Chapter 265

Screening Designs

Introduction

Screening designs are used to find the important factors from a large number (up to 31) of two-level factors. When the number of runs is 4, 8, 16, or 32 (powers of 2), the design is a regular fractional replication. When the number of runs is 12, 20, 24, or 28, the design used is a Plackett-Burman design.

This program uses the screening designs given in Lawson (1987). These designs make it possible to evaluate each main effect, although these are aliased with several interactions.

When you analyze the data from these designs, it is simplest to use our Multiple Regression routine. The Analysis of Two-Level Designs program can be used to analyze designs in which the number of runs is a power of 2 (the non-Plackett Burman designs).

Procedure Options

This section describes the options available in this procedure.

Design Tab

This panel specifies the parameters that will be used to create the design values.

Experimental Setup

Runs

The desired size (number of rows) of the experiment. This number must be 4, 8, 12, 16, 20, 24, 28, or 32. This number determines which design is generated.

- **Random**

  The rows are randomly ordered (random blocks and random rows within blocks). Use this option when the order of application to experimental units is governed by the row number.

- **Standard**

  The rows are not randomly ordered. Instead, they are placed in standard order. Use this option when you want to quickly see the structure of the design.

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Experimental Setup – Factor Values

Factor Values

Each factor has two possible values (levels), which are specified here. These are the values that will be written to the database. The first value is used to represent the low value. The second value represents the high value. You may use both text and numeric values, although we recommend that you stick with numeric values since these may be used in the regression program.

Enter a pair of values separated by a blank or comma, such as '-1 1' or '0 1.'

Storage Tab

This panel specifies the parameters for storing the results on the spreadsheet.

Data Storage

Store Data with the Dataset

Check this box to generate the design data on the dataset. The data will be identical to the design data generated on the output window.

First Factor Column

This is where the group of columns that is to contain your design begins. The K-1 columns after this column are also filled with data. The number of columns generated depends on the number of Factor Value boxes that contain data.

Warning: The program fills these variables with data, so any previous data will be lost.

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Example 1 – Screening Design

This section presents an example of how to generate an experimental design using this program. **CAUTION: since the purpose of this routine is to generate (not analyze) data, you should always begin with an empty dataset.**

In this example, we will show you how to generate a six-factor design using 16 runs. You may follow along here by making the appropriate entries or load the completed template **Example 1** by clicking on Open Example Template from the File menu of the Screening Designs window.

1 Open a new (empty) dataset.

- From the File menu of the NCSS Data window, select **New**.
- Click the **Ok** button.

2 Open the Screening Designs window.

- Using the Analysis menu or the Procedure Navigator, find and select the **Screening Designs** procedure.
- On the menus, select **File**, then **New Template**. This will fill the procedure with the default template.

3 Specify the design parameters.

- On the Screening Designs window, select the **Design** tab.
- Set **Runs** to **16**.
- Select **Standard** in the **Sort Order** list box.
- Set **six** of the **Factor Values** boxes equal to **-1 1**.
- One the **Storage** tab, check the box **Store Data with the Dataset**.
- Enter **1** in the **First Factor Column** box.

4 Run the procedure.

- From the Run menu, select **Run Procedure**. Alternatively, just click the green Run button.

Six-Factor Screening Design in Sixteen Runs

C1	C2	C3	C4	C5	C6
-1	-1	-1	-1	-1	-1
1	-1	-1	-1	1	1
-1	1	-1	-1	1	1
1	1	-1	-1	-1	-1
-1	-1	1	-1	1	-1
1	-1	1	-1	-1	1
-1	1	1	-1	-1	1
1	1	1	-1	1	-1
-1	-1	-1	1	-1	1
1	-1	-1	1	1	-1
-1	1	-1	1	1	-1
1	1	-1	1	-1	1
-1	-1	1	1	1	1
1	-1	1	1	-1	-1
-1	1	1	1	-1	-1
1	1	1	1	1	1

Usually, you would specify the number of runs as close to the number of variables as possible, while still leaving some degrees of freedom for an estimate of error.

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