

Proficiency of Numeracy and Literacy for Senior Workers

Zhen Liu

Summary

The study aims to identify how demographic, organizational and learning factors are associated with South Korean senior workers' proficiency of numeracy and literacy. Stepwise AIC and adjusted R^2 are used in the statistical analysis, which indicate what factors are important to predict the numeracy/literacy proficiency test score. The result shows that numeracy and literacy proficiency test score are highly correlated. Therefore, for both dependent variables, the possible important factors for them are: demographic (gender, age, education level), organizational (work flexibility, public/private), and learning factors (active learning strategies).

Introduction

The senior population in South Korea is rapidly growing. As a result, seniors continue to participate in the labour market, and often engage in educational programs to further develop their workplace skills. Identifying what is the association between the aspects of senior workers and their proficiency is a critical research issue because it will help Human Resource officers to develop training programs.

Data Description

The data set was obtained from the open source of the Programme for the International Assessment of Adult Competencies. These data were collected from questionnaires that measured two key cognitive skills: literacy and numeracy. Based on the study's objective, employers aged 50-65 year-old on the private sector in South Korea were included. There are two dependent variables: the score of numeracy proficiency and the score of literacy proficiency.

The proficiency test score is the average test score of numeracy or literacy. They are continuous and seem to be Gaussian distributed. For independent variables, we have 14 independent variables that need to be test and they are shown below:

Demographic Factor	Organizational Contexts	Learning/Education
Continuous: Age Work Experience (in years) Categorical: Gender Education level Employment type: full-time or part-time	Continuous: Work Flexibility Learning opportunity Private/ public sector	Continuous: Active learning strategies number of hour of participation Categorical: Participation in non-formal education Participation in job-related education Participation in job-related adult education Participation in non-job-related adult education

Methods

1. Stepwise AIC:

To address the two research questions above, we will use a stepwise linear model with AIC criterion because AIC helps to choose the best 'predictive' model. AIC helps to seek a model that has a good fit to the truth but few parameters.

2. ANOVA Comparison:

ANOVA Comparison use R^2 as a criterion to compare if two models are the same. For example, when we compare model 1 (A+B+C) and model 2 (A+B) using ANOVA, F test is be used and its corresponding p-value is measured. If the p-value for them are considerable small enough(say, <0.05), these two models are more likely to be different so factor C could provide important information for the variable we test. On the other hand, if the p-value is not small enough, these two models do not have big difference and due to parsimony, the model 2 would be a better choice.

Results:

1. For numeracy:

The variables selected by stepwise AIC and ANOVA Comparison are shown below:

Stepwise AIC	gender, age, ED_Level, work_flex, public/private, and act_lrn , NFEHRS
ANOVA Comparison	gender, age, ED_Level, work_flex, public/private, and act_lrn , FNFAET12NJR

* NFEHRS: number of hour of participation

* act_lrn: active learning strategies

* work_flex: work flexibility

* ED_Level: education level

* FNFAET12NJR: Participation in non-job-related adult education

For NFEHRS, its p-value in least-squared model by stepwise AIC is 0.137 and it is not an important factor when using ANOVA comparison. They indicate that NFEHRS cannot provide additive information and are not significantly important.

For FNFAET12NJR, we used a ANOVA comparison again to check if the selected models (six variables) with or without out FNFAET12NJR are different. The Corresponding p-value is 0.296 (>0.05), which indicate that it provides less information about the response.

2. For literacy:

Similar as the above analysis. The variables selected by stepwise AIC and ANOVA Comparison are shown below:

Stepwise AIC	gender, age, ED_Level, work_flex, public/private, and act_lrn , NFEHRS
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ANOVA Comparison	age, ED_Level, work_flex, public/private, and act_lrn
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For NFEHRS, its p-value in least-squared model by stepwise AIC is 0.156 and it is not an important factor when using ANOVA comparison. They indicate that NFEHRS cannot provide additive information and are not significantly important.

For Gender, we used a ANOVA comparison again to check if the selected models(five variables) with or without out Gender are different. The Corresponding p-value is 0.0375 (<0.05), which indicate that it provides additional predictive information about the response.

Conclusion and Discussion:

In conclusion, gender, age, education level, work flexibility, public/private and active learning strategies are highly associated with both proficiency score (numeracy/literacy). The correlation between numeracy score and literacy score are 0.93, which strongly agrees with the same results they get. For further analysis, adjusted R^2 can be used to determine the goodness-of-fit. Using multiple approach to do model selection could provide further evidence supporting the inclusion or exclusion of certain variables.