***Analytic Hierarchy Process***

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*Saaty’s Analytic Hierarchy Process.* It is an investigation and analysis which allow to decide on a choice from the alternatives, when the ultimate goal is formulated and the hierarchy of subordinate elements logically leading to the goal is built, the alternatives being the elements of the lowest level of the hierarchy.

*Read “*[*About SPSS macros*](https://www.spsstools.net/en/KO-aboutmacros)*” what are they and how to run them.*

# MACRO !KO\_AHP: SAATY’s ANALYTIC HIERARCHY PROCESS

Version 1, Jan 2025. Tested on SPSS Statistics 22, 27, 30.

!KO\_ahp levels= 3 4 /\*List of the number of nodes on the levels: from highest level to lowest

/altlab= /\*Optional: add the lowest level with the priorities ready

/\*(list of the nodes on it)

/altpri= /\*(and the matrix of priorities on it)

/print= MATR PRIOR CONSIST /\*Show results: matrix of pairwise

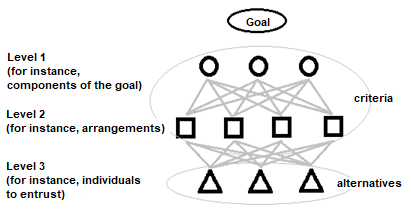
/\*comparisons (MATR), priority vectors (PRIOR),

/\*consistency of comparisons (CONSIST).

Минимум надо задать LEVELS.

The macro performs Saaty’s Analytic Hierarchy Process (AHP) in its classical form as it was developed by T.L. Saaty in the 70s of the 20th century. The AHP is an investigation and analysis which allow to decide on a choice from the alternatives, when the ultimate goal is formulated and there built is a hierarchy of aspects, factors, means or other criteria that are necessary to consider and compare in view of the goal.

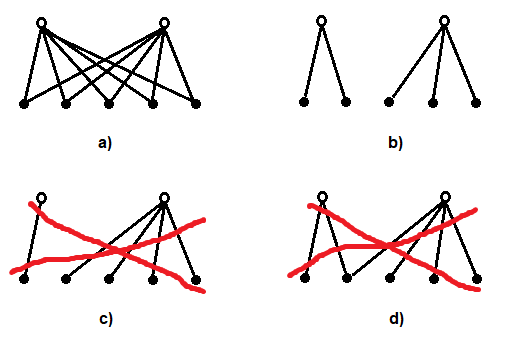
Let there be the Goal and one or more levels of the hierarchy. Each next level is subordinate to the previous one on the way (actual or logical) to the Goal. Each level consists of variants called *nodes* (**Fig. 1**). Nodes of the last, lowest level are called *alternatives*. Nodes of intermediate levels are called *criteria*. The final aim of the analysis is to select the best alternative to reach the Goal. Nodes on the same level are what get compared in the investigation: they should be immediately comparable – so one can be preferred to another.



**Fig. 1.** A hierarchy.

Data input to the analysis are the results of *pairwise comparisons* – done by some “expert” or a group of “experts” – between the variants-nodes (that is, between the criteria or the alternatives) lying on one and the same each level of the hierarchy, relative each of the criteria of the level above it, to which it is subordinate (which they “serve” to as a sort of local goal). The topmost (1st) level is subordinate immediately to the Goal, so relative to it the nodes of the topmost level are compared together. The comparisons are the comparison for preference by the rating scale from 1 to 9.

Between two adjacent levels there exist two kinds of subordination of the underlying nodes to the overlying nodes – *crossed* and *nested* (**Fig. 2**). With crossed subordination, all nodes of the level relate to all nodes of the overlying level; therefore, the number of sets of pairwise comparisons to be done on the level should be as many as there exist nodes on the overlying level. With nested subordination, a node relates to just one node of the overlying level; in this case pairwise comparisons must be done only between nodes subordinate to the same overlying node. So should be in the input data. Generally, (a) a node must be subordinate either to all nodes or to one node of the overlying level, and (b) an overlying node must have at least two nodes under, subordinate to it.



**Fig. 2.** Crossed (a) and nested (b) linkage between levels. (c) and (d) – structures not permitted by the macro.

Data for AHP analysis come as follows. A surveyed “expert” is asked: What is preferred for I – A or B?, and how much preferred: the preference of one to the other should be rated on the scale from 1 to 9. Here A and B are some nodes (alternatives or criteria) on the i-th level of the hierarchy, that are subordinate to node I of the overlying (i-1-th) level. All *n* nodes A, B, C, …, that are subordinate to level I should be thus compared in pairs with each other – it is the set of *n(n-1)*/2 comparisons related to I. For each criterion I, II, …, of the i-1-th level there will be obtained such set of pairwise comparisons between its subordinate nodes of the i-th level. Yield of comparisons is entered into a dataset (See “Dataset structure”).

Saaty requires that the scores of preference be specifically from 1 to 9, according to approximately the following word anchoring:

1 equal, indifferent

2

3 somewhat [or moderately] better

4

5 certainly [or definitely] better

6

7 considerably [or strongly/much] better

8

9 absolutely [or very strongly/much] better

In case the researcher permits fine differentiation, the respondent may use fractional value, like score 1.1 or 1.2.

Besides, Saaty grounds mathematically that *n*, the number of elements being pairwisely compared, should be not larger than 9. This macro permits *n* up to 12.

The dataset is input to the !KO\_AHP macro. The macro computes, on each level of the hierarchy, *priorities* (the computed ratings) of nodes of the level relative the overlying level nodes to which they are subordinate (for level 1 the overlying level is the Goal). The “cumulated from the bottom” result is output in the end – these are priorities of the alternatives, the nodes of the lowest level, relative the Goal.

Additionally, the macro computes indices of *consistency* in each set of *n(n-1)*/2 pairwise comparisons. Consistency is the logical non-contradiction between input scores of pairwise comparisons. For example, if A is better than B, and B is better than C, then we expect that A is a lot better than C. If C appears not worse or just slightly worse than A, then it is the violation of consistency. A little violation of consistency in a set of pairwise comparisons is natural and is tolerable with subjective estimations made by people.

**Computations**

Let scores data of *n(n-1)*/2 pairwise comparisons between *n* nodes are recorded in a square matrix **A** of size *n* (let, for a minute, *n*=4). If node i is preferred to node j, the score is written in cell (i,j), and if j is preferred, then in cell (j,i).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| A |  | 5 |  | 9 |
| B |  |  |  | 6 |
| C | 3 | 2 |  | 7 |
| D |  |  |  |  |

1s are put on the diagonal, after which the matrix is divided by its transpose and becomes the reciprocal matrix of pairwise comparisons, or *judgement matrix*:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| A | 1 | 5 | 1/3 | 9 |
| B | 1/5 | 1 | 1/2 | 6 |
| C | 3 | 2 | 1 | 7 |
| D | 1/9 | 1/6 | 1/7 | 1 |

This matrix is positive, so it always has the dominant positive eigenvalue *Lmax* and the unique positive eigenvector **v** associated with it. Eigenvector **v**, normalized by its sum, is the *priority* vector. On each level, the macro collects all the priority vectors computed on it into one matrix **V** and prints it out in the Output. Priorities of the compared nodes are their ratings vis-a-vis each other, they belong to ratio scale, so one can say how much time more a node is preferred than another node as the result of all *n(n-1)*/2 comparisons. Sum of priorities in each vector (column) equals 1.

*Consistency index* CI = (*Lmax*-*n*)/(*n*-1). With full consistency in **A**, *Lmax* = *n*, so CI = 0[[1]](#footnote-1). With retreat from consistency, *Lmax* > *n* and CI is above 0. Saaty writes that CI can be interpreted as the statistical error of consistency – the variance of deviations of values of **A** from consistency.

*Consistency ratio* CR = CI/RI, where random consistency (random index) RI was obtained in simulations of random reciprocal matrices **A** with values 1/9, 1/8, …, 1, …, 8, 9 and is taken from the following table:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *n* | 1 | 2[[2]](#footnote-2) | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| RI | - | 0.01 | 0.52 | 0.89 | 1.12 | 1.26 | 1.36 | 1.41 | 1.46 | 1.49 | 1.52 | 1.54 |

Saaty justifies that CR < 0.10 is a tolerable (weak) nonconsistency of the matrix (in this condition vector **v** is a good candidate to express “priority”). With greater values of CR (for example, 0.20 and higher) one should seriously consider the possibility of re-doing the comparisons.

*Consistency ratio of hierarchy* (CRH) is the overall measure of consistency of all the hierarchy. It is computed from CI and RI of all the **A** matrices analyzed in the AHP analysis of the input hierarchy of *l* levels. Let **ci** be the row vector of CI values computed on level i; and **ri** is the corresponding row vector of RI. Let **wi** be the column vector containing the row sums of **Vi** (the matrix of priority vectors on level i). **w0** is taken for 1. Then

If CRH < 0.10, although some CR are large, one may feel satisfied because in this case matrices with high CR have received low weight in the hierarchy.

*Priorities of alternatives relative the Goal* are computed by sequential multiplication of all the priority matrices from the bottom level to the top. For example, if there are three levels in the hierarchy, 1, 2 and 3, on which priority matrices **V1**, **V2**, **V3** were obtained, then priorities of alternatives relative the Goal is the vector equal to **V3V2V1**.

References

1. Саати, Т. Принятие решений: Метод Анализа Иерархий. – М: Радио и связь. – 1993.

2. Saaty, T.L., Vargas, L.G. Models, methods, concepts & applications of the Analytic Hierarchy Process. – 2nd ed. – NY: Springer. – 2012.

3. Saaty, T.L. How to make a decision: the Analytic Hierarchy Process // European Journal of Operational Research, 48, 1990, 9-26.

4. Saaty, R.W. The Analytic Hierarchy Process – what it is and how it is used // Mathematical Modelling, 9 (3-5), 1987, 161-176.

***Dataset structure***

Each case of the dataset is a pairwise comparison between two nodes. The following variables must be in the dataset (other variables are ignored):

*LEVEL* – numeric variable with figures 1, 2, …, number\_of\_levels\_of\_the\_hierarchy, indicating the current level.

*OVERLIER* – string variable indicating the patron – the node of the overlying level, to which the two being compared nodes are subordinate.

*NODE1* and *NODE2* – string variable indicating the two being compared nodes of the current level.

*WINNER* – string variable indicating the preferred node of the two.

*SCORE* – preference score – number between 1 and 9 (numeric variable).

String variables *OVERLIER*, *NODE1*, *NODE2*, *WINNER* can be up to 8 bytes wide. And we recommend to denote levels with Latin characters and/or digits. For level 1, value of *OVERLIER* is blank.

Comparisons pertaining to one level and one patron should go adjacently. Comparisons must go in combinatorial order. For example, let there are some nodes A, B, C, D under patron I. The comparisons must go in the order:

A B

A C

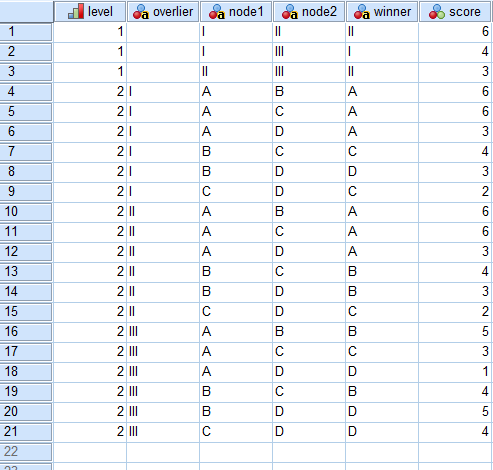
A D

B C

B D

C D

On the picture, there is shown an example of 2-level hierarchy with three criteria (I, II, III) and four alternatives (A, B, C, D), and complete (crossed) subordination (each criterion is a patron to all the alternatives).



The macro sorts cases by descending of *LEVEL*. No other changes are introduced to the dataset.

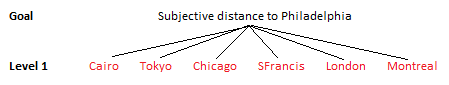
There should be no missing values in the data of the above-described variables.

### Subcommands

**LEVELS**

Enumerate the number of nodes on each level of the hierarchy, starting from the topmost (adjoint with the Goal) level. Be careful: this specification must agree with the data in the dataset. If you mistake, the macro may or may not issue an error message, but the result will be wrong.

EXAMPLE 1. Simplest case: hierarchy with one level. An individual evaluated subjective flight distance from different cities to Philadelphia [1, p. 42].



data list list /level (f8) overlier node1 node2 winner (4a8) score (f8).

begin data

1 ' ' Cairo Tokyo Tokyo 3

1 ' ' Cairo Chicago Cairo 8

1 ' ' Cairo SFrancis Cairo 3

1 ' ' Cairo London Cairo 3

1 ' ' Cairo Montreal Cairo 7

1 ' ' Tokyo Chicago Tokyo 9

1 ' ' Tokyo SFrancis Tokyo 3

1 ' ' Tokyo London Tokyo 3

1 ' ' Tokyo Montreal Tokyo 9

1 ' ' Chicago SFrancis SFrancis 6

1 ' ' Chicago London London 5

1 ' ' Chicago Montreal Chicago 2

1 ' ' SFrancis London London 3

1 ' ' SFrancis Montreal SFrancis 6

1 ' ' London Montreal London 6

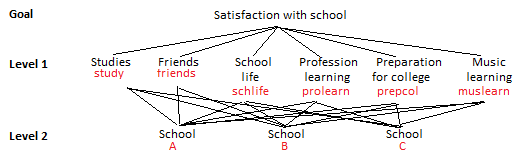
end data.

variable level level (ordinal) score(scale).

!KO\_ahp levels= 6.

* According to the priority vector computed, the longest flight to Philadelphia is from Tokyo, and the shortest is from Montreal.

EXAMPLE 2. Hierarchy with two levels. Choice of school in which to continue studying [1, p. 29].



data list list /level (f8) overlier node1 node2 winner (4a8) score (f8).

begin data

1 ' ' study friends study 4

1 ' ' study schlife study 3

1 ' ' study prolearn study 1

1 ' ' study prepcol study 3

1 ' ' study muslearn study 4

1 ' ' friends schlife friends 7

1 ' ' friends prolearn friends 3

1 ' ' friends prepcol prepcol 5

1 ' ' friends muslearn friends 1

1 ' ' schlife prolearn prolearn 5

1 ' ' schlife prepcol prepcol 5

1 ' ' schlife muslearn muslearn 6

1 ' ' prolearn prepcol prolearn 1

1 ' ' prolearn muslearn muslearn 3

1 ' ' prepcol muslearn prepcol 3

2 study A B B 3

2 study A C C 2

2 study B C B 3

2 friends A B A 1

2 friends A C A 1

2 friends B C B 1

2 schlife A B A 5

2 schlife A C A 1

2 schlife B C C 5

2 prolearn A B A 9

2 prolearn A C A 7

2 prolearn B C C 5

2 prepcol A B B 2

2 prepcol A C A 1

2 prepcol B C B 2

2 muslearn A B A 6

2 muslearn A C A 4

2 muslearn B C C 3

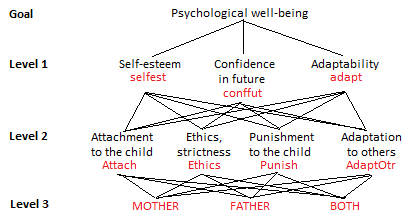
end data.

variable level level (ordinal) score(scale).

!KO\_ahp levels= 6 3 /print= MATR PRIOR CONSIST.

* The macro always sorts LEVEL descendingly. It makes no other changes in data.
* There are six criteria on level 1. And three alternatives on level 2.
* Detailed output is requested.
* The macro displays reciprocal matrices of pairwise comparisons (judgements). The hierarchy is complete (crossed), therefore there are six judgement matrices on level 2 – one matrix per each criterion of level 1. There is one judgement matrix on level 1.
* The macro displays consistency statistics for each matrix: eigenvalue Lmax, consistency index CI and consistency ratio CR.
* For each level, priority vectors are displayed, they are gathered in one matrix. One vector for each judgement matrix.
* Finally, displayed are priorities of alternatives relative the Goal, and CRH. School B is of the highest priority. CRH > 0.1, which says of not quite satisfactory consistency on the level of entire hierarchy.

EXAMPLE 3. Hierarchy with three levels. Psychological well-being. A psychotherapist asked a patient to evaluate importance of three aspects of their psychological well-being (level 1), give some impressions of their upbringing in childhood (level 2) and report whose influence on this was stronger (level 3) [1, p. 44].



data list list /level (f8) overlier node1 node2 winner (4a8) score (f8).

begin data

1 ' ' selfest conffut selfest 6

1 ' ' selfest adapt selfest 4

1 ' ' conffut adapt conffut 3

2 selfest Attach Ethics Attach 6

2 selfest Attach Punish Attach 6

2 selfest Attach AdaptOtr Attach 3

2 selfest Ethics Punish Ethics 4

2 selfest Ethics AdaptOtr Ethics 3

2 selfest Punish AdaptOtr AdaptOtr 2

2 conffut Attach Ethics Attach 6

2 conffut Attach Punish Attach 6

2 conffut Attach AdaptOtr Attach 3

2 conffut Ethics Punish Ethics 4

2 conffut Ethics AdaptOtr Ethics 3

2 conffut Punish AdaptOtr AdaptOtr 2

2 adapt Attach Ethics Ethics 5

2 adapt Attach Punish Punish 3

2 adapt Attach AdaptOtr AdaptOtr 1

2 adapt Ethics Punish Ethics 4

2 adapt Ethics AdaptOtr AdaptOtr 5

2 adapt Punish AdaptOtr AdaptOtr 4

3 Attach MOTHER FATHER MOTHER 9

3 Attach MOTHER BOTH MOTHER 4

3 Attach FATHER BOTH FATHER 8

3 Ethics MOTHER FATHER MOTHER 1

3 Ethics MOTHER BOTH MOTHER 1

3 Ethics FATHER BOTH FATHER 1

3 Punish MOTHER FATHER MOTHER 9

3 Punish MOTHER BOTH MOTHER 6

3 Punish FATHER BOTH BOTH 4

3 AdaptOtr MOTHER FATHER MOTHER 5

3 AdaptOtr MOTHER BOTH MOTHER 5

3 AdaptOtr FATHER BOTH BOTH 3

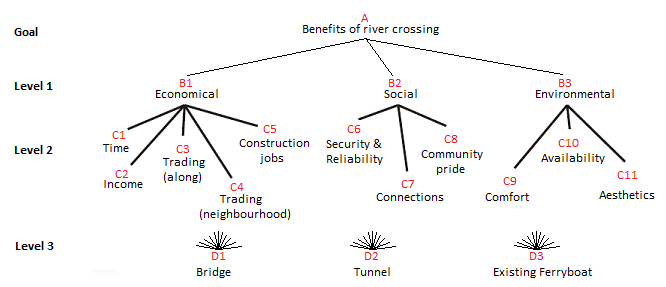
end data.

variable level level (ordinal) score(scale).

!KO\_ahp levels= 3 4 3 /print= MATR PRIOR CONSIST.

* The macro always sorts LEVEL descendingly. It makes no other changes in data.
* There are three criteria on level 1. Four criteria on level 2. And three alternatives on level 3.
* Detailed output is requested.
* The macro displays reciprocal matrices of pairwise comparisons (judgements). The hierarchy is complete (crossed), therefore there are four judgement matrices on level 3 – one matrix per each criterion of level 2. There are three judgement matrices on level 2 – one matrix per each criterion of level 1. There is one judgement matrix on level 1.
* The macro displays consistency statistics for each matrix: eigenvalue Lmax, consistency index CI and consistency ratio CR.
* For each level, priority vectors are displayed, they are gathered in one matrix. One vector for each judgement matrix.
* Finally, displayed are priorities of alternatives relative the Goal, and CRH.

EXAMPLE 4. Hierarchy with three levels, the 2nd level nested in the 1st. A prospect to arrange a river crossing facility is being considered. What are the benefits of river crossing with a bridge, a tunnel, or the existing ferryboat? [1, p. 108].



data list list /level (f8) overlier node1 node2 winner (4a8) score (f8).

begin data

1 ' ' B1 B2 B1 3

1 ' ' B1 B3 B1 6

1 ' ' B2 B3 B2 2

2 B1 C1 C2 C2 3

2 B1 C1 C3 C3 7

2 B1 C1 C4 C4 5

2 B1 C1 C5 C5 6

2 B1 C2 C3 C3 4

2 B1 C2 C4 C4 2

2 B1 C2 C5 C5 2

2 B1 C3 C4 C3 7

2 B1 C3 C5 C3 5

2 B1 C4 C5 C5 5

2 B2 C6 C7 C6 6

2 B2 C6 C8 C6 9

2 B2 C7 C8 C7 4

2 B3 C9 C10 C10 4

2 B3 C9 C11 C9 6

2 B3 C10 C11 C10 8

3 C1 D1 D2 D1 2

3 C1 D1 D3 D1 7

3 C1 D2 D3 D2 6

3 C2 D1 D2 D2 2

3 C2 D1 D3 D1 8

3 C2 D2 D3 D2 9

3 C3 D1 D2 D1 4

3 C3 D1 D3 D1 8

3 C3 D2 D3 D2 6

3 C4 D1 D2 D1 1

3 C4 D1 D3 D1 6

3 C4 D2 D3 D2 6

3 C5 D1 D2 D2 4

3 C5 D1 D3 D1 9

3 C5 D2 D3 D2 9

3 C6 D1 D2 D1 4

3 C6 D1 D3 D1 7

3 C6 D2 D3 D2 6

3 C7 D1 D2 D1 1

3 C7 D1 D3 D1 5

3 C7 D2 D3 D2 5

3 C8 D1 D2 D1 5

3 C8 D1 D3 D1 3

3 C8 D2 D3 D3 3

3 C9 D1 D2 D1 5

3 C9 D1 D3 D1 9

3 C9 D2 D3 D2 5

3 C10 D1 D2 D1 3

3 C10 D1 D3 D1 7

3 C10 D2 D3 D2 6

3 C11 D1 D2 D1 6

3 C11 D1 D3 D3 5

3 C11 D2 D3 D3 3

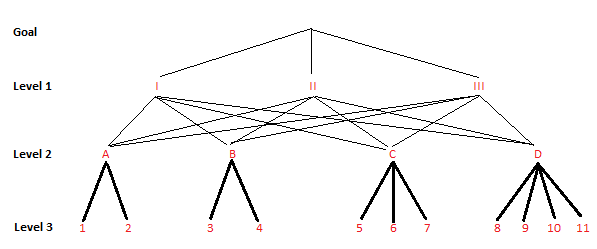
end data.

variable level level (ordinal) score(scale).

!KO\_ahp levels= 3 11 3 /print= MATR PRIOR CONSIST.

* There are three criteria on level 1. There are eleven (five plus three plus three) criteria on level 2. And three alternatives on level 3.
* Detailed output is requested.
* The macro displays reciprocal matrices of pairwise comparisons (judgements). The hierarchy is nested between levels 1 and 2, therefore three matrices on level 2 are displayed: of size 5, 3, and 3, respectively.
* The macro displays consistency statistics for each matrix: eigenvalue Lmax, consistency index CI and consistency ratio CR.
* For each level, priority vectors are displayed, they are gathered in one matrix. One vector for each judgement matrix. On level 2, because it is nested, the matrix of vectors has the block shape.
* Finally, displayed are priorities of alternatives relative the Goal, and CRH.

EXAMPLE 5. Hierarchy with three levels, the 3rd level nested in the 2nd. (*SCORE* for this artificial example were generated as random numbers, so one will expect bad consistency.)



data list list /level (f8) overlier node1 node2 winner (4a8) score (f8).

begin data

1 ' ' I II I 1

1 ' ' I III I 4

1 ' ' II III II 6

2 I A B B 3

2 I A C C 1

2 I A D A 6

2 I B C C 3

2 I B D D 4

2 I C D C 1

2 II A B A 1

2 II A C A 1

2 II A D A 6

2 II B C B 6

2 II B D D 1

2 II C D D 6

2 III A B A 8

2 III A C C 5

2 III A D D 2

2 III B C B 7

2 III B D B 5

2 III C D C 1

3 A 1 2 1 7

3 B 3 4 4 2

3 C 5 6 5 2

3 C 5 7 5 5

3 C 6 7 5 9

3 D 8 9 8 2

3 D 8 10 8 3

3 D 8 11 11 2

3 D 9 10 10 7

3 D 9 11 11 1

3 D 10 11 11 1

end data.

variable level level (ordinal) score(scale).

!KO\_ahp levels= 3 4 11 /print= MATR PRIOR CONSIST.

* There are three criteria on level 1. Four criteria on level 2. And eleven alternatives (two plus two plus three plus four) on level three.

**ALTLAB, ALTPRI**

These subcommands allow to add a lowest level to the hierarchy, a level of alternatives, in the form of ready, already computed priorities for them. Thus, priorities on this added bottom level will not be computed by the macro: you specify them. Consideration behind this option is that there can be many alternatives sometimes, and the researcher is forced to establish their priorities not by pairwise comparison with each other in the frame of standard AHP procedure, but by direct rating or ranking outside of AHP procedure; then he or she applies these priorities in AHP analysis on the rights of bottom level of the hierarchy.

For example, a hierarchy of three levels may have 20 alternatives on the 3rd level. There are three criteria on level 2. Say, relations between levels 2 and 3 are crossed. The researcher asks the being surveyed expert to evaluate in provisional scores each of the 20 alternatives separately by criterion 1, criterion 2, criterion 3. The obtained scores can be seen alternatives’ priorities, it is left only to enter them in the analysis – to enter with AHP with two levels, 1st and 2nd: the 3rd level is entered by the user in the form of ready priorities.

In ALTLAB, specify the list of alternatives of the being added lowest level. Put the elements of the list in quotes or apostrophes.

In ALTPRI, specify the priorities themselves, in the form of a matrix with number of rows as the number of elements of ALTLAB list and the number of columns as the number of criteria on the overlying level. Each column of the matrix is a priority vector. Use {}, comma and semicolon. For example:

{5,3,4;

3,2,1;

5,5,5;

1,2,4;

3,1,2}

Sum in the columns need not be equal to 1: the macro will at input normalize the matrix columns to sum 1 in each.

EXAMPLE 6. Take the data of EXAMPLE 3. SELECT IF removes the 3rd level, the level of alternatives, from the data. We will input this level newly.

select if level<3.

!KO\_ahp levels= 3 4

/altlab= 'MOTHER' 'FATHER' 'BOTH'

/altpri=

{.7212, .3333, .7626, .7007;

.2100, .3333, .0611, .0972;

.0688, .3333, .1763, .2021}

/print= MATR PRIOR CONSIST.

* The macro inputs the level of alternatives by subcommands ALTLAB/ALTPRI. The alternatives are Mother, Father, and Both. Columns of the being specified matrix of priorities correspond to the 4 criteria of the overlying level.
* That overlying level is the last in LEVELS. LEVELS specifies only two levels. The 3rd level, we’ve specified it with ALTLAB/ALTPRI subcommands.

EXAMPLE 7. Take the data of EXAMPLE 5. SELECT IF removes the 3rd level, the level of alternatives, from the data. We will input this level newly.

select if level<3.

!KO\_ahp levels= 3 4

/altlab= '1' '2' '3' '4' '5' '6' '7' '8' '9' '10' '11'

/altpri=

{.8750, .0000, .0000, .0000;

.1250, .0000, .0000, .0000;

.0000, .3333, .0000, .0000;

.0000, .6667, .0000, .0000;

.0000, .0000, .5741, .0000;

.0000, .0000, .1017, .0000;

.0000, .0000, .3242, .0000;

.0000, .0000, .0000, .3182;

.0000, .0000, .0000, .1173;

.0000, .0000, .0000, .2997;

.0000, .0000, .0000, .2648}

/print= PRIOR CONSIST.

* The macro inputs the level of alternatives by subcommands ALTLAB/ALTPRI. The alternatives are numbers 1 through 11. Columns of the being specified matrix of priorities correspond to the 4 criteria of the overlying level.
* That overlying level is the last in LEVELS. LEVELS specifies only two levels. The 3rd level, we’ve specified it with ALTLAB/ALTPRI subcommands.
* Notice the block shape of the matrix. This is because we are specifying the 3rd level as nested in the 2nd. See picture in EXAMPLE 5. 1 and 2 relate to A; 3 and 4 relate to B; 5, 6, 7 relate to C; 8, 9, 10, 11 relate to D.

**PRINT**

By default, the macro displays only priorities of the alternatives relative the Goal and overall consistency CRH. Use one or combination of the following keywords for more detailed report: MATR shows judgement matrices; PRIOR shows priorities obtained from each judgement matrix (on each level the priority vectors are gathered together in a matrix); CONSIST shows consistency statistics: Lmax, CI, CR for each judgement matrix.

### Special regimes

The macro obeys case filtering (FILTER, SELECT IF, USE). Don’t use dataset splitting. The macro does not obey temporary (standing under TEMPORARY) operations.

### Some questions

*Multiple experts*. Saaty thinks that when a group of people is surveyed, it is best of all to achieve a consensus of them via discussion/debates. If this is impossible or unwanted, one may average the data (variable *SCORE*) of the respondents, and one should use not arithmetic but geometric mean (weighted, if needed – if importance of respondents is unequal). Of course, you alternatively may do averaging of respondents on the stage of analysis results, i.e., computed priorities, here arithmetic mean will do.

*Delete node with low priority*. If some node receives very low priority, you may want to exclude it from the data if you conclude it is irrelevant, and run the analysis without it.

1. Remarked also, that under full consistency each row in **A** is a multiple of any other row, and all eigenvalues except the 1st are equal to zero. [↑](#footnote-ref-1)
2. Actually RI=0, but the macro uses .01 for technical reasons (escaping division by 0). [↑](#footnote-ref-2)