An Empirical Comparison of Rasch Analysis and Factor Analysis in a Survey on HR Selection Criteria

Confronto tra i punteggi dei modelli di Rasch e di Factor Analysis applicati ad un’indagine sui criteri di selezione dei neo-laureati

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1. Rasch and factor analysis

Rasch and Factor models are usually employed in the analysis of psychometric tests and of data coming from socio-economic surveys, gathered by means of a questionnaire. In both cases, and with reference to a particular measurement scale, for a specific latent aspect (ability or opinion), the response $x_{nj}$ of the generic unit $n=1,\ldots,N$ to the item $j=1,\ldots,J$ (typically given on a conventional Likert scale, choosing, for example, among the values $1,\ldots,k$) may be represented as

$$x_{nj} = \varphi(\vartheta_n, \beta_j)$$

where $\varphi(\cdot)$ is a proper “link function” and parameters $\vartheta_n$, $\beta_j$ account, respectively, for individual and item variability. Rasch models (see, for example, Fischer, Molenaar, 1995) consider the last relation to be a sort of logistic type, while Factor models (in the case of a unique latent factor, uni-dimensionality) assume a linear relationship, $x_{nj} = b \beta_j + \vartheta_n$, where $\vartheta_n$ takes up the role of the error component.

We consider the two following distinct uses of the above mentioned models

a) scale purification
b) evaluation of item importance,

addressed respectively to get a ranking of

a) the respondent units
b) the items/aspects defining the latent factor.

In the former case, a typical application concerns the development of a psychometric test for which the researcher is mainly interested in identifying the most similar items, proxies of the same latent factor. The Rasch approach, in that case, comes in useful in order to carry out a ranking of the statistical units: it corrects the latent score estimates from the measurement system weakness represented by the inter-item differences. Another interesting application of the Rasch model is represented by its use in the analysis of Customer Satisfaction (see, for example, De Battisti et al, 2005): the $\beta_j$

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coefficients explain the importance of the quality aspects of the product/service under investigation.

2. Analysis of survey data on HR selection criteria

The work presented in Bonanomi (2007) shows a further application of the Rasch analysis in evaluating the importance of the items defining a scale/factor.

In this particular case, reference is made on the potential, personal characteristics that HR managers take into consideration during the recruitment phase of new graduates.

A random sample of 168 firms in Milan district was asked for. A systematic sampling procedure was used, with a selection rate proportional to the number of firm employees. Observe that the sampling fractions also represent the opposite of the importance weights that we assigned to the strata (graduate people are more frequently engaged by larger firms). So we can consider the sampling procedure being a simple random sampling from the population of the registered firms of the district. The analysis mainly concerned in identifying which 23 evaluation criteria are most appreciated and which are less enjoyed. Statistics provided by the Rasch analysis (see RUMM2010, 2001) may then be used to rank the items by their importance: remember that the main target, in building a psychometric scale is that of locating those items that best reproduce the observed data (giving rise to a $\chi^2$ significant statistic of concordance), and of selecting the most similar ones (giving a high level of scale reliability). Observe that, while Rasch scores are corrected in order to take into account location levels away from zero, the same adjustment is not performed under the traditional Factor Analysis procedures. In our case the main interest is addressed to produce a ranking of the items by their importance on the basis of the “location” statistic. In particular, those items characterized by strong negative location values prove to be the most important criteria during the HR selection activity while items presenting strong positive location show a lack of interest. The research results confirm what previously presented in similar works: personal characteristics best appreciated by the firms are those connected to “motivation”, “taking interest in working activity” and “target achievement”; less interesting are the items concerning “competences external to the working environment”, “staff management and development”, ”creativity”, ”competition” and ”flexible mind”. Ideal applicants are therefore the new-graduates ready to share the company mission and at the same time indifferent to all competences not strictly related to the company core business or deriving from previous working/cultural experiences.

References

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