Assignment 1 Report

by Evgeny Gushchin (November 11, 2023)

Using CPS-earnings dataset we have built and analyzed 4 prediction models using linear regression for earnings per hour (y_i) for occupation 4110 Waiters and waitresses. The sample contains 2,178 observations with mean earnings per hour of 12 USD.

Models. The two main predictors of wages are experience and education and skill level. In our dataset we can use age_i as a proxy for experience and $educ\_level_i$ as a proxy for education and skill level. We also add age_i^2 as one can expect diminishing returns from additional years of experience. Thus, our simplest model has the following form:

$$y_i = \alpha + \beta \cdot age_i + \gamma \cdot age_i^2 + \delta \cdot educ\_level_i$$

Other models are adding more variables to this baseline model. In Model 2 we add union membership status (unionisation may help negotiate better wages) and min_wage[1] (the occupation is low-paid, so minimum wage legislation should play an important role). Model 3 includes a dummies on sex (we can expect gender bias), $class\_new$ (type of business: for profit, non-profit or government), and an interaction term between sex and age. Model 4 includes dummies on industry, race, citizenship status, and interaction term between sex and education level.

Results. Table 1 presents the results of estimating BIC in the full sample, RMSE in the full sample, and cross-validated RMSE. Both BIC and cross-validated RMSE show that Model 3 (with 14 regressors) is the best. Model 4 is overfitting while Models 1 and 2 are too simple (can contain more variables to improve performance). RMSE in the full sample is decreasing with increasing model complexity (as expected).

Table 1: Comparing prediction model performance

	Model1	Model2	Model3	Model4
BIC	15,006	15,002	14,997	15,106
RMSE (full sample)	7.46	7.43	7.37	7.32
RMSE (4-fold cross validation)	7.51	7.49	7.44	7.49
Number of regressors	8	10	14	32

[1]Constructed based on the *stfips* variable and state-level data of minimum wages in 2014 taken from https://www.dol.gov/agencies/whd/state/minimum-wage/history.