# A Critical Test of Self-Explicated Utility Measurement vs. Decompositional Conjoint

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# Many Streams of Methods

- Developments in discrete choice methods (DCM) dominate the leading marketing research conferences and journals.
  - Made possible in large part by today's powerful desktop computers.
- These methods have been applied to a wide range of product design issues in marketing and other fields.
  - Also extended far beyond tangible product design (cf. Allenby and Fennell, 2002).

# Many Streams of Methods

- Other streams of conjoint technique trickle through our field, but with the exception of Sawtooth's ACA, receive much less attention.
- So-called hybrid methods that combine self-explication with conjoint tasks are occasionally cited, tested, and used.
  - Green promoted (1984).
  - Huber (1997) endorsed self-explicated or hybrid methods under certain conditions.
  - Test by Pullman et al. (1999) showed that full profile conjoint was more predictive than self-explication

# Many Streams of Methods

- The most-remote from DCM are methods that rely on simple self-explication by respondents.
  - Self-explication methods are notably absent from reviews of conjoint literature (e.g. Louviere, 1994; Ben Akiva et al. 2002).
  - Gibson (2001) forcefully defended the validity of self-explication over repeated measures techniques.
  - Other conjoint methods are decompositional; self-explication methods assume that consumers can tell us directly what they value without the intervention of multivariate statistics.

- Historically, self-explicated methods asked respondents to separately rate:
  - The importance of each factor (variable)
  - The appeal of each level of each factor

# Many Streams of Methods

- One persistent champion of simple self-explicated utility methods has been Eric Marder (1997).
- Eric Marder and Associates have evolved their proprietary SUMM™ method over the years.
  - Very little published, pro or con (BonDurant and Gibson, 1991; Srinivasan & DeMaCarty, 1999).
- As of 1997, had dropped the measurement of "importance" of factors.
  - Claim that attribute ratings alone are sufficient to estimate utility of multi-attribute concepts.

# Unbounded Utility Scales

- Perhaps the most unique aspect of the self-explication technique described by Marder is the use of “unbounded” utility scales.
- For each factor level, survey respondents are asked to write in any number of letters showing their Liking (L), Disliking (D), or neutrality (N).

**Dessert Choices**

| | |
|---|---|
| Hot fudge sundae | L L L L L |
| Broccoli tart | D D D D D D D D D |
| One Oreo cookie | L |
| Lemon custard pie | N |

# Unbounded Utility Scales

- The total utility for a concept is simply the sum of the “Ls”minus the sum of the “Ds”.
- Marder has relied on paper questionnaires but has also used online methods.
- Arguments in favor:
  - Intuitive and direct for respondents
  - Simple to administer
  - Can easily handle much larger number of factors and levels than DCM as we know it
- But can it work as well?????

# A Test

# Method

- We tested unbounded utility measurement against typical discrete choice measurement with a split sample Internet survey in September, 2002.
  - 520 adult members of established U.S. Internet panel
  - Subject was features of health insurance plans
  - Seven factors, e.g. (see Appendix)
    - Prescription co-payment ($10, $20, 20%)
    - Provider network (open, PPO, HMO)
  - Deliberately omitted major pricing variables because they are known to dominate choices.
- First known comparison of DCM and Marder-style utility measurement.

# Method

- All first answered three conventional discrete choice tasks with three alternatives.
  - Used as the holdout tasks
  - Details in Appendix
  - Median length=2.7 minutes
- Half completed another 12 choice tasks (N=261).
  - Estimated utilities with Sawtooth CBC/HB
  - Median length=4.2 minutes for these tasks
- Other half rated liking/disliking of the attributes with unbounded “letter” scale (N=259).
  - Median length=4.2 minutes

# Comparisons

# Predictive Power by Case: Virtually Identical

- Self-explicated utilities correctly predicted 61.4% of the holdout choices.
- DCM-based utilities correctly predicted 63.3% of the holdout choices.
  - Both close to twice as good as chance alone.
- Considerations:
  - Could expect slightly better fit in DCM sample since the calibration and holdout tasks were of the same type.
  - Could be argued that a larger number of calibration tasks would have resulted in a better fit for DCM.

# Predictive Power in Terms of Overall Shares Favors DCM

- Hierarchical Bayes algorithm used by Sawtooth is optimized to reproduce the overall shares of preferences.
- This superiority could be seen in our data.
- Both Mean Absolute Error and Root Mean Squared Error for holdout sets were lower for DCM.

# Share Prediction Errors

- Across three holdout sets, were a total of nine preference shares to be predicted.
  - Mean absolute error (MAE) was 4.4 share points with the DCM model.
  - MAE was 8.7 share points with the self-explicated model.
  - Root mean squared error (RMSE) was 6.2 share points with the DCM model.
  - RMSE was 10.0 share points with the self-explicated model.

# Holdout Choice Sets

| | DCM Actual Share | DCM Predicted Share | Self-Exp Actual Share | Self-Exp Predicted Share |
|---|---|---|---|---|
| **Set 1** | | | | |
| Choice Alternative “A” | 23% | 37% | 21% | 23% |
| Choice Alternative “B” | 49% | 40% | 50% | 61% |
| Choice Alternative “C” | 28% | 23% | 29% | 16% |
| **Set 2** | | | | |
| Choice Alternative “A” | 13% | 14% | 10% | 5% |
| Choice Alternative “B” | 60% | 60% | 63% | 53% |
| Choice Alternative “C” | 27% | 26% | 27% | 42% |
| **Set 3** | | | | |
| Choice Alternative “A” | 15% | 13% | 16% | 12% |
| Choice Alternative “B” | 22% | 19% | 27% | 39% |
| Choice Alternative “C” | 63% | 68% | 57% | 49% |

# Respondent Effort: Self Explicated Faster

- Our online conjoint studies usually need to cover other material as well, so two minutes saved is meaningful.
- The DCM cell spent an average of seven minutes doing discrete choice tasks (including the first three).
  - The 12 calibration tasks only took 4.2 minutes but I would normally use more.
- Self-explication task required less than five minutes.

# Response to Tasks: About the Same

- All were asked how likely they were to participate in future surveys.
- 50% in each cell said they “definitely will”
- Top two box percentages were 75% for self-explicated cell, 77% for DCM cell
  - Note that these are panel members who have probably seen DCM tasks before—but not this form of self-explication.

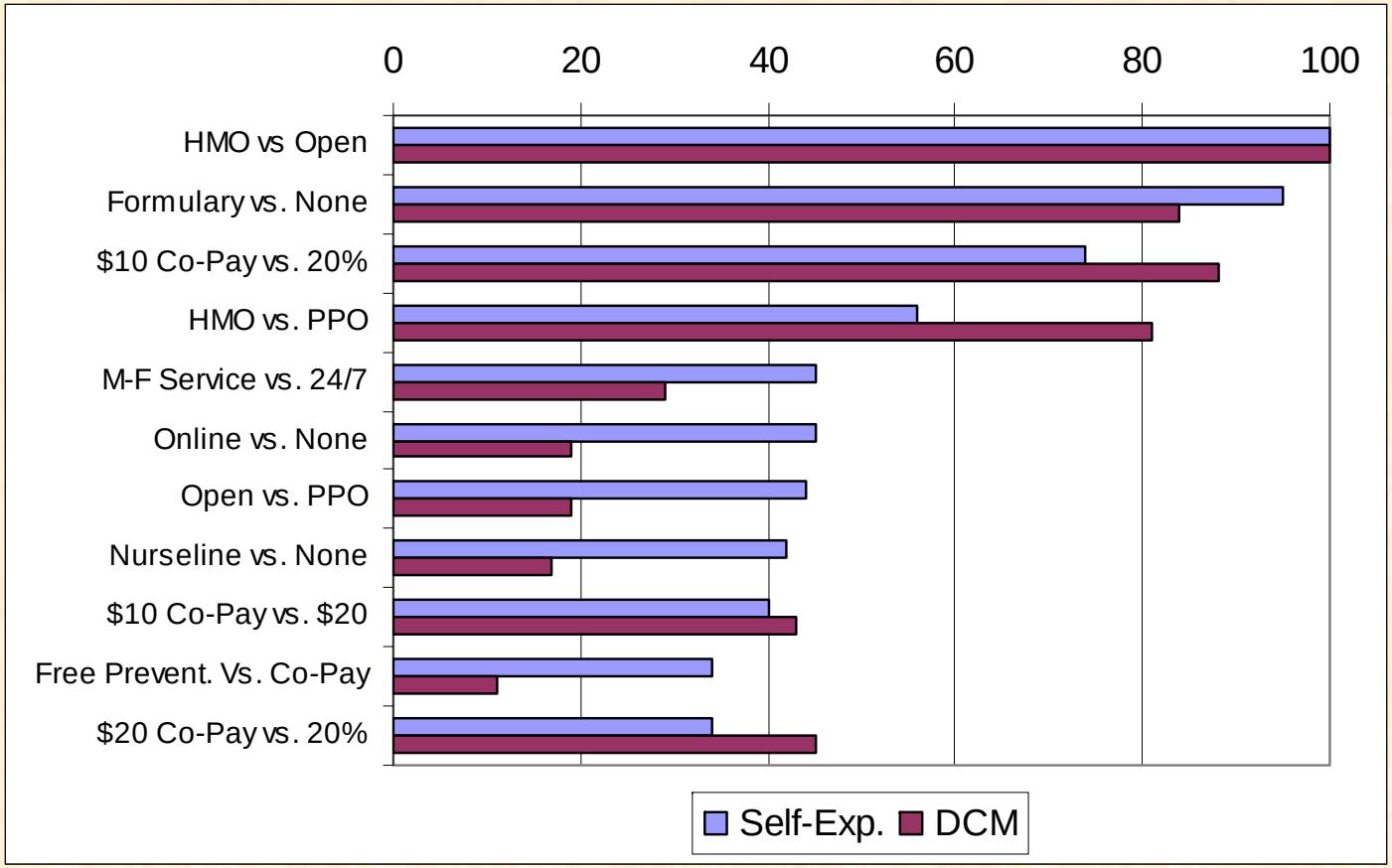
# Salience/Importance of Attributes

- Traditional "importance of variable" calculations in conjoint are flawed (viz. highest minus lowest utility).
  - Number of levels (NOL) problem is only one drawback
- Marder also gave up on collecting separate importance scores for the variables.
- We look instead at the average utility gap between pairs of attribute levels, e.g.
  - $10 co-pay vs. $20 co-pay for prescriptions
  - $10 co-pay vs. 20% co-pay
  - $20 co-pay vs. 20% co-pay

# Salience/Importance of Attributes

- Eleven such pairs in this study
- Scaled largest gap in each cell to 100
  - I.e. is the “most important” contrast to consumers
- In both cells the largest gap was between an “open” plan (see any doctor) and an HMO (only doctors in network are covered).
- The correlation between the values for the two cells was +0.85.
  - But far from perfect

# Scaled Gaps Between Mean Attribute Utilities



# Cell Differences

- DCM utilities suggest more sensitivity to the nature of prescription co-payments; self-explicated cell more sensitive to the availability of a nurse line or online services.
- Appears to be more variability among the DCM utilities.
  - A sign of more discriminating measurement?

# Illustrative Simulations

- The two approaches usually, but not always, give similar estimates of net preferences
- Start with these three options:
  - Open plan with preventative co-pay, $10 Rx, formulary
  - PPO with no preventative co-pay, 20% Rx, no formulary
  - HMO with no preventative co-pay, $20 Rx, no formulary
  - (Same on all other factors)
- Following table shows simulations with various modifications

# Simulated Preferences

| | Open Plan | PPO Plan | HMO Plan |
|---|---|---|---|
| **Base** | | | |
| DCM | 37% | 40% | 23% |
| Self-Explicated | 35% | 40% | 25% |
| **Change PPO to Formulary** | | | |
| DCM | 54% | 17% | 29% |
| Self-Explicated | 49% | 6% | 45% |
| **Change PPO Rx Co-Pay to $10** | | | |
| DCM | 21% | 70% | 8% |
| Self-Explicated | 13% | 81% | 6% |
| **Change Open Rx Co-Pay to 20%** | | | |
| DCM | 20% | 64% | 16% |
| Self-Explicated | 11% | 81% | 9% |

# Conclusions

- The self-explicated method with unbounded scales did about as well as a DCM-HB model in predicting individual holdout choices.
- DCM-HB gave more accurate predictions of overall shares within the holdout sets.
- Self-explicated method required less time for respondents to complete.
- The two cells generally agree in their priorities, but there are some differences that lead to different substantive direction.

# Conclusions

- We are going to offer both methods to clients.
  - Some are enamored of DCM.
  - For studies with large number of variables and levels, we are going to recommend the self-explicated approach.
  - For studies with only a few meaningful variables, we will probably use DCM because of its superior prediction of preference shares.

# More Research Needed!

- Would larger number of calibration choice sets improve prediction significantly?
  - Probably, though questionnaire length must often be limited.
- How would problems with major interaction terms fare?
  - Unbounded scales can be used with interactions.
- How do the two approaches fare in other substantive areas—e.g. consumer goods, industrial durables?
- How do results compare when you have more variables—say 10 to 15?
- Calls for a more-comprehensive validation experiment.

# A Challenge

- A good solution might be a new kind of hybrid method in which self-explicated utilities are treated as respondent-level constraints as a DCM model is being estimated.
  - Fit will not match pure DCM—but results would carry more credibility.
  - Computation would certainly be even more time-intensive than current HB methods.
  - Larger concern is interview length with both kinds of tasks present.
  - Number of variables would still be a major limitation.

# Pluralitas non est ponenda sine neccesitate

- Original Latin formulation of Occam's razor—literally "Entities should not be multiplied unnecessarily."
- In the philosophy of science, this has meant favoring a simple explanation over a more complex one (the law of parsimony).
- And if two methods work equally well, what is the rationale for preferring the more complicated one?

Whether on its own or as part of a new hybrid, unbounded, self-explicated utility measurement deserves to be taken seriously.

# References


Allenby, Greg and Geraldine Fennel (2002), “Conceptualizing and Measuring User Wants: Understanding the Source of Brand Preference”, *Advanced Research Techniques Forum.*

Ben Akiva, Moshe et al. (2002), “Hybrid Choice Models: Progress and Challenges.” *Marketing Letters*, 13 (August), 163-176.

BonDurant, William and Larry Gibson (1991), "Marketing with Choice Models", *Advanced Research Techniques Forum*.

Gibson, Lawrence D. (2001), "What's Wrong with Conjoint Analysis?", *Marketing Research,* 13 (Winter 2001), 16-19.

Green, Paul E. (1984), “Hybrid Models for Conjoint Analysis: An Expository Review”, *Journal of Marketing Research,* 21 (May), 155-159.

Green, Paul E. and V. Srinivasan (1990), "Conjoint Analysis in Marketing: New Developments with Implications for Research and Practice", *Journal of Marketing*, 54 (October), 3-19.

Huber, Joel (1997), "What We Have Learned from 20 Years of Conjoint Research", *Sawtooth Software Research Papers*.

Huber, Joel, Rich Johnson and Neeraj Arora (1998), "Capturing Heterogeneity in Consumer Choices", *Advanced Research Techniques Forum*.

# References


Louviere, Jordan J. (1994), “Conjoint Analysis” in *Advanced Methods of Marketing Research*, Richard P. Bagozzi (ed). Oxford: Blackwell Publishers.

Marder, Eric (1997), *The Laws of Choice*. New York: Free Press.

Pullman, Madeleine E., Kimberly J. Dodson, and William L. Moore (1999), "A Comparison of Conjoint Methods When There Are Many Attributes", *Marketing Letters*, 10 (Number 2), 125-138.

Srinivasan, V. and Peter deMaCarty, (1999), "Predictive Validation of Multiattribute Choice Models", *Marketing Research*, 11 (Winter 1999/Spring 2000), 29-34.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# Appendix: Attributes and Levels

- Type of plan:
  - Open—see any doctor
  - Preferred Provider (PPO)—see any doctor but higher co-pay if out of network
  - HMO—see network doctors only
- Preventative care office visits
  - No co-payment
  - Normal office co-payment
- Prescription co-payment
  - $10
  - $20
  - 20% of cost (average Rx costs $70)

# Appendix: Attributes and Levels

- Prescription Formulary
  - None—covers any approved drug
  - Yes—only 2-3 per category are covered
- Online services
  - Available
  - Not available
- Nurse Line
  - Available
  - Not available
- Customer service hours
  - M-F 7-7
  - 24/7

# Appendix: Holdout Choice Set #1

- Alternative A
  - PPO; no preventative copayment; $20 Rx copayment; no formulary; no online access; no Nurse line; M-F customer service
- Alternative B
  - HMO; preventative copayment; $10 Rx copayment; no formulary; online access; Nurse Line; 24/7 customer service.
- Alternative C
  - Open; preventative copayment; 20% Rx copayment; formulary; online access; Nurse Line; 24/7 customer service

# Appendix: Holdout Choice Set #2

- Alternative A
  - Open; preventative copayment; 20% Rx copayment; formulary; no online access; no Nurse Line; M-F customer service.
- Alternative B
  - PPO; preventative copayment; $20 Rx copayment; formulary; online access; no Nurse Line; 24/7 customer service.
- Alternative C
  - HMO; no preventative copayment; $10 Rx copayment; formulary; online access; Nurse Line; 24/7 customer service

# Appendix: Holdout Choice Set #3

- Alternative A
  - HMO plan; preventative copayment; $20 Rx copayment; no formulary; no online access; Nurse Line; 24/7 customer service.
- Alternative B
  - Open; no preventative copayment; 20% Rx copayment; formulary; online access; Nurse Line; M-F customer service.
- Alternative C
  - PPO; preventative copayment; $10 Rx copayment; no formulary; no online access; no Nurse Line; 24/7 customer service