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## A Different Coding of Assessment Scales Odysseas Moschidis\*

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The purpose of this article is to propose a new encoding of ordinal variables expressed in scales to deal accurately with the methods of multidimensional statistical analysis. With the method of factor analysis variables expressed in the form of rating scales are treated as quantitative variables, while with the method of multiple correspondence analysis as nominal. But it is clear that the scales are arranged qualitative variables.

This work was proposed with the analysis of the scales of assessment to be carried out with the new coding using the multi-factorial analysis of correspondences. With the proposed coding e.g. degree 2 of a 5-point scale assessment, transformed to 5-group (0.17, 0.66, 0.11, 0.04, 0.02), which captures mathematically scaled preference of the individual rather than the five known group (0, 1, 0, 0, 0) of the logical table to encode the grade 2 to "flatten" with zeros, the different value of the classification of 5-positions of the group.

For a brief explanation of the creation of the proposed 5- group assume that a person gives the degree of 2 to a 5-point scale assessment [1,2]. By selecting the second rating, it indicates that the fifth gradation is more remote than the fourth graduation and is more remote from the third, which together with the first gradient is the most scales of the second alternative, to express his opinion for the person. This obvious device indicated by the level 2 must be captured mathematically. It is obvious that the 5- group (0, 1, 0, 0, 0) of the usual coding degree 2, flattens to zero, the value of different position classification of the 5-group. It would clearly be more appropriate instead of the 5-group (0, 1, 0, 0, 0), to consider the 5-group (0.04, 0.9, 0.03, 0.02, 0.01) or the 5-group (0.05, 0.89, 0.04, 0.02, 0.00), as these figures illustrate that the removal of 2 rating means a reduction of preference. In the new encoding e.g. the initial degree 2 of a five-point scale is considered as a unit (the whole view of the person), which allocate a percentage of the five positions of 5-group to reflect the preference of the classified person as mentioned above. The unit is split by a mathematical algorithm.

Let us examine briefly the rationale of the proposed coding. Consider a 5-point scale assessment. We consider a quantitative and continuous variable with values in D = (0.5, 5.5). Then dismember D space in classes of equal width JI = [0.5, 1.5), J2 = [1.5, 2.5), J3 = [2.5, 3.5), J4 = [3.5, 4.5) and J5 = [4.5, 5.5), so the central values of these classes are the numbers 1, 2, 3, 4, 5. Suppose then that a person ranks his opinion on the question with a value from the interval D. This value is just a class and agree identical to the central value of the class. In this way each value of D space is assigned to exactly one of the numbers 1, 2, 3, 4, 5 degrees of 5-point scale. In this sense we consider the scale of assessment as the encoding of a continuous quantitative variable. That is, an imprint of view on a question with a degree is a good approximation of the exact terms of the individual.

Then considering each degree as a unit (as the whole view of the person), its transformed into a 5-group rates, as will accurately present below for number 2.

## The decay of grade 2

Step 1: The grade 2 is all the information, the mass m, which we consider as a unit, i.e., m = 1 and located at x = 2.







The mass m = 1 splits the masses m1 and m2 = 1-m1 in positions x1 = 1.5, the left end of interval (1.5, 2.5) and x2 = 2.5, right end of the interval (1.5, 2.5), respectively, in the manner formula  $m_1 = \frac{x_2 - x_m}{x_2 - x_1} \cdot m$ Therefore  $m_1 = \frac{2.5 - 2}{2.5 - 1.5} \cdot 1 = 0.5$  and so m2 = 1-0.5 = 0.5 (Figure 1). In this way the whole divided by 50% left and 50% right of the person's choice.

Step 2: The mass m1 = 0.5 splits the masses m1' and m2' = m1-m1' in positions x1' = 0.5 and x2' = 2, respectively (Figure 2), so it is

$$m_1' = \frac{x_2' - x_1}{x_2' - x_1'} \cdot m_1 = \frac{2 - 1.5}{2 - 0.5} \cdot 0.5 = 0.166... = 0.17$$
  
So m2' = 0.5-0.17 = 0.33.

At this point it begins to fill the 5-group rates corresponding to grade 2. It completed the first 5-position of the group rate m1' = 0.17; that at present are: (0.17, \_, \_, \_, \_). The mass m2'=0.33 is a fraction of the total share of second position of the 5-group.

Step 3: The mass m2=0.5 that occurred during the first division in position x2=2.5 splits the masses m1<sup> $\prime\prime$ </sup> and m2<sup> $\prime\prime$ </sup> at positions z1=2 and

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z2=3.5, respectively (Figure 3), just as in step 2 and resulting m1''=0.33, m2''=0.17.

The new rate m1''=0.33 with m2'=0.33 in the previous step are the percentage of the second 5-position of group rates, so we have: (0.17, 0.66, \_, \_, \_).

Step 4: The percentage m2''=0.17 at position z2=3.5 splits into

two new masses m1<sup>'''</sup>=0.11 and m2<sup>'''</sup>=0.06 at positions z1<sup>'=3</sup> and z2<sup>'=4.5</sup>, respectively (Figure 4).

The mass m1<sup>''</sup>=0.11 is the rate of the third position of the 5-group: (0.17, 0.66, 0.11, \_, \_).

Step 5: In this last step the mass m2'''=0.06 splits the masses 0.04 and 0.02 at positions 4 and 5.5, respectively, as in (Figure 5) and in turn are the percentages of fourth and fifth position.

The final form of the 5-group: (0.17, 0.66, 0.11, 0.04, 0.02).

With the proposal of the new coding scales analyzed by factorial analysis of multiple correspondences in such a way as to maintain both qualitative (categorical) and ordered their character, so the analysis is more accurate and precise.

## References

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