SPSS Conjoint™ 8.0

SPSS

For more information about SPSS® software products, please visit our WWW site at *http://www.spss.com* or contact

Marketing Department
SPSS Inc.
233 South Wacker Drive, 11th Floor
Chicago, IL 60606-6412
Tel: (312) 651-3000
Fax: (312) 651-3668

7 8 9 0   05 04 03 02

ISBN 1-56827-212-X

Preface

SPSS® 8.0 is a powerful software package for data management and analysis. The Conjoint option is an add-on enhancement that provides a comprehensive set of procedures for conjoint analysis. The procedures in Conjoint must be used with the SPSS Base system and are completely integrated into that system.

The Conjoint option includes:

- Procedures for developing and producing profiles for use in conjoint studies.
- Four different models for conjoint analysis.
- Graphic summary of conjoint results.

Compatibility

The SPSS system is designed to operate on many computer systems. See the materials that came with your system for specific information on minimum and recommended requirements.

Customer Service

If you have any questions concerning your shipment or account, contact your local office, listed on page v. Please have your serial number ready for identification when calling.

Training Seminars

SPSS Inc. provides both public and onsite training seminars. All seminars feature hands-on workshops. Seminars will be offered in major cities on a regular basis. For more information on these seminars, call your local office, listed on page v.

Technical Support

The services of SPSS Technical Support are available to registered customers. Customers may contact Technical Support for assistance in using SPSS products or for installation help for one of the supported hardware environments. To reach Technical Support, see the SPSS home page on the World Wide Web at *http://www.spss.com*, or call your local office, listed on page v. Be prepared to identify yourself, your organization, and the serial number of your system.

Tell Us Your Thoughts

Your comments are important. Please send us a letter and let us know about your experiences with SPSS products. We especially like to hear about new and interesting applications using the SPSS system. Write to SPSS Inc. Marketing Department, Attn.: Director of Product Planning, 444 N. Michigan Avenue, Chicago, IL 60611.

About This Manual

This manual is divided into two parts. The first part provides a guide to the various statistical techniques available with the Conjoint option and how to obtain the appropriate statistical analyses with the dialog box interface. The second part is a Syntax Reference section that provides complete command syntax for all of the commands included in the Conjoint option. Most features of the system can be accessed through the dialog box interface, but some functionality can be accessed only through command syntax.

This manual contains two indexes: a subject index and a syntax index. The subject index covers both sections of the manual. The syntax index applies only to the Syntax Reference section.

Contents

3 Creating the Experimental Stimuli: Displaying the Design 19

4 Analyzing Preferences: Using the Conjoint Procedure 25

Chapter

1

Introduction to Conjoint Analysis

Market research is frequently concerned with finding out which characteristics of a product or service are most important to consumers. The ideal product or service, of course, would have all the best characteristics, but realistically, tradeoffs have to be made. The product with the most expensive features, for example, cannot have the lowest price.

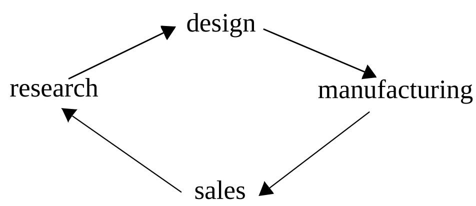
Conjoint analysis is a technique for measuring consumer preferences about the attributes of a product or service. There are two general approaches to collecting data for conjoint analysis—the two-factor-at-a-time tradeoff method and the multiple factor full-concept method. With the tradeoff method, respondents are asked to rank the cells of a series of matrices, each matrix crossing the levels of one factor with the levels of another.

The two-factor-at-a-time tradeoff method is hardly ever used today. The full-concept method, which will be explained in detail in this chapter, is considered a more realistic, ecologically valid method because all factors are considered at the same time. The three conjoint analysis procedures—Generate Orthogonal Design, Display Design, and Conjoint—are designed for the full-concept method. For more explanation of the tradeoff method and comparisons with the full-concept method, see Aaker and Day (1986).

Why Use Conjoint Analysis?

The Deming Cycle, originated by W. Edwards Deming and pictured in Figure 1-1, is a convenient model for thinking about the production of consumer goods.

Figure 1-1
The Deming Cycle



Design and manufacturing are the responsibility of laboratories and engineers. Sales is the responsibility of the sales department. Market research is the responsibility of the marketing department.

Effective market research is integral to the design, manufacture, and sale of successful products. It identifies the needs and wants of target markets, ensuring that products will sell because they meet the needs of buyers.

Conjoint analysis is a market research tool for developing effective product design. Using conjoint analysis, the researcher can answer questions such as: What product attributes are important or unimportant to the consumer? What levels of product attributes are the most or least desirable ones in the consumer's mind? What is the market share of preference for leading competitors' products versus our existing or proposed product? Answers to these questions are of crucial importance in the design and launch of a successful product.

The virtue of conjoint analysis is that it asks the respondent to make choices in the same fashion as the consumer presumably does—by trading off features, one against another.

For example, suppose that you want to book an airline flight. You have the choice of sitting in a cramped seat or a spacious seat. If this were the only consideration, your choice would be clear. You would probably prefer a spacious seat. Or suppose you have a choice of ticket prices: $225 or $800. On price alone, taking nothing else into consideration, the lower price would be preferable. Finally, suppose you can take either a direct flight, which takes two hours, or a flight with one layover, which takes five hours. Most people would choose the direct flight.

The drawback of the above approach is that choice alternatives are presented on single attributes alone, one at a time. Conjoint analysis presents choice alternatives between products defined by sets of attributes. This is illustrated by the following choice: would you prefer a flight that is cramped, costs $225, and has one layover, or a flight that is spacious, costs $800, and is direct? Extending this, we see that if comfort, price, and duration are the relevant attributes, there are potentially eight products:

	Comfort	**Price**	**Duration**
1	cramped	$225	2 hours
2	cramped	$225	5 hours
3	cramped	$800	2 hours
4	cramped	$800	5 hours
5	spacious	$225	2 hours
6	spacious	$225	5 hours
7	spacious	$800	2 hours
8	spacious	$800	5 hours

Given the above alternatives, product 4 is probably the least preferred while product 5 is probably the most preferred. The preferences of respondents for the other product offerings are implicitly determined by what is important to the respondent.

Using conjoint analysis, you can determine both the relative importance of each attribute as well as which levels of each attribute are most preferred. If the most preferable product is not feasible for some reason, such as cost, you would know the next most preferred alternative. If you have other information on the respondents, such as background demographics, you might be able to identify market segments for which distinct products can be packaged. For example, the business traveler and the student traveler might have different preferences that could be met by distinct product offerings.

SPSS Conjoint uses the **full-concept approach** for conjoint analysis. In the full-concept approach, respondents rank alternative products defined by particular levels of all attributes, as in the example above. The full-concept approach in Conjoint uses what are termed **fractional factorial designs**, which present a suitable fraction of all possible alternatives. Fractional designs are used when presenting all alternatives would be too time-consuming, cost too much, or fatigue the respondent, thereby potentially invalidating the responses. The Generate Orthogonal Design procedure automatically generates main-effects orthogonal fractional factorial plans. The Display

Design procedure enables you to generate physical profiles that can be sorted by the respondent to arrive at a ranking.

The Conjoint procedure performs conjoint analysis using the ordinary least-squares estimation method. This method has been found to perform as well as other methods, and it has the advantage of being easier to use and interpret.

Output from conjoint analysis includes importance ratings of the attributes, part-worth estimates showing preferences for attribute alternatives, and correlations relating predicted rankings from the conjoint model with observed rankings.

You can specify holdout cards, which are useful for validating the conjoint model. You can also specify simulation cards, which represent actual or prospective products for which the Conjoint procedure can be used to estimate market share of preference using several popular models.

The Full-Concept Method

In the full-concept (also known as full-profile) method, the respondent is asked to rank, order, or score a set of profiles, or cards, according to preference. On each of these profiles, all factors of interest are represented and a different combination of factor levels (**features**) appears. In this way, a **full concept** (that is, a complete product or service) is described on each profile. An example of such a profile is shown in Figure 1-2.

Figure 1-2
Full-concept profile (drawings reprinted with permission from Green and Wind, 1973)

The respondent's task is to rank or score each profile from most to least preferred, most to least likely to purchase, or some other preference scale. From these rankings or scores, conjoint analysis derives utility scores for each factor level. These utility scores, analogous to regression coefficients, are called **part-worths** and can be used to find the relative importance of each factor. Such information can be very useful when deciding which combination of factor levels is best for a new product or service and when predicting various outcomes, such as sales, given certain combinations of factor levels.

An Orthogonal Array

A potential problem with the full-concept method soon becomes obvious if more than a few factors are involved and each factor has more than a couple of levels. The total number of profiles resulting from all possible combinations of the levels becomes too great for respondents to rank or score in a meaningful way. For this reason, frequently only a subset of all possible profiles is used in the experiment. The subset, called an **orthogonal array**, is a type of design in which only main effects are considered and interactions are assumed to be negligible.

The Generate Orthogonal Design procedure generates an orthogonal main-effects plan. From the factors and levels specified, Generate Orthogonal Design can either create a new working data file containing the orthogonal plan or it can replace the current working data file.

The Experimental Stimuli

As discussed in "Collecting and Analyzing the Data" below, data collection in a full-concept design requires that the stimuli be presented to each subject on a set of individual profiles. Once the orthogonal array is chosen, each example of a complete product must be put on a separate profile. This helps the respondent to focus on only the one product currently under evaluation. The stimuli should also be standardized by making sure that the profiles are all similar in physical appearance except for the different combinations of features.

The Display Design procedure accomplishes these tasks by taking the design generated by Generate Orthogonal Design or entered by the user and printing the full-concept profiles in a ready-to-use format. The information in Figure 1-2 was produced mainly with the Display Design procedure, and the drawings were then added to the profile.

Collecting and Analyzing the Data

Each respondent in the study is given a complete set of the profiles and is asked to indicate his or her preference for the product. The researcher can ask the respondent to indicate preference in one of several ways. The respondent can be asked to assign a score to each profile, where the higher the score, the greater the preference. Alternatively, the respondent can be asked to assign a rank to each profile ranging from 1 to *n*, where *n* equals the total number of profiles and a lower rank means greater preference. A slight variant of this is to ask the respondent to order the profiles from most to least preferred.

Whichever method is used, the data are then recorded for each subject. The Conjoint procedure is then used to estimate utility scores for each individual respondent and for the whole sample. The results show such things as which combination of features is most preferred, which particular features most influence preference of the total product, and the relative importance of each factor. Since each factor level has a part-worth score, you can also predict the effects of factor level combinations that were not actually presented in the experiment.

The information obtained from a conjoint analysis can be applied to a wide variety of market research questions. It can be used to investigate areas such as product design, market share, strategic advertising, cost-benefit analysis, and market segmentation.

Although the focus of this manual is on market research applications, conjoint analysis can be useful in almost any scientific or business field where measuring people's perceptions or judgments is important.

This chapter briefly introduced conjoint analysis. Chapter 2 through Chapter 4 demonstrate how a research question about people's preferences can be addressed using SPSS Conjoint.

Chapter

2

Designing the Conjoint Study: Generating an Orthogonal Design

In conjoint analysis studies, the researcher assumes that the product being evaluated can be defined in terms of a few important characteristics. It is further assumed that when a consumer makes a decision about such a product, the decision is based on tradeoffs among these characteristics. Since any one product probably won't contain all of the best characteristics and none of the worst, the consumer decides which characteristics are important and which are unimportant. The purpose of conjoint analysis is to estimate utility scores, called **part-worths**, for these characteristics. Utility scores are measures of how important each characteristic is to the respondent's overall preference of a product.

The characteristics of a product are described in terms of its factors and factor levels. The **factors** are the general attribute categories of the product, such as color, size, or price. In other areas of data analysis, they are commonly known as the independent variables. The factor levels (also called **features**) are the specific values of the factors for a particular product, such as *blue*, *large*, and *$10*. In other areas of data analysis, these are the values of the independent variables.

For each case presented to the subjects, one factor level is listed for each factor in the study. The total number of cases needed to represent all possible combinations of factor levels is thus equal to the number of levels of factor 1 times the number of levels of factor 2 times the number of levels of factor *n*. The obvious problem with this is that if profiles, or cards, are included for every possible combination of levels, there are too many profiles for the subjects to rank or score. This is why many conjoint studies use only a small subset of all possible combinations, called an **orthogonal array**. This chapter describes the generation of an orthogonal design for a study of consumer preferences about carpet cleaners.

The Carpet-Cleaner Study

Throughout this chapter and the next two chapters, we'll be using a popular example of conjoint analysis by Green and Wind (1973). In their example, a company interested in marketing a new carpet cleaner wants to examine the influence of five factors on consumer preference—package design, brand name, price, a *Good Housekeeping* seal, and a money-back guarantee. There are three factor levels for package design, each one differing in the location of the applicator brush; three brand names (*K2R*, *Glory*, and *Bissell*); three price levels; and two levels (either no or yes) for each of the last two factors. Table 2-1 displays the variables used in the carpet-cleaner study, with their variable labels and values.

Table 2-1
Variables in the carpet-cleaner study

Variable name	**Variable label**	**Value labels**
package	Package design	*A*, B*, C**
brand	Brand name	*K2R, Glory, Bissell*
price	Price	$1.19, $1.39, $1.59
seal	*Good Housekeeping* seal	No, yes
money	Money-back guarantee	No, yes

There could be other factors and factor levels that characterize carpet cleaners, but these are the only ones that management is interested in. Thus, they are the only ones that are considered in the analysis. This is an important point in conjoint analysis. Just as in other experimental designs, you want to choose only those factors (independent variables) that you think will most influence the subject's preference (the dependent variable). Likewise, if a factor has more than a few levels, you want to select only a sample of realistic levels that will most likely influence preference of the product. For example, a consumer is unlikely to have a strong preference for one cleaner over another because of price if the prices differ by less than five cents.

An Orthogonal Array

Even after careful selection of the factors and levels for the study, there are frequently still too many cases for a subject to judge in a meaningful way. For example, the carpet-cleaner study would require 108 cases $(3 \times 3 \times 3 \times 2 \times 2)$ —clearly too demanding a task. Luckily, an alternative to the full factorial design, called an **orthogonal array**, can be used.

An orthogonal array is a subset of all of the possible combinations that still allows estimation of the part-worths for all main effects. Interactions, where the part-worth for a level of one factor depends on the level of another factor, are assumed to be negligible. In an orthogonal array, each level of one factor occurs with each level of another factor with equal or at least proportional frequencies, assuring independence of the main effects.

An orthogonal array represents the most parsimonious way to estimate all main effects. Even though it is true that estimation improves as the number of profiles increases, information is not really lost by omitting some combinations. This is because once you have part-worths (utilities) for each factor level, you can use them in prediction equations for those combinations that subjects did not evaluate. One restriction on the number of profiles is that it must sufficiently exceed the number of factors to allow for error degrees of freedom.

Generating an Orthogonal Design

You can generate an orthogonal array design for the factors and factor levels you specify. Unlike most SPSS procedures, a working data file is not required before generating an orthogonal design. If you have not opened a working data file, SPSS creates one, generating variable names, variable labels, and value labels from the options that you select in the dialog boxes.

If you have already opened a working data file, you can either replace it or create a new data file. The orthogonal design is displayed in the Data Editor.

Figure 2-1 shows the Data Editor, displaying the orthogonal design for the carpet-cleaner example. The factors are displayed as the variables and the cases created by the procedure. Each case in the Data Editor represents one case in the orthogonal design.

Figure 2-1
Orthogonal design for the carpet-cleaner example

	package	brand	price	seal	money	status_	card_
14	A*	GLORY	$1.19	YES	NO	Design	14
15	B*	K2R	$1.39	YES	YES	Design	15
16	A*	K2R	$1.19	NO	NO	Design	16
17	A*	BISSEL	$1.59	NO	YES	Design	17
18	B*	BISSEL	$1.19	NO	NO	Design	18
19	A*	BISSEL	$1.59	YES	NO	Holdout	19
20	C*	K2R	$1.19	YES	NO	Holdout	20
21	A*	GLORY	$1.59	NO	NO	Holdout	21
22	A*	BISSEL	$1.19	NO	NO	Holdout	22

By default, the minimum number of cases necessary for an orthogonal array is generated. The procedure determines the number of cases that needs to be administered to allow estimation of the utilities. You can also specify a minimum number of cases to generate. You might want to do this because the default number of minimum cases is too small to be useful, or because you have experimental design considerations that require a certain minimum number of cases. In this example, a minimum of 18 cases was specified.

In addition to the cases in the design, you can specify **holdout cases**. Holdout cases are judged by the subjects but are not used by the conjoint analysis to estimate utilities. They are used as a check on the validity of the estimated utilities. The holdout cases are generated from another random plan, not the experimental orthogonal plan. Holdout cases always appear after the experimental cases, unless you specify that they are to be mixed randomly with the other cases.

The orthogonal plan is saved like any other data file for use in displaying the design as profiles for subjects, and in the conjoint analysis.

Notice that two additional variables, *card_* and *status_*, appear in the data file. *Card_* assigns a sequential number to each profile for your convenience. *Status_* indicates whether a case is part of the experimental orthogonal design (the first 18 cases in Figure 2-1 above), a holdout case (cases 19–22 in the example), or a simulation case.

Entering Simulation Cases

After you have generated an orthogonal design, you can create **simulation cases**. These are combinations that are not rated by the subjects but are included in the conjoint analysis, based on the ratings of the experimental profiles. Enter the cases directly into the Data Editor, just as you would enter any data. The simplest way to enter simulation cases is to use the value labels created when you generated the experimental design, as displayed in Figure 2-2. To enter simulation cases using value labels, be sure that Value Labels is selected on the Utilities menu. Select the cell, and click the *right* mouse button to display the list of value labels for that variable. Select the value label that you want to enter from the list. To enter the value into the cell, double-click the left mouse button or press Enter. For more information about entering data into the Data Editor, see the *SPSS Base User's Guide*. Figure 2-3 displays the design for the carpet-cleaner study with two simulation cases added.

Figure 2-2
Entering values using value labels

	package	brand	price	seal	money	status_	card_
17	A*	BISSEL	$1.59	NO	YES	Design	17
18	B*	BISSEL	$1.19	NO	NO	Design	18
19	A*	BISSEL	$1.59	YES	NO	Holdout	19
20	C*	K2R	$1.19	YES	NO	Holdout	20
21	A*	GLORY	$1.59	NO	NO	Holdout	21
22	A*	BISSEL	$1.19	NO	NO	Holdout	22
23	C*	K2R	K2R GLORY		NO	Simulatio	1
24	B*	GLORY	BISSEL		ES	Simulatio	2
25							

Figure 2-3
Carpet-cleaner data including simulation cases

	package	brand	price	seal	money	status_	card_
17	A*	BISSEL	$1.59	NO	YES	Design	17
18	B*	BISSEL	$1.19	NO	NO	Design	18
19	A*	BISSEL	$1.59	YES	NO	Holdout	19
20	C*	K2R	$1.19	YES	NO	Holdout	20
21	A*	GLORY	$1.59	NO	NO	Holdout	21
22	A*	BISSEL	$1.19	NO	NO	Holdout	22
23	C*	K2R	$1.19	NO	NO	Simulatio	1
24	B*	GLORY	$1.19	YES	YES	Simulatio	2

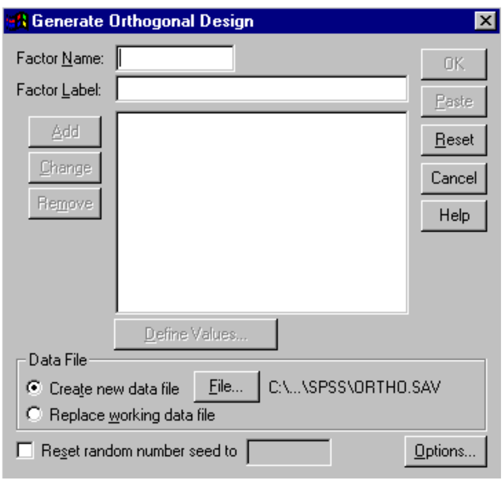
What's Next?

Thus far, we've generated an orthogonal plan of 18 cases, plus 4 holdouts and 2 simulations. To analyze the rankings of these profiles later, the plan must be saved. To save the file, select Save Data from the File menu, and save the file just as you would any other data file. All factor names, factor levels, variable and value labels, the exact factorial combination of each sequential case, the *card_* variable, the *status_* variable, and any data you have entered can be saved and used to display subject profiles and can be used by a conjoint analysis.

How to Obtain an Orthogonal Design

The Generate Orthogonal Design procedure generates a data file containing an orthogonal main-effects design that permits the statistical testing of several factors without testing every combination of factor levels. This design can be displayed with the Display Design procedure, and the data file may be used by other SPSS procedures, such as Conjoint.

Figure 2-4
Generate Orthogonal Design dialog box



▶ To obtain an orthogonal design, from the menus choose:

Data
  Orthogonal Design ▶
    Generate...

This opens the Generate Orthogonal Design dialog box, as shown in Figure 2-4.

▶ Define at least one factor. Enter a name for Factor Name. Factor names can be any valid SPSS variable name, except *status_* or *card_*. You can also assign an optional factor label.

▶ Click Add to add the factor name and an optional label. To delete a factor, select it in the list and click Remove. To modify a factor name or label, select it in the list and then click Change.

▶ Define values for the factors. (See "Define Values" on p. 15.)

Data File. Allows you to control the destination of the orthogonal design. You can either create a new data file containing the orthogonal design, or you can replace the current working data file.

- **Create new data file**. Creates a new data file containing the factors and cases generated by the plan. By default, this data file is named *ortho.sav*, and it is saved to the current directory. Click File to specify a different name and destination for the file.
- **Replace working data file**. Replaces the working data file with the generated plan.

You can choose to reset the random number seed.

- **Reset random number seed to**. Resets the random number seed to the specified value. The seed can be any integer value from 0 through 2,000,000,000. Within a session, SPSS uses a different seed each time you generate a set of random numbers, producing different results. If you want to duplicate the same random numbers, you should set the seed value before you generate your first design, and reset the seed to the same value each subsequent time you generate the design.

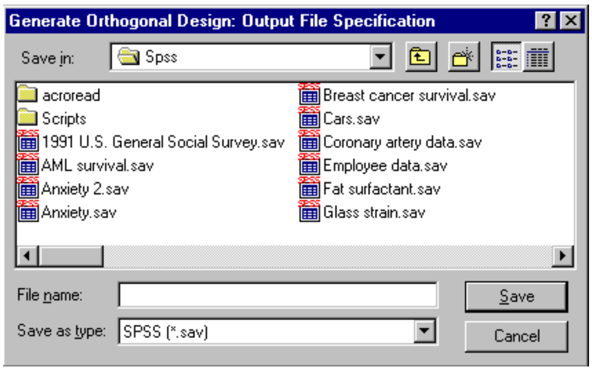
To define values and value labels for a factor or factors, select the factor or factors in the list and then click Define Values in the main dialog box.

Click Options to specify the minimum number of cases in the orthogonal design and to select holdout cases.

Output File Specification

The Generate Orthogonal Design Output File Specification dialog box allows you to specify a destination file for the orthogonal design. Figure 2-5 shows the Generate Orthogonal Design Output File Specification dialog box for Windows.

Figure 2-5
Generate Orthogonal Design Output File Specification dialog box (Windows version)

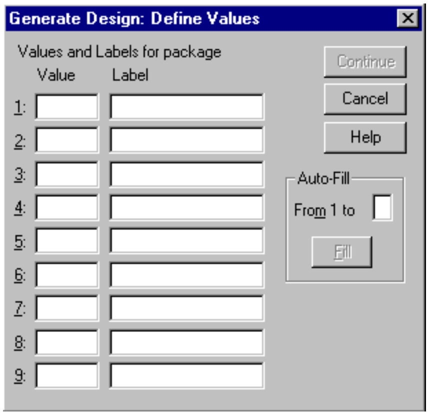


See the *SPSS Base User's Guide* for information on how to save data files.

Define Values

You must assign values to each level of the selected factor or factors. Select one or more factors and click Define Values. This opens the Generate Design Define Values dialog box, as shown in Figure 2-6.

Figure 2-6
Generate Design Define Values dialog box



If you have selected one factor, the factor name will be displayed after Values and Labels for. If you have selected multiple factors, the text displays Values and Labels for Selected Variables.

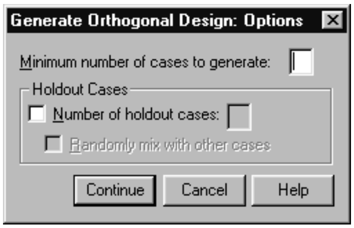
Enter each value of the factor for Value. You can elect to give the values descriptive labels. Enter the label names for Label. If you do not assign labels to the values, labels that correspond to the values are automatically assigned (that is, a value of 1 is assigned a label of 1, a value of 3 is assigned a label of 3, and so on).

Auto-Fill. Allows you to automatically fill the Value boxes with consecutive values beginning with 1. Enter the maximum value for From 1 to, and click Fill to fill in the values.

Options

The Generate Orthogonal Design Options dialog box, shown in Figure 2-7, allows you to specify a minimum number of cases to be included in the orthogonal design and to select holdout cases.

Figure 2-7
Generate Orthogonal Design Options dialog box



Minimum number of cases to generate. Specifies a minimum number of cases for the plan. Select a positive integer less than or equal to the total number of cases that can be formed from all possible combinations of the factor levels. If you do not explicitly specify the minimum number of cases to generate, the minimum number of cases necessary for the orthogonal plan is generated. If the Orthoplan procedure cannot generate at least the number of profiles requested for the minimum, it will generate the largest number it can that fits the specified factors and levels. Note that the design does not necessarily include exactly the number of specified cases, but rather the smallest possible number of cases in the orthogonal design using this value as a minimum.

Holdout Cases. You can define holdout cases that are rated by subjects but are not included in the conjoint analysis.

- **Number of holdout cases**. Creates holdout cases in addition to the regular plan cases. Holdout cases are judged by the subjects, but are not used when the Conjoint procedure estimates utilities. You can specify any positive integer less than or equal to the total number of cases that can be formed from all possible combinations of factor levels. If you do not specify a holdout value, no holdout cases are produced. Holdout cases are generated from another random plan, not the main-effects experimental plan. The holdout cases do not duplicate the experimental profiles or each other.
- **Randomly mix with other cases**. Randomly mixes holdout cases with the experimental cases. When this option is deselected, holdout cases appear separately after the experimental cases in the file.

Additional Features Available with Command Syntax

You can customize your orthogonal design if you paste your selections into a syntax window and edit the resulting ORTHOPLAN command syntax (see the *SPSS Base User's Guide*). SPSS command language also allows you to:

- Append the orthogonal design to the existing working data file, rather than creating a new file.
- Specify simulation cases before generating the orthogonal design, rather than after the design has been created.

See the Syntax Reference section of this manual for command syntax rules and for complete ORTHOPLAN command syntax.

Chapter

3

Creating the Experimental Stimuli: Displaying the Design

As described in Chapter 1, once you have your design plan, you need to put each full concept on a separate profile to administer to respondents. Each case in the orthogonal design is displayed as a profile.

You can display subject profiles easily. Profiles can be customized to look as you want them to look. Each concept can be produced as a separate page and you can add titles and/or footers at the top or bottom of each profile. You can also control spacing so that graphics or pictorial stimuli can be added to the profiles.

Creating the Carpet-Cleaner Profiles

Before printing each profile on a separate page, you might want to look at them either online or on a printout in a more condensed format. Figure 3-1 displays the orthogonal design generated in Chapter 2. This format is an easy way to get an idea of what your output will look like so that you can go back and make any additions or changes that you want. You can also view your plan file by displaying it in the Data Editor.

Figure 3-1
Profiles displayed in listing format

```
Title: A Carpet Cleaner
Card 1
  brand name  Glory
  moneyback guarantee?  no
  package design  A*
  price  $1.39
  Good Housekeeping Seal?  yes
Card 2
  brand name  K2R
  moneyback guarantee?  no
  package design  B*
  price  $1.19
  Good Housekeeping Seal?  no
...
Card 22  (Holdout)
  brand name  Bissell
  moneyback guarantee?  no
  package design  A*
  price  $1.19
  Good Housekeeping Seal?  no

Simulations:

Card 1
  brand name  K2R
  moneyback guarantee?  no
  package design  C*
  price  $1.19
  Good Housekeeping Seal?  no
Card 2
  brand name  Glory
  moneyback guarantee?  yes
  package design  B*
  price  $1.19
  Good Housekeeping Seal?  yes
```

Once you're sure that the output looks satisfactory, you can display the design again, this time with each profile on a separate page. Figure 3-2 shows the design displayed in this format for the first two profiles.

Figure 3-2
Profiles displayed in single-profile format

```
A New Carpet Cleaner

brand name  Glory
moneyback guarantee?  no
package design  A*
price  $1.39
Good Housekeeping Seal?  yes

*Package Designs:

A New Carpet Cleaner

brand name  K2R
moneyback guarantee?  no
package design  B*
price  $1.19
Good Housekeeping Seal?  no

*Package Designs:
```

Note that profiles that are rated by the subjects, including holdout profiles, are printed in single-profile format. Simulation profiles, however, are printed only in listing format, since these profiles never actually get rated.

The last line on each profile in Figure 3-2 is *Package Designs. Using a footer like this allows you to reserve space to manually add pictorial representations. Pictures can sometimes be a very important part of conveying the concept to the subject. In this example, any verbal description of the different package designs falls short when compared to the drawings.

When you administer these profiles to subjects, you need to know the *number* of the profile to accurately record and analyze the data. This number is the sequential number of the profile as it appears in the plan file. You can either put this number on the front of the profile as part of the title or footer, or you can simply write the number on the back of each profile yourself. It is important to be able to easily identify each profile's position in the plan file so that the conjoint analysis knows what factor levels are on what profiles by matching the order of the ranking or scores with the order in the plan file.

How to Display an Orthogonal Design

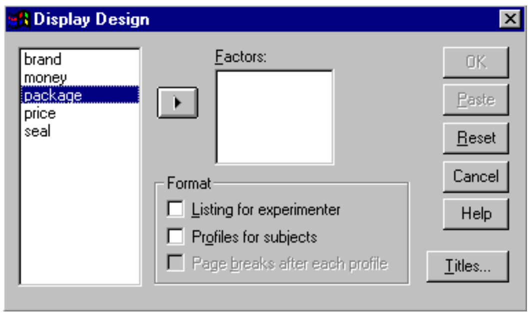
The Display Design procedure allows you to print an experimental design. You can print the design in either a rough-draft listing format or as profiles that you can present to subjects in a conjoint study. This procedure can display designs created with the Generate Orthogonal Design procedure or any designs displayed in a working data file.

▶ To display an orthogonal design, from the menus choose:

Data
  Orthogonal Design ▶
    Display...

This displays the Display Design dialog box, as shown in Figure 3-3.

Figure 3-3
Display Design dialog box



▶ Move one or more factors into the Factors list.

▶ Select a format for displaying the profiles in the output.

▶ You can choose to define headers and footers for the profiles. (See "How to Display Orthogonal Design Titles" on p. 23.)

Format. You can choose one or more of the following format options:

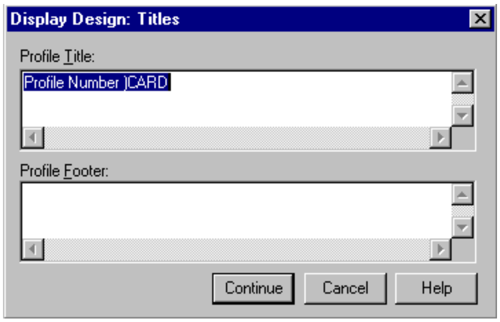
- **Listing for experimenter.** Displays the design in a draft format that differentiates holdout profiles from experimental profiles and lists simulation profiles separately following the experimental and holdout profiles.

- **Profiles for subjects.** Produces profiles that can be presented to subjects. This format does not differentiate holdout profiles and does not produce simulation profiles.
- **Page breaks after each profile.** Begins each new profile on a new page.

How to Display Orthogonal Design Titles

You can define text that appears at either the top or the bottom of the output or profile. To define titles, click Titles. This opens the Display Design Titles dialog box, as shown in Figure 3-4.

Figure 3-4
Display Design Titles dialog box



Profile Title. Enter a profile title up to 80 characters long. Titles appear at the top of the output if you have selected Listing for experimenter, and at the top of each new profile if you have selected Profiles for subjects in the main dialog box. The default title displays the profile number at the top of each profile. The variable)CARD prints the profile number and is available only if you are displaying profiles for subjects.

Profile Footer. Enter a profile footer up to 80 characters long. Footers appear at the bottom of the output if you have selected Listing for experimenter and at the bottom of each profile if you have selected Profiles for subjects in the main dialog box. If you are displaying profiles for subjects, you can enter)CARD to print the profile number in the footer.

Additional Features Available with Command Syntax

You can customize your display design if you paste your selections into a syntax window and edit the resulting PLANCARDS command syntax (see the *SPSS Base User's Guide*). SPSS command language also allows you to:

- Write profiles for subjects to an external file (using the OUTFILE subcommand).

See the Syntax Reference section of this manual for command syntax rules and for complete PLANCARDS command syntax.

Chapter

4

Analyzing Preferences: Using the Conjoint Procedure

In Chapter 2 and Chapter 3, we generated an orthogonal design and printed the experimental stimuli for a full-concept conjoint analysis study. In this chapter, we'll see how the data are collected and analyzed.

Collecting the Data

Since there is typically a great deal of between-subject variation in preferences, much of conjoint analysis focuses on the single subject. To generalize the results, a random sample of subjects from the target population is selected so that group results can be examined.

The size of the sample in conjoint studies varies greatly. Cattin and Wittink (1982) report that the sample size in commercial conjoint studies usually ranges from 100 to 1000, with 300 to 550 the most typical range. Akaah and Korgaonkar (1988) report that smaller sample sizes (less than 100) are typical. As always, the sample size should be large enough to ensure reliability.

Once the sample is chosen, the researcher administers the set of full-concept cards, or profiles, to each respondent. The Conjoint procedure allows three methods of data recording. In the first method, subjects are asked to assign a preference score to each profile. This kind of method is typical when a Likert scale is used or when the subjects are asked to assign a number from 1 to 100 to indicate preference. In the second method, subjects are asked to assign a rank to each profile ranging from 1 to the total number of profiles. In the third method, subjects are asked to sort the profiles in terms of preference. With this last method, the researcher records the profile numbers in the order given by each subject.

Analyzing Carpet-Cleaner Preference

Once the data are collected, the Conjoint procedure can be used to estimate part-worths for each factor level. These part-worth scores indicate the influence of each factor level on the respondent's preference for a particular combination. They are computed by the procedure through a set of regressions of the rankings or scores on the profiles. Since they are all expressed in a common unit, the part-worth scores can be added together to give the **total utility** of a combination. To be useful, the total utilities should be highly correlated with the observed preference data.

In this release of SPSS, a graphical user interface is not yet available for the Conjoint procedure. Examples in this chapter demonstrate conjoint analysis using SPSS command syntax. Figure 4-1 shows the set of SPSS commands for analyzing the carpet-cleaner data. Preference data for 10 subjects are defined. In this example, the **sequence method** of data collection was used. That is, subjects were asked to sort the profiles from the most to the least preferred. Subject 1, for example, liked profile 13 most of all, so 13 is the first data point. Once again, this shows why it is important for the preference data to match the sequential order of the profiles in the plan file. The CONJOINT command will look at the 13th profile in that plan file for information on what factor levels subject 1 liked best. The PLAN subcommand identifies the plan system file, and the DATA subcommand indicates that the preference data are located in the working data file.

Figure 4-1
CONJOINT command for carpet-cleaner example

```
DATA LIST FREE /ID PREF1 TO PREF22.
BEGIN DATA
01 13 15 01 20 14 07 11 19 03 10 17 08 05 09 06 12 04 21 18 02 22 16
02 15 07 18 02 12 03 11 20 16 21 06 22 08 17 19 01 14 04 09 05 10 13
03 02 18 14 16 22 13 20 10 15 03 01 06 09 05 07 12 19 08 17 21 11 04
04 13 10 20 14 02 18 16 22 15 03 01 09 05 06 08 17 11 07 19 04 12 21
05 13 18 02 10 20 15 09 05 03 07 11 04 12 22 14 16 01 06 19 21 17 08
06 15 02 03 12 18 07 20 10 11 04 09 05 13 16 14 22 08 06 01 21 19 17
07 13 07 15 18 02 03 10 20 14 11 19 17 12 01 09 05 04 06 08 16 21 22
08 15 07 13 04 06 16 08 22 05 09 21 18 10 03 02 20 14 11 17 19 01 12
09 20 09 10 11 04 05 13 15 02 03 12 18 07 01 21 14 16 22 08 06 17 19
10 08 21 19 17 04 11 12 07 01 06 09 05 03 15 14 16 22 20 10 13 02 18
END DATA.
CONJOINT PLAN='CPLAN.SAV'
 /DATA=* /SEQUENCE=PREF1 TO PREF22 /SUBJECT=ID
 /FACTORS=PACKAGE BRAND (DISCRETE) PRICE (LINEAR LESS)
 SEAL (LINEAR MORE) MONEY (LINEAR MORE)
 /PRINT=ALL /UTILITY='RUGUTIL.SAV'.
SAVE OUTFILE='RUGRANKS.SAV'.
```

The FACTORS subcommand specifies a model describing the expected relationship between the preference data and the factor levels. The factors specified refer to variables defined in the plan system file named on the PLAN subcommand.

Four different kinds of models can be specified on FACTORS: DISCRETE, LINEAR, IDEAL, and ANTIIDEAL. DISCRETE is used when the factor levels are categorical and no assumption is made about the relationship between the levels and the data. DISCRETE is assumed by default if you don't include a model specification on FACTORS. LINEAR indicates that the data are expected to be linearly related to the factor. Price is typically linear, since consumers frequently prefer lower prices. You can also specify keywords MORE or LESS after DISCRETE or LINEAR to indicate an expected direction of the relationship. IDEAL and ANTIIDEAL are quadratic function models. The IDEAL model has an ideal factor level, and distance from this ideal point is associated with decreasing preference. When plotted, the IDEAL function usually has an upside-down U shape. ANTIIDEAL is very similar. The only difference is that preference increases with distance from the point, so this point is hypothesized to be the worst level of the factor. When plotted, the ANTIIDEAL function is usually U-shaped.

For our example, the DISCRETE model was specified for factors *package* and *brand*, and a LINEAR model for factors *price*, *seal*, and *money*. LESS was specified for factor *price,* since it is expected that the higher the price, the lower the preference. For *seal* and *money*, the levels were ordered *No* first and *Yes* second in the plan file. Thus, MORE is used for these factors, since it is expected that Yes (the higher level) will be associated with higher preference.

Separate output for each subject as well as the group is obtained by using the SUBJECT subcommand. Figure 4-2 shows the output for the first subject. The output shows the utility (part-worth) scores and their standard errors for each factor level. As mentioned previously, by adding these values, the total utility of a specific combination can be computed.

For example, the total utility of a cleaner with package design *B**, brand *K2R*, price *$1.19*, and no seal of approval or money-back guarantee is:

utility(package B*) + utility(K2R) + utility($1.19) + utility(no seal)
+ utility(no money-back) + constant

or:

$$(-0.6667) + (-1.3333) + 2.4792 + 9.000 + 5.0000 + (-12.062) = 2.4172$$

If the cleaner had package design *C**, brand *Bissell*, price of *$1.59*, a seal of approval, and a money-back guarantee, the total utility would be:

$$0.6667 + 0.3333 + 3.3125 + 18.0000 + 10.0000 + (-12.062) = 20.2505$$

The total utilities should correspond closely to the observed data. For RANK and SEQUENCE data, however, remember that the relationship is reversed. Low values indicate high preference and will therefore produce high utilities. Conversely, high values indicate low preference and yield low utilities.

The total utilities might be a little off from the observed data due to the lack of fit. The standard error for each utility is one indication of how well the model fits that particular subject's data. Looking at subject 1, we can see that the standard errors for *price* are relatively high, and thus a linear model was probably not best for this factor for this subject.

Figure 4-2
CONJOINT results for subject 1

```
SUBJECT NAME:      1.00

Importance   Utility(s.e.)  Factor   ** Reversed ( 1 reversal )

         ++                 PACKAGE     package design
 7.21    II   .0000( .6303)     I         A*
         ++  -.6667( .6303)     I         B*
          I   .6667( .6303)     I         C*
          I
       +--+                 BRAND       brand name
12.61  I  I -1.3333( .6303)     I         K2R
       +--+  1.0000( .6303)     I         Glory
          I   .3333( .6303)     I         Bissell
          I
         ++                 PRICE    ** price
 4.50    II  2.4792(3.2476)     I-        $1.19
         ++  2.8958(3.7934)     I-        $1.39
          I  3.3125(4.3392)     I-        $1.59
          I B =  2.0833(2.7291)
          I
+---------+                 SEAL        Good Housekeeping Seal?
I48.65    I  9.0000( .9454)     I--       no
+---------+ 18.0000(1.8908)     I----     yes
          I B =  9.0000( .9454)
          I
    +-----+                 MONEY       moneyback guarantee?
    I27.03I  5.0000( .9454)     I-        no
    +-----+ 10.0000(1.8908)     I--       yes
          I B =  5.0000( .9454)
          I
            -12.062(4.2150) CONSTANT

Pearson's R   =  .962                    Significance =  .0000

Kendall's tau =  .869                    Significance =  .0000
Kendall's tau =  .667 for 4 holdouts     Significance =  .0871

   Simulation results:
     Card:     1    2
     Score:   3.8 18.8
```

Some additional results for each factor in the CONJOINT output are the value of B, the linear regression coefficient or slope for linear and quadratic models, and the value of C, the quadratic term for IDEAL and ANTIIDEAL models. For LINEAR models, the predicted score can be calculated by multiplying the factor value by B. For quadratic models, the predicted score can be calculated by multiplying the factor value by B, and adding that value to the product of C and the square of the factor value.

For IDEAL and ANTIIDEAL models, the value of the ideal point is also displayed.

Relative Importance

Since the part-worth scores are expressed on a common scale, the factors can be compared by looking at the ranges (highest–lowest) of these utilities. CONJOINT uses these ranges to compute importance scores for each factor. These are listed in the leftmost column of Figure 4-2 along with a bar chart to give you an idea of how the factors compare.

The **importance scores** are computed by taking the utility range for the particular factor and dividing it by the sum of all the utility ranges. From Figure 4-2, we can see that subject 1 thought a *Good Housekeeping* seal was very important (48.65), whereas the price was not (4.50). By using the importance scores, the total utility of any combination, even ones not rated by subjects, can be predicted.

Notice also that there are two asterisks (**) displayed next to *price*. This indicates that the direction specified (LESS) was not observed. This subject preferred the more expensive cleaners. “Reversals” are marked in this way whenever a specified MORE or LESS direction is not observed, or when a predicted IDEAL or ANTIIDEAL function is reversed.

The Pearson’s *R* and Kendall’s tau statistics displayed at the bottom of each subject’s output is another indication of how well the model fits the data. They are correlations between the observed and estimated preferences. As such, these coefficients should always be very high.

In many conjoint analyses, the number of parameters is close to the number of profiles rated, which will artificially inflate the correlation between observed and estimated scores. In these cases, the correlation between observed and estimated scores for the holdout profiles may give a better indication of the fit of the model, since these profiles were not used to estimate scores. Keep in mind, however, that holdouts will always produce lower correlation coefficients.

The Holdouts and Simulations

Four of the profiles in the carpet-cleaner example were holdout profiles. This means that they were rated by the subjects but that the Conjoint procedure did not use them when estimating the utilities. Instead, the Conjoint procedure computes correlations between the observed and predicted rank orders for these profiles as a check on the validity of the utilities.

There were two other combinations in the plan file, the simulations. These combinations were never printed by PLANCARDS or administered to the subjects. Results for these two hypothetical profiles are estimated by the Conjoint procedure based on the ratings of the experimental profiles. As can be seen from the bottom of Figure 4-2, CONJOINT computes an estimated preference score for each simulation profile for each subject. With preference scores estimated by CONJOINT, the higher the score, the greater the preference, regardless of how the observed data were scaled. Thus, for subject 1, we see that simulation profile 1 would not have been rated favorably but simulation profile 2 would have been rated very favorably.

Simulations do not have to be entered during the same session as the experimental profiles, nor do they have to already be part of the accessed plan file, as they were in this example. Adding a saved plan file to some new simulations and then accessing the preference data file, as in Figure 4-3, produces simulated judgments of the new profiles by using the part-worths estimated from the rankings of the experimental profiles. Keyword SIMULATION is available on the PRINT subcommand to limit output to just the simulation analysis. The commands in Figure 4-3 reproduce the same results for the two simulation profiles previously analyzed.

Figure 4-3
Running future simulations

```
DATA LIST FREE /PACKAGE BRAND PRICE SEAL MONEY CARD_.
BEGIN DATA
3 1 1.19 1 1 1
2 2 1.19 2 2 2
END DATA.
COMPUTE STATUS_=2.
ADD FILES FILE='CPLAN.SAV' /FILE=*.
CONJOINT PLAN=* /DATA='RUGRANKS.SAV'
 /SEQUENCE=PREF1 TO PREF22
 /SUBJECT=ID
 /FACTORS=PACKAGE BRAND (DISCRETE) PRICE (LINEAR LESS)
  SEAL (LINEAR MORE) MONEY (LINEAR MORE)
 /PRINT=SIMULATION.
```

Subfile Summary

When using the SUBJECT subcommand, you get the results discussed in this chapter for each subject as well as averaged results for the whole group. Figure 4-4 shows the group results for the carpet-cleaner study. Across all subjects in this study, package design was clearly the most important factor.

Figure 4-4
Group results from CONJOINT

```
SUBFILE SUMMARY
Averaged
Importance   Utility       Factor
+---------+                PACKAGE     package design
I35.63    I -2.2333           -I         A*
+---------+  1.8667            I-        B*
          I   .3667            I         C*
          I
      +---+                BRAND       brand name
14.91 I   I   .3667            I         K2R
      +---+  -.3500            I         Glory
          I  -.0167            I         Bissell
          I
  +-------+                PRICE       price
  I29.41  I -6.5946         ---I         $1.19
  +-------+ -7.7029         ---I         $1.39
          I -8.8113        ----I         $1.59
          I B = -5.5417
          I
       +--+                SEAL        Good Housekeeping Seal?
11.17  I  I  2.0000            I-        no
       +--+  4.0000            I--       yes
          I B =  2.0000
          I
        +-+                MONEY       moneyback guarantee?
 8.87   I I  1.2500            I-        no
        +-+  2.5000            I-        yes
          I B =  1.2500
          I
            12.8696        CONSTANT

Pearson's R   =  .982                   Significance =  .0000
Kendall's tau =  .892                   Significance =  .0000
Kendall's tau =  .667 for 4 holdouts    Significance =  .0871

Simulation results:
  Card:     1    2
  Score:  10.3 14.3
```

The PLOT subcommand provides another way for you to look at the group results. The SUMMARY keyword produces one bar chart for every variable, showing the utility scores for each category of that variable, and a chart showing the summary importance scores for each variable. You can also request charts of the utility and importance scores by subjects with the SUBJECT keyword. Figure 4-5 displays the summary utilities for *package* and Figure 4-6 shows the importance summary.

Figure 4-5
Summary utilities for package

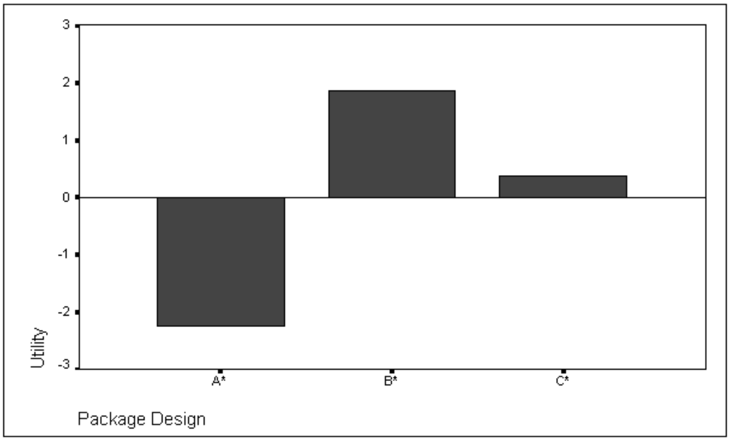


Figure 4-6
Importance summary

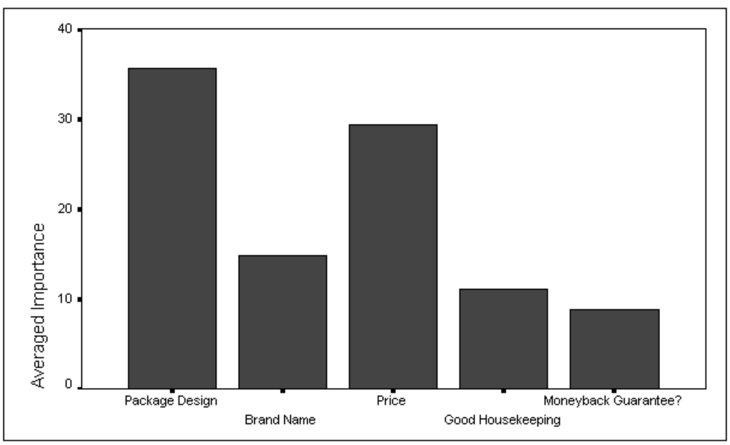


Figure 4-7 shows some additional group statistics. The Conjoint procedure displays summary results on reversals and simulations. The simulation summary gives the probabilities of choosing particular simulation profiles as the most preferred profiles under three different probability-of-choice models. The **maximum utility model** is simply the probability of choosing a profile as the most preferred. The **BTL (Bradley-Terry-Luce) model** computes the probability of choosing a profile as the most preferred by dividing the profile's utility by the sum of all the simulation total utilities. The **logit model** is similar to BTL but uses the natural log of the utilities instead of the utilities. Across the 10 subjects in this study, all three models indicated that simulation profile 2 would be more preferred.

Figure 4-7
Reversal and simulation summary

```
Reversal Summary:
2 subjects had  2 reversals
     3 subjects had  1 reversals

Reversals by factor:
PRICE      3
   MONEY      2
   SEAL       2
   BRAND      0
   PACKAGE    0

Reversal index:
Page   Reversals   Subject
   49        1           1.00
   50        2           2.00
   51        0           3.00
   52        0           4.00
   53        0           5.00
   54        1           6.00
   55        0           7.00
   56        0           8.00
   57        1           9.00
   58        2          10.00

Simulation Summary  (10 subjects/ 10 subjects with non-negative scores)
Card    Max Utility        BTL          Logit
     1       30.00%         43.07%         30.92%
     2       70.00          56.93          69.08
```

The Utility File

The UTILITY subcommand, shown in Figure 4-1, writes out an SPSS data file containing for each subject the utilities for DISCRETE factors, the slope and quadratic functions for LINEAR, IDEAL, and ANTIIDEAL factors (labeled *B* and *C* in the output), the regression constant, and the estimated preference scores. These values can then be used in further analyses or for making additional plots and graphs with other procedures.

How to Obtain a Conjoint Analysis

Conjoint analysis is a technique for measuring people's preferences of stimuli with multiple attributes. It provides a means of determining which combinations of attributes are most preferred, which individual attributes most influence preference of the total item, and the relative importance of each factor. Conjoint analysis also allows you to predict the effects of factor level combinations that were not actually presented in the experiment.

In this release of SPSS, a graphical user interface is not yet available for the Conjoint procedure. To obtain a conjoint analysis, you must enter SPSS commands into a syntax window, and then run them. To obtain a conjoint analysis:

▶ From the menus choose:

File
  New ▶
    SPSS Syntax...

This opens an SPSS syntax window.

▶ Enter the commands that you want to run in the syntax window.

▶ Select the commands that you want to run, and then click the Run Syntax tool () on the toolbar.

See the *SPSS Base User's Guide* for more information about running commands in syntax windows. See the Syntax Reference section of this manual for command syntax rules and for complete CONJOINT command syntax.

Minimum Specifications

The minimum specifications for a Conjoint analysis include the specification of two files—a data file and a plan file—and the specification of how data were recorded. Files are specified with the PLAN and DATA subcommands. The method of data recording is specified with the SEQUENCE/RANK/SCORE subcommands. The following syntax shows a minimal specification for a conjoint analysis of the carpet-cleaner study:

```
CONJOINT PLAN=* /DATA='RUGRANKS.SAV'
 /SEQUENCE=PREF1 TO PREF 22.
```

Specifying the Files

The Conjoint procedure requires two files—a plan file and a data file. The plan file can be created using the Orthoplan procedure, as in the example shown in Figure 4-1, or it can be entered into the Data Editor like any data file. If only a plan file or a data file is specified, the CONJOINT command reads the specified file and uses the working data file as the other. The plan file is specified with the PLAN subcommand, and the data file is specified with the DATA subcommand.

For example, the command

```
CONJOINT PLAN='CPLAN.SAV' /DATA='RUGRANKS.SAV'
```

specifies that the plan file to be used in the conjoint analysis is *cplan.sav*, and the data file to be used in the analysis is *rugranks.sav.* To specify a plan file and use the current working data file as the data file, specify:

```
CONJOINT PLAN='CPLAN.SAV' /DATA=*
```

The asterisk (*) indicates that the working data file should be used as the data file. You can also eliminate the DATA subcommand altogether, and the working data file will automatically be used as the data file. Similarly, you can specify a data file and use the current working data file as the plan file. For example:

```
CONJOINT PLAN=* /DATA='RUGRANKS.SAV'
```

Specifying How Data Were Recorded

You must specify the way in which preference data were recorded. Data can be recorded in one of three ways: sequentially, as rankings, or as preference scores. These three methods are indicated by the SEQUENCE, RANK, and SCORE subcommands. You must specify one, and only one, of these subcommands.

SEQUENCE Subcommand

The SEQUENCE subcommand indicates that data were recorded sequentially so that each data point in the data file is a profile number, starting with the most preferred profile and ending with the least preferred profile. This is how data are recorded if the subject is asked to order the profiles from the most to the least preferred. The researcher records which profile number was first, which profile number was second, and so on. The data in the carpet-cleaner study were recorded this way, as specified by the following syntax:

```
CONJOINT PLAN='CPLAN.SAV'
 /DATA=* /SEQUENCE=PREF1 TO PREF22.
```

RANK Subcommand

The RANK subcommand indicates that each data point is a ranking, starting with the ranking of profile 1, then the ranking of profile 2, and so on. This is how the data are recorded if the subject is asked to assign a rank to each profile, ranging from 1 to *n*, where *n* is the number of profiles. A lower rank implies greater preference. For example, if the carpet-cleaner study had recorded data this way, and the variables in the study were named *rank1* to *rank22*, it would be specified by the following syntax:

```
CONJOINT PLAN='CPLAN.SAV'
 /DATA=* /RANK=RANK1 TO RANK22.
```

SCORE Subcommand

The SCORE subcommand indicates that each data point is a preference score assigned to the profiles, starting with the score of profile 1, then the score of profile 2, and so on. This type of data might be generated, for example, by asking subjects to assign a number from 1 to 100 to show how much they liked the profile. A higher score implies greater preference. For example, if the carpet-cleaner study had recorded data this way, and the variables in the study were named *score1* to *score22*, it would be specified by the following syntax:

```
CONJOINT PLAN='CPLAN.SAV'
/DATA=* /SCORE=SCORE1 TO SCORE22.
```

Optional Specifications

In addition to the minimum required specifications, the CONJOINT command contains optional subcommands that allow you to specify a subject identification variable, specify a model for each factor, control analyses included in your output, and write a utility file to a specified file.

SUBJECT Subcommand

The SUBJECT subcommand allows you to specify a subject identification variable. If you do not specify a subject variable, the CONJOINT command assumes that all data come from one subject. In the carpet-cleaner study, the subject identification variable is named *id*, as specified with the following syntax:

```
CONJOINT PLAN=CPLAN
/DATA=* /SEQUENCE=PREF1 TO PREF22 /SUBJECT=ID
```

FACTOR Subcommand

The FACTOR subcommand allows you to specify the model describing the expected relationship between factors and the rankings or scores. You can specify one of four models:

DISCRETE. The DISCRETE model indicates that the factor levels are categorical and that no assumption is made about the relationship between the factor and the scores or ranks. If you do not specify a model for a factor, CONJOINT assumes a discrete model.

LINEAR. The LINEAR model indicates an expected linear relationship between the factor and the scores or ranks. You can specify the expected direction of the linear relationship with the keywords MORE and LESS. MORE indicates that higher levels of a factor are expected to be preferred, while LESS indicates that lower levels of a factor are expected to be preferred.

IDEAL. The IDEAL model indicates an expected quadratic relationship with a decreasing preference between the factor and the scores or ranks.

ANTIIDEAL. The ANTIIDEAL model indicates an expected quadratic relationship with an increasing preference between the factor and the scores or ranks. In the carpet-cleaner study, the factors *package* and *brand* are categorical, and therefore assigned a discrete model. *Price*, *seal*, and *money* were all expected to have a linear relationship to the preference scores. *Seal* and *money* are expected to have a positive linear relationship, as indicated by the keyword MORE, while *price* is expected to have a negative linear relationship, as indicated by the keyword LESS. That is, with the higher levels of *seal* and *money,* which correspond to the existence of a *Good Housekeeping* seal and a money-back guarantee, preference is expected to increase. However, as price increases, preference is expected to decrease. Following is the syntax specifying the factors for the carpet-cleaner study:

```
/FACTORS=PACKAGE BRAND (DISCRETE) PRICE (LINEAR LESS) SEAL
 (LINEAR MORE) MONEY (LINEAR MORE)
```

PRINT Subcommand

The PRINT subcommand allows you to control whether the output includes the analysis of the experimental data, results of simulation data, both, or none. If you do not specify a PRINT subcommand, the results of both the experimental data and the simulation data are printed. The carpet-cleaner example included the results of both the experimental and simulation data:

```
/PRINT=ALL
```

UTILITY Subcommand

The UTILITY subcommand writes a utility data file containing one case for each subject. The utility file can be opened in the Data Editor and displayed or edited like any data file. The following syntax creates a utility file named *rugutil.sav*:

```
/UTILITY='RUGUTIL.SAV'
```

Syntax Reference

Introduction

This syntax reference guide describes the SPSS command language underlying SPSS Conjoint. Most of the features of these commands are implemented in the dialog boxes and can be used directly from the dialog boxes for ORTHOPLAN and PLANCARDS. Or you can paste the syntax into a syntax window and edit it or build a command file, which you can save and reuse. The features that are available only in command syntax are summarized following the discussion of the dialog box interface in the corresponding chapter on each statistical procedure. In contrast to the other procedures, CONJOINT is available only through syntax.

A Few Useful Terms

All terms in the SPSS command language fall into one or more of the following categories:

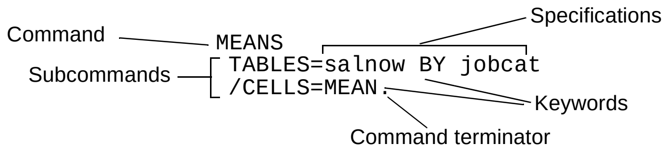
Keyword. A word already defined by SPSS to identify a command, subcommand, or specification. Most keywords are, or resemble, common English words.

Command. A specific instruction that controls the execution of SPSS.

Subcommand. Additional instructions for SPSS commands. A command can contain more than one subcommand, each with its own specifications.

Specifications. Instructions added to a command or subcommand. Specifications may include subcommands, keywords, numbers, arithmetic operators, variable names, special delimiters, and so forth.

Each command begins with a command keyword (which may contain more than one word). The command keyword is followed by at least one blank space and then any additional specifications. Each command ends with a command terminator, which is a period. For example:



Syntax Diagrams

Each SPSS command described in this manual includes a syntax diagram that shows all of the subcommands, keywords, and specifications allowed for that command. These syntax diagrams are also available in the online Help system for easy reference when entering commands in a syntax window. By remembering the following rules, you can use the syntax diagram as a quick reference for any command:

- Elements shown in all capital letters are keywords defined by SPSS to identify commands, subcommands, functions, operators, and other specifications.
- Elements in lower case describe specifications you supply.
- Elements in boldface type are defaults. A default indicated with two asterisks (**) is in effect when the keyword is not specified. (Boldface is not used in the online Help system syntax diagrams.)
- Parentheses, apostrophes, and quotation marks are required where indicated.
- Elements enclosed in square brackets ([ ]) are optional.
- Braces ({ }) indicate a choice among elements. You can specify any one of the elements enclosed within the aligned braces.
- Ellipses indicate that an element can be repeated.
- Most abbreviations are obvious; for example, varname stands for variable name and varlist stands for a list of variables.
- The command terminator is not shown in the syntax diagrams.

Syntax Rules

Keep in mind the following simple rules when writing and editing commands in a syntax window:

- Each command must begin on a new line and end with a period.
- Subcommands are separated by slashes. The slash before the first subcommand in a command is optional in most commands.
- SPSS keywords are not case-sensitive, and three-letter abbreviations can be used for most keywords.
- Variable names must be spelled out in full.
- You can use as many lines as you want to specify a single command. However, text included within apostrophes or quotation marks must be contained on a single line.
- You can add space or break lines at almost any point where a single blank is allowed, such as around slashes, parentheses, arithmetic operators, or between variable names.
- Each line of syntax cannot exceed 80 characters.
- The period must be used as the decimal indicator, regardless of your language settings-*LANG* environment variable setting.

For example,

```
FREQUENCIES
 VARIABLES=JOBCAT SEXRACE
 /PERCENTILES=25 50 75
 /BARCHART.
```

and

```
freq var=jobcat sexrace /percent=25 50 75 /bar.
```

are both acceptable alternatives that generate the same results. The second example uses three-letter abbreviations and lower case, and the command is on one line.

Batch Mode and INCLUDE Files

If your SPSS commands are contained in a command file that is specified on the SPSS INCLUDE command, For SPSS command files run in batch mode (see the *SPSS Base System User's Guide*) or via the SPSS INCLUDE command, the syntax rules are slightly different:

- Each command must begin in the first column of a new line.
- Continuation lines within a command must be indented at least one space.
- The period at the end of the command is optional.

If you generate command syntax by pasting dialog box choices into a syntax window, the format of the commands is suitable for all modes of operation.

CONJOINT

```
CONJOINT  [PLAN={*   }]
                {file}

 [/DATA={*   }]
        {file}

  /{SEQUENCE}=varlist
   {RANK    }
   {SCORE   }

 [/SUBJECT=variable]

 [/FACTORS=varlist['labels'] ([{DISCRETE[{MORE}]}]
                               {          {LESS} }
                               {LINEAR[{MORE}]  }
                               {        {LESS}   }
                               {IDEAL            }
                               {ANTIIDEAL        }
           [values['labels']])]

           varlist...


 [/PRINT={ALL**      } [SUMMARYONLY]]
         {ANALYSIS   }
         {SIMULATION }
         {NONE       }

 [/UTILITY=file]

 [/PLOT={[SUMMARY] [SUBJECT] [ALL]}]
        {[NONE**]                 }
```

**Default if subcommand or keyword is omitted.

Example:

```
CONJOINT PLAN='CARPLAN.SAV'
 /FACTORS=SPEED (LINEAR MORE) WARRANTY (DISCRETE MORE)
  PRICE (LINEAR LESS) SEATS
 /SUBJECT=SUBJ /RANK=RANK1 TO RANK15 /UTILITY='UTIL.SAV'.
```

Overview

CONJOINT analyzes score or rank data from full-concept conjoint studies. A plan file generated by ORTHOPLAN or entered by the user describes the set of full concepts scored or ranked in terms of preference. A variety of continuous and discrete models is available to estimate utilities for each individual subject and for the group. Simulation estimates for concepts not rated can also be computed.

Options

Data Input. You can analyze data recorded as rankings of an ordered set of profiles, or cards, as the profile numbers arranged in rank order, or as preference scores of an ordered set of profiles.

Model Specification. You can specify how each factor is expected to be related to the scores or ranks.

Display Output. The output can include the analysis of the experimental data, results of simulation data, or both.

Writing an External File. An SPSS data file containing utility estimates and associated statistics for each subject can be written for use in further analyses or graphs.

Basic Specification

- The basic specification is CONJOINT, a PLAN or DATA subcommand, and a SEQUENCE, RANK, or SCORE subcommand to describe the type of data.
- CONJOINT requires two files: a plan file and a data file. If only the PLAN subcommand or the DATA subcommand, but not both, is specified, CONJOINT will read the file specified on the PLAN or DATA subcommand and use the working data file as the other file.
- By default, estimates are computed using the DISCRETE model for all variables in the plan file (except those named *STATUS_* and *CARD_*). Output includes Kendall's tau and Pearson's product-moment correlation coefficients measuring the relationship between predicted and actual scores. Significance levels for one-tailed tests are displayed.

Subcommand Order

- Subcommands can appear in any order.

Syntax Rules

- Multiple FACTORS subcommands are all executed. For all other subcommands, only the last occurrence is executed.

Operations

- Both the plan and data files can be external SPSS data files. In this case, CONJOINT can be used before a working data file is defined.
- The variable *STATUS_* in the plan file must equal 0 for experimental profiles, 1 for holdout profiles, and 2 for simulation profiles. Holdout profiles are judged by the subjects but are not used when CONJOINT estimates utilities. Instead, they are used as a check on the validity of the estimated utilities. Simulation profiles are factor-level combinations that are not rated by the subjects but are estimated by CONJOINT based on the ratings of

the experimental profiles. If there is no *STATUS_* variable, all profiles in the plan file are assumed to be experimental profiles.

- All variables in the plan file except *STATUS_* and *CARD_* are used by CONJOINT as factors.
- In addition to the estimates for each individual subject, average estimates for each split-file group identified in the data file are computed. The plan file cannot have a split-file structure.
- Factors are tested for orthogonality by CONJOINT. If all of the factors are not orthogonal, a matrix of Cramér's *V* statistics is displayed to describe the nonorthogonality.
- When SEQUENCE or RANK data are used, CONJOINT internally reverses the ranking scale so that the coefficients computed are positive.
- The plan file cannot be sorted or modified in any way once the data are collected, since the sequence of profiles in the plan file must match the sequence of values in the data file in a one-to-one correspondence. (CONJOINT uses the order of profiles as they appear in the plan file, not the value of *CARD_*, to determine profile order.) If RANK or SCORE is the data-recording method, the first response from the first subject in the data file is the rank or score of the first profile in the plan file. If SEQUENCE is the data-recording method, the first response from the first subject in the data file is the profile number (determined by the order of profiles in the plan file) of the most preferred profile.

Limitations

- Factors must be numeric.
- The plan file cannot contain missing values or case weights. In the working data file, profiles with missing values on the SUBJECT variable are grouped together and averaged at the end. If any preference data (the ranks, scores, or profile numbers) are missing, that subject is skipped.
- Factors must have at least two levels. The maximum number of levels for each factor is 99.

Example

```
CONJOINT PLAN='CARPLAN.SAV'
 /FACTORS=SPEED (LINEAR MORE) WARRANTY (DISCRETE MORE)
  PRICE (LINEAR LESS) SEATS
 /SUBJECT=SUBJ /RANK=RANK1 TO RANK15 /UTILITY='UTIL.SAV'.
```

- The PLAN subcommand specifies the SPSS data file *CARPLAN.SAV* as the plan file containing the full-concept profiles. Since there is no DATA subcommand, the working data file is assumed to contain the subjects' rankings of these profiles.
- The FACTORS subcommand specifies the ways in which the factors are expected to be related to the rankings. For example, speed is expected to be linearly related to the rankings, so that cars with higher speeds will receive lower (more-preferred) rankings.
- The SUBJECT subcommand specifies the variable *SUBJ* in the working data file as an identification variable. All consecutive cases with the same value on this variable are combined to estimate utilities.

- The RANK subcommand specifies that each data point is a ranking of a specific profile and identifies the variables in the working data file that contain these rankings.
- UTILITY writes out an external data file named *UTIL.SAV* containing the utility estimates and associated statistics for each subject.

PLAN Subcommand

PLAN identifies the file containing the full-concept profiles.

- PLAN is followed by the name of an external SPSS data file containing the plan or an asterisk to indicate the working data file.
- If the PLAN subcommand is omitted, the working data file is assumed by default. However, you must specify at least one external SPSS data file on a PLAN or a DATA subcommand. The working data file cannot be specified as both the plan and the data file.
- The file is specified in the usual manner for your operating system.
- The plan file is a specially prepared file generated by ORTHOPLAN or entered by the user. The plan file can contain the variables *CARD_* and *STATUS_*, and it must contain the factors of the conjoint study. The value of *CARD_* is a profile identification number. The value of *STATUS_* is 0, 1, or 2, depending on whether the profile is an experimental profile (0), a holdout profile (1), or a simulation profile (2).
- The sequence of the profiles in the plan file must match the sequence of values in the data file (see “Operations” on p. 2).
- Any simulation profiles (*STATUS_*=2) must follow experimental and holdout profiles in the plan file.
- All variables in the plan file except *CARD_* and *STATUS_* are used as factors by CONJOINT.

Example

```
DATA LIST FREE /CARD_ WARRANTY SEATS PRICE SPEED STATUS_.
BEGIN DATA
1 1 4 14000 130 2
2 1 4 14000 100 2
3 3 4 14000 130 2
4 3 4 14000 100 2
END DATA.
ADD FILES FILE='CARPLAN.SAV'/FILE=*.
CONJOINT PLAN=* /DATA='DATA.SAV'
  /FACTORS=PRICE (ANTIIDEAL) SPEED (LINEAR) WARRANTY (DISCRETE MORE)
  /SUBJECT=SUBJ /RANK=RANK1 TO RANK15 /PRINT=SIMULATION.
```

- DATA LIST defines six variables—a *CARD_* identification variable, four factors, and a *STATUS_* variable.
- The data between BEGIN DATA and END DATA are four simulation profiles. Each one contains a *CARD_* identification number and the specific combination of factor levels of interest.
- The variable *STATUS_* is equal to 2 for all cases (profiles). CONJOINT interprets profiles with *STATUS_* equal to 2 as simulation profiles.

- The ADD FILES command joins an old plan file, *CARPLAN.SAV*, with the working data file. Note that the working data file is indicated last on the ADD FILES command so that the simulation profiles are appended to the end of *CARPLAN.SAV*.
- The PLAN subcommand on CONJOINT defines the new working data file as the plan file. The DATA subcommand specifies a data file from a previous CONJOINT analysis.

DATA Subcommand

DATA identifies the file containing the subjects' preference scores or rankings.

- DATA is followed by the name of an external SPSS data file containing the data or an asterisk to indicate the current working data file.
- If the DATA subcommand is omitted, the working data file is assumed by default. However, you must specify at least one external SPSS data file on a DATA or a PLAN subcommand. The working data file cannot be specified as both the plan and the data file.
- The file is specified in the usual manner for your operating system.
- One variable in the data file can be a subject identification variable. All other variables are the subject responses and are equal in number to the number of experimental and hold-out profiles in the plan file.
- The subject responses can be in the form of ranks assigned to an ordered sequence of profiles, scores assigned to an ordered sequence of profiles, or profile numbers in preference order from most to least liked.
- Tied ranks or scores are allowed. CONJOINT issues a warning if tied ranks are present and then proceeds with the analysis. Data recorded in SEQUENCE format, however, cannot have ties, since each profile number must be unique.

Example

```
DATA LIST FREE /SUBJ RANK1 TO RANK15.
BEGIN DATA
01  3  7  6  1  2  4  9 12 15 13 14  5  8 10 11
02  7  3  4  9  6 15 10 13  5 11  1  8  4  2 12
03 12 13  5  1 14  8 11  2  7  6  3  4 15  9 10
04  3  6  7  4  2  1  9 12 15 11 14  5  8 10 13
05  9  3  4  7  6 10 15 13  5 12  1  8  4  2 11
50 12 13  8  1 14  5 11  6  7  2  3  4 15 10  9
END DATA.
SAVE OUTFILE='RANKINGS.SAV'.
DATA LIST FREE /CARD_ WARRANTY SEATS PRICE SPEED.
BEGIN DATA
 1 1 4 14000 130
 2 1 4 14000 100
 3 3 4 14000 130
 4 3 4 14000 100
 5 5 2 10000 130
 6 1 4 10000 070
 7 3 4 10000 070
 8 5 2 10000 100
 9 1 4 07000 130
10 1 4 07000 100
11 5 2 07000 070
12 5 4 07000 070
13 1 4 07000 070
14 5 2 10000 070
15 5 2 14000 130
END DATA.
CONJOINT PLAN=* /DATA='RANKINGS.SAV'
  /FACTORS=PRICE (ANTIIDEAL) SPEED (LINEAR)
   WARRANTY (DISCRETE MORE)
  /SUBJECT=SUBJ /RANK=RANK1 TO RANK15.
```

- The first set of DATA LIST and BEGIN–END DATA commands creates a data file containing the rankings. This file is saved in the external file *RANKINGS.SAV*.
- The second set of DATA LIST and BEGIN–END DATA commands defines the plan file as the working data file.
- The CONJOINT command uses the working data file as the plan file and *RANKINGS.SAV* as the data file.

SEQUENCE, RANK, or SCORE Subcommand

The SEQUENCE, RANK, or SCORE subcommand is specified to indicate the way in which the preference data were recorded.

SEQUENCE *Each data point in the data file is a profile number, starting with the most-preferred profile and ending with the least-preferred profile*. This is how the data are recorded if the subject is asked to order the deck of profiles from most to least preferred. The researcher records which profile number was first, which profile number was second, and so on.

RANK *Each data point is a ranking, starting with the ranking of profile 1, then the ranking of profile 2, and so on*. This is how the data are recorded if the subject is asked to assign a rank to each profile, ranging from 1 to *n*, where *n* is the number of profiles. A lower rank implies greater preference.

SCORE *Each data point is a preference score assigned to the profiles, starting with the score of profile 1, then the score of profile 2, and so on*. These types of data might be generated, for example, by asking subjects to use a Likert scale to assign a score to each profile or by asking subjects to assign a number from 1 to 100 to show how much they like the profile. A higher score implies greater preference.

- You must specify one, and only one, of these three subcommands.
- After each subcommand, the names of the variables containing the preference data (the profile numbers, ranks, or scores) are listed. There must be as many variable names listed as there are experimental and holdout profiles in the plan file.

Example

```
CONJOINT PLAN=* /DATA='DATA.SAV'
  /FACTORS=PRICE (ANTIIDEAL) SPEED (LINEAR) WARRANTY (DISCRETE MORE)
  /SUBJECT=SUBJ
  /RANK=RANK1 TO RANK15.
```

- The RANK subcommand indicates that the data are rankings of an ordered sequence of profiles. The first data point after *SUBJ* is variable *RANK1*, which is the ranking given by subject 1 to profile 1.
- There are 15 profiles in the plan file, so there must be 15 variables listed on the RANK subcommand.
- The example uses the TO keyword to refer to the 15 rank variables.

SUBJECT Subcommand

SUBJECT specifies an identification variable. All consecutive cases having the same value on this variable are combined to estimate the utilities.

- If SUBJECT is not specified, all data are assumed to come from one subject and only a group summary is displayed.
- SUBJECT is followed by the name of a variable in the working data file.
- If the same SUBJECT value appears later in the data file, it is treated as a different subject.

FACTORS Subcommand

FACTORS specifies the way in which each factor is expected to be related to the rankings or scores.

- If FACTORS is not specified, the DISCRETE model is assumed for all factors.
- All variables in the plan file except *CARD_* and *STATUS_* are used as factors, even if they are not specified on FACTORS.

- FACTORS is followed by a variable list and a model specification in parentheses that describes the expected relationship between scores or ranks and factor levels for that variable list.
- The model specification consists of a model name and, for the DISCRETE and LINEAR models, an optional MORE or LESS keyword to indicate the direction of the expected relationship. Values and value labels can also be specified.
- MORE and LESS keywords will *not* affect estimates of utilities. They are used simply to identify subjects whose estimates do not match the expected direction.

The four available models are:

DISCRETE *No assumption*. The factor levels are categorical and no assumption is made about the relationship between the factor and the scores or ranks. This is the default. Specify keyword MORE after DISCRETE to indicate that higher levels of a factor are expected to be more preferred. Specify keyword LESS after DISCRETE to indicate that lower levels of a factor are expected to be more preferred.

LINEAR *Linear relationship*. The scores or ranks are expected to be linearly related to the factor. Specify keyword MORE after LINEAR to indicate that higher levels of a factor are expected to be more preferred. Specify keyword LESS after LINEAR to indicate that lower levels of a factor are expected to be more preferred.

IDEAL *Quadratic relationship, decreasing preference*. A quadratic relationship is expected between the scores or ranks and the factor. It is assumed that there is an ideal level for the factor, and distance from this ideal point, in either direction, is associated with decreasing preference. Factors described with this model should have at least three levels.

ANTIIDEAL *Quadratic relationship, increasing preference*. A quadratic relationship is expected between the scores or ranks and the factor. It is assumed that there is a worst level for the factor, and distance from this point, in either direction, is associated with increasing preference. Factors described with this model should have at least three levels.

- The DISCRETE model is assumed for those variables not listed on the FACTORS subcommand.
- When a MORE or LESS keyword is used with DISCRETE or LINEAR, a reversal is noted when the expected direction does not occur.
- Both IDEAL and ANTIIDEAL create a quadratic function for the factor. The only difference is whether preference increases or decreases with distance from the point. The estimated utilities are the same for these two models. A reversal is noted when the expected model (IDEAL or ANTIIDEAL) does not occur.
- The optional value and value label lists allow you to recode data and/or replace value labels. The new values, in the order in which they appear on the value list, replace existing values starting with the smallest existing value. If a new value is not specified for an existing value, the value remains unchanged.

- New value labels are specified in apostrophes or quotation marks. New values without new labels retain existing labels; new value labels without new values are assigned to values in the order in which they appear, starting with the smallest existing value.
- A table is displayed for each factor that is recoded, showing the original and recoded values and the value labels.
- If the factor levels are coded in discrete categories (for example, 1, 2, 3), these are the values used by CONJOINT in computations, even if the value labels contain the actual values (for example, 80, 100, 130). Value labels are never used in computations. You can recode the values as described above to change the coded values to the real values. Recoding does not affect DISCRETE factors but does change the coefficients of LINEAR, IDEAL, and ANTIIDEAL factors.
- In the output, variables are described in the following order:

1. All DISCRETE variables in the order in which they appear on the FACTORS subcommand.
2. All LINEAR variables in the order in which they appear on the FACTORS subcommand.
3. All IDEAL and ANTIIDEAL factors in the order in which they appear on the FACTORS subcommand.

Example

```
CONJOINT DATA='DATA.SAV'
 /FACTORS=PRICE (LINEAR LESS) SPEED (IDEAL 70 100 130)
  WARRANTY (DISCRETE MORE)
 /RANK=RANK1 TO RANK15.
```

- The FACTORS subcommand specifies the expected relationships. A linear relationship is expected between price and rankings, so that the higher the price, the lower the preference (higher ranks). A quadratic relationship is expected between speed levels and rankings, and longer warranties are expected to be associated with greater preference (lower ranks).
- The *SPEED* factor has a new value list. If the existing values were 1, 2, and 3, 70 replaces 1, 100 replaces 2, and 130 replaces 3.
- Any variable in the plan file (except *CARD_* and *STATUS_*) not listed on the FACTORS subcommand uses the DISCRETE model.

PRINT Subcommand

PRINT controls whether your output includes the analysis of the experimental data, the results of the simulation data, both, or none.

The following keywords are available:

ANALYSIS *Only the results of the experimental data analysis.*

SIMULATIONS *Only the results of the simulation data analysis*. The results of three simulation models—maximum utility, Bradley-Terry-Luce (BTL), and logit—are displayed.

SUMMARYONLY *Only the summaries in the output, not the individual subjects*. Thus, if you have a large number of subjects, you can see the summary results without having to generate output for each subject.

ALL *The results of both the experimental data and simulation data analyses*. ALL is the default.

NONE *No results are written to the display file*. This keyword is useful if you are interested only in writing the utility file (see “UTILITY Subcommand” below).

UTILITY Subcommand

UTILITY writes a utility file to the file specified. The utility file is an SPSS data file.

- If UTILITY is not specified, no utility file is written.
- UTILITY is followed by the name of the file to be written.
- The file is specified in the usual manner for your operating system.
- The utility file contains one case for each subject.

The variables written to the utility file are in the following order:

- Any SPLIT FILE variables in the working data file.
- Any SUBJECT variable.
- The constant for the regression equation for the subject. The regression equation constant is named CONSTANT.
- For DISCRETE factors, all of the utilities estimated for the subject. The names of the utilities estimated with DISCRETE factors are formed by appending a digit after the factor name. The first utility gets a 1, the second a 2, and so on.
- For LINEAR factors, a single coefficient. The name of the coefficient for LINEAR factors is formed by appending *_L* to the factor name. (To calculate the predicted score, multiply the factor value by the coefficient.)
- For IDEAL or ANTIIDEAL factors, two coefficients. The name of the two coefficients for IDEAL or ANTIIDEAL factors are formed by appending *_L* and *_Q*, respectively, to the factor name. (To use these coefficients in calculating the predicted score, multiply the factor value by the first and add that to the product of the second coefficient and the square of the factor value.)
- The estimated ranks or scores for all profiles in the plan file. The names of the estimated ranks or scores are of the form *SCOREn* for experimental and holdout profiles, or *SIMULn* for simulation profiles, where *n* is the position in the plan file. The name is *SCORE* for experimental and holdout profiles even if the data are ranks.

If the variable names created are too long, letters are truncated from the end of the original variable name before new suffixes are appended.

PLOT Subcommand

The PLOT subcommand produces high-resolution plots in addition to the output usually produced by CONJOINT.

- If high-resolution graphics is turned off, the plots are not produced and a warning is displayed (see the HIGHRES subcommand of the SET command in the *SPSS Base Syntax Reference Guide*).

The following keywords are available for this subcommand:

SUMMARY *Plots a high-resolution bar chart of the importance values for all variables, plus a utility bar chart for each variable*. This is the default if the PLOT subcommand is specified with no keywords.

SUBJECT *Plots a clustered bar chart of the importance values for each factor, clustered by subjects, and one clustered bar chart for each factor showing the utilities for each factor level, clustered by subjects*. If no SUBJECT subcommand was specified naming the variables, no plots are produced and a warning is displayed.

ALL *Plots both summary and subject charts*.

NONE *Does not plot any high-resolution charts*. This is the default if the subcommand is omitted.

ORTHOPLAN

```
ORTHOPLAN [FACTORS=varlist ['labels'] (values ['labels'])...]

 [{/REPLACE     }]
  {/OUTFILE=file}

 [/MINIMUM=value]

 [/HOLDOUT=value]  [/MIXHOLD={YES}]
                            {NO }
```

Example:

```
ORTHOPLAN FACTORS=SPEED 'Highest possible speed'
   (70 '70 mph' 100 '100 mph' 130 '130mph')
 WARRANTY 'Length of warranty'
   ('1 year' '3 year' '5 year')
 SEATS (2, 4)
 /MINIMUM=9 /HOLDOUT=6.
```

Overview

ORTHOPLAN generates an orthogonal main-effects plan for a full-concept conjoint analysis. It can append or replace an existing working data file, or build a working data file if one does not already exist. The generated plan can be listed in full-concept profile, or card, format using PLANCARDS. The file created by ORTHOPLAN can be used as the plan file for CONJOINT.

Options

Number of Cases. You can specify the minimum number of cases to be generated in the plan.

Holdout and Simulation Cases. In addition to the experimental main-effects cases, you can generate a specified number of holdout cases and identify input data as simulation cases.

Basic Specification

- The basic specification is ORTHOPLAN followed by FACTORS, a variable list, and a value list in parentheses. ORTHOPLAN will generate cases in the working data file, with each case representing a profile in the conjoint experimental plan and consisting of a new combination of the factor values. By default, the smallest possible orthogonal plan is generated.
- If you are appending to an existing working data file that has previously defined values, the FACTORS subcommand is optional.

Subcommand Order

- Subcommands can be named in any order.

Operations

- ORTHOPLAN builds a working data file if one does not already exist by using the variable and value information on the FACTORS subcommand.
- When ORTHOPLAN appends to a working data file and FACTORS is not used, the factor levels (values) must be defined on a previous ORTHOPLAN or VALUE LABELS command.
- New variables *STATUS_* and *CARD_* are created and added to the working data file by ORTHOPLAN if they do not already exist. *STATUS_*=0 for experimental cases, 1 for holdout cases, and 2 for simulation cases. Holdout cases are judged by the subjects but are not used when CONJOINT estimates utilities. Instead, they are used as a check on the validity of the estimated utilities. Simulation cases are entered by the user. They are factor-level combinations that are not rated by the subjects but are estimated by CONJOINT based on the ratings of the experimental cases. *CARD_* contains the case identification numbers in the generated plan.
- Duplication between experimental and simulation cases is reported.
- If a user-entered experimental case (*STATUS_*=0) is duplicated by ORTHOPLAN, only one copy of the case is kept.
- Occasionally, ORTHOPLAN may generate duplicate experimental cases. One way to handle these duplicates is simply to edit or delete them, in which case the plan is no longer orthogonal. Alternatively, you can try running ORTHOPLAN again. With a different *seed*, ORTHOPLAN might produce a plan without duplicates. See the SEED subcommand on SET in the *SPSS Base Syntax Reference Guide* for more information on the random seed generator.
- The SPLIT FILE and WEIGHT commands are ignored by ORTHOPLAN.

Limitations

- Missing data are not allowed.
- A maximum of 10 factors and 9 levels can be specified per factor.
- A maximum of 81 cases can be generated by ORTHOPLAN.

Example

```
ORTHOPLAN FACTORS=SPEED 'Highest possible speed'
   (70 '70 mph' 100 '100 mph' 130 '130mph')
  WARRANTY 'Length of warranty'
   ('1 year' '3 year' '5 year')
  SEATS (2, 4) /MINIMUM=9 /HOLDOUT=6 /OUTFILE='CARPLAN.SAV'.
```

- The FACTORS subcommand defines the factors and levels to be used in building the file. Labels for some of the factors and some of the levels of each factor are also supplied.
- The MINIMUM subcommand specifies that the orthogonal plan should contain at least nine full-concept cases.
- HOLDOUT specifies that six holdout cases should be generated. A new variable, *STATUS_*, is created by ORTHOPLAN to distinguish these holdout cases from the regular experimental cases. Another variable, *CARD_*, is created to assign identification numbers to the plan cases.
- The OUTFILE subcommand saves the plan generated by ORTHOPLAN as a data file so it can be used at a later date with CONJOINT.

Example

```
DATA LIST FREE /SPEED WARRANTY SEATS.
VALUE LABELS speed 70 '70 mph' 100 '100 mph' 130 '130 mph'
 /WARRANTY 1 '1 year' 3 '3 year' 5 '5 year'
 /SEATS 2 '2 seats' 4 '4 seats'.
BEGIN DATA
130 5 2
130 1 4
END DATA.
ORTHOPLAN
 /OUTFILE='CARPLAN.SAV'.
```

- In this example, ORTHOPLAN appends the plan to the working data file and uses the variables and values previously defined in the working data file as the factors and levels of the plan.
- The data between BEGIN DATA and END DATA are assumed to be simulation cases and are assigned a value of 2 on the newly created *STATUS_* variable.
- The OUTFILE subcommand saves the plan generated by ORTHOPLAN as a data file so it can be used at a later date with CONJOINT.

FACTORS Subcommand

FACTORS specifies the variables to be used as factors and the values to be used as levels in the plan.

- FACTORS is required for building a new working data file or replacing an existing one. It is optional for appending to an existing file.
- The keyword FACTORS is followed by a variable list, an optional label for each variable, a list of values for each variable, and optional value labels.
- The list of values and the value labels are enclosed in parentheses. Values can be numeric or they can be strings enclosed in apostrophes.
- The optional variable and value labels are enclosed in apostrophes.
- If the FACTORS subcommand is not used, every variable in the working data file (other than *STATUS_* and *CARD_*) is used as a factor, and level information is obtained from the value labels that are defined in the working data file. ORTHOPLAN *must* be able to find value information either from a FACTORS subcommand or from a VALUE LABELS command. (See the VALUE LABELS command in the *SPSS Base Syntax Reference Guide*.)

Example

```
ORTHOPLAN FACTORS=SPEED 'Highest possible speed'
   (70 '70 mph' 100 '100 mph' 130 '130mph')
  WARRANTY 'Length of warranty'
   (1 '1 year' 3 '3 year' 5 '5 year')
  SEATS 'Number of seats' (2 '2 seats' 4 '4 seats')
  EXCOLOR 'Exterior color'
  INCOLOR 'Interior color' ('RED' 'BLUE' 'SILVER').
```

- *SPEED*, *WARRANTY*, *SEATS*, *EXCOLOR*, and *INCOLOR* are specified as the factors. They are given the labels *Highest possible speed*, *Length of warranty*, *Number of seats*, *Exterior color*, and *Interior color*.
- Following each factor and its label are the list of values and the value labels in parentheses. Note that the values for two of the factors, *EXCOLOR* and *INCOLOR*, are the same and thus need to be specified only once after both factors are listed.

REPLACE Subcommand

REPLACE can be specified to indicate that the working data file, if present, should be replaced by the generated plan. There is no further specification after the REPLACE keyword.

- By default, the working data file is not replaced. Any new variables specified on a FACTORS subcommand plus the variables *STATUS_* and *CARD_* are appended to the working data file.
- REPLACE should be used when the current working data file has nothing to do with the plan file to be built. The working data file will be replaced with one that has variables *STATUS_*, *CARD_*, and any other variables specified on the FACTORS subcommand.
- If REPLACE is specified, the FACTORS subcommand is required.

OUTFILE Subcommand

OUTFILE saves the orthogonal design to an SPSS data file. The only specification is a name for the output file.

- By default, a new data file is not created. Any new variables specified on a FACTORS subcommand plus the variables *STATUS_* and *CARD_* are appended to the working data file.
- The output data file contains variables *STATUS_*, *CARD_*, and any other variables specified on the FACTORS subcommand.
- The file created by OUTFILE can be used by other SPSS commands, such as PLANCARDS and CONJOINT.
- If both OUTFILE and REPLACE are specified, REPLACE is ignored.

MINIMUM Subcommand

MINIMUM specifies a minimum number of cases for the plan.

- By default, the minimum number of cases necessary for the orthogonal plan is generated.

- MINIMUM is followed by a positive integer less than or equal to the total number of cases that can be formed from all possible combinations of the factor levels.
- If ORTHOPLAN cannot generate at least the number of cases requested on MINIMUM, it will generate the largest number it can that fits the specified factors and levels.

HOLDOUT Subcommand

HOLDOUT creates holdout cases in addition to the regular plan cases. Holdout cases are judged by the subjects but are not used when CONJOINT estimates utilities.

- If HOLDOUT is not specified, no holdout cases are produced.
- HOLDOUT is followed by a positive integer less than or equal to the total number of cases that can be formed from all possible combinations of factor levels.
- Holdout cases are generated from another random plan, not the main-effects experimental plan. The holdout cases will not duplicate the experimental cases or each other.
- The experimental and holdout cases will be randomly mixed in the generated plan or the holdout cases will be listed after the experimental cases, depending on subcommand MIXHOLD. The value of *STATUS_* for holdout cases is 1. Any simulation cases will follow the experimental and holdout cases.

MIXHOLD Subcommand

MIXHOLD indicates whether holdout cases should be randomly mixed with the experimental cases or should appear separately after the experimental plan in the file.

- If MIXHOLD is not specified, the default is NO, meaning holdout cases will appear after the experimental cases in the file.
- MIXHOLD followed by keyword YES requests that the holdout cases be randomly mixed with the experimental cases.
- MIXHOLD specified without a HOLDOUT subcommand has no effect.

PLANCARDS

```
PLANCARDS [FACTORS=varlist]

 [/FORMAT={LIST}]
          {CARD}
          {BOTH}

 [/TITLE='string']

 [/FOOTER='string']

 [/OUTFILE=file]

 [/PAGINATE]
```

Example:

```
PLANCARDS FORMAT=BOTH/ OUTFILE='DESIGN.FRM'
 /TITLE='Car for Sale' /FOOTER='Type )card'
 /PAGINATE.
```

Overview

PLANCARDS produces full-concept profiles, or cards, from a plan file for a conjoint analysis study. The plan file can be generated by ORTHOPLAN or entered by the user. The printed profiles can be used as the experimental stimuli that subjects judge in terms of preference.

Options

Format. You can produce profiles in the usual listing-file format, in single-profile format, or both.

Titles and Footers. You can specify title and footer labels that appear at the top and bottom of the listing or, for single-card format, at the top and bottom of each profile. You can include an identifying profile number as part of the title or footer.

Pagination. You can control whether profiles written in single-profile format should begin a new page at the beginning of each profile.

Basic Specification

- The basic specification is PLANCARDS. This produces a standard listing of profiles in your listing file using all variables in the working data file except *STATUS_* and *CARD_* as factors.

Subcommand Order

- Subcommands can be named in any order.

Operations

- PLANCARDS assumes that the working data file represents a plan for a full-concept conjoint study. Each “case” in such a file is one profile in the conjoint experimental plan.
- Factor and factor-level labels in the working data file, generated by ORTHOPLAN or by the VARIABLE and VALUE LABELS commands, are used in the output.
- The SPSS command SPLIT FILE is ignored for single-profile format. In listing-file format, each subfile represents a different plan, and a new listing begins for each one.
- The WEIGHT command is ignored by PLANCARDS.

Limitations

- Missing values are not recognized as missing and are treated like other values.

Example

```
ORTHOPLAN FACTORS=SPEED ’Highest possible speed’
   (70 ’70 mph’ 100 ’100 mph’ 130 ’130mph)
  WARRANTY ’Length of warranty’ (’1 year’ ’3 year’ ’5 year’)
  SEATS ’Number of seats’ (2, 4) /MINIMUM=9 /HOLDOUT=6.
PLANCARDS FORMAT=BOTH /OUTFILE=’DESIGN.FRM’
 /TITLE=’Car for Sale’ /FOOTER=’Type )card’ /PAGINATE.
```

- ORTHOPLAN generates a set of profiles (cases) for a full-concept conjoint analysis in the working data file.
- PLANCARDS produces a standard listing file containing the profiles in the output file *DESIGN.FRM*.
- Each profile in *DESIGN.FRM* will have the title *Car for Sale* at the top and the label *Type n* at the bottom, where *n* is a profile identification number.
- The PAGINATE subcommand specifies that each new profile in the *DESIGN.FRM* file should begin on a new page. This makes the profiles in the file convenient to use as the actual profiles the experimenter hands to the subjects.

Example

```
DATA LIST FREE/ COST NEWNESS EXPER NAME REP
                GUARAN TRIAL TRUST.
VARIABLE LABELS
  COST ’Product cost’
  NEWNESS ’Product newness’
  EXPER ’Brand experience’
  NAME "Manufacturer’s Name"
  REP "Distributor’s reputation"
  GUARAN ’Money-back Guarantee’
  TRIAL ’Free sample/trial’
  TRUST ’Endorsed by a trusted person’.
VALUE LABELS
  COST 1 ’LOW’ 2 ’HIGH’/
  NEWNESS 1 ’NEW’ 2 ’OLD’/
  EXPER 1 ’SOME’ 2 ’NONE’/
  NAME 1 ’ESTABLISHED’ 2 ’UNKNOWN’/
  REP 1 ’GOOD’ 2 ’UNKNOWN’/
  GUARAN 1 ’YES’ 2 ’NO’/
  TRIAL 1 ’YES’ 2 ’NO’/
  TRUST 1 ’YES’ 2 ’NO’.
BEGIN DATA
 1 2 2 1 2 2 2 1
 2 2 2 1 1 1 2 1
 2 2 1 2 2 1 1 1
 2 1 2 1 2 2 1 2
 2 1 1 2 2 2 2 1
 2 1 2 2 1 1 2 2
 1 1 2 2 1 2 1 1
 1 1 1 1 2 1 2 2
 1 2 1 2 1 2 2 2
 1 1 1 1 1 1 1 1
 2 2 1 1 1 2 1 2
 1 2 2 2 2 1 1 2
END DATA.
PLANCARDS TITLE=’ ’ ’Profile #)CARD’ /FOOTER=’RANK:’ ’ ’.
```

- In this example, the plan is entered and defined by the user rather than by ORTHOPLAN.
- PLANCARDS uses the information in the working data file to produce a set of profiles in the standard listing file. See Figure 1 on p. 20 for the output produced by this command. (The variables and values in this example were taken from Akaah & Korgaonkar, 1988).

FACTORS Subcommand

FACTORS identifies the variables to be used as factors and the order in which their labels are to appear in the output. String variables are permitted.

- Keyword FACTORS is followed by a variable list.
- By default, if FACTORS is not specified, all variables in the working data file except those named *STATUS_* or *CARD_* are used as factors in the order in which they appear in the file. (See the ORTHOPLAN command for information on variables *STATUS_* and *CARD_*.)

FORMAT Subcommand

FORMAT specifies whether the profiles should use standard listing-file format, single-profile format, or both.

- The keyword FORMAT is followed by LIST, CARD, or BOTH. (ALL is an alias for BOTH.)
- The default output is LIST (listing-file format).
- With LIST format, holdout profiles are differentiated from experimental profiles, and simulation profiles are listed separately following the experimental and holdout profiles. With CARD format, holdout profiles are not differentiated and simulation profiles are not produced.
- If CARD or BOTH is specified without an OUTFILE subcommand, the single profiles are included in the listing file.

Example

```
PLANCARDS FORMAT=BOTH
  /TITLE=' ' 'Profile #)CARD' /FOOTER='RANK:'.
```

- The listing-file and single-profile output for the first two profiles are shown in Figure 1 and Figure 2.

Figure 1 Listing-file format

```
Plancards:

Title:
       Profile #)CARD
Card 1
  Product cost  LOW
  Product newness  OLD
  Brand experience  NONE
  Manufacturer's Name  ESTABLISHED
  Distributor's reputation  UNKNOWN
  Money-back Guarantee  NO
  Free sample/trial  NO
  Endorsed by a trusted person  YES
Card 2
  Product cost  HIGH
  Product newness  OLD
  Brand experience  NONE
  Manufacturer's Name  ESTABLISHED
  Distributor's reputation  GOOD
  Money-back Guarantee  YES
  Free sample/trial  NO
  Endorsed by a trusted person  YES
  . . .

Footer: RANK:
```

Figure 2 Single-profile format

```
Profile #1

Product cost  LOW
Product newness  OLD
Brand experience  NONE
Manufacturer’s Name  ESTABLISHED
Distributor’s reputation  UNKNOWN
Money-back Guarantee  NO
Free sample/trial  NO
Endorsed by a trusted person  YES

RANK:


Profile #2

Product cost  HIGH
Product newness  OLD
Brand experience  NONE
Manufacturer’s Name  ESTABLISHED
Distributor’s reputation  GOOD
Money-back Guarantee  YES
Free sample/trial  NO
Endorsed by a trusted person  YES

RANK:

  . . .
```

OUTFILE Subcommand

OUTFILE names an external file where profiles in single-profile format are to be written.

- By default, profiles are written to the listing file; no external file is written.
- The OUTFILE keyword is followed by the name of an external file. The file is specified in the usual manner for your system.
- Profiles are written to an external file in single-profile format unless otherwise specified on the FORMAT subcommand.

TITLE Subcommand

TITLE specifies a string to be used at the top of the output in listing format or at the top of each new profile in profile format.

- If TITLE is not used, no title appears above the first attribute.
- The keyword TITLE is followed by a string enclosed in apostrophes.
- Quotation marks can be used to enclose the string instead of apostrophes when you want to use an apostrophe in the title.
- Multiple strings per TITLE subcommand can be specified; each one will appear on a separate line.
- Use an empty string (’ ’) to cause a blank line.
- Multiple TITLE subcommands can be specified; each one will appear on a separate line.

- If the special character sequence)CARD is specified anywhere in the title, PLANCARDS will replace it with the sequential profile number in single-profile-formatted output. Having the profile number automatically printed on the profile will help the experimenter to record the data accurately. This character sequence is not translated in listing-file format.

FOOTER Subcommand

FOOTER specifies a string to be used at the bottom of the output in listing format or at the bottom of each profile in profile format.

- If FOOTER is not used, nothing appears after the last attribute.
- FOOTER is followed by a string enclosed in apostrophes.
- Quotation marks can be used to enclose the string instead of apostrophes when you want to use an apostrophe in the footer.
- Multiple strings per FOOTER subcommand can be specified; each one will appear on a separate line.
- Use an empty string (' ') to cause a blank line.
- Multiple FOOTER subcommands can be specified; each one will appear on a separate line.
- If the special character sequence)CARD is specified anywhere in the footer, PLANCARDS will replace it with the sequential profile number in single-profile-formatted output. Having the profile number automatically printed on the profile will help the experimenter to record the data accurately. This character sequence is not translated in listing-file format.

Example

```
PLANCARDS
 TITLE='Profile # )CARD' ' '
   'Circle the number in the scale at the bottom that'
   'indicates how likely you are to purchase this item.' ' '
 /FOOTER= '0   1   2   3   4   5   6   7   8   9  10'
          'Not at all      May or may      Certainly'
          'likely to          not              would'
          'purchase        purchase        purchase'
          '-----------------------------------------'
 /FORMAT=CARD.
```

The above example would produce the following output for the first profile:

```
Profile # 1

Circle the number in the scale at the bottom that
indicates how likely you are to purchase this item.


Product cost  LOW
Product newness  OLD
Brand experience  NONE
Manufacturer’s Name  ESTABLISHED
Distributor’s reputation  UNKNOWN
Money-back Guarantee  NO
Free sample/trial  NO
Endorsed by a trusted person  YES

0   1   2   3   4   5   6   7   8   9  10
Not at all      May or may       Certainly
likely to          not               would
purchase         purchase         purchase
------------------------------------------
```

PAGINATE Subcommand

PAGINATE indicates that each new profile in single-profile format should begin on a new page.

- PAGINATE is ignored in listing-file format.
- If PAGINATE is not specified with the profile format, the profiles will not have carriage control characters that cause page breaks after each profile.
- PAGINATE has no additional specifications.

Bibliography

Aaker, D. A., and G. S. Day. 1986. *Marketing research*. New York: John Wiley and Sons.

Akaah, I., and P. K. Korgaonkar. 1988. A conjoint investigation of the relative importance of risk relievers in direct marketing. *Journal of Advertising Research*, August–September).

Barlow, R. E., D. J. Bartholomew, D. J. Bremner, and H. D. Brunk. 1972. *Statistical inference under order restrictions*. New York: John Wiley and Sons.

Bell, E. H. 1961. *Social foundations of human behavior: Introduction to the study of sociology*. New York: Harper & Row.

Benzecri, J. P. 1969. Statistical analysis as a tool to make patterns emerge from data. In: *Methodologies of Pattern Recognition*, S. Watanabe, ed. New York: Academic Press.

Bishop, Y. M., S. E. Feinberg, and P. W. Holland. 1975. *Discrete multivariate analysis*. Cambridge, Mass.: MIT Press.

Cattin, P., and D. R. Wittink. 1982. Commercial use of conjoint analysis: A survey. *Journal of Marketing*, Summer.

Green, P. E., and Y. Wind. 1973. *Multiattribute decisions in marketing: A measurement approach*. Hinsdale, Ill.: Dryden Press.

Lebart L., A. Morineau, and K. M. Warwick. 1984. *Multivariate descriptive statistical analysis*. New York: John Wiley and Sons.

Lingoes, J. C. 1968. The multivariate analysis of qualitative data. *Multivariate Behavioral Research*, 3: 61–94.

Wolter, K. M. 1985. *Introduction to variance estimation*. Berlin: Springer-Verlag.

Young, F. W. 1981. Quantitative analysis of qualitative data. *Psychometrika*, 40: 357–387.

Subject Index

Syntax Index