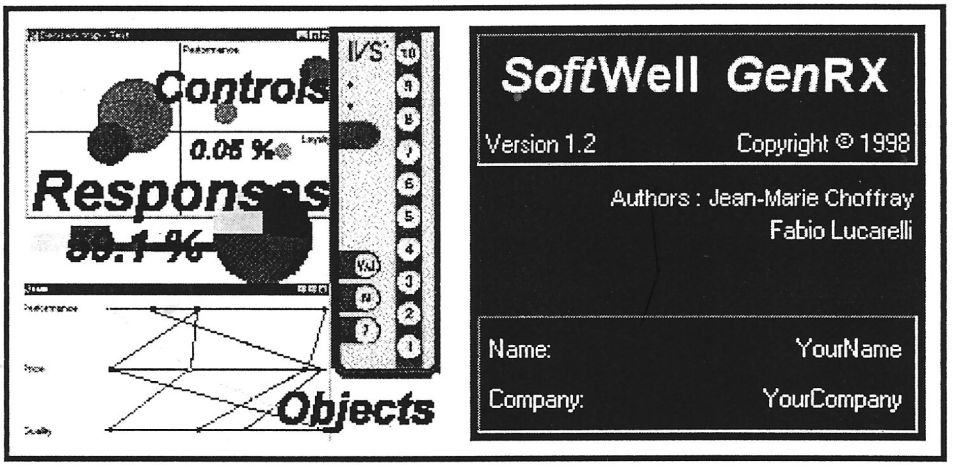
GenRX



Version 1.2 GTI*

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Dealer

*** Group Technology for Interaction**

*Gen*RX 1.2

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Sample decision models (decision templates) are provided on the *Gen*RX diskette as examples of how to use the various features. You may edit or modify these models and incorporate them into your own models. In these examples we use fictitious names of hypothetical businesses and persons. Any similarity to names of actual businesses or persons is purely coincidental.

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Exhibits

1. Introduction

Welcome to the *Gen*RX decision-making environment, the ultimate *Decision*Processor.

Over the past few years, management as a science, has considerably evolved. Powerful decision support systems are currently in use which provide managers with real-time access to vast quantities of data, information and expertise.

*Gen*RX is a versatile graphic software designed for both simple and complex, individual or group decision analysis, modeling and simulation. Nevertheless, it is easy to master and use, so you can quickly take advantage of its full power. It is cost-effective and helps you discover the best decision model, blending your managerial experience with hard data. It enables you to build and validate prototypes inexpensively, without forcing you to learn complex decision modeling software.

The Group Technology for Interaction **(GTI)** version makes use of an exclusive interactive voting technology designed by SysCom, Inc. This special hardware comprises a set of numeric keypads and a cluster controller to be connected to your computer.

In these pages, we describe the major components of the *Gen*RX software and the way they interact. Several sample decision models (decision templates) are introduced for product decisions, marketing mix simulation, and portfolio analysis. They are available in the Demos Folder. You may edit or modify these models and incorporate them into your own models.

Should you need any assistance, try the Help menu. It has been designed to answer the most important questions addressed to us by *Gen*RX users.

As you begin your exploration of the exciting world of computer-assisted decision analysis, we would just like to wish you "bon appetit".

2. Decision problems that can be solved with *Gen*RX

This software allows you to investigate and resolve most simple and complex decision situations. You can use it either individually or in a group environment to analyze, model and simulate the consequences of alternative courses of action.

Powerful benchmarking systems can be developed with *Gen*RX, as well as dynamic allocation methodologies.

Here is a sample of decision problems that can be addressed with *Gen*RX:

- Marketing
  * New product evaluation
  * Marketing mix analysis

    * Product pricing
    * Sales territory evaluation
    * Advertising response

- Finance
    * Portfolio analysis
    * Pricing of assets (bonds, shares, etc.)
    * Identification of acquisition targets
    * Return on equity analysis
    * Vulnerability assessment

- Production
    * Plant productivity analysis
    * Location of production facilities
    * Technology assessment
    * R&D benchmarking
    * Product/service design

- Human resources
    * Personnel evaluation
    * Recruitment procedures
    * Design of compensation schemes
    * Team management
    * Creativity monitoring

- Strategy
    * Business portfolio analysis
    * Evaluation of joint-ventures
    * Country, political risk evaluation
    * Assessment of sub-contractors and suppliers
    * Credit scoring

This list is in no way exhaustive. As you progress in your understanding of this powerful decision tool, you will find other relevant areas of application in your immediate environment, such as family choices, public decisions, car evaluation, and... wine selection.

3. What is a *Decision*Processor

Business performance is closely tied to the continuous creation of new knowledge, the ability to diffuse it quickly throughout the organization, and to transform it into a flow of new technologies, products and services. Managers are evaluated on their ability to get access to information, analyze it, and extract from it the key elements of constructive competition.

Most companies face serious difficulties in this process. Especially in the strategic, finance, human resources and marketing areas, radical changes are required in the way we conduct studies, analyze and transfer results into decision-making.

"Core competencies" are the collective knowledge of managers and their ability to translate that knowledge into successful products and services. This requires coordination of diverse skills and integration of rapid changes in consumer values, into the distribution system and available technologies.

In a world where the only certainty is uncertainty, a *Decision*Processor acts like a human consultant, helping a manager or a group of managers define, understand, analyze and solve their problems. As they continue using it, the *Gen*RX software will provide them with direct access to vast quantities of information and knowledge, such as analogies, model parameters and/or response functions.

In short, a *Decision*Processor has essentially three objectives:

- Risk reduction. Through its ability to manipulate large volumes of information, facts and expertise, *Gen*RX helps managers understand, measure and reduce uncertainty.
- Creativity enhancement. The ability to simulate the impact of various changes in the decision environment and hypotheses, broadens the scope of the analysis and invites decision-makers to investigate a larger number of alternatives.
- Sharing of expertise. A *Decison*Processor such as *Gen*RX provides an ideal environment to accumulate managerial expertise and share it with others in an operational form.

The *Gen*RX *Decision*Processor considerably shortens the individual and group decision-making cycle and improves the likelihood of identifying the best courses of action.

4. Getting started with *Gen*RX

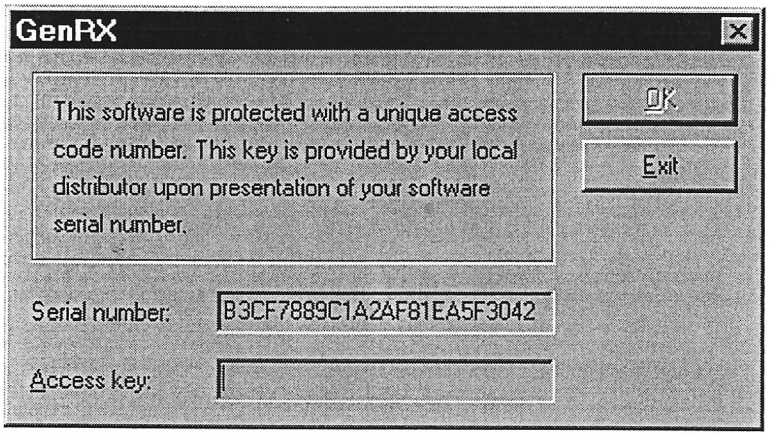
Ready to start deciding? This section takes you on a step-by-step tour of the *Gen*RX environment, using commented examples for both basic and sophisticated individual or group decision analysis. The examples build on each other. Each of them introduces you to a specific feature of the software. But first, let's install it with the "setup" program which is available on your *Gen*RX diskette, using the following command:

Start/Run/a:\Setup

Your copy of the *Gen*RX software is protected with a *unique access code number*. As shown in exhibit 1, this key is provided by your local dealer upon presentation of your software serial number. Thus, use of the software is limited to one computer. You cannot move it from one location to another. If you need another personal copy of the *Gen*RX software, please contact your dealer or the *Soft*Well customer service department.

A second dialog box requests the user to enter a personal *software password*. Because you might be modeling and analyzing confidential data, access to *Gen*RX is denied to unauthorized users. This password is needed every time you launch the software.

Exhibit 1: *Gen*RX software protection



Should you run into any problem with the installation program, the best reaction is probably to repeat the installation process again after having removed the *Gen*RX files from your computer with the following command:

Start/Settings/Control panel/Add/Remove Programs/*Gen*RX

Three decision templates, available in the Demos Folder, are included with the *Gen*RX software:

- BCG.GNX: a business portfolio analysis example
- NewProd.GNX: a new product potential evaluation example
- MarketingMix.GNX: a marketing mix simulation example

In the following pages, using these examples we briefly describe the *Gen*RX's Integrated Decision Environment and its three key modules:

- Domain Definition
- Decision Models
- Diagnosis and Simulation

5. *Gen*RX's Integrated Decision Environment

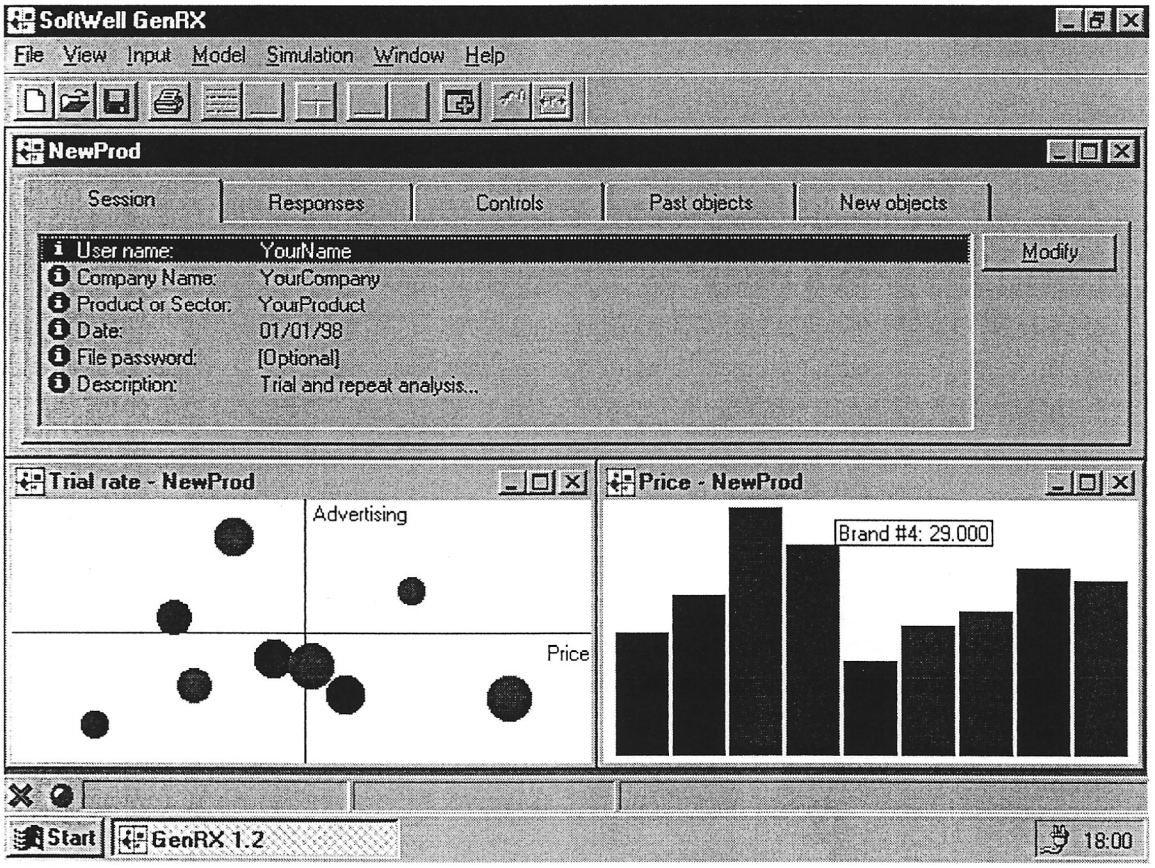
At the core of *Gen*RX, you will find its Integrated Decision Environment, as shown in Exhibit 2.

The main window requests the user to define and conceptualize the decision problem he is facing. He enters the general description of the current analysis/decision session. He specifies the number and labels of his ***response variables***, if any. In the same way, he defines his ***control variables***. An optional *file password* allows him to limit access to his decision model.

A ***response variable*** or a ***response*** is a criterion that a manager or a group of managers uses to assess the performance or consequences of a decision. In the new product example (NewProd.GNX), trial and repeat rates are used as *response* variables.

A ***control variable*** or a ***control*** is a dimension that a manager or a group of managers uses to characterize a decision. In the marketing mix simulation example (MarketingMix.GNX), three dimensions are used as *control* variables: price, advertising, and sales force.

Exhibit 2: *Gen*RX Integrated Decision Environment (NewProd.GNX file)



The main window also allows the user to specify a set of ***decisions objects*** (if any) whose performance (response scores) and characteristics (control scores) are well known. Most of the time, past decisions will be used for this purpose. These observations provide the information basis on which a decision model will be developed.

A ***decision object*** or an ***object*** is the general term used by *Gen*RX to express a possible choice (or course of action) in an analog model or a reference period (or time-dependent response and/or control scores) in a dynamic model. For simulation purposes, it is always useful to associate different colors to the decision objects. This can be done easily while defining and editing these objects.

An ***analog*** model is a decision model that attempts to capture the relationship between a response variable (e.g. cash flow) and a set of control variables (e.g. industry growth rate and relative market share) from a cross-section of similar observations or analogies. See for example the BCG.GNX file.

A ***dynamic*** model is a model that attempts to capture the relationship between a response variable (e.g. market share) and a set of control variables (e.g. price, advertising, and sales force) from series of time-dependent observations (periods). See for example the MarketingMix.GNX file.

Don't worry if you are not used to these terms and concepts. As you get through the examples and improve your understanding of the *Gen*RX decision software, its modeling and simulation capabilities, they will become increasing clear.

You will find the Integrated Decision Environment particularly helpful in this respect, allowing you to switch easily from one task to another, moving from problem description to model building, diagnosis, simulation, and then back again.

Version 1.2 of *Gen*Rx allows you to formulate and analyze decision problems that satisfy the following constraints (maximum):

- 10 response variables
- 10 control variables
- 36 past decision objects
- 24 new decision objects

6. Defining the decision domain

Once the response variables (if any), the control variables and the decision objects (if any) have been appropriately defined and labeled (see Exhibit 3), the user is invited to characterize his decision domain. This is done through the estimation of the scores (positioning) of the past decision objects along every response and control variable.

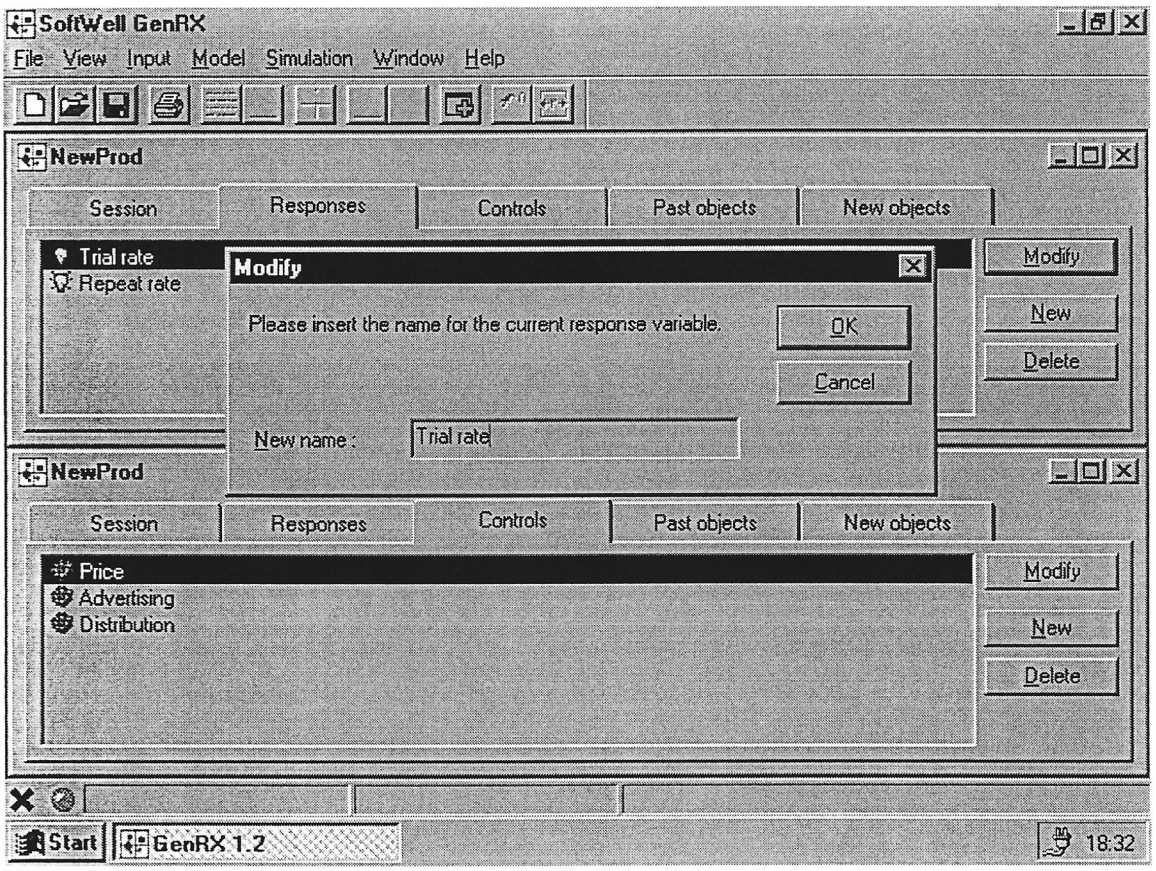
Broadly speaking, there are four ways to enter past decision object scores on both response and control variables: direct (numeric and/or graphic) and indirect (paired comparisons and/or interactive voting). The latter is available only with the Group Technology for Interaction **(GTI)** version of *Gen*RX. Whatever the method, don't forget to save regularly your data with the **Save** and **Save as...** items of the **File** menu.

6.1. Direct estimation

We have reproduced in Exhibit 4 the cash flow (response variable) generated by a sample of strategic business units, as available in the BCG.GNX file. In this case, the values were entered directly by the user. They reflect some "objective" or "hard" elements of information available to the decision-maker.

Positive and negative scores can be entered. Depending upon the situation, the user can re-scale his estimates by modifying the **min** and/or **max** values that appear underneath the past objects edit fields.

Exhibit 3: Definition of a set of response and control variables (NewProd.GNX file)

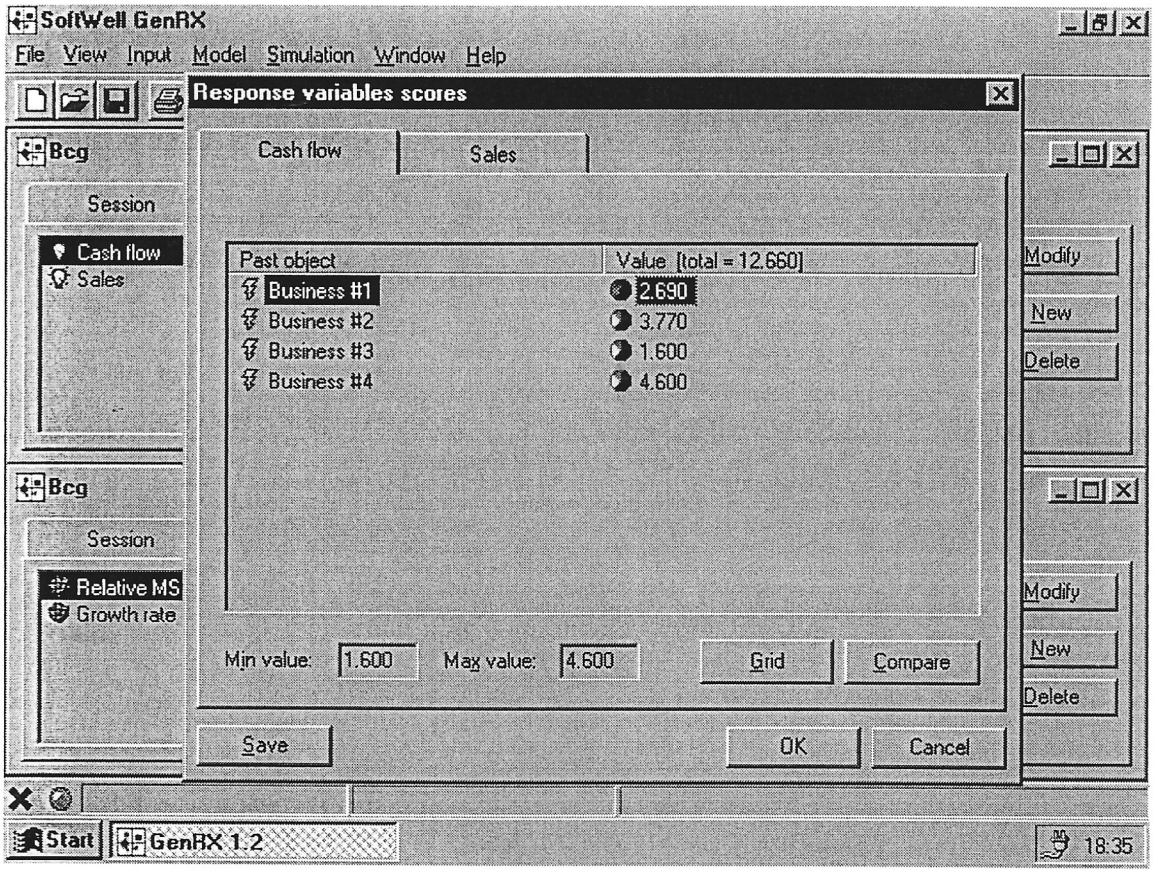


While editing a decision domain, a few shortcuts might be useful:

- **Return** to get the *Modify* dialog box
- **Insert** to get the *New* dialog box
- **Delete** to get the *Delete* dialog box
- **Up** and **down** arrows to move up and down the editing fields

- **Escape** to close the dialog box

Exhibit 4: Direct (numeric) estimation of past objects response scores (BCG.GNX file)



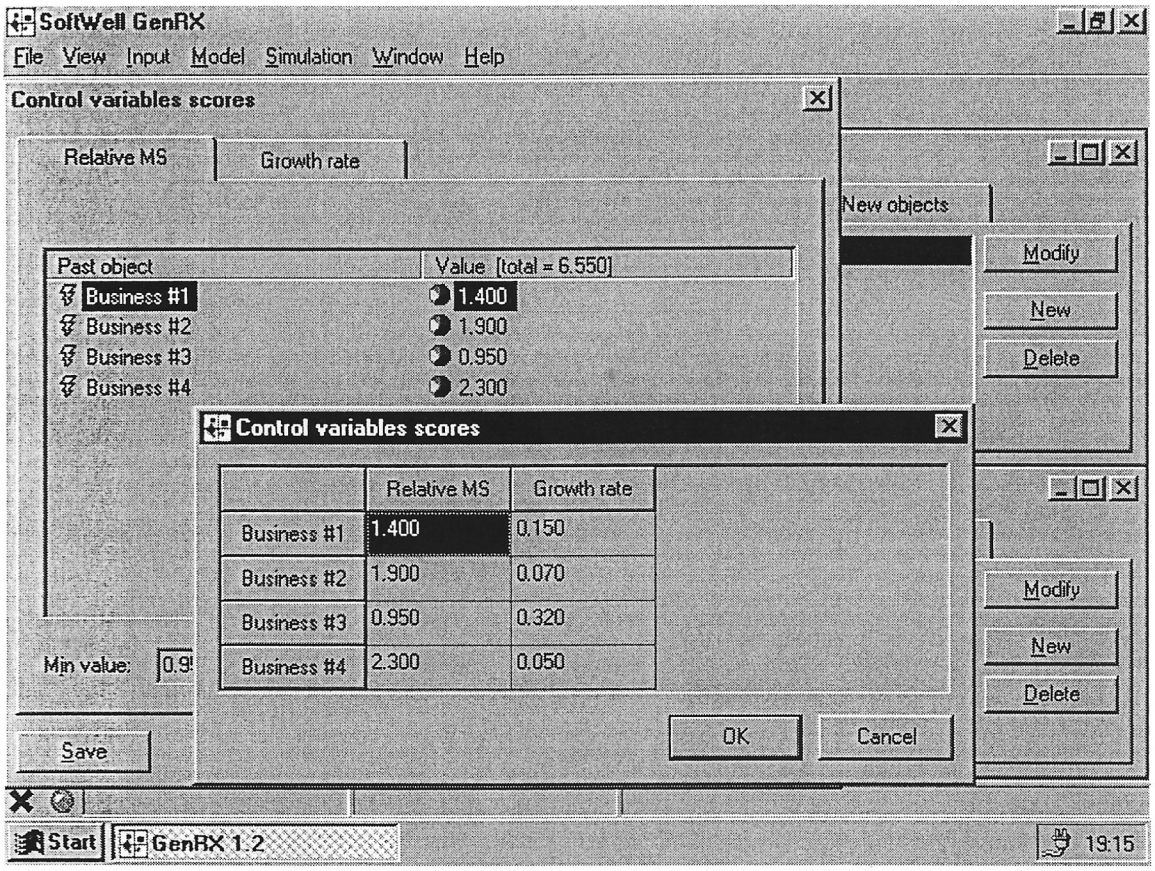
The "Grid" option (Exhibit 5) allows the user to edit and import decision object scores in a spreadsheet format. The right button of the mouse gives access to an edit menu, allowing cut, copy, paste, and clear operations.

This option can save you considerable time when you are entering data for a dynamic model based on series of time-dependent observations, as it is the case in the marketing mix example [MarketingMix.GNX].

Several consistency checks are performed by the software to verify that the selection (matrix of cells) corresponds to the definition of the decision problem considered (number of response variables, number of control variables, and number of decision objects).

The grid can also be used as an input medium to enter response and/or control variables scores directly from the keyboard.

Exhibit 5: Using the "Grid" option to assess objects scores (BCG.GNX file)



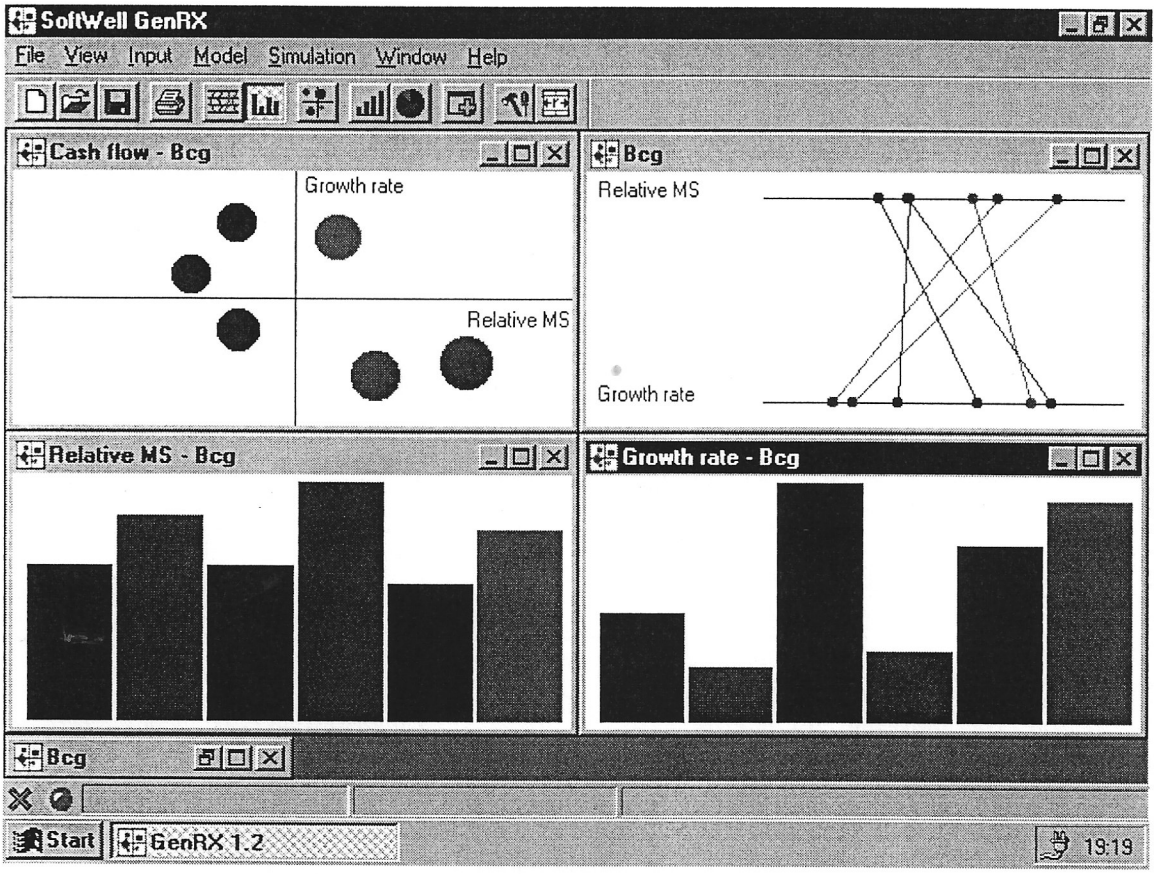
When a decision domain (response variables, control variables and decision objects) has been specified, control variable scores can also be entered graphically (see Exhibit 6) through a diagnosis and/or simulation window.

Three types of control windows are available in the *Gen*RX Integrated Decision Environment to perform such a task:

- multidimensional interactive decision maps (all control variables)
- unidimensional interactive decision histograms (one control variable)
- two-dimensional interactive decision and evaluation space (two control variables, one response variable)

More information about the use of this powerful tool appears in Section 8.

Exhibit 6: Direct (graphic) estimation of past objects response scores (BCG.GNX file)



6.2. Indirect estimation

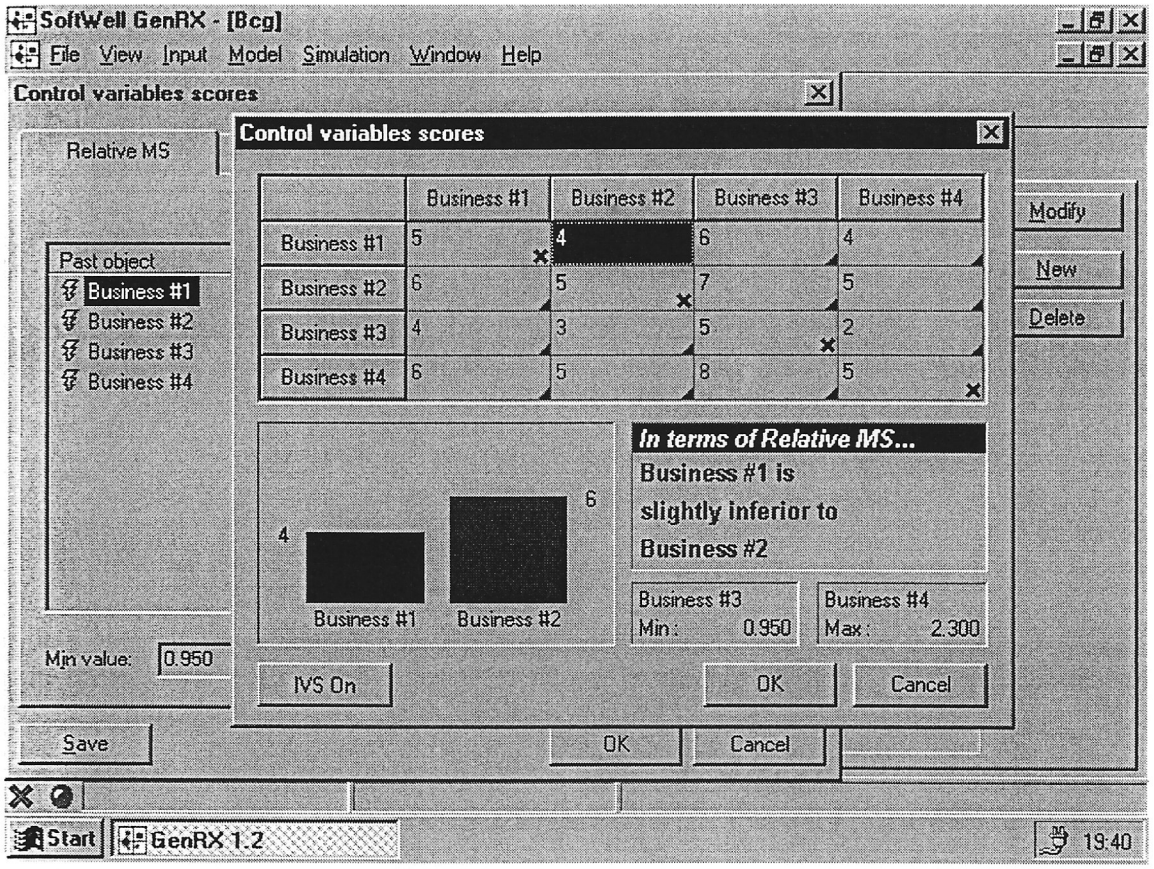
In complex decision situations, users most of the time do not have access to objective measures of response and/or control variable scores. In this case, *Gen*RX provides them with a very powerful tool to assess these scores subjectively. The methodology used at this level rests upon some of the latest developments in decision analysis.

As the user clicks on the **Compare** button, *Gen*RX gives him access to complex measurement algorithms through a set of simplified choice situations (paired comparisons). Based on the decision-maker's perceptions of the relative *dominance* of a decision object relative to another, in terms of the response or the control variable considered, *Gen*RX will produce accurate estimates of all objects scores. See Exhibit 7.

By clicking on a matrix cell, the user selects the corresponding choice. Subjective evaluations can then be entered directly (through numeric keys) or visually (through re-sizing the interactive rectangles).

During this process, it is important to keep in mind that the numeric values [1...9] have no specific meaning. What matters is the corresponding subjective evaluation, defined from ***Very highly inferior*** to ***Very highly superior***.

Exhibit 7: Indirect (subjective) estimation of past object control scores (BCG.GNX file)



Information should be entered for as many paired comparisons as possible, but not necessarily all of them. Depending on the complexity of the problem, the depth of past experience and time constraints, emphasis should be put on the most relevant choices. Diagonal values, of course, cannot be changed. The presence of a small red triangle in the lower right corner of a cell indicates that the underlying comparison has been made.

Based on these subjective judgments, the scale values produced by the algorithm can be compared to some initial values in an attempt to test the ability of the software to reproduce *objective* scores. Exhibit 7 illustrates such a fit.

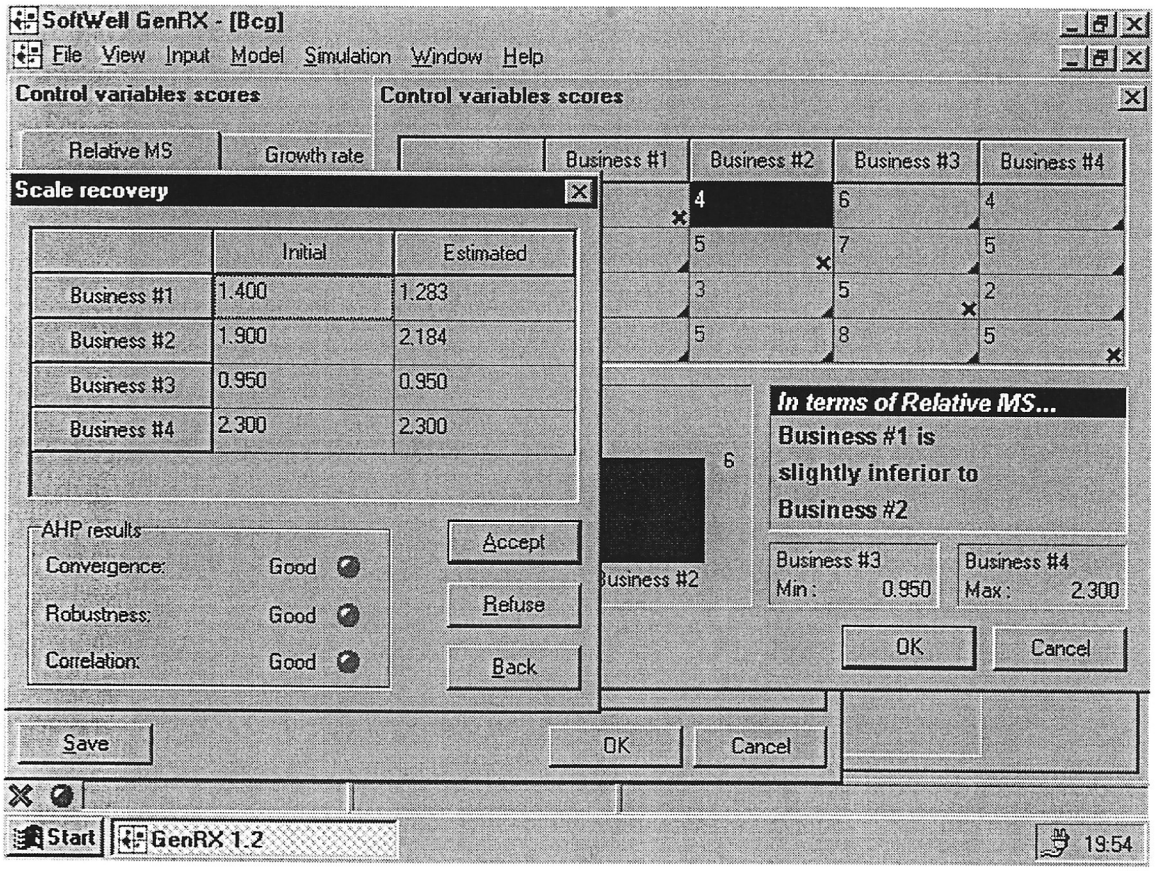
The ***convergence*** index measures the accuracy with which the algorithm has been able to estimate the underlying decision object scores.

The ***robustness*** index measures the internal coherence of the various paired comparisons, and hence the validity of the postulated scaling algorithm.

The ***correlation*** coefficient measures the accuracy with which the scores computed by the algorithm reproduce an *initial* or *a priori* set of response or control scores.

As long as you get three *green lights*, you should feel fairly confident and satisfied with the scores computed by this powerful subjective assessment procedure!

Exhibit 8: Response or control scores recovery (BCG.GNX file)



Once the scores produced by *Gen*RX are considered as a good description of the performance (response) and/or characteristics (controls) of the decision objects, they can be kept for further analysis, decision, diagnosis and simulation.

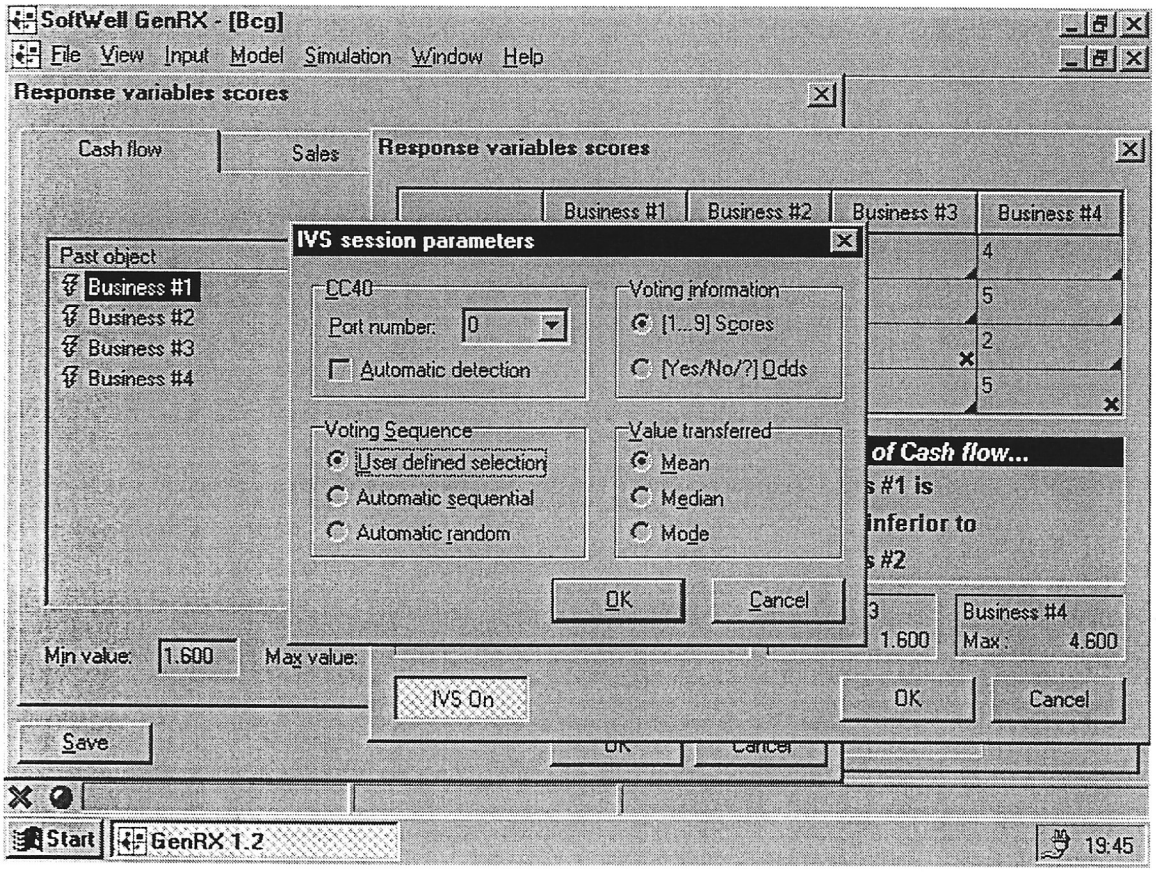
If you are using the Group Technology for Interaction **(GTI)** version of the software, response and control variable scores can also be entered through an interactive voting system designed by SysCom, Inc. This powerful decision environment is available through clicking on the **IVS On** button.

After having set the key parameters of the IVS session (Exhibit 9), decision participants are invited to express their individual perceptions through a set of simplified choice situations (paired comparisons). Based on the *collective dominance* of a decision object relative to another in terms of the response or the control variable considered, *Gen*RX will produce group estimates for all object scores.

Depending on the objective of the group session, different levels of information can be provided by individual decision-makers (numeric scores [1...9] or favorable votes [yes/no]). In the first case, means, medians or modes can be transferred to the measurement algorithm (Exhibit 10).

The voting sequence defines the selection order of the simplified choice situations (paired comparisons). It is either user *selected*, *automatic sequential* or *automatic random*.

Exhibit 9: Specification of interactive voting session parameters



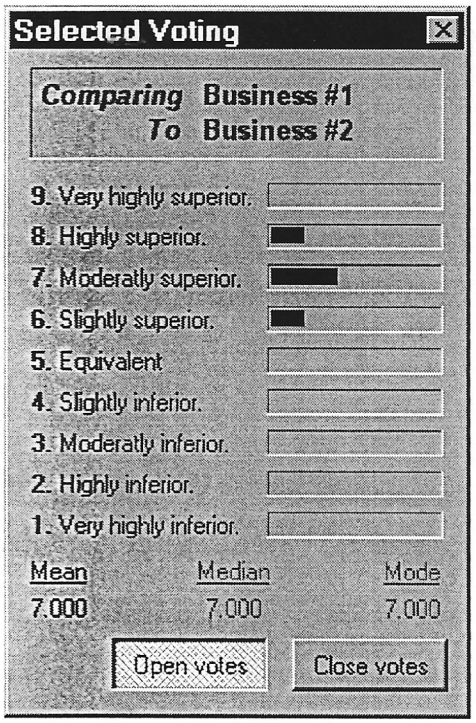
The automatic detection checkbox allows the user to test the availability of the IVS hardware. The initialization of the SysCom, Inc. interactive voting technology can also be performed through selecting the **Test IVS** item in the **File** menu.

As discussed earlier, the scale values produced by the algorithm on the basis of group judgments can be compared to some *initial a priori* values in an attempt to test the ability of the software to reproduce *objective* scores.

If needed, some of the scale values can be updated directly by the user, allowing him to combine his perception of the situation at hand with the *collective wisdom* of the group.

Once the scores produced by *Gen*RX are considered as a good description of the performance (response) and/or characteristics (controls) of the decision objects, they can be kept for further analysis, decision, diagnosis and simulation.

Exhibit 10: Distribution of decision participants scores



This window gives the results of an interactive voting session, whose sequence of choices was user defined (selected voting).

The votes are expressed as a histogram, reflecting the heterogeneity of the participants' evaluations.

Depending on the selection made by the user, the mean, the median or the mode of this distribution is transferred into the scaling algorithm.

At any time, the session manager can close the vote, allowing selection of another paired comparison, manually or automatically.

7. Decision Models

Once the user has defined his decision domain, a set of response variables (if any), a set of control variables, a set of past decision objects (if any), and a set of new decision objects, it is time to build his decision model(s).

As discussed earlier, *Gen*RX allows the user to define and assess (calibrate) the parameters of two broad families of decision models: analog and dynamic.

An ***analog*** model is a decision model that attempts to capture the relationship between a response variable (e.g. cash flow) and a set of control variables (e.g. industry growth rate and relative market share) from a cross-section of similar observations or analogies. See for example the BCG.GNX file.

A ***dynamic*** model is a decision model that attempts to capture the relationship between a response variable (e.g. market share) and a set of control variables (e.g. price, advertising, and sales force) from series of time-dependent observations (periods). See for example the MarketingMix.GNX file.

Both models can use either a **linear** or a **multiplicative** analytical form, depending on the complexity of the interactions assumed among the control variables.

7.1. Choice of a model

*Gen*RX assumes that the relationship that exists between a response variable and a set of control variables is either linear or multiplicative. The parameters (i.e. the control variable weights) can be assessed either statistically or subjectively. The default is linear, subjective.

A ***linear*** analytical form implies that the relationship between a response variable [R_i] and a set of control variables [C_i's] may be expressed as follows :

$R_i = k + a_1C_{1i} + a_2C_{2i} + ...$, (where k, the intercept, may be 0).

Such a model is often referred to as linear compensatory. It means that a strong or weak score on one of the control variables can easily be traded off by a similar or an opposite score (depending on the signs of the weights) on another control variable.

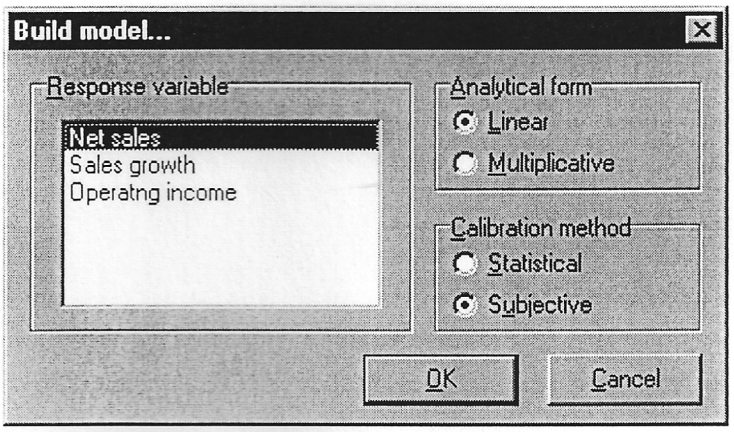
A ***multiplicative*** analytical form implies that the link between a response variable [R_i] and a set of control variables [C_i's] may be expressed as follows :

$R_i = k \cdot [C_{1i}]^{b}_{1} \cdot [C_{2i}]^{b}_{2} ...$, (where k may be 1).

This nonlinear model (log-linear) is best suited when complex interactions are postulated among the control variables. Most of the time, a multiplicative form will be used to approximate disjoint effects that occur when some control variables express thresholds to be satisfied.

The selection of the appropriate model for each response variable is illustrated in Exhibit 11.

Exhibit 11: Choice of a decision model



In this dialog box , the user specifies the analytical form of the model, as well as the calibration method that he wants to use for each response variable.

The default is linear, subjective.

As you gain experience with *Gen*RX, the selection of the appropriate analytical form will become easier. The *statistical fit* of your model (*green*, *orange* or *red light*) gives you a first basis for evaluation. In the case of a dynamic model, its *tracking ability*, that is the accuracy with which it reproduces past observations, provides you with a sound measure of its adequacy.

Special attention should be given to a situation that occurs when the scores of several control variables are highly correlated. This problem known as *multicollinearity* makes it difficult, if not impossible, to measure accurately the weight of each control variable. The weight of some of them may even have a wrong sign!

Hence, keep in mind that the best models are often the simplest ones. You must understand them perfectly. Most important, they must reflect your best experience and expertise. If necessary don't hesitate to take the statistical estimates of the control variable weights as a first basis to be improved through the use of the subjective assessment algorithm.

7.2. Estimation of model parameters

There are two ways to assess the parameters (i.e. the control variable weights) of the model(s) postulated by a *Gen*RX user: *statistical* and *subjective*. The default is subjective. However, whatever the method, the user is always kept in control. He is allowed to update subjectively his model parameters at any time.

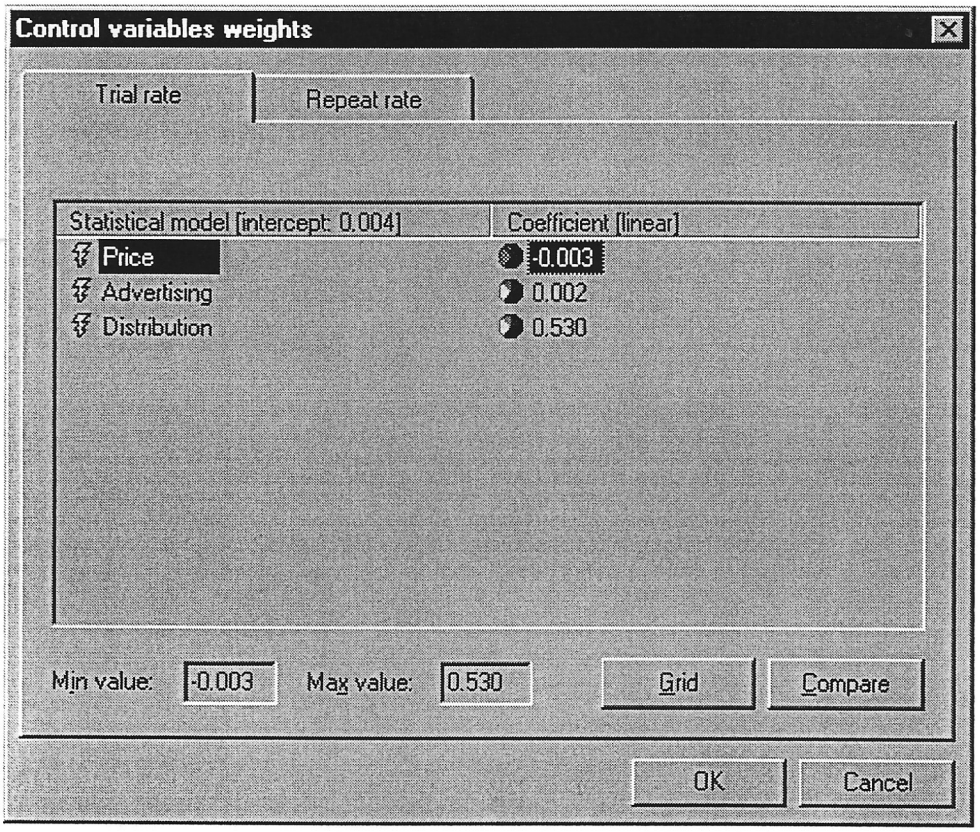
Exhibit 12 gives the weight estimators of the three control variables - price, advertising and distribution - as determinants of the trial rate (response) of a product (NewProd.GNX).

The *statistical estimators* are obtained through regression analysis when the number of past decision objects exceeds the number of control variables. If these numbers are equal, an exact mathematical solution is available.

When the number of past decision objects is inferior to the number of control variables, *subjective assessment* should be used. In this case, *Gen*RX offers the full power of the measurement algorithms described in section 5 (through a click on the **Compare** button).The GTI version of the software also allows group assessment of the model parameters (through a click on the **IVS On** button of the paired comparisons window).

If, for a given response variable, the user wants to *freeze* some control variables, he may do so by specifying a weight of [0.0] for those variables. In this case, attention should be given to the impact of such a decision on the weights of the remaining controls.

Exhibit 12: Estimates model parameters (NewProd.GNX file)



8. Diagnosis and Simulation

You have described a decision domain. A model or a set of response models has been specified. It is now time to diagnose, investigate and simulate.

Different types of diagnosis and/or simulation windows are available in the GenRX Integrated Decision Environment:

- multidimensional interactive decision map (all control variables)
- unidimensional interactive decision histogram (one control variable)
- two-dimensional interactive decision and evaluation space (two control variables, one response)
- unidimensional response histogram (one response variable)
- unidimensional response pie

At any time, the user can modify the active diagnosis and/or simulation window's display options: choice of variables (response or control, as applicable), zooming step used for automatic re-scaling and re-sizing of the graphs.

As you move the mouse pointer over an *active* area (a decision object *dot* in a multidimensional interactive decision map, or a decision object *rectangle* in a unidimensional interactive decision histogram, or a decision object *circle* in a two-dimensional interactive decision and evaluation space) the corresponding response and control scores are displayed. For additional accuracy, these scores also appear interactively on the **Status bar**.

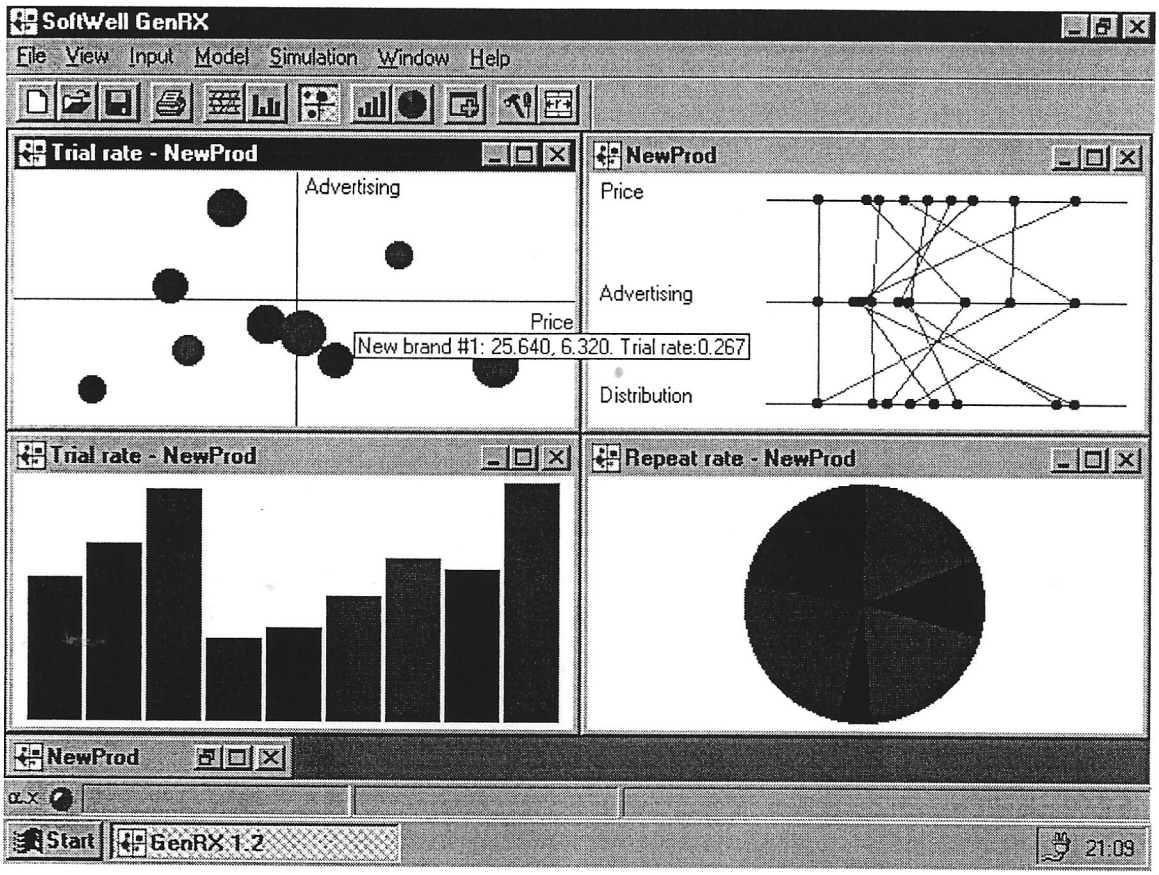
If you are using in a unidimensional interactive decision histogram (one control variable), you can change the sign of the underlying score (corresponding to the active rectangle) by holding down the **+ key** while you click on the right button of the mouse or by holding down the **- key** while you click on the right button of the mouse.

Exhibit 13 gives a general view of a complex simulation environment involving several decision, diagnosis and response windows.

The power of *Gen*RX is well illustrated through the real-time implications of multiple changes in the control variable scores (decision characteristics). Whatever the complexity of the hypotheses made by the user, a graphic representation of the consequences is readily available in terms of response.

If a decision object is moved outside the decision domain, a *red light* appears in the lower left corner of the screen (**Status bar**) indicating that the simulation algorithm is switching from *interpolation* (low risk) to *extrapolation* (high risk). As discussed earlier, moving the mouse pointer over the *active* portion of any graph or surface allows identification of the underlying object and of its response and control scores.

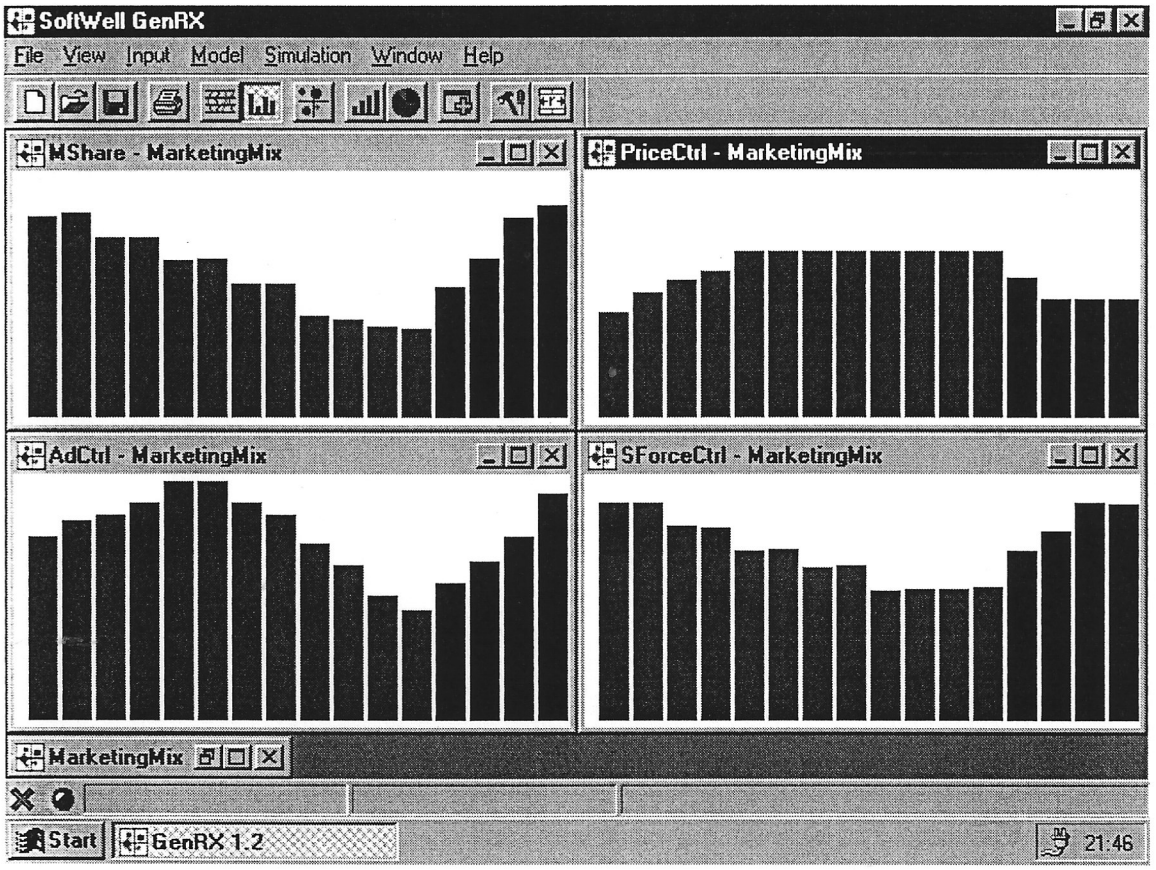
Exhibit 13: Example of a complex simulation environment (NewProd.GNX file)



Interactive decision histograms are illustrated in Exhibit 14. Three control variables are used in this example (advertising, sales force, and price). Changes in the marketing mix hypotheses lead to real-time estimates of market share (response variable) allowing the decision-maker to investigate the dynamic impact of his strategies.

In this specific case, different colors are used to separate the *analysis* portion of the time horizon (past marketing mix decisions for the last eight quarters) from the *simulation* portion of the time horizon (marketing mix decisions for the next four quarters).

Exhibit 14: Example of a complex simulation environment (MarketingMix.GNX file)



The power of *Gen*RX is well illustrated through these examples. Whatever the complexity of the hypotheses made by the user, a real-time evaluation of the consequences is readily available. The use of interactive graphics facilitates investigation of the solution space, allowing the user to approach the optimum.

As a *Decision*Processor, *Gen*RX considerably shortens the individual and group decision-making cycle and improves the likelihood of identifying the best courses of action. It provides an operational environment for formalizing and sharing managerial expertise.

9. Decision domain printout

At any time, the user can print the data he is working on and/or the active simulation window. As an example, here is a printed portion of the decision domain investigated in the BCG.GNX file.

Session

Filename: Bcg.gnx
User: YourName
Company: YourCompany
Product or sector: YourBusiness
Date: 05/05/98
Description: BCG Matrix

Past decision objects

Past decision object 1: Business #1
Past decision object 2: Business #2
Past decision object 3: Business #3
Past decision object 4: Business #4

New decision objects

New decision object 1: New business #1
New decision object 2: New business #2

Control variables

Control 1: Relative MS
Control 2: Growth rate

Response variables

Response 1: Cash flow
Response 2: Sales

Control variables scores

Business #1: {1.400, 0.150}
Business #2: {1.900, 0.070}
Business #3: {0.950, 0.320}
Business #4: {2.300, 0.050}
New business #1: {1.280, 0.220}
New business #2: {1.580, 0.120}

10. Shortcuts and accelerators

The *Gen*RX Integrated Decision Environment provides you with a quick and easy way to access its three modules - Domain Definition, Decision Models, Diagnosis and Simulation - as well as the key parameters that characterize them.

 Direct access to the GenRX's main window (Domain Description)

 Open file dialog box

 Save file dialog box

 Print setup dialog box

 Active diagnosis and/or simulation window is transformed into a multidimensional interactive decision map (all control variables)

 Active diagnosis and/or simulation window is transformed into a unidimensional interactive decision histogram (one control variable)

 Active diagnosis and/or simulation window is transformed into a two-dimensional interactive decision and evaluation space (two control variables, one response)

 Active diagnosis and/or simulation window is transformed into a unidimensional response histogram (one response variable)

 Active diagnosis and/or simulation window is transformed into a unidimensional response pie

 Display an additional diagnosis and/or simulation window

 Set active diagnosis and/or simulation window display options

 Re-scale/resize active diagnosis and/or simulation window