Analysis of Conjoint Data: Introduction

Aurélie Lemmens
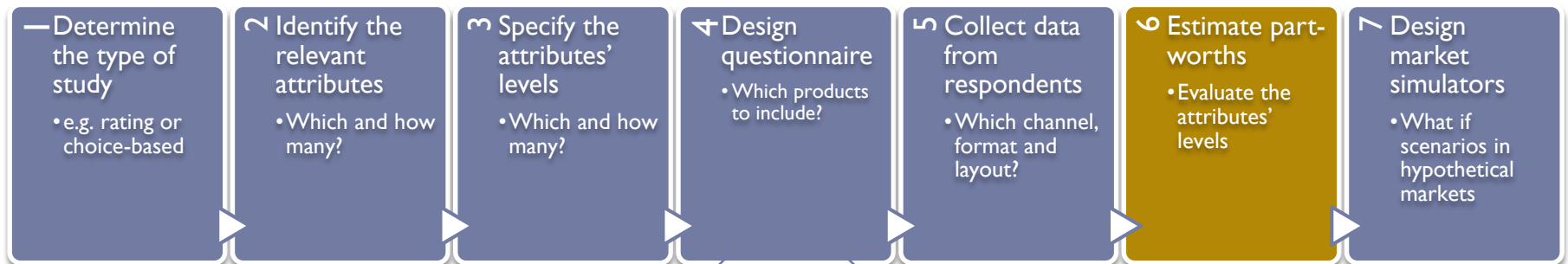
What Have We Done So Far?

Up to 6 attributes

2 to 4 levels

Max. 12-20 choice sets

A few golden numbers to remember

1 Determine the type of study
- e.g. rating or choice-based

2 Identify the relevant attributes
- Which and how many?

3 Specify the attributes' levels
- Which and how many?

4 Design questionnaire
- Which products to include?

5 Collect data from respondents
- Which channel, format and layout?

6 Estimate part-worths
- Evaluate the attributes' levels

7 Design market simulators
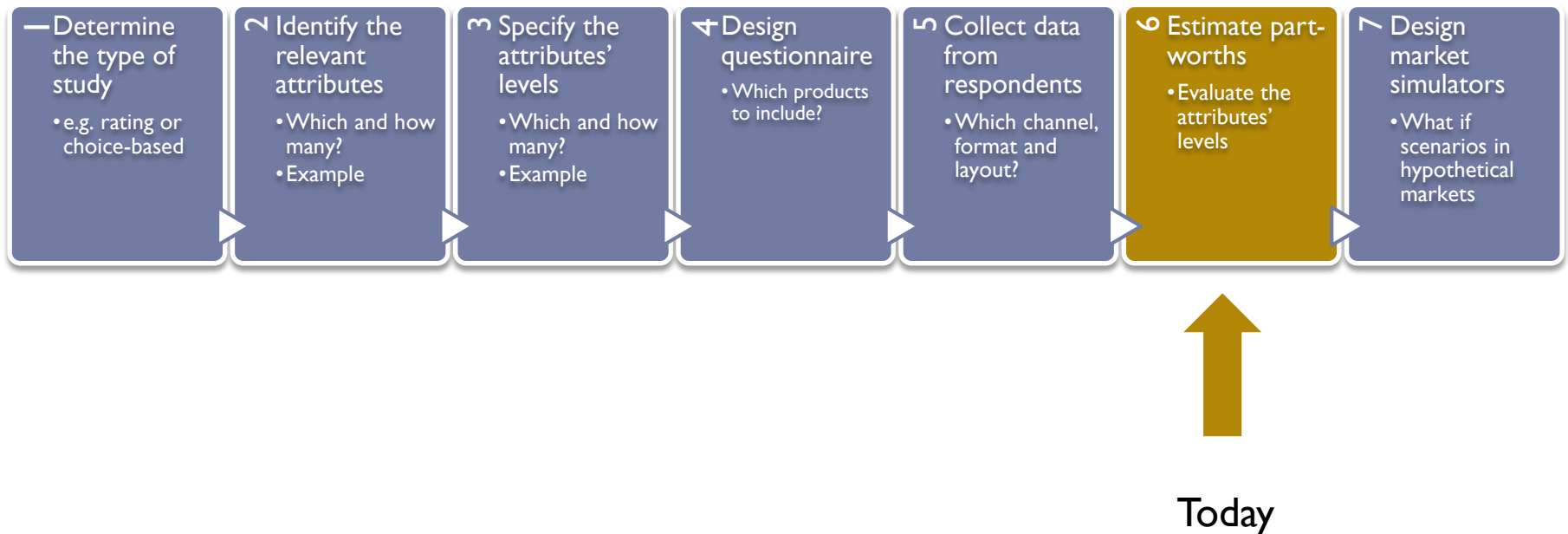- What if scenarios in hypothetical markets

4 criteria for a good design
- Level balance
- Orthogonality
- Minimum overlap
- Utility balance

alternatives per set: max. 20 bits of information

Step 6: Estimate Preferences

1 Determine the type of study	2 Identify the relevant attributes	3 Specify the attributes' levels	4 Design questionnaire	5 Collect data from respondents	6 Estimate part-worths	7 Design market simulators
• e.g. rating or choice-based	• Which and how many? • Example	• Which and how many? • Example	• Which products to include?	• Which channel, format and layout?	• Evaluate the attributes' levels	• What if scenarios in hypothetical markets

Today

Different Methods of Analysis

▶ Counting Analysis

▶ Logit (logistic regression)

▶ Latent Class Analysis

▶ Hierarchical Bayesian Analysis

Business Case

The Golf Market

Business Case: The Golf Market

Magnum Force

High Flyer Pro

Performance Plus developed a new ball that flies farther than average!

Business Case: The Golf Market

Magnum Force

High Flyer Pro

Long Shot

Eclipse +

The Golf Market

▸ Performance Plus has developed a golf ball that flies farther than average balls. The proposed name for the ball is "Long Shot."

▸ Because Performance Plus is not well known among golfers, your client has considered approaching a well-known maker of golf clubs and balls (Golfers, Inc.) to market the ball using their existing brand name for balls: "Eclipse."

▸ Sales for Eclipse have been declining and they welcome the opportunity to benefit from the new technology. A line extension brand called "Eclipse+" has been proposed. However, the royalty Golfers, Inc. is proposing seems high.

▸ Two other manufacturers already market "high performance" balls: High-Flyer Pro (by Smith and Forester), and Magnum Force (by Durango).

▸ High performance balls command a price premium of between 20% to 50% over traditional balls and the market is growing rapidly.

The Managerial Questions

▸ 1) How well could Long Shot hope to compete with existing competitors?

▸ 2) Should Performance Plus form an alliance with Eclipse and brand her new product as "Eclipse+"? How much incremental value does the brand name "Eclipse" add?

▸ 3) How do golfers trade off performance vs. price?

▸ 4) How should "Long Shot" be manufactured and positioned in terms of performance and price to maximize profitability?

▸ 5) Do novice or experienced golfers differ in their preferences for high performance golf balls? Could this lead to a target market strategy?

Pricing of Golf Balls

▸ Two competitors are currently selling packages of three balls for between $7.99 to $10.99.

▸ Good to select a wider range to cover the price levels we are interested in.

▸ We do not want any prices below $4.99, having determined that such a low price cannot cover the manufacturing and marketing costs and result in a profit.

Golf Balls: Attributes and Levels

▶ Suppose we describe golf balls using the following three attributes:

- **Brand** [4 levels]:
  - High-Flyer Pro
  - Magnum Force
  - Eclipse+
  - Long Shot

- **Performance** [3 levels]:
  - Drives 5 yards farther than the average ball
  - Drives 10 yards farther than the average ball
  - Drives 15 yards farther than the average ball

- **Price** [4 levels]
  - $4.99 for a package of 3 balls
  - $6.99 for a package of 3 balls
  - $8.99 for a package of 3 balls
  - $10.99 for a package of 3 balls

Golf Balls: Attributes and Levels
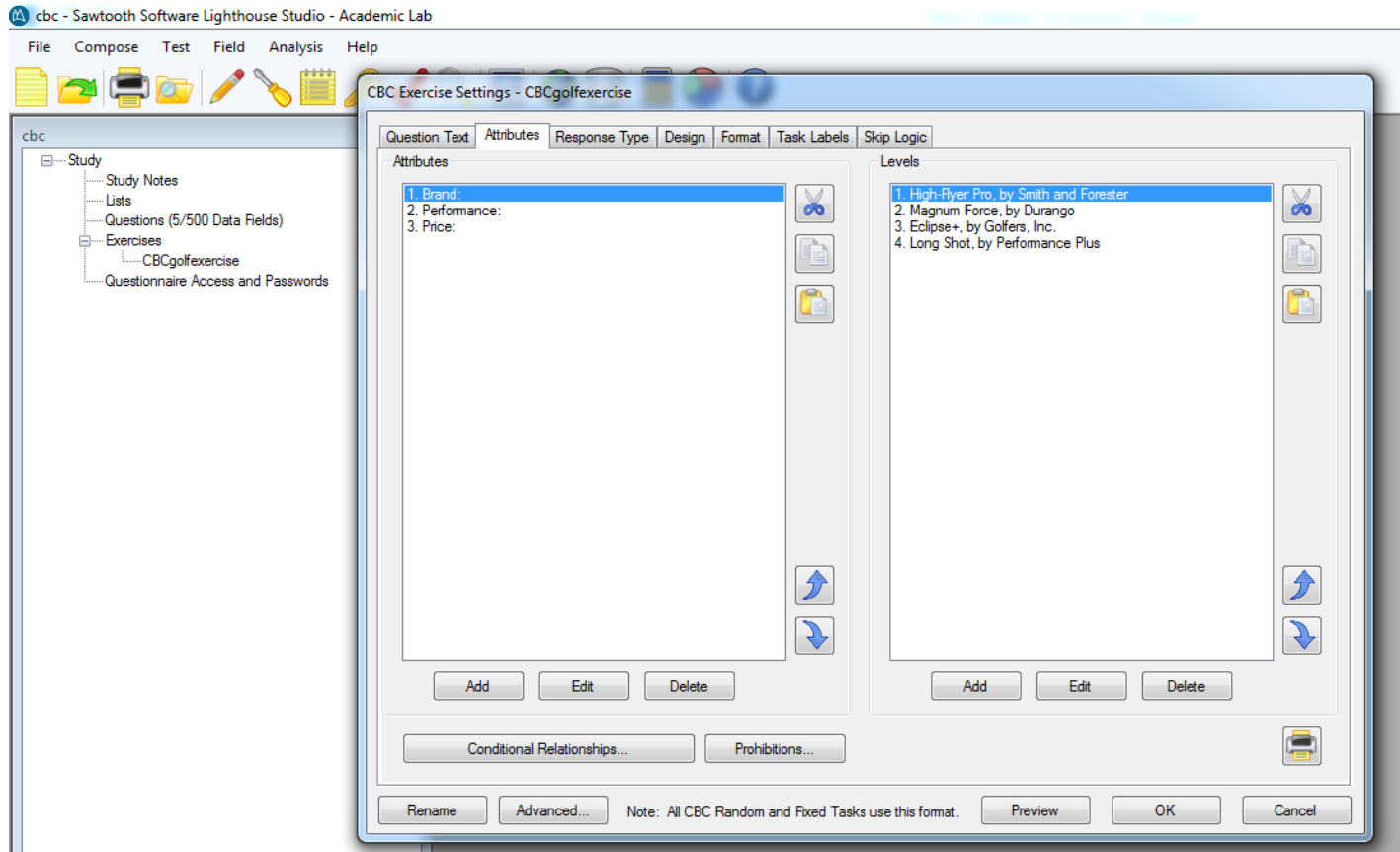
Choice Sets

- 15 choice sets

- 3 alternatives + None option

Choice Sets

Survey

Data Collection

▸ 250 respondents

Analysis of Conjoint Data
Part I: Count Analysis

Aurélie Lemmens

Counting Analysis

▸ Counts provides quick and automatic calculation of the main effects and joint effects for collected CBC data.

▸ It calculates a proportion of "wins" for each level, based on how many times a concept including that level is chosen, *divided by* the number of times a concept including that level appeared in the choice task.

▸ As top-line survey of the results

Data Collection

Counting Analysis

▸ In randomized CBC designs, each attribute level is equally likely to occur with each level of every other attribute. Therefore, the impact of each level can be assessed just by counting the proportion of times concepts including it are chosen.

▸ That method of analysis can be used not only for main effects, but for joint effects as well. CBC's "COUNT" option automatically does such an analysis for each main effect and for all two-way and three-way joint effects.

▸ Segmentation variables can also be specified as banner points in the COUNT option for comparing differences between respondent subgroups.

Counting Analysis

▸ Main Effects

Brand:	
	Total
Total Respondents	250
High-Flyer Pro, by Smith and Forester	0.369
Magnum Force, by Durango	0.329
Eclipse+, by Golfers, Inc.	0.188
Long Shot, by Performance Plus	0.156
Within Att. Chi-Square	352.705
D.F.	3
Significance	$p < .01$

Performance:	
	Total
Total Respondents	250
Drives 5 yards farther than the average ball	0.169
Drives 10 yards farther than the average ball	0.279
Drives 15 yards farther than the average ball	0.332
Within Att. Chi-Square	198.542
D.F.	2
Significance	$p < .01$
Price:	
	Total
Total Respondents	250
$4.99 for package of 3 balls	0.390
$6.99 for package of 3 balls	0.292
$8.99 for package of 3 balls	0.230
$10.99 for package of 3 balls	0.132
Within Att. Chi-Square	385.095
D.F.	3
Significance	$p < .01$

Brands seem to matter when choosing a golf ball.
Respondents tend to prefer High-Flyer Pro.

Counting Analysis

▸ ## Main Effects

	Analysis Manager		
Home			

Analysis Types: **Counts**

ANALYSIS RUNS — Add, Duplicate, Rename, Run
RUN SETTINGS

Analysis run 1

	A	B
4	**Brand:**	
5		Total
6	Total Respondents	250
7	High-Flyer Pro, by Smith and Forester	0.369
8	Magnum Force, by Durango	0.329
9	Eclipse+, by Golfers, Inc.	0.188
10	Long Shot, by Performance Plus	0.156
11		
12	Within Att. Chi-Square	352.705
13	D.F.	3
14	Significance	p < .01
15		

		Total
16		
17	**Performance:**	
18		Total
19	Total Respondents	250
20	Drives 5 yards farther than the average ball	0.169
21	Drives 10 yards farther than the average ball	0.279
22	Drives 15 yards farther than the average ball	0.332
23		
24	Within Att. Chi-Square	198.542
25	D.F.	2
26	Significance	p < .01
27		
28		
29	**Price:**	
30		Total
31	Total Respondents	250
32	$4.99 for package of 3 balls	0.390
33	$6.99 for package of 3 balls	0.292
34	$8.99 for package of 3 balls	0.230
35	$10.99 for package of 3 balls	0.132
36		
37	Within Att. Chi-Square	385.095
38	D.F.	3
39	Significance	p < .01

Performance and price also matter. Not surprisingly, respondents prefer high performance and low prices.

Counting Analysis

▸ Chi-Square statistic:

   ▸ Whether the proportions in that table differ significantly from one another.

   ▸ DF = degrees of freedom = number of levels - 1

   ▸ In the case of a main effect count, the Chi-Square indicates whether levels of that attribute differ significantly in their frequency of choice.

   ▸ Beware of interpreting the Chi-Square from aggregate counts as a measure of "Importance" for an attribute or assuming that the main-effect Chi-Square test that is not significant indicates that the attribute had little impact on choice.

      ▸ Disagreement between individuals on what level is preferred can mask the impact of an attribute when respondent choices are aggregated. For example, if half of the respondents strongly prefer Brand A over Brand B, and the other half feels exactly the opposite, the aggregate count proportions will be equal, and the Chi-Square will also be zero. In that case, we would be in error to infer that brand had no impact on choice for individuals.

Counting Analysis

‣ Interaction effects:
  ‣ The output of counts is particularly useful for understanding how the demand for each brand varies as a function of price.

|			Total
61			
62	**Brand: x Price:**		
63			Total
64	Total Respondents		250
65	High-Flyer Pro, by Smith and Forester	$4.99 for package of 3 balls	0.556
66	High-Flyer Pro, by Smith and Forester	$6.99 for package of 3 balls	0.400
67	High-Flyer Pro, by Smith and Forester	$8.99 for package of 3 balls	0.331
68	High-Flyer Pro, by Smith and Forester	$10.99 for package of 3 balls	0.201
69	Magnum Force, by Durango	$4.99 for package of 3 balls	0.454
70	Magnum Force, by Durango	$6.99 for package of 3 balls	0.328
71	Magnum Force, by Durango	$8.99 for package of 3 balls	0.316
72	Magnum Force, by Durango	$10.99 for package of 3 balls	0.215
73	Eclipse+, by Golfers, Inc.	$4.99 for package of 3 balls	0.287
74	Eclipse+, by Golfers, Inc.	$6.99 for package of 3 balls	0.226
75	Eclipse+, by Golfers, Inc.	$8.99 for package of 3 balls	0.151
76	Eclipse+, by Golfers, Inc.	$10.99 for package of 3 balls	0.081
77	Long Shot, by Performance Plus	$4.99 for package of 3 balls	0.282
78	Long Shot, by Performance Plus	$6.99 for package of 3 balls	0.193
79	Long Shot, by Performance Plus	$8.99 for package of 3 balls	0.121
80	Long Shot, by Performance Plus	$10.99 for package of 3 balls	0.039
81			
82	Interaction Chi-Square		45.647
83	D.F.		9
84	Significance		p < .01

Counting Analysis

▸ Joint effects:

  ▸ The output of counts is particularly useful for understanding how the demand for each brand varies as a function of price.

Average Percent Choice for Each Brand at Each Price

	$ 4.99	$ 6.99	$ 8.99	$ 10.99	Average
High-Flyer Pro	55.6%	40.0%	33.1%	20.1%	37.2%
Magnum Force	46.4%	32.8%	31.6%	21.5%	33.1%
Eclipse +	28.7%	22.6%	15.1%	8.1%	18.6%
Long Shot	28.2%	19.3%	12.1%	3.9%	15.9%

High-Flyer is the most popular and receives 20% choices at highest price, and 56% at lowest price

Counting Analysis
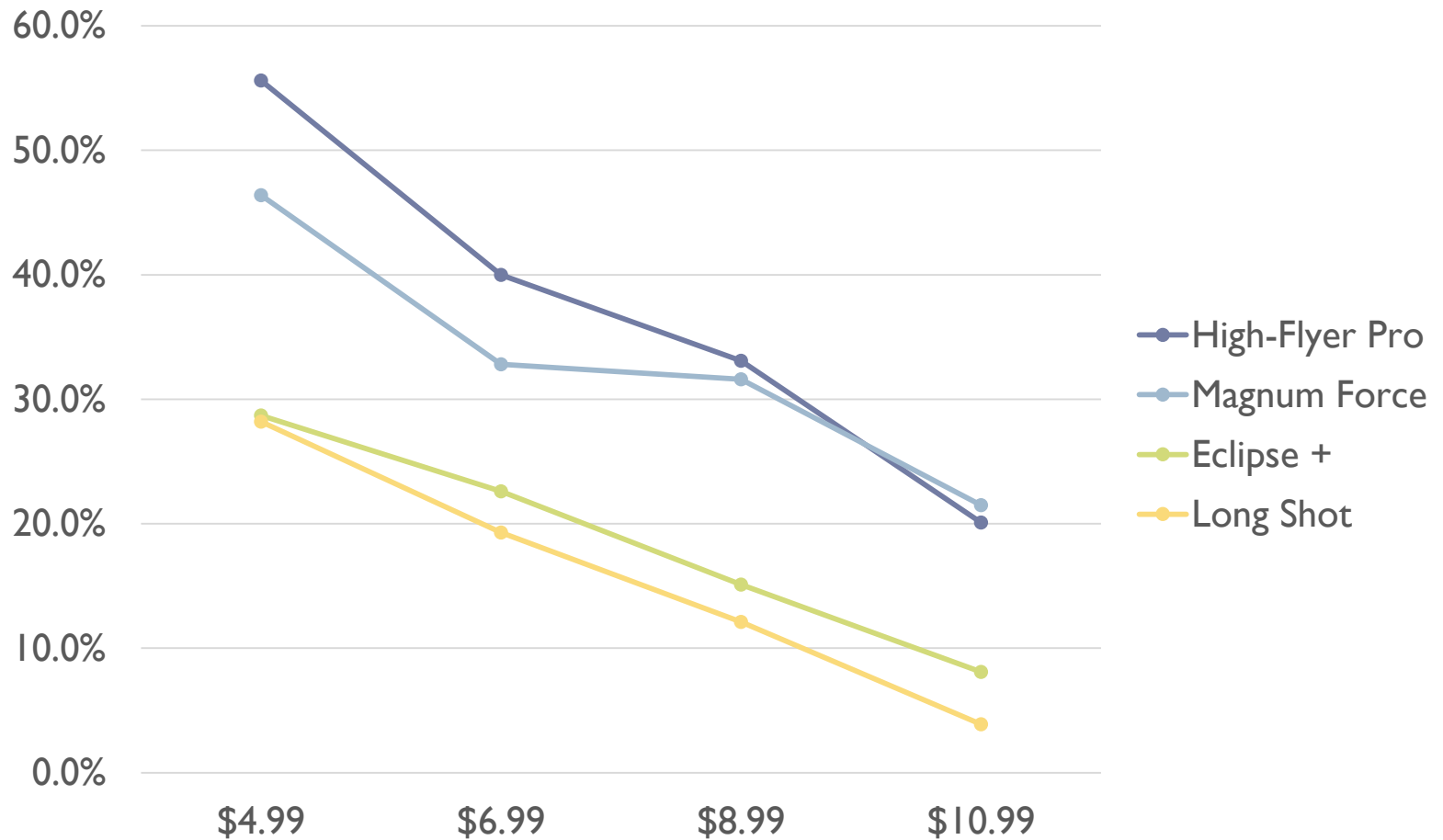
Counting Analysis

▸ As a first step only! Depends on the orthogonality criterion:

- ▸ Given a large enough sample size, the number of times each level was displayed should be nearly balanced.

- ▸ But with smaller sample sizes, random imbalances in the design can distort counts proportions. For example, if a particular brand level happened to be shown at a low price more often than other brands, the count proportion for that brand could be distorted upward.

- ▸ Other methods of analysis (Logit, Latent Class, or HB) are not subject to this difficulty.