Overview of Joint EU/USNRC Project on Uncertainty Analysis of Probabilistic Accident Consequence Codes

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Introduction

This note gives a brief overview of the uncertainty analysis of probabilistic accident consequence codes, COSYMA (EU) and MACCS (USNRC), initiated and funded jointly by the European Commission and the U.S. Nuclear Regulatory Commission between 1990 and 2000. Although precise cost estimates have not been retrieved, a ball park estimate for the entire study, including expert remuneration ($15,000 per expert) is 4 million USD (1990). The joint study builds on the earlier NUREG-1150 expert judgment exercise (Hora and Iman, 1989). In total, there were 2036 elicitation variables, assessed by 69 experts spread over 9 panels with 2036 uncertain quantities. In total 15,422 individual expert-variable elicitations were performed.

The reports from this study, and selected supporting documents are listed in the references. Also included are links and websites from which digitized reports may be downloaded.

Background and Purpose

Accident consequence codes model the adverse consequences of potential accidents in nuclear power plants. Separate codes have been developed with support from the European Commission (COSYMA) and by the US Nuclear Regulatory Commission (MACCS). The scope of these models is depicted in Figure 1.

The objectives of the project were formulated as:

1. to formulate a generic, state-of-the-art methodology for uncertainty estimation which is capable of finding broad acceptance;
2. to apply the methodology to estimate uncertainties associated with the predictions of probabilistic accident consequence codes designed for assessing the risk associated with nuclear power plants; and
3. to quantify better and obtain more valid estimates of the uncertainties associated with probabilistic accident consequence codes, thus enabling more informed judgments to be made in the areas of risk comparison and acceptability and therefore to help set priorities for future research.

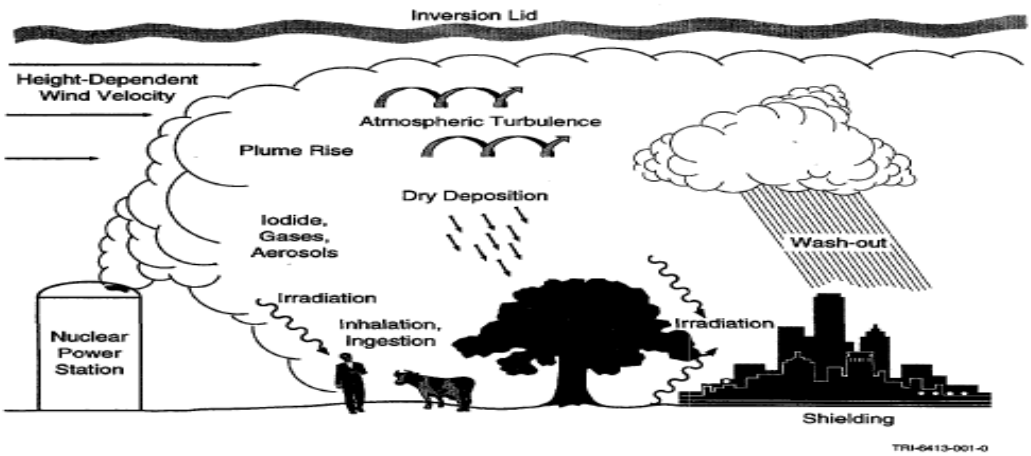

Figure A-1. Dispersion and deposition phenomena considered in an accident consequence analysis.

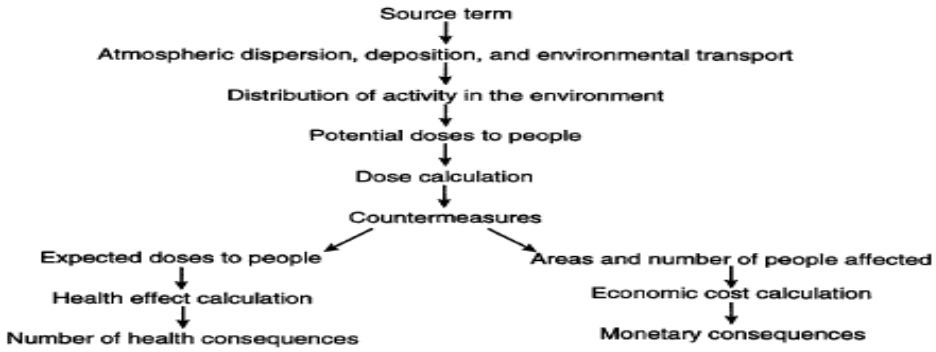

Figure 1. Scope of Accident Consequence Codes

Uncertainty analyses had been preformed with predecessors of both codes, whereby the probability distributions were assigned primarily by the code developers, based largely on literature reviews, rather than by independent experts. Since many input variables, as well as the models themselves, were uncertain, a rigorous and transparent procedure was required to arrive at defensible uncertainty distributions. Both Commissions decided to pool their efforts to quantify uncertainty on physical variables, and to perform uncertainty analyses on each code separately. The uncertainty quantification was broken into nine separate panels; the number of experts in each panel is shown in Table 1.

Expert panel	Number of experts[1]	Year	Reference
Atmospheric dispersion	8	1993	Harper *et al* 1995 Cooke *et al* 1995
Deposition (wet and dry)	8	1993	Harper *et al* 1995 Cooke *et al* 1995
Behaviour of deposited material and its related doses	10	1995	Goossens *et al* 1997
Foodchain on animal transfer and behaviour	7	1995	Brown *et al* 1997
Foodchain on plant/soil transfer and processes	4	1995	Brown *et al* 1997
Internal dosimetry	6	1996	Goossens *et al* 1998
Early health effects	7	1996	Haskin *et al* 1997
Late health effects	10	1996	Little *et al* 1997
Countermeasures	9	2000	Goossens *et al* 2001

Table 1: Expert Panels

Expert Judgment Methodology

The expert judgment methodology is extensively described in the referenced reports. Suffice here to indicate a few principal features

1. Experts are nominated and selected via a traceable and defensible procedure.
2. Experts undergo a training / familiarization session.
3. Experts prepare their responses prior to the elicitations.
4. Elicitations are conducted individually by a “domain expert” familiar with the subject matter and a “normative expert” experienced in probabilistic assessment.
5. Experts are queried only about the possible results of physical measurements or experiments, and about possible correlations.
6. With a few exceptions, experts also quantify uncertainty with respect to “seed” or “calibration” variables whose true values are or become known within the time frame of the study.
7. Experts write up their assessment rationales and these are published as appendices to the reports.
8. Expert names and assessments are preserved for peer review, names and assessments are published, although names are not associated with assessments in the open literature.

[1] The general goal of the panels was to have half of the experts coming from Europe and the other half coming from the USA. This has not been achieved in all panels for various reasons

Point (8) is characteristic of most structured expert judgment studies and is designed to discourage "expert shopping", whereby stakeholders or interveners might cherry pick experts to buttress a pre-defined viewpoint.

Point (6) is designed to enable performance assessment and to enable validation of the resulting combined distributions. Since expert assessments are by their nature subjective, the attempt is made, to "calibrate" these assessments against true values of variables from their field of expertise. Performance is measured in two dimensions, namely, statistical accuracy and informativeness. Statistical accuracy is measured as the p-value of the hypothesis that the expert's probabilistic statements are accurate in a statistical sense. Informativeness (Shannon relative information) measures the degree to which an expert's distributions are concentrated on a narrow range of possible values. Table 2 shows the number of elicitation questions and number of calibration questions ("seeds") for each panel.

Expert panel	**Number of questions**	**Number of seeds**	**Remarks**
Atmospheric dispersion	77	23	
Deposition (wet and dry)	87	19	14 for dry depos. 5 for wet depos.
Behaviour of deposited material and its related doses	505	0	No seed questions
Foodchain on animal transfer and behaviour[2]	80	8	
Foodchain on plant/soil transfer and processes	244	31	
Internal dosimetry	332	55	
Early health effects	489	15	
Late health effects	111	8	*Post hoc* values
Countermeasures[3]	111	0	Country specific

Table 2: Number of elicitation variables and calibration variables for each panel

[2] The Countermeasures panel was not part of the joint USNRC/CEC Project, but part of the EC follow-up project on Uncertainty Analysis of the COSYMA software package

3 Since the practices of farming with respect to animals is different in Europe and in the USA, the questionnaires were adapted for European and American experts

The experts' assessments were combined according to two weighting schemes. The "equal weight scheme" assigned each expert equal weight, while the "performance based weighting scheme" assigned experts a weight based on their performance on calibration variables. Each scheme can be regarded as a "virtual expert" whose statistical accuracy

and informativeness can be assessed in the same way as that of the experts. Table 3 shows the performance of these two weighting schemes.

As a general conclusion, the performance based decision maker exhibits better statistical accuracy and higher informativeness. In most cases the equal weight decision maker exhibits acceptable statistical accuracy. In one panel (Food chain on soil/plant transfer and processes) the statistical accuracy of both decision makers was problematic. This was attributed to the small number of experts (only four) in this panel. For programmatic reasons, primarily to insure methodological consistency with the earlier NUREG-1150 study[3] that addressed uncertainties in Level 1 and Level 2 Probabilistic Safety Assessment (PSA), the equal weight decision maker was used for the uncertainty analyses, though both decision makers are made available, leaving the choice up to the discretion of the user.

Case Name	weighting scheme	P-value	Mean Information
DISPERSION	Perform	0.9	1.024
	Equal	0.15	0.811
DRY DEPOSITION	Perform	0.52	1.435
	Equal	0.001	1.103
WET DEPOSITION	Perform	0.25	1.117
	Equal	0.001	0.793
ANIMAL	Perform	0.75	2.697
	Equal	0.55	1.778
SOIL/PLANT	Perform	0.0001	1.024
	Equal	0.0001	0.973
INTERNAL DOSE	Perform	0.85	0.796
	Equal	0.11	0.56
EARLY HEALTH	Perform	0.23	0.216
	Equal	0.07	0.165
LATE HEALTH	Equal	*******	0.28

Table 3: Performance scores for equal weight and performance based combinations, per panel

Point (5) requires that experts assess uncertainty only with regard to observable variables. This entails that experts do not assess uncertainty on abstract modeling parameters. Indeed, all models are simplifications, and large codes necessarily employ simplified models. The dispersion models in the codes, for example, employ simple Gaussian models with simple schemes for classifying atmospheric stability. More sophisticated models are available, but impose a computational burden that does not comport with the computational demands of probabilistic consequence model. Experts are not required to

[3] NUREG 1150 dealt with level 1 and level 2 PSAs, loss of pimary systems and loss of containment.

"buy into" the models used in the codes, and indeed, their assessments could be used to quantify other models than those used in the consequence codes.

The restriction to observable query variables entails that experts' distributions must be "pulled back" onto the parameter space of the models, via a process known as probabilistic inversion. In short, distributions on model parameters must be found, such that when pushed through the models, the results on the observable quantities agree to the extent possible with the (combined) expert distributions. The development of practical techniques for probabilistic inversion was one of the major achievements of this research project.

Lessons learned

The joint EU-USNRC uncertainty studies represent a benchmark in each of the sub-modeling areas addressed as well as in quantifying the uncertainty in the risk of nuclear power plants. Moreover, with their reliance on observable query variables, they represent a major methodological advance in the use of structured expert judgment. The major lessons learned are elaborated below:

1. Value of Structured Expert Judgment Process
Structured expert judgment treats the entire uncertainty quantification process as a scientific data collection activity. The value of following a structured and transparent process, as opposed to "best guesses" and "engineering judgment" is very large.

One benefit resides in clarifying the operational meaning of the variables whose uncertainty is quantified. When modelers adapt values from published literature, it may happen that the operational meaning of the published error bars is not the meaning required in the uncertainty analysis. Thus, error bars for dispersion coefficients reported from tracer experiments reflect the variability in the estimates if the entire measurement procedure were often repeated. This is comparable to fluctuations of sample means under repeated experiments. However, the consequence codes are not concerned with an "average accident" and the target uncertainty concerns downwind concentrations following a *single* release event. The difference between these two uncertainties is considerable (see Kurowicka and Cooke 2006).

A second major benefit in structured expert judgment lies in capturing the experts reasoning in published rationales. These not only illustrate the different thought processes underlying the uncertainty assessments, they also provide valuable introductions to the modeling issues.

2. Dependence modeling and dependence elicitation
Prior to the joint study the question of probabilistic dependence was largely ignored, as if all important dependences were captured in functional relationships, and that dependence

between random variables could be ignored. Of course this is not remotely true, as best illustrated with a few examples from the Joint Study:

- the uncertainties in effectiveness of supportive treatment for high radiation exposure in people over 40 and people under 40.
- The amount of radioactivity after one month in the muscle of beef and dairy cattle
- The transport of radionuclides through different soil types.

The joint study had to break new ground in dependence modeling and dependence elicitation, and these subjects are treated extensively in the documentation. The format for eliciting dependence was to ask about joint exceedence probabilities: "Suppose the effectiveness of supportive treatment in people over 40 was observed to be above the median value, what is your probability that also the effectiveness of supportive treatment in people under 40 would be above its median value?" Experts became quickly familiar with this format. Dependent bivariate distibutions were found by taking the minimally informative copula which reproduced these exceedence probabilities, and linking these together in a Markov tree structure. Further developments, generalizing both the choice of copula and the tree dependence structure are found in (Kurowicka and Cooke 2006).

3. Validation of probabilistic assessments

Calibration or seed variables were used to assess expert and combined expert performance as probabilistic assessors. Considerable effort went into finding appropriate calibration variables. This has the multiple benefit of raising awareness that subjective probabilities are amenable to objective empirical control, and enhancing credibility in the combined assessments.

4. Combination methods

Some practitioners believe that expert probabilities should not be combined, but simply presented as multiple views. There is no doubt that individual expert assessments should be part of the published record. However, it is quite unthinkable that all possible combinations of experts in diverse panels should be carried forward to constitute the overall output. Referring to Table 1, this would mean that over 67 million possible combinations of experts in the various panels would be carried through the entire uncertainty analysis and presented to the user. There is no practical alternative but to combine the experts in each panel. The equal weight alternative was used in the NUREG-1150 studies, but the notion that this is the only way of combining experts was criticized. Indeed, equal weighting tends to produce distributions which are significantly more diffuse than any of those provided by experts. Having a well-founded alternative to equal weighting deflects such criticism. The appendix range graphs for all seed variables, showing expert assessments, equal and performance based combinations, and true values.

5. Probabilistic inversion

Essential to the success of the Joint Study was the decision that experts should be queried only about outcomes of possible measurements. This relieved experts of the burden of assessing parameters of models to which they might not subscribe. Instead, observable quantities were identified which were predicted by the models and experts were queried on these. New mathematical techniques were developed to pull these distributions back

onto the parameter space of the models. These techniques have been further developed since the Joint Study (Kraan 2002, Kraan and Bedford 2005, Kurowicka and Cooke 2006), and probabilistic inversion is now faster, more flexible and better grounded mathematically.

6. Sensitivity analysis and communication

Extracting useful information for a user from the wealth of data emerging from a large scale uncertainty analysis is a daunting task. The Joint Study explored several methods of gauging the importance of the input variables. At the end of the study, however, there was little time to study optimal ways of packaging this information for users. Subsequent work (van Noortwijk and Cooke 2000) further explored graphical communication methods. Figure 2 shows one such graphical tool. 161 variables were potentially influential on high values of collective radiation dose to 6 critical organs. A local sensitivity measure was used to capture influence of the variables on the high dose regime. A radar graph was used to represent all this information in one picture. In A3 format, this gives all the relationships at once, although in normal A4 format it is rather dense.

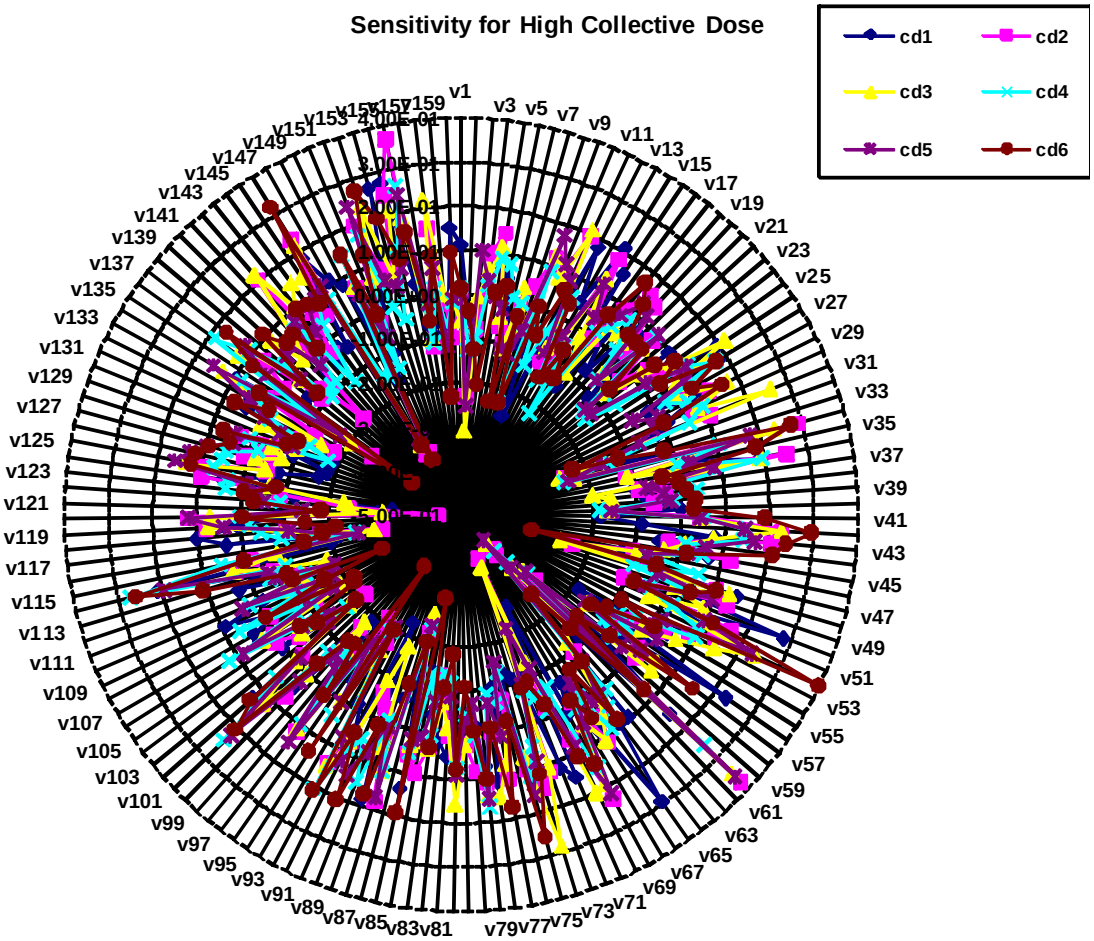

Figure 2: Radar graph for influence of 161 variables on high collective dose to 6 organs

7 Volitional Uncertainty

Volitional uncertainty is uncertainty with regard to what people will do. First Person uncertainty is uncertainty with regard to what I will do. Although I can be uncertain about what I will do, this type of uncertainty cannot be represented as subjective probability. Uncertainty with regard to what OTHER people will do; however, can be so represented. In the countermeasures module the Joint Study had to confront the issue of volitional uncertainty. The reports propose uncertainty distributions for problem owners, risk managers, and local officials, and indeed some of these people were also experts in the panel. Consistent with the overall starting point, uncertainty regarding what people will do must be queried in a way which is divorced from question what the expert him/herself would do. People's actions in the event of an accident must be treated as unknown but potentially observable values of physical measurements.

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APPENDIX Range Graphs for Equal Weight and Performance Weight Decision makers, seed variables

Dispersion

```
Item no.:  75 Item name: B-1-220 chi/Q Scale: LOG
Experts
  1 [-------------------------------------*-----------------------------------]
  2                                                          [-------*---------]
  3            [--------------------------------*-----------]
  4                                  [----------------*----------------]
  5                                                [---------*-------]
  6                                   [---------*-----------]
  7                                      [-----------*---------]
  8                              [----------------------*----------------------]
prf.wgts                            [==================*==============]
eq wgt          [=====================================*======================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::
                                                  2.39E-5
    3.48E-7                                                                0.00036

Item no.:  76 Item name: B-1-315 chi/Q Scale: LOG
Experts
  1 [-------------------------------------*--------------------------------]
  2                                                [------------*----------------]
  3          [-----------------------*-------------------]
  4                 [---------------------------*----------------------------]
  5                                [------------*-----------------]
  6                      [---------------*----------------]
  7                           [----------------*------------------]
  8                          [------------------------*-----------------------]
prf.wgts            [============================*==========================]
eq wgt        [==================================*=========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::
                                                   4.19E-5
    2.96E-6                                                               0.000203

Item no.:  77 Item name: B-2-220 chi/Q Scale: LOG
Experts
  1 [-------------------------------------*---------------------------------]
  2                                                          [------*--------]
  3                 [------------------------------*----------]
  4                                                [----------------*---------------]
  5                                                      [----------*-----------]
  6                                                [----------*------]
  7                                                   [---------*---------]
  8                                                    [--------------*-------------]
prf.wgts                                           [================*===============]
eq wgt            [=========================================*================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::
                                                        3.07E-5
    2.11E-7                                                                0.00029

Item no.:  78 Item name: B-2-315 chi/Q Scale: LOG
Experts
  1 [--------------------------------*----------------------------]
  2                                                   [----------*-----------]
  3                 [---------------------*----------------]
  4                        [-------------------------*-----------------------]
  5                                 [-----------------*---------------]
  6                            [---------------*-------]
  7                                 [---------------*----------------]
  8                                [---------------------*--------------------]
prf.wgts                     [========================*======================]
eq wgt          [==================================*======================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
```

```
                                                        5.38E-5
    1.8E-6                                                                0.000205

Item no.:  79 Item name: B-3-300 chi/Q Scale: LOG
Experts
  1       [---------------------*----------------]
  2                         [-----------*------------------]
  3 [---------------------------*-----------------------]
  4             [---------------------------*---------------------------]
  5                [-----------------*----------------]
  6                    [-----------*--------------]
  7                         [-----------------*----------------]
  8                           [-----------------------*----------------------]
prf.wgts         [=======================*============================]
eq wgt     [============================*============================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::
                                                          5.26E-5
    2E-6                                                                 0.0001524

Item no.:  80 Item name: B-3-600 chi/Q Scale: LOG
Experts
  1    [--------------------*----------------]
  2            [-----------*------------------]
  3 [-------------------------*----------------------]
  4     [-------------------------*-------------------------]
  5       [------------------*----------------]
  6             [---------------*-------------]
  7                   [-----------------*-----------------]
  8                              [----------------------*----------------------]
prf.wgt [=======================*============================]
eq wgt  [=========================*==================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::
                                                                    5.19E-5
    1E-6                                                                  9.2E-5

Item no.:  81 Item name: B-4-300 chi/Q Scale: LOG
Experts
  1 [----------------------------*--------------------------]
  2                          [----------*----------------]
  3                [----------------*----------------]
  4                      [-------------------------*-------------------------]
  5                                [--------------*--------------]
  6                     [--------------*---------]
  7                               [------------*--------------]
  8                               [------------------*-----------------]
prf.wgts                 [=======================*=========================]
eq wgt        [============================*=========================]
Real:::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::::::::::::::::
                            2.1E-5
    2.6E-6                                                                0.00069

Item no.:  82 Item name: B-4-600 chi/Q Scale: LOG
Experts
  1     [-----------------------*------------------]
  2 [---------------*----------------------]
  3   [----------------------*------------------------]
  4 [-----------------------------------*-----------------------------------]
  5                  [-------------------*------------------]
  6                [---------------*----------------]
  7             [-------------------*--------------------]
  8                     [------------------------*-------------------------]
prf. [==================================*==================================]
eq wg [============================*================================]
Real:::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::
                                     3.79E-5
    5.2E-6                                                                0.00029

Item no.:  83 Item name: B-5-600 chi(y) Scale: UNI
Experts
  1  [*---]
  2    [--------*]
```

```
  3  [--*------]
  4 [-----*----]
  5 [--*--------]
  6  [--*-----]
  7 [-*------]
  8  [-------*------------------------------------------------------------------]
prf [=====*=====]
eq  [====*==========================================]
Real::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.18
    0.005                                                                  5.36

Item no.:  84 Item name: B-5-600 chi(z) Scale: UNI
Experts
  1                              [--------*-----------]
  2                            [----------------------------*-------]
  3                                 [------*----------------------------------]
  4                              [--------------------------*--------]
  5      [-----------------------------------*-----------------------]
  6        [---------------------------------------*------]
  7 [----------------------*-------------------------------------]
  8 [-----------------------------*-----------------------------------]
prf.wgts     [=====================================*============]
eq wgt  [=====================================*========================]
Real::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
              0.2
    0.05                                                                    1.1

Item no.:  85 Item name: B-5-600 sig_y Scale: UNI
Experts
  1 [------*------]
  2                      [----------------------*----------------------------]
  3    [---------*------------------------------]
  4     [---------*---------------------]
  5    [-----*------]
  6    [-------*-------]
  7 [-----*-----------------]
  8        [--------------*---------------------------]
prf.wg [========*======================]
eq w [===========*================================================]
Real::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
           28
    13                                                                      159

Item no.:  86 Item name: B-5-600 sig_z Scale: UNI
Experts
  1     [-----------*------------]
  2                    [-----------------*---------------------]
  3     [------------------------*-----------------------------------]
  4             [--------------------*----------------------------------------]
  5          [------*------------]
  6             [-----------------*------------------]
  7 [--------*-------------------]
  8   [---------*------------------]
prf.wgts     [================*=============================================]
eq wg [===================*=====================================]
Real::::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
               8.36
     3                                                                       34

Item no.:  87 Item name: C-60-1 chi/Q Scale: LOG
Experts
  1 [-------------------------------------*-----------------------------------]
  2 [---------------------------------------------*-------------------]
  3                                            [----------------------*-----]
  4                                                     [--------*---------]
  5                                                           [-----*---]
  6                                                  [---------------------*----]
  7                                         [--------*--------------------]
  8                              [--------*-------]
prf.wgts                                                [=========*========]
```

```
eq wgt       [=============================================*================]
Real:::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::
                                              3.6E-8
    1E-12                                                                 6.69E-5

Item no.:  88 Item name: C-60-2 chi/Q Scale: LOG
Experts
  1 [-------------------------------*-----------------------------]
  2                                [*-------------]
  3        [-----------------------------------------*----------]
  4                      [--------------------------*------------------------]
  5                                   [-----------*-----------]
  6                  [--------------------------*---------]
  7                                 [---------*-----------]
  8            [-----------------------*----------------------]
prf.wgts                     [=======================*=========================]
eq wgt       [==============================*==========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::
                                                1.46E-5
    2.44E-7                                                               0.00021

Item no.:  89 Item name: C-60-3 chi/Q Scale: LOG
Experts
  1       [-----------------------*-------------------]
  2 [---------------------*---------------]
  3   [------------------------*---------------------]
  4   [-----------------------------------*-----------------------------------]
  5                         [----------------*------------------]
  6                   [----------*------------------]
  7              [-------------------*--------------------]
  8        [---------------------*------------------]
prf.wg [====================================*================================]
eq wgt [==========================*==============================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::
                                                1.46E-5
    8.4E-7                                                                 0.0001

Item no.:  90 Item name: C-120-1 chi/Q Scale: LOG
Experts
  1 [----------------------------------*---------------------------------]
  2 [-------------------------------------------*-----------------]
  3                                         [--------------------*-----]
  4                                                 [--------*--------]
  5                                                      [-----*---]
  6                                             [-------------------*-----]
  7                                       [-------*------------------]
  8                            [-------*-------]
prf.wgts                                            [=========*=======]
eq wgt      [=============================================*===============]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#
                                                                     0.000194
    1E-12                                                            0.000194

Item no.:  91 Item name: C-120-2 chi/Q Scale: LOG
Experts
  1              [-------------------------*----------------------]
  2 [----------------------------------------*----------]
  3                   [--------------------------------*-------]
  4                                [--------------------*--------------------]
  5                                      [--------*---------]
  6                             [---------------------*-------]
  7                                       [-------*---------]
  8                        [-----------------*-----------------]
prf.wgts                                [=================*====================]
eq wgt          [==================================*===================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::
                                                     1.75E-5
    5.2E-8                                                                0.00026

Item no.:  92 Item name: C-120-3 chi/Q Scale: LOG
Experts
```

```
  1       [----------------------*------------------]
  2   [---------------------*---------------]
  3 [-----------------------*-------------------]
  4       [---------------------------------*--------------------------------]
  5                  [----------------*----------------]
  6                  [-------------*-------------------]
  7                [-----------------*------------------]
  8          [--------------------*-------------------]
prf.wgts  [==============================*================================]
eq wgt  [========================*==============================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::
                                                   2.64E-5
    1E-6                                                                  0.00015

Item no.:  93 Item name: C-240-1 chi/Q Scale: LOG
Experts
  1 [----------------------------------*--------------------------------]
  2 [-------------------------------------------*----------------]
  3                                        [--------------------*-----]
  4                                                [--------*--------]
  5                                                      [----*---]
  6                                             [-------------------*----]
  7                                   [-------*------------------]
  8                            [-------*-------]
prf.wgts                                           [========*=======]
eq wgt      [=========================================*===============]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#
                                                                       0.000295
    1E-12                                                              0.000295

Item no.:  94 Item name: C-240-2 chi/Q Scale: LOG
Experts
  1           [--------------------------*------------------------]
  2 [-----------------------------------------*-----------]
  3                 [---------------------------------*-------]
  4                                [--------------------*--------------------]
  5                                      [--------*---------]
  6                          [----------------------*--------]
  7                                   [--------*---------]
  8                      [------------------*------------------]
prf.wgts                             [=================*======================]
eq wgt         [==================================*====================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::
                                                   2.15E-5
    7.6E-8                                                                0.00026

Item no.:  95 Item name: C-240-3 chi/Q Scale: LOG
Experts
  1       [----------------------*------------------]
  2        [--------------------*----------------]
  3 [-----------------------*-------------------]
  4       [---------------------------------*--------------------------------]
  5                 [---------------*-----------------]
  6                   [------------*--------------------]
  7                [-----------------*------------------]
  8           [-------------------*-------------------]
prf.wgts  [==============================*================================]
eq wgt   [========================*==============================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::
                                                   3.14E-5
    1E-6                                                                  0.00015
                       0.154
Item no.:  97 Item name: D-60 sig_z Scale: UNI
Experts
  1 [-*--]
  2    [--*---]
  3             [-------*---------------]
  4  [--------*---------]
  5  [----------*------------------------------]
  6             [---------------*---------------------------------------------]
  7  [----------*---------------------]
```

```
  8     [------*------------]
prf. [=========*============================]
eq  [==========*============================================]
Real:::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::
                                 4
    0.34                                                                  10

Item no.:  98 Item name: D-60 sig_y Scale: UNI
Experts
  1 [*-]
  2                          [--------------------*--------------------------]
  3    [---*--------]
  4  [--*----------------------------]
  5 [----*----------]
  6      [-*-------------]
  7 [--*--------]
  8  [-*----]
prf [====*==========================]
eq  [=====*=====================================================]
Real:::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::
                                 13
    0.7                                                                   33

Item no.:  99 Item name: E-80 90% arc Scale: LOG
```

Dry Deposition

```
Item no.:  57 Item name: DD-E-1 0.55 mu Scale: LOG
Experts
  1                  [-------------*--------]
  2                [-----------------------------*---------------------------]
  3                  [-------------------*-------------------]
  4                              [-------*------------------]
  5              [------------*---------------]
  6                                   [---*------]
  7             [----------*-----------------------------]
  8 [-----------------------------*------------]
prf wgt            [==============================*==========================]
eq wgt       [==========================*===========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
                                                          0.7
    0.001                                                                 10

Item no.:  58 Item name: DD-E-1 0.7 mu Scale: LOG
Experts
  1                  [--------------*---------]
  2               [----------------------------------*------------------------]
  3                    [------------------*-------------------]
  4                             [--------*------------------]
  5              [------------*--------------]
  6                                  [---*------]
  7               [---------*-----------------------------]
  8 [-----------------------------*------------]
prf wgt           [================================*========================]
eq wgt       [==========================*===========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
                                                          0.87
    0.001                                                                 11

Item no.:  59 Item name: DD-E-1 0.9 mu Scale: LOG
Experts
  1                  [----------------*---------]
  2               [-------------------------------------*----------------------]
  3                     [-------------------*-----------------]
  4                               [--------*-----------------]
  5                  [--------*-----------------]
  6                                  [---*------]
  7                  [--------*---------------------------]
  8 [-------------------------------*-------------]
prf wgt           [===================================*======================]
```

```
eq wgt       [============================*==========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::
                                                            0.87
    0.001                                                                      12

Item no.:  60 Item name: DD-E-1 1.2 mu Scale: LOG
Experts
  1                [-------------------*---------]
  2              [---------------------------------------*--------------------]
  3                   [-------------------*-------------------]
  4                              [--------*------------------]
  5              [-----------*----------------]
  6                                            [---*------]
  7                   [-------*------------------------]
  8 [--------------------------*--------------]
prf wgt          [=====================================*======================]
eq wgt      [============================*==============================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::
                                                  0.33
    0.002                                                                      14

Item no.:  61 Item name: DD-E-1 1.6 mu Scale: LOG
Experts
  1                    [-------------------*---------]
  2                 [-------------------------------------*-------------------]
  3                      [------------------*------------------]
  4                               [--------*--------------------]
  5                    [-------*--------]
  6                                                [---*------]
  7                          [-------*------------------]
  8 [----------------------------*--------------]
prf wgt             [====================================*======================]
eq wgt       [============================*==============================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::
                                                  0.38
    0.002                                                                      18

Item no.:  62 Item name: DD-E-2 0.55 mu Scale: LOG
Experts
  1             [---------------*---------]
  2             [-------------------------------*----------------------------]
  3               [--------------------*---------------------]
  4                     [--------*--------------------]
  5    [-------------------*----------------]
  6                                   [-----*-------]
  7         [-----------*-----------------------------------]
  8 [---------------------------------*-------------]
prf wgt        [================================*============================]
eq wgt   [============================*==============================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::
                                                0.37
    0.002                                                                      10

Item no.:  63 Item name: DD-E-2 0.7 mu Scale: LOG
Experts
  1     [-------------------*-----------]
  2    [---------------------------------------*------------------------------]
  3         [-----------------------*----------------------]
  4                  [---------*---------------------]
  5  [---------------*-----------------]
  6                                [------*--------]
  7    [-----------*-------------------------------------]
  8 [----------------------------*--------------]
prf wg [=======================================*==============================]
eq wgt [=========================*=================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::
                                                0.41
    0.005                                                                      11

Item no.:  64 Item name: DD-E-2 0.9 mu Scale: LOG
Experts
```

```
  1     [---------------------*-----------]
  2    [-----------------------------------------*---------------------------]
  3          [------------------------*--------------------]
  4                  [---------*----------------------]
  5       [----------*----------------------]
  6                                [-----*--------]
  7       [----------*---------------------------------]
  8 [-----------------------------------*--------]
prf wg [=========================================*============================]
eq wgt  [==========================*================================]
Real::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::
                                          0.29
    0.005                                                                  12

Item no.:  65 Item name: DD-E-2 1.2mu Scale: LOG
Experts
  1 [-------------------------*------------]
  2 [-------------------------------------------------*------------------------]
  3       [-------------------------*----------------------]
  4            [-----------*-----------------------]
  5 [-------------*--------------------]
  6                                  [------*---------]
  7        [------*--------------------------------]
  8 [------------------------------*--------]
prf [=============================================*==========================]
eq w [==========================*================================]
Real::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::
                                     0.31
    0.01                                                                   14

Item no.:  66 Item name: DD-E-2 1.6 mu Scale: LOG
Experts
  1     [------------------------*------------]
  2    [-------------------------------------------------*----------------------]
  3          [------------------------*--------------------]
  4              [----------*----------------------]
  5       [---------*-------------------]
  6                                     [------*---------]
  7              [-----*---------------------------]
  8 [-----------------------------*----------]
prf wg [=========================================*=========================]
eq wgt   [========================*================================]
Real::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::
                                       0.45
    0.01                                                                   18

Item no.:  67 Item name: DD-E-2 2.3 mu Scale: LOG
Experts
  1          [-----------------------*----------]
  2                                  [----------------*--------------------]
  3              [---------------------*------------------]
  4                [--------*---------------------]
  5             [--------*---------------------]
  6                                    [-----*--------]
  7                  [----*--------------------]
  8 [---------------------------*------------]
prf wgt                    [============================*====================]
eq wgt      [=========================*==============================]
Real::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::
                        0.1
    0.01                                                                   30

Item no.:  68 Item name: DD-E-2 3.2 mu Scale: LOG
Experts
  1        [-----------------------*-----------]
  2           [----------------------------------------*----------------------]
  3             [--------------------*------------------]
  4         [----------*----------------------]
  5               [---------*----------------------]
  6                                     [-----*--------]
  7                    [--*------------------]
```

```
  8 [------------------------*----------]
prf wgt        [=====================================*=======================]
eq wgt    [=======================*=================================]
Real::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::
                                     0.79
    0.02                                                                  50

Item no.:  69 Item name: DD-E-2 4.2 mu Scale: LOG
Experts
  1           [----------------------*-----------]
  2                 [-------------------------------------*---------------------]
  3                [---------------------*---------------]
  4            [---------*---------------------]
  5                [--------------*------------------]
  6                                          [-----*--------]
  7                        [-*-----------------]
  8 [---------------------------*-------]
prf wgt             [==================================*=====================]
eq wgt     [=========================*==============================]
Real::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::
                                            1.3
    0.02                                                                  60

Item no.:  70 Item name: DD-F  0.5-2.0 Scale: LOG
Experts
  1          [-------------------------*-----------------]
  2   [------------------------*---------------------------------------------]
  3        [-----------------------*----------------------------------------]
  4              [---------------------*--------------------]
  5   [-------------------*--------------------------]
  6 [--------------------------*-----------------]
  7                [---------------------*------------------]
  8          [--------------------------------------*-------]
prf w [========================*============================================]
eq wgt [============================*=================================]
Real::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::
                                                0.4
    0.00374                                                               10
```

Wet Deposition

```
Item no.:   3 Item name: WD-A 0.075 Scale: UNI
Experts
  1 |
  2  [---------*-------------------------------------------------------------]
  3 [----*-----------------------------------]
  4  [--------*---------------------------------------------]
  5   [---*-----]
  6 [-*----------]
  7      [-*-----]
Perr [========*==============================================================]
EqW [=====*=================================================]
Real::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::
                   0.064
    0.0001                                                            0.287

Item no.:   4 Item name: WD-A 0.05 Scale: UNI
Experts
  1 |
  2  [--------*-------------------------------------------------------------]
  3 [----*----------------------------------------]
  4  [----*-------------------------]
  5  [---*---]
  6 [*---]
  7     [--*---]
Perr [======*================================================================]
EqW [===*=================================================]
```

```
    ~~~
```

```
Per [===========*==============================================================]
EqW [====*=========================================================]
Real:::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::
                                           0.7
    0.001                                                                1.31

Item no.:  38 Item name: DD-E-1 0.7 mu Scale: UNI
Experts
  1 [--*-----]
  2 [-----*-------------------------------------------------------------]
  3   [----*-------------------------------------------------------------------]
  4 [*-------]
  5         [----*------------------]
  6 [*---------------------------------------------]
  7 [*-------]
Per [==========*=============================================================]
EqW [====*=========================================================]
Real:::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::
                                          0.87
    0.001                                                                 1.6

Item no.:  39 Item name: DD-E-1 0.9 mu Scale: UNI
Experts
  1 [--*--------]
  2 [------*----------------------------------------------------------------]
  3   [----*----------------------------------------------------------------]
  4 [*----------]
  5       [----*----------------]
  6 [*----------------------------------------]
  7 [-*---------]
Per [=========*==============================================================]
EqW [=====*========================================================]
Real::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::
                                       0.87
    0.001                                                                 1.8

Item no.:  40 Item name: DD-E-1 1.2 mu Scale: UNI
Experts
  1 [---*----------]
  2 [------*------------------------------------------------------------------]
  3   [---*-------------------------------------------------------------]
  4 [*--------]
  5           [------*------------------------]
  6 [*----------------------------------]
  7 [*--------]
Per [============*=============================================================]
EqW [=====*========================================================]
Real::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
              0.33
    0.002                                                                2.13

Item no.:  41 Item name: DD-E-1 1.6 mu Scale: UNI
Experts
  1 [----*----------]
  2 [-----*-------------------------------------------------------]
  3  [---*-----------------------------------------------------------------------]
  4 [*-]
  5               [--------*------------------------------]
  6 [-*---------------------]
  7 [*-------]
Per [=============*==============================================================]
EqW [====*=========================================================]
Real::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
            0.38
    0.002                                                                  3

Item no.:  42 Item name: DD-E-2 0.55 mu Scale: UNI
Experts
  1 [-*-----]
  2 [-----*-----------------------------------------------------------------------]
  3  [-*-----------------------------]
```

```
  4 [*---------]
  5        [-----*----------------------]
  6 [*----------------------------------------------------]
  7 [----*---------------------]
Per [========*==============================================================]
EqW [====*==================================================]
Real:::::::::::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::
                       0.37
    0.002                                                                1.34

Item no.:  43 Item name: DD-E-2 0.7 mu Scale: UNI
Experts
  1 [-*-------]
  2 [-----*------------------------------------------------------------------]
  3  [-*-----------------------------------]
  4 [*-------]
  5       [----*-------------------]
  6 *-----------------------------------------------]
  7 [---*-------------------]
Per [========*==============================================================]
EqW [====*==================================================]
Real:::::::::::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::
                      0.41
    0.005                                                                1.53

Item no.:  44 Item name: DD-E-2 0.9 mu Scale: UNI
Experts
  1 [--*-------]
  2 [------*-----------------------------------------------------------------]
  3  [-*----------------------------------]
  4 [*----------]
  5      [----*---------------]
  6 [*----------------------------------------]
  7 [-------*-----------]
Per [=======*===============================================================]
EqW [=====*=================================================]
Real:::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
              0.29
    0.005                                                                1.79

Item no.:  45 Item name: DD-E-2 1.2mu Scale: UNI
Experts
  1 [---*----------]
  2 [------*-----------------------------------------------------------------]
  3 [--*-------------------------------]
  4 [*--------]
  5        [-------*------------------------]
  6 [*---------------------------------]
  7 [-----*----------]
Per [=========*=============================================================]
EqW [=====*=================================================]
Real::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
             0.31
    0.01                                                                 2.13

Item no.:  46 Item name: DD-E-2 1.6 mu Scale: UNI
Experts
  1 [----*-------------]
  2 [-------*----------------------------------------------------------------]
  3 [--*-------------------------------]
  4 [*---------]
  5            [----------*-------------------------------------]
  6 [*---------------------------]
  7 [----*-----------]
Per [============*==========================================================]
EqW [======*================================================]
Real::::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::
               0.45
    0.01                                                                 2.59

Item no.:  47 Item name: DD-E-2 2.3 mu Scale: UNI
```

```
Experts
  1 [-----*--------------]
  2 [------*-------------------------------------------------------]
  3 [-*---------------------]
  4 [*---------------]
  5               [-------------*---------------------------------------------]
  6  *-------------------]
  7 [--*----------]
Per [==========*=====================================================]
EqW [=====*=====================================================]
Real:#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.1
    0.01                                                                  4.22

Item no.:  48 Item name: DD-E-2 3.2 mu Scale: UNI
Experts
  1 [---*-----------]
  2 [-----*-------------------------------------]
  3 [*------------]
  4 [-*------------------------]
  5               [-------------*---------------------------------------------]
  6  *-----------]
  7 [-*-----]
Per [=======*==================================================]
EqW [====*==================================================]
Real:::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
          0.79
    0.02                                                                  8.17

Item no.:  49 Item name: DD-E-2 4.2 mu Scale: UNI
Experts
  1 [--*---------]
  2 [----*---------------------------]
  3 *---------]
  4 [-*------------------]
  5               [-------------*---------------------------------------------]
  6  *--------]
  7 [-*--]
Per [======*==================================================]
EqW [===*==================================================]
Real::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
          1.3
    0.02                                                                  14.1

Item no.:  50 Item name: DD-F  0.5-2.0 Scale: UNI
Experts
  1 [*-------]
  2 *-------------------------------------------------------------------------]
  3 [*-----------]
  4 *------]
  5 *---]
  6 [*-----------]
  7 [----*-------]
Per [*=====================================================================]
EqW [*=============================================]
Real:::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
       0.4
    0.00374                                                                8.1
```

Animal

```
                        Range graph of input data
Item no.:   1 Item name: S1_TF_MUSCLE Scale: log
Experts
  1 [----------------------------------------*----------]
  2                                                [-------*------------------]
  3                [-----------------------*---------------------------]
  4                         [--------------*------------]
  5
```

```
  6                           [---------------------*-----------]
  7
prf wgt                     [==============*============]
eq wgt      [=====================================*========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::
                                                 0.027
    0.002                                                                  0.15

Item no.:   2 Item name: S1B_AC_LA Scale: log
Experts
  1 [-----------------------------------*-----------]
  2                          [-----------------*-----]
  3            [-------------------------------*------------------------------]
  4                              [-------------*-------]
  5                        [-----------*-------]
  6                          [---------*------]
  7                                   [---*---]
prf wgt                          [=============*=======]
eq wgt        [==========================*=========================]
Real:::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::::
                                            3460
    449                                                                     2E4

Item no.:   3 Item name: S1B_AC_NLA Scale: log
Experts
  1       [-----------------------------------*-----------]
  2                        [------------------*------]
  3 [-----------------------------------------*------------------------------]
  4                                     [-------------*-------]
  5                                     [-----------*-------]
  6                                     [---------*--------]
  7                                             [---*-]
prf wgt                                 [=============*=======]
eq wgt       [====================================*===================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::
                                                 5090
    500                                                                     2E4

Item no.:   4 Item name: S2_Fm Scale: log
Experts
  1                                                [-------*----]
  2                                          [--------*---------]
  3 [--------------------------------------*-----------------------------------]
  4                  [--------------------*-------------------------]
  5
  6                  [----------------------*---------------------]
  7                                                   [----*--]
prf wgt              [====================*=========================]
eq wgt        [=====================================*==================]
Real:::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::::::::::::::::
                                    0.0065
    0.0015                                                                 0.03

Item no.:   5 Item name: S3_5DAYS Scale: log
Experts
  1                                                                  [--*--]
  2                                                                  [--*-----]
  3 [----------------------------------------------*------------------]
  4                                                                  [------*-]
  5                                                                     [--*-]
  6                                                                        [-*]
  7                                                            [------*---]
prf wgt                                                          [======*=]
eq wgt                 [==================================================*====]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#
                                                                          92
    10                                                                    92

Item no.:   6 Item name: S3_10DAYS Scale: log
Experts
  1                                                        [----*---]
```

```
  2                                                          [-----*----]
  3 [----------------------------*----------------------------]
  4                                                        [-------------*--]
  5                                                             [-----*---]
  6                                                                   [--*-]
  7                                                  [--------------*------]
prf wgt                                                    [=============*==]
eq wgt           [=================================================*========]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::
                                                                          75
     8                                                                     83

Item no.:   7 Item name: S3_30DAYS Scale: log
Experts
  1                              [------------*--------]
  2                                  [---------------*--------------]
  3 [--------------------------------*-----------------------------]
  4                                                        [-----*---------]
  5                                        [-----------------*---------]
  6                                                          [-------*-----]
  7 [-----------------------------------------*----------------------]
prf wgt                                                    [=====*========]
eq wgt     [=============================================*==================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::
                                                                           46
     5                                                                      57

Item no.:   8 Item name: S3_60DAYS Scale: log
Experts
  1                            [---------*---------]
  2                                                [---------*------------]
  3                    [-------------------------------------*--------------]
  4                                                [-----------------*--------]
  5                                        [------------------*----------]
  6                                                [------------------*-------]
  7 [-----------------------------------------*----------------------]
prf wgt                                            [=================*========]
eq wgt           [=========================================*==================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::
                                                                          21
    0.3                                                                    33
```

Soil

```
                        Range graph of input data
Item no.:   1 Item name: S1_SM_CS_4Y Scale: LOG
Experts
  1 [------------------*-------------]
  2                    [--------*----]
  3                                        [-----------------------------*-----]
  4                                                        [---------*-----]
PerfWgt                                    [============================*=======]
EqWgt   [================================*==================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::
                                                                 0.37
    0.002                                                                0.91

Item no.:   2 Item name: S1_SM_CS_7Y Scale: LOG
Experts
  1 [----------------*--------------------]
  2 [----------------*--------]
  3                              [-------------------------------------*----]
  4                                                  [------------*----]
PerfWgt                          [==================================*=======]
EqWg [=================================*=====================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                                0.42
    0.02                                                                 0.98

Item no.:   3 Item name: S1B_SL1_3Y_1C Scale: LOG
```

```
Experts
  1                                                   [-------*----------]
  2                   [---------------*--------------]
  3                 [---*-----]
  4                                             [-------------*-------------]
PerfWgt             [====*==============================================]
EqWgt               [==============================*=======================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.41
    0.41                                                                0.929

Item no.:   4 Item name: S1B_SL1_3Y_5C Scale: LOG
Experts
  1       [-----*-----------]
  2 [-------------------*--------------]
  3     [-----------------------------------------------------*--------------]
  4            [---------------------*------------------------------]
PerfWgt [===============================================*====================]
EqWgt [====================*==============================================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.15
    0.15                                                                 0.44

Item no.:   5 Item name: S1B_SL1_3Y_10 Scale: LOG
Experts
  1                      [*--]
  2                   [-----------------------*-------------]
  3 [-------------------------------------------------------*-------------------]
  4                        [-----*-----------------]
Per [=========================================*==========================]
EqWgt       [====================*=========================================]
Real:::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::
                    0.05
    0.03                                                                 0.25

Item no.:   6 Item name: S1B_SL2_1Y_1C Scale: LOG
Experts
  1                                   [-------*--------------]
  2 [----------------------------*-------------------------]
  3          [-----*-------------]
  4                                 [----------------*----------------------]
PerfWgt      [========*=============================================]
EqWgt    [================================*================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::
                                                                  0.73
    0.5                                                                 0.789

Item no.:   7 Item name: S1B_SL2_1Y_5C Scale: LOG
Experts
  1          [*--]
  2 [-----------------------------------------*------------------------------]
  3          [-----------------------------*--------------------]
  4           [------*---------------]
PerfWgt      [=======================*========================]
EqWgt   [===============*==============================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::
                                                              0.45
    0.3                                                                   0.5

Item no.:   8 Item name: S1B_SL2_1Y Scale: LOG
Experts
  1                     []
  2 [-------------------------------------------*------------------------------]
  3                         [----------------------*------------------------]
  4                      [*---]
PerfWgt                  [====================*============================]
EqWgt      [================*=========================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::
                                                            0.34
    0.2                                                                   0.4
```

```
Item no.:   9 Item name: S1B_SL2_2Y_ Scale: LOG
Experts
  1                                   [--------*--------------]
  2      [----------------------*---------]
  3 [---------*-----------------]
  4                                   [-------------------*------------------]
Per [============*====================================================]
EqWgt [=================================*==============================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::
                                                                     0.82
    0.53                                                                        0.905

Item no.:  10 Item name: S1B_SL2_2Y_5C Scale: LOG
Experts
  1 [-*-----]
  2          [-----------------------------------*----------------------------]
  3 [---------------------------*-----------------------------------]
  4     [---------------*----------------------------]
Perf [=========================*====================================]
EqW [===================*==============================================]
Real:::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        0.34
    0.328                                                                        0.55

Item no.:  11 Item name: S1B_SL2_2Y_10 Scale: LOG
Experts
  1           [*]
  2              [-----------------------------------*-------------------------]
  3              [-----------------------------------------------*---------]
  4            [---*---------]
PerfWgt         [=====================================*===================]
EqWgt         [==========*==================================================]
Real#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.22
    0.22                                                                         0.45

Item no.:  12 Item name: S1B_SL2_3Y_1C Scale: LOG
Experts
  1                                             [--------*------------]
  2                          [---------*--------]
  3 [--------------*-------------------]
  4                                             [------------------*------------]
Per [==================*==================================================]
EqWgt  [=========================================*============================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::
                                                                     0.88
    0.53                                                                        0.957

Item no.:  13 Item name: S1B_SL2_3Y_5C Scale: LOG
Experts
  1 [--*------]
  2                                       [-------------*-----------]
  3  [-----------------------------*-----------------------------------------]
  4        [--------------------*---------------------------------]
Perf [=============================*=========================================]
EqW [============================*=====================================]
Real::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::
                                   0.44
    0.337                                                                         0.6

Item no.:  14 Item name: S1B_SL2_3Y_10 Scale: LOG
Experts
  1 *-]
  2                      [----------------------------*----------------------]
  3       [-----------------------------------------------*-------------]
  4   [-----*----------------]
PerfWg [=========================================*======================]
EqW [===================*==================================================]
Real:::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::
                           0.31
    0.245                                                                         0.5
```

```
Item no.:  15 Item name: S1B_SL3_1Y_1C Scale: LOG
Experts
  1                                                  [-------*--------------]
  2 [-----------------------------*------------------------]
  3                      [--------*----]
  4                                     [--------------*--------------------]
PerfWgt                   [========*==================================]
EqWgt     [=====================================*=========================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.4
    0.4                                                                0.694

Item no.:  16 Item name: S1B_SL3_1Y_5C Scale: LOG
Experts
  1                                            [*]
  2                       [-----------------------*------------]
  3                                            [-------------*-----------------]
  4                                         [-*-----]
PerfWgt                                     [============*====================]
EqWgt                         [==================*==========================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.05
    0.05                                                                0.49

Item no.:  17 Item name: S1B_SL3_1Y_10 Scale: LOG
Experts
  1            *-]
  2         [------*-------------------]
  3 [---------------------------*-----------------------------------------]
  4            [-*----]
Per [======================*==================================================]
EqWgt  [=========*==================================================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.03
    0.03                                                                0.38

Item no.:  18 Item name: S1B_SL3_3Y_1C Scale: LOG
Experts
  1                                                      [--------*-----------]
  2              [------------------*---------------]
  3            [---*----------------]
  4                                         [-----------------*---------------]
PerfWgt        [======*==================================================]
EqWgt          [================================*==========================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.44
    0.44                                                               0.902

Item no.:  19 Item name: S1B_SL3_3Y_5C Scale: LOG
Experts
  1                                                  [*---]
  2                                       [--------------*---------]
  3                                                    [-----------*----------]
  4                                                 [-----*----------]
PerfWgt                                             [==============*============]
EqWgt                                     [=============*====================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.04
    0.04                                                                0.55

Item no.:  20 Item name: S1B_SL3_3Y_10 Scale: LOG
Experts
  1                                [*--]
  2                                [------------*-------]
  3                           [--------------------------*--------------------]
  4                                [----*--------]
PerfWgt                       [======================*========================]
EqWgt                          [=========*================================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.01
```

```
    0.01                                                                0.49

Item no.:  21 Item name: S1B_SL3_6Y_1C Scale: LOG
Experts
  1                                                        [-------*-------]
  2                    [----------------*--------------]
  3 [-----*------------------------------]
  4                                                [----------------*--------]
Per [===========*==========================================================]
EqWg [=============================================*======================]
Real:::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
             0.55
    0.5                                                                0.982

Item no.:  22 Item name: S1B_SL3_6Y_5C Scale: LOG
Experts
  1                                                [---*------]
  2                                          [-----------*--------]
  3                                                     [------------*------]
  4                                                [----------*-------------]
PerfWgt                                             [===============*=======]
EqWgt                                      [==============*================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.05
    0.05                                                                0.58

Item no.:  23 Item name: S1B_SL3_6Y_10 Scale: LOG
Experts
  1                          [--*-----]
  2                                     [---------*-----]
  3                          [-----------------------------------*-------------]
  4                            [---------*----------------]
PerfWgt                      [===========================*====================]
EqWgt                        [==============*==============================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.02
    0.02                                                                0.53

Item no.:  24 Item name: S2_RU_CS_CA Scale: LOG
Experts
  1                       [---------------*--------------]
  2 [------------------------------*------------------------------]
  3        [---------------------------*--------------------------------]
  4            [-------------------------------*------------------------------]
PerfWgt    [============================*================================]
EqWgt   [================================*================================]
Real:::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::
                         0.0032
    0.0006                                                              0.14

Item no.:  25 Item name: S2_RU_CS_PO Scale: LOG
Experts
  1                [-------------*------------]
  2 [----------------------*----------------------------]
  3                   [-----------------------------*-------------------------]
  4             [--------------------------*-------------------------]
PerfWgt            [================================*=========================]
EqWgt  [==============================*====================================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::
                                                        0.053
    0.0004                                                              0.25

Item no.:  26 Item name: S2_RU_CS_BA Scale: LOG
Experts
  1 [-------------*----------------]
  2         [-------------------------------*-----------------------------]
  3                   [----------------------------*---------------------------]
  4 [---------------------------*------------------------------]
PerfWgt    [=====================================*============================]
EqWg [==========================*=========================================]
Real:::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::
```

```
                    0.0044
    0.001                                                                0.245

Item no.:  27 Item name: S2_RU_SR_CA Scale: LOG
Experts
  1                          [------------*-----------]
  2 [------------------------*------------------------]
  3      [----------------------------*---------------------]
  4                         [------------------------*------------------------]
PerfWgt  [==============================*==============================]
EqWgt  [=================================*=================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
                                                            0.69
    0.006                                                                  5.5

Item no.:  28 Item name: S2_RU_SR_PO Scale: LOG
Experts
  1                       [--------------*-------------]
  2 [---------------------------*---------------------------]
  3                         [----------------------*-----------------------]
  4                  [----------------------------*----------------------------]
PerfWgt                [==========================*=======================]
EqWgt    [==================================*==============================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::
                                                                  0.14
    0.001                                                                  0.4

Item no.:  29 Item name: S2_RU_SR_BA Scale: LOG
Experts
  1  [-----------------*----------------]
  2    [-----------------------------------*-----------------------------------]
  3                      [--------------------------*-------------------------]
  4 [----------------------------------*----------------------------------]
PerfWgt     [=====================================*=========================]
EqWg [==============================*=======================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::
                                                 0.28
    0.014                                                                1.807

Item no.:  30 Item name: S2B_CR_CS_SS Scale: LOG
Experts
  1                      [-------------*--------------]
  2              [-----------------------------*-----------------------------]
  3            [--------------------------*--------------------------]
  4 [----------------------------*----------------------------]
PerfWgt  [================================*==========================]
EqWgt   [=================================*================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
                                                          0.085
    0.0016                                                                 0.5

Item no.:  31 Item name: S2B_CR_CS_LS Scale: LOG
Experts
  1            [----------------*---------------]
  2       [----------------------------*-----------------------------------]
  3            [-----------------------------*-----------------------------]
  4 [--------------------------------*--------------------------------]
PerfWgt   [==================================*================================]
EqWgt  [=============================*=================================]
Real::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
             0.0028
    0.0013                                                                0.22
```

Internal Dose

```
                          Range graph of input data
Item no.:   1 Item name: study 1 - 45 d Scale: UNI
```

```
Experts
  1   [--------*-------]
  2    [------*------------]
  3   [---------*-----------------]
  4      [-*---]
  5 [------------*------------------------------------------------------------]
  6        [---------*-------------------]
PerfWg [======*===============]
EqWg [=========*============================================]
Real:::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
             0.011
    0.0025                                                                0.07

Item no.:   2 Item name: study 1 - 68 d Scale: UNI
Experts
  1 [--------*-----]
  2  [-----*---------]
  3  [--------*--------------------]
  4   [--*---]
  5 [---------*----------------------------------------------------------------]
  6      [------*---------------]
Perf [=====*===========]
EqWg [======*==============================================]
Real::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
            0.01
    0.0025                                                                0.07

Item no.:   3 Item name: study 1 - 75 d Scale: UNI
Experts
  1  [------*-----]
  2   [----*--------]
  3  [-------*---------]
  4   [--*--]
  5 [--------*-----------------------------------------------------------------]
  6      [------*-------------]
PerfW [====*==========]
EqWg [======*==============================================]
Real::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
            0.01
    0.002                                                                 0.07

Item no.:   4 Item name: study 1 -325 d Scale: UNI
Experts
  1  [-------*-----------------------]
  2      [-----*----------------]
  3   [--------*-----------]
  4  [-*--]
  5 [----------*---------------------------------------------------------------]
  6      [------*---------------]
PerfWgt  [=====*================]
EqWg [=======*=============================================]
Real::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                  0.007
    0.001                                                                 0.03

Item no.:   5 Item name: study 1 -378 d Scale: UNI
Experts
  1  [------*-------------------]
  2      [-----*-------------]
  3   [-------*------------]
  4 [--*-]
  5 [---------*---------------------------------------------------------------]
  6    [------*------------]
PerfWgt [======*==============]
EqW [========*=============================================]
Real::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                 0.0065
    0.001                                                                 0.03

Item no.:   6 Item name: study 1 -382 d Scale: UNI
Experts
```

```
  1 [------*--------------------]
  2      [-----*-------------]
  3   [-------*------------]
  4 [--*-]
  5 [---------*-------------------------------------------------------------]
  6    [------*------------]
PerfWgt [======*==============]
EqW [========*==============================================]
Real:::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                0.0065
    0.001                                                                0.03

Item no.:   7 Item name: study 1-1155 d Scale: UNI
Experts
  1 [*----------------------------------------------------------------------]
  2   [--*------]
  3  [---*------------]
  4 [*]
  5 [----*----------------------------------------]
  6   [-*-----]
PerfW [==*========]
EqW [===*==============================================]
Real::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
           0.005
    0.0004                                                               0.04

Item no.:   8 Item name: st2/lung - 2 d Scale: UNI
Experts
  1                                                [--------------------*--------]
  2     [--------*-------------------------------------------------]
  3 [-----*----]
  4   [-*---]
  5    [-----*--]
  6
PerfWgt [========*==============================================]
EqWg [=======*==============================================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
                                                          70
     4                                                                     99

Item no.:   9 Item name: st2/lung - 9 d Scale: UNI
Experts
  1                                          [-------------------*---------------]
  2     [----*-----------------------------------------------------]
  3 [--*---]
  4    [*--]
  5   [------*---]
  6
PerfWgt [====*==================================================]
EqW [======*==============================================================]
Real:::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::
                                               60
     2                                                                     99

Item no.:  10 Item name: st2/lung -16 d Scale: UNI
Experts
  1                                     [-----------------*---------------------]
  2    [--------*-----------------------------------------------]
  3 [--*--]
  4    [*-]
  5   [-----*----]
  6
PerfWg [========*==============================================]
EqW [=====*==============================================================]
Real::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::
                                          50
     1                                                                     99

Item no.:  11 Item name: st2/lung -30 d Scale: UNI
Experts
  1                                   [---------------*------------------------]
```

```
  2   [--------*--------------------------------------------------]
  3 [--*--]
  4   [-*]
  5   [----*----]
  6
PerfW [========*==================================================]
EqW [=====*==========================================================]
Real:::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::
                             30
    0.5                                                                 90

Item no.:  12 Item name: st2/lung -90 d Scale: UNI
Experts
  1                          [------------------------*------------------------]
  2 [----*-------------------------------------------------------------------]
  3 [*----]
  4  [*]
  5  [-*--------]
  6
Per [====*=================================================================]
EqW [==*===============================================================]
Real:::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::
                             20
    0.1                                                                 60

Item no.:  13 Item name: st2/lung-180 d Scale: UNI
Experts
  1                  [--------------------*-------------------------------------]
  2 [*---]
  3 *-]
  4 *]
  5 [*--]
  6
Per [*=======]
EqW [*==========================================================]
Real:::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::
                   10
    0.01                                                                50

Item no.:  14 Item name: st2/urin - 2 d Scale: UNI
Experts
  1 [*]
  2 *-------------------------------------------------------------------------]
  3 |
  4        [------*------]
  5 [-*--------------------------]
  6
Per *=====================================================================]
EqW [*=====================================================]
Real:::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::
                                   0.4
    1E-6                                                                 1

Item no.:  15 Item name: st2/urin - 9 d Scale: UNI
Experts
  1 |
  2 [-*-----------------------------------------------------------------------]
  3 |
  4 *]
  5 *-]
  6
Per [=*===========================================================================]
EqW *=====================================================]
Real::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        0.2
    1E-6                                                                 3

Item no.:  16 Item name: st2/urin -16 d Scale: UNI
Experts
  1 |
  2 [--*----------------------------------------------------------------------]
```

```
  3 |
  4 |
  5 *]
  6
Per [==*==================================================================]
EqW *=====================================================]
Real:#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.15
    1E-6                                                                  6

Item no.:  17 Item name: st2/urin -30 d Scale: UNI
Experts
  1 |
  2 [----*-------------------------------------------------------------]
  3 |
  4 |
  5 |
  6
Per [====*================================================================]
EqW *=====================================================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.08
    1E-6                                                                  9

Item no.:  18 Item name: st2/urin -90 d Scale: UNI
Experts
  1 |
  2  [---------*---------------------------------------------------------]
  3 |
  4 |
  5 |
  6
Perf [=========*==============================================================]
EqW *=====================================================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.06
    1E-6                                                                 12

Item no.:  19 Item name: st3/Po-liver Scale: UNI
Experts
  1      [-------*--------------]
  2 [------------*--------------]
  3                             [--------*------]
  4 [-*---]
  5              [----------------------*--------------]
  6                     [---------------*-------------------------------------]
Per [============*===================]
EqW [======================*=====================================]
Real:::::::::::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                 10
    1.5                                                                  50

Item no.:  20 Item name: st3/Po-femora Scale: UNI
Experts
  1     [---------*----------------------------]
  2  [---*------------]
  3         [-------*--------------------]
  4 *]
  5      [---------------------*---------------------------------------------]
  6  [---*------------]
Perf [===*=============]
EqW [=========*==============================================]
Real:::::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
         0.3
    0.03                                                                  4

Item no.:  21 Item name: st3/Po-spleen Scale: UNI
Experts
  1        [----------------*-------------------------------------------------]
  2 [-*------]
  3 [*-]
```

```
  4 [*-]
  5          [-----------*----------------------]
  6          [---------*------------------]
Per [=*==============]
EqW [=======*==================================================]
Real::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
      0.7
    0.2                                                                  15

Item no.:  22 Item name: st3/Po-kidney Scale: UNI
Experts
  1    [------------*-------------------------------------]
  2                 [--------------------------*------------------------------]
  3             [------------------*-----------------------------------------]
  4 [-*--]
  5         [----------------------*-----------]
  6             [-------------------*----------------------]
PerfWgt            [===========================*==============================]
EqWg [=========================*=========================================]
Real::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::
                                              11
    0.7                                                                  20

Item no.:  23 Item name: st3/Np-liver Scale: UNI
Experts
  1            [------*---------]
  2 [*----------------]
  3          [--------*---------]
  4    [---*------]
  5          [--------*---------------------------]
  6                   [------------------*-----------------------------------]
Per [*=======================]
EqW [===============*=============================================]
Real:#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
      1
    0.1                                                                  40

Item no.:  24 Item name: st3/Np-femora Scale: UNI
Experts
  1     [------------*----------------------------------]
  2 [---------*-------------------------]
  3       [--------*-----------------]
  4     [-----*----------]
  5     [----------------------------*----------------------------------------]
  6     [---------*---------------------]
Per [=========*==========================]
EqWgt [============*==============================================]
Real::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
               3
    0.3                                                                  20

Item no.:  25 Item name: st3/Np-spleen Scale: UNI
Experts
  1 [--*-------]
  2        [--------------*-----------------------------------------------------]
  3 [*]
  4 [*-]
  5 *----------]
  6 [--*---]
PerfWgt   [===============*=====================================================]
EqW [=*==================================================]
Real::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.06
    0.006                                                                 2

Item no.:  26 Item name: st3/Np-kidney Scale: UNI
Experts
  1    [-------*-------------------------]
  2     [---------*----------------------------------]
  3     [-------*-----------]
  4 *-]
```

```
  5             [--------------------------*----------------------------------]
  6     [------------*------------------------------]
PerfWgt [=========*==================================]
EqW [============*==================================================]
Real:::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                 0.6
    0.02                                                                   3

Item no.:  27 Item name: st3/Pu-liver Scale: UNI
Experts
  1                                [----------------*------------------------]
  2 [-----*----------]
  3                  [-------*-----------]
  4                       [----*---------]
  5                  [---------*------------------]
  6                  [-----------------------------------*-------------------]
Per [======*====================]
EqWgt [==========================*=======================================]
Real:::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::
                     20
     2                                                                    78

Item no.:  28 Item name: st3/Pu-femora Scale: UNI
Experts
  1   [-----*------------------]
  2 [-----*-----------------------------]
  3       [---------*----------------]
  4     [-----*--------------]
  5     [-------------------------------*-------------------------------------]
  6       [-------*--------------]
Per [=====*============================]
EqWg [============*==================================================]
Real::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
           2
    0.3                                                                  20

Item no.:  29 Item name: st3/Pu-spleen Scale: UNI
Experts
  1    [-----*---------------------]
  2               [--------------*--------------------------------------------]
  3 [-*---]
  4               [--------------*----------------------------]
  5 [--*----------------------------------]
  6    [----------*----------------------------]
PerfWgt         [================*==========================================]
EqW [===============*==========================================]
Real:::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::
                                 0.4
    0.01                                                                   1

Item no.:  30 Item name: st3/Pu-kidney Scale: UNI
Experts
  1 [------*-------------------------]
  2  [-------*--------------------------------------]
  3  [------*----------]
  4  [----*----------]
  5          [--------------------*-------------------------------------------]
  6  [------------*---------------------------------]
Perf [=======*=====================================]
EqW [===========*==================================================]
Real:::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
             0.5
    0.14                                                                   3

Item no.:  31 Item name: st3/Am-liver Scale: UNI
Experts
  1                [--------*-------------]
  2 [-------*------------]
  3                                        [-----------------*----------------]
  4                        [------*-----------]
  5                                  [------------------------*-----------]
```

```
  6                     [-----------*-----------------------------------]
Per [=======*====================]
EqWgt  [==============================*==================================]
Real:::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
             10
     2                                                                   65

Item no.:  32 Item name: st3/Am-femora Scale: UNI
Experts
  1    [----------*---------------------------------]
  2 [------*----------------------------------------]
  3      [------*---------------]
  4        [----------*--------------------]
  5   [--------------------------*---------------------------------------------]
  6      [------*---------------]
Per [=======*=========================================]
EqWg [==============*============================================]
Real:::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
            2
    0.5                                                                  15

Item no.:  33 Item name: st3/Am-spleen Scale: UNI
Experts
  1      [----------*-----------------------------------]
  2            [------------*-------------------------------------]
  3 [-*--]
  4            [------------*------------------------]
  5 [--*---------------------------------]
  6            [------------*-------------------------------------------------]
PerfWgt        [============*=======================================]
EqW [=================*==============================================]
Real:::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::
                             0.2
    0.006                                                               0.6

Item no.:  34 Item name: st3/Am-kidney Scale: UNI
Experts
  1   [--------*---------------------------]
  2   [----*----------------------------]
  3   [-------*------------]
  4 [-*----]
  5           [----------------------------*-----------------------------------]
  6   [------------*--------------------------------]
PerfW [====*=============================]
EqW [==========*==========================================================]
Real::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
              0.5
    0.1                                                                   3

Item no.:  35 Item name: st4/A/tiss  1d Scale: UNI
Experts
  1                                         [---------------------*----------]
  2 [-------------------------------------------------------------------------*]
  3                                                                [--------*-]
  4                                                        [-----------*------]
  5                                                        [---------------------*-]
  6                                                                     [---*-]
Per [==========================================================================*]
EqWgt                     [=============================================*====]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::
                                                                          99
    68                                                                  99.9

Item no.:  36 Item name: st4/A/tiss  7d Scale: UNI
Experts
  1                                   [---------------*---------------]
  2 [-------------------------------------------------------------------*-------]
  3                                             [-------------------*---------]
  4               [---------*---------]
  5     [-------------------------------------------------------------*---------]
  6                                       [---------------------*-------]
```

```
Per [==============================================================*=======]
EqWgt        [=========================================*====================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::#:::::::::::::::::::::::::
                                                    82
    58                                                                      95

Item no.:  37 Item name: st4/A/tiss 50d Scale: UNI
Experts
  1                   [--------------*---------------------]
  2          [---------------------------------------*------------------------]
  3             [------------------------*------------------------]
  4                                        [-----*----]
  5 [-----------------------------------*-----------------------------]
  6    [---------------------------------*------------------]
PerfWgt      [=====================================*========================]
EqWgt    [=====================================*==========================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::
                                                                   57
    10                                                                      71

Item no.:  38 Item name: st4/A/tiss200d Scale: UNI
Experts
  1         [--*-----]
  2 [----------------*-------------------------------------------------------]
  3  [---*------------------------]
  4      [-----------*--------]
  5 [-----*-----------------------]
  6 [----*--------------------]
Per [================*==============================================================]
EqW [===========*=========================================]
Real::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::
                                       12
    0.04                                                                    25

Item no.:  39 Item name: st4/B/f1 Scale: UNI
Experts
  1   [-------------------------*--------------]
  2 [--------------------------------------*-----------------------------------]
  3
  4  [--*--]
  5   [--------------------*-------------------]
  6   [--------------------*-------------------]
Per [=====================================*==================================]
EqWg [==================*=============================================]
Real::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::
                                                 0.9
    0.05                                                                  1.5

Item no.:  40 Item name: st5/Co/lung 1d Scale: UNI
Experts
  1
  2                      [--------------------------------*-------------------]
  3 [--------------------------------------*--------------]
  4
  5
  6
PerfWgt                  [================================*===================]
EqWgt [=========================================*============================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::
                                                                   61
    10                                                                      80

Item no.:  41 Item name: st5/Co/lung 7d Scale: UNI
Experts
  1
  2                      [----------------------------*-----------------------]
  3 [--------------------------------*--------------]
  4
  5
  6
PerfWgt                  [============================*======================]
```

```
EqWgt [=====================================*=================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::
                                                            52
     5                                                                          75

Item no.:  42 Item name: st5/Co/lung28d Scale: UNI
Experts
  1
  2                            [--------------------------*--------------------]
  3 [-----------------*------------]
  4
  5
  6
PerfWgt                      [===========================*====================]
EqWg [==========================*=========================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::
                                                                 50
     1                                                                          70

Item no.:  43 Item name: st5/Co/lun168d Scale: UNI
Experts
  1
  2                        [-----------------------------*---------------------]
  3 *-------------]
  4
  5
  6
PerfWgt                    [=============================*=====================]
EqW [===================*==================================================]
Real::::::::::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::
                                                              33
    0.001                                                                       50

Item no.:  44 Item name: st5/Co/tiss 1d Scale: UNI
Experts
  1
  2 [--*---------]
  3                                                [--------------------*--------]
  4
  5
  6
Per [==*==========]
EqW [================================*=========================================]
Real:::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        3
     1                                                                          50

Item no.:  45 Item name: st5/Co/tiss 7d Scale: UNI
Experts
  1
  2 [-*--------------]
  3           [------------------*---------------------------------------------]
  4
  5
  6
Per [=*===============]
EqW [=============*=========================================================]
Real::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
       1
    0.3                                                                         20

Item no.:  46 Item name: st5/Co/tiss28d Scale: UNI
Experts
  1
  2 [*----------------------]
  3          [--------------*-------------------------------------------------]
  4
  5
  6
Per [*======================]
EqW [==============*=======================================================]
```

```
Real::#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
      0.6
    0.2                                                                  15

Item no.:  47 Item name: st5/Co/tis168d Scale: UNI
Experts
  1
  2 [--*-----------------------------------------]
  3    [--------------*-------------------------------------------------------]
  4
  5
  6
Per [==*=========================================]
EqW [=============*=========================================================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.2
    0.1                                                                   8

Item no.:  48 Item name: st5/Cs/lung 1d Scale: UNI
Experts
  1
  2 [---------------*----------------------------------------------------------]
  3
  4
  5
  6
Per [===============*==========================================================]
EqW [===============*==========================================================]
Real::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::
                   19
    10                                                                   50

Item no.:  49 Item name: st5/Cs/lung 7d Scale: UNI
Experts
  1
  2 [-------------------*------------------------------------------------------]
  3
  4
  5
  6
Per [====================*=====================================================]
EqW [====================*=====================================================]
Real::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::
                              14
     5                                                                   30

Item no.:  50 Item name: st5/Cs/lung28d Scale: UNI
Experts
  1
  2 [--------------------------------*----------------------------------------]
  3
  4
  5
  6
Per [================================*========================================]
EqW [================================*========================================]
Real::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::
                                 12
     1                                                                   30

Item no.:  51 Item name: st5/Cs/lun168d Scale: UNI
Experts
  1
  2 [-----------------------*--------------------------------------------------]
  3
  4
  5
  6
Per [=======================*==================================================]
EqW [=======================*==================================================]
Real::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::
```

```
                    7
    0.1                                                                  30

Item no.:  52 Item name: st5/Cs/tiss 1d Scale: UNI
Experts
  1
  2 [--------------------------*------------------------]
  3                                                                       []
  4
  5
  6
Per [==========================*========================]
EqWgt [=========================================================*===============]
Real:::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::
                               56
    30                                                                   100

Item no.:  53 Item name: st5/Cs/tiss 7d Scale: UNI
Experts
  1
  2 [---------------------*-----------------------------]
  3                                                            [--------*---]
  4
  5
  6
Per [====================*=============================]
EqWgt [=====================================================*==================]
Real:::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::
                           36
    10                                                                    95

Item no.:  54 Item name: st5/Cs/tiss28d Scale: UNI
Experts
  1
  2 [-----*---------------]
  3                                                 [-----------------*-------]
  4
  5
  6
Per [=====*===============]
EqW [===================================*===================================]
Real::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
          12
     5                                                                    90

Item no.:  55 Item name: st5/Cs/tis168d Scale: UNI
Experts
  1
  2 [*------------]
  3               [-----------------------------*-----------------------------]
  4
  5
  6
Per [*=============]
EqW [=============*==========================================================]
Real#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     0.4
    0.1                                                                   50
```

Early Health

```
                           Range graph of input data
Item no.:   1 Item name: case 1 (1) Scale: UNI
Experts
  1                  [------------------*------------------]
  2                                [--------------*------------------]
  3                                      [------------------*-----------------]
  4 [-------------------------------------*--------]
  5                             [-----------------*------------------]
```

```
  6          [--------------*------------]
  7              [------------------*----------------------------]
PerfWgt      [================================*============================]
eq           [==============================*============================]
Real:::::::::::::::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::
                                                       3.2
    0.5                                                                    4.5

Item no.:   2 Item name: case 2 (1) Scale: UNI
Experts
  1    [---*---]
  2        [-----*-----]
  3                          [-----*---------]
  4 [------]
  5                    [---*--]
  6          [--------------*---]
  7                                  [---------------------*------------------]
PerfW [==============*========================================]
eq    [=================*==============================================]
Real::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
         2.125
    0.5                                                                     20

Item no.:   3 Item name: case 3 (1) Scale: UNI
Experts
  1                     [-------------*------------]
  2                     [------*------]
  3                                          [-------------*-------------]
  4 [--------------------------*------]
  5                                                  [-------------*------------]
  6              [------*-------------]
  7          [----------*-------------------------]
PerfWgt     [========================*=====================================]
eq          [=======================*====================================]
Real::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::
                                2.5
    0.5                                                                      6

Item no.:   4 Item name: case 4 (1) Scale:  UNI
Experts
  1            [-----------*----------]
  2   [--------*--------]
  3                             [-----------*----------]
  4      [----------------------*-----------------]
  5                                   [-----------*----------]
  6            [----------------------------*--------------------------------]
  7 [----------------------*----------------------]
PerfWg [==========================*==============================]
eq     [==========================*==============================]
Real:::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
         2.5
     2                                                                    8.5

Item no.:   5 Item name: case 5 (1) Scale: UNI
Experts
  1          [-----------------*----------------------------]
  2 [--------*---------]
  3                      [-----------*-----------]
  4                      [-----------*-----------]
  5                            [-----------*-----------]
  6                      [-----------------*----------------------------------]
  7          [-----------------------*-----------------]
PerfW [==========================*==========================]
eq     [============================*==============================]
Real::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
              3.5
    2.7                                                                      9

Item no.:   6 Item name: case 6 (1) Scale: UNI
Experts
  1           [----------*----------]
```

```
  2             [--------*------]
  3                     [----------*---------]
  4                 [-------------------------*---------------------]
  5                                   [----------*---------]
  6                 [---------*-----------------------------------------------]
  7 [--------------------*----------------------]
PerfWgt      [==================*================================]
eq        [=====================*================================]
Real:::::::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::
                                          5.5
     2                                                                        9

Item no.:   7 Item name: case 7 (1) Scale: UNI
Experts
  1      [-----------*----------]
  2          [-------*------]
  3                  [----------*-----------]
  4            [----------------------*-----]
  5                                      [----------*-----------]
  6            [-----------------------------------*---------------------------]
  7 [----------------------*---------------------------]
PerfWgt   [====================*==================================]
eq       [=====================*=========================================]
Real:::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::
                           4.4
    2.5                                                                       9

Item no.:   8 Item name: case 8 (1) Scale: UNI
Experts
  1 [----------*-----------]
  2           [*--]
  3                  [-------*--------]
  4      [-----------------*----------------]
  5                                      [-----*----]
  6         [--*----------------------------]
  7                  [----------------------------*---------------------------]
PerfWg [================*================================]
eq     [==================*=================================]
Real:::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::
                               6.8
     2                                                                       15

Item no.:   9 Item name: case 9 (1) Scale: UNI
Experts
  1      [---------------*---------------]
  2             [--------*-----]
  3 [---------*----------]
  4           [--------------------------------*---------------------]
  5                                                   [----------*---------]
  6              [------------*-------------------------------------]
  7                 [--------------------*------------------]
PerfWg [======================*=============================================]
eq     [=======================*============================================]
Real:::::::::::::::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                   5.58
     4                                                                       11

Item no.:  10 Item name: case 10 (1) Scale: UNI
Experts
  1           [-------*------------]
  2                     [--*-]
  3                                 [----*----]
  4                [------------*------------------------]
  5 [----*----]
  6                [----------------------*---------------]
  7                                 [--------------------*-------------------]
Perf [======================*================================]
eq    [=======================*=====================================]
Real::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
       2
    1.5                                                                      16
```

```
Item no.:  11 Item name: case 2 (2) Scale: UNI
Experts
  1    [---*---]
  2        [-----*-----]
  3                          [-----*---------]
  4 [------]
  5                    [---*--]
  6          [--------------*---]
  7                                  [---------------------*------------------]
PerfW [==============*========================================]
eq    [=================*============================================]
Real::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     1.25
    0.5                                                                  20

Item no.:  12 Item name: case 5 (2) Scale: UNI
Experts
  1          [-----------------*----------------------------]
  2 [--------*---------]
  3                      [-----------*-----------]
  4                      [-----------*-----------]
  5                            [-----------*-----------]
  6                      [-----------------*----------------------------------]
  7          [-----------------------*-----------------]
PerfW [===========================*============================]
eq     [============================*=============================]
Real::::::::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::
                                   5.4
    2.7                                                                   9

Item no.:  13 Item name: case 5 (3) Scale: UNI
Experts
  1          [-----------------*----------------------------]
  2 [--------*---------]
  3                      [-----------*-----------]
  4                      [-----------*-----------]
  5                            [-----------*-----------]
  6                      [-----------------*----------------------------------]
  7          [-----------------------*-----------------]
PerfW [===========================*============================]
eq     [============================*=============================]
Real:::#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        3
    2.7                                                                   9

Item no.:  14 Item name: case 5 (4) Scale: UNI
Experts
  1          [-----------------*----------------------------]
  2 [--------*---------]
  3                      [-----------*-----------]
  4                      [-----------*-----------]
  5                            [-----------*-----------]
  6                      [-----------------*----------------------------------]
  7          [-----------------------*-----------------]
PerfW [===========================*============================]
eq     [============================*=============================]
Real::::::::::::::::::::::::::::#::::::::::::::::::::::::::::::::::::::::::
                                5
    2.7                                                                   9

Item no.:  15 Item name: case 5 (5) Scale: UNI
Experts
  1            [----------------*----------------------------]
  2   [--------*--------]
  3                        [----------*-----------]
  4                        [----------*-----------]
  5                             [-----------*----------]
  6                        [----------------*---------------------------------]
  7            [----------------------*----------------]
PerfWgt [===========================*==========================]
```

```
eq       [==========================*==============================]
Real#:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     2.5
    2.5                                                                          9
```