2008) and Radcliffe (2007).
Net Lift Solution: Asking the Right Question

Targeting people who are likely to buy if they are included in a campaign

VS

Targeting people who are only likely to buy if they are included in a campaign

- **Swing Clients**
  - TREATMENT: A
  - CONTROL: D

- **Self-Selectors**
  - TREATMENT: B
  - CONTROL: E

- **No Purchase**
  - TREATMENT: C
  - CONTROL: F

Purchase Due To Treatment =

\[
P(A | A U B U C) = \\
\frac{P(A U B | A U B U C)}{P(\text{PURCHASE} | \text{TREATMENT})} \times \frac{2 - 1}{P(A U B U E)}
\]

Uplift is the Difference Between Purchase Probability With and Without Treatment
The Product: Quick Books Desktop

Compare QuickBooks Products

The QuickBooks lineup at-a-glance

Whether you’re just starting out or your business is growing, there’s a QuickBooks that fits your needs. Learn how different versions compare with this easy-to-use QuickBooks comparison chart.
Application: QBDT Upgrades - Direct Marketing Campaign

• Used mailing to drive upgrades amongst active customers.
• Some of the targets were chosen by a traditional response model, and some by uplift modeling.
• Models built on approximately 1.7M existing active customers.
• The campaign identified customers likely to be “high responders”, neutral and not so likely to respond.
• Approximately 10% were to be held back in each decile as control group.
Results – Response Vs. Uplift Model

• Both approaches led to significant incremental sales in the higher deciles, and significantly outperformed an untargeted approach.

• At most higher deciles, the uplift model slightly outperformed the traditional response approach.

• The last few deciles of the uplift model exhibit very unstable behavior because the volumes were much smaller increasing noise...
Evaluating Uplift

• We recognize three problems:

1. Model complexity and noise
   - Uplift models are harder to build and fit than conventional models, because they predict a second-order effect—the difference between two probabilities. The error bars tended to be larger.
   - In our case the biggest problem was the size of the control group. We had initially planned on 10% control group of the size of the treated group, but in practice this turned out to be much lower. (~2-3%) This impacted our model and results greatly.

2. High Marketing Spend in Intuit
   - The purchase probability without treatment for our products perhaps is negligible? Therefore the uplift models reduce to response models?

3. Sales correlated with incremental sales
   - We used rank ordering from the model with a fixed targeting volume. Therefore, targeting customers with both higher background purchase rate, and a high incremental purchase rate.
Conclusion

What feels good...

- Intuit has ability to test uplift models and evaluate the results of those campaigns in a more robust way.

- Experience with building and evaluating uplift modeling has led to a shift in business prioritizing – reallocation of marketing spend/budget.

Growth opportunities...

- Evaluation needs to lead to more actionable outcomes - increase control group size across all product marketing campaigns to meaningfully measure campaign impact.
Questions?