Case Study 3: Analysis of labor market data

Econometrics I / Ökonometrie I WS 2025/2026

Deadline: December 08, 2025@ 23:59

1 Data description

How often do Austrian workers change employer and what are the factors that have an influence on the decision? The file `change.csv` contains data for 2222 non-self-employed workers. The data is from the years 1986–1998 and contains the following information for each person:

- 'nchange': counts of how many changes of employer occurred from 1986 to 1998
- 'gender': 1 for women, 0 for men
- 'occupation': 1 for white collars, 0 for blue collars
- 'age': age in 1986 (in years)
- 'periodsincome': in how many years a positive income was registered
- 'medianwage': wage categories (5 categories according to the year quintile income, '1' is the lowest, '5' is the highest wage level).

Attention: The income is expressed in wage categories. Therefore several dummy variables need to be introduced.

2 Tasks

Estimate various regression models that explain the response variable `nchange` through the covariates `gender`, `occupation`, `age`, `periodsincome`, and `medianwage`.

Specifically:

1. (1 p.) Describe the data using (sensibly chosen) statistics and graphics.
2. (1 p.) Model 1: Fit a linear regression model based on the variables `gender`, `occupation`, `age`, `periodsincome` and `medianwage`.

   - Interpret the estimated coefficients. (Some suggestions: Do women change employers more often than men? Do blue collar workers change employer more often than white collar workers? Do low-income people change employers more often than high-income people?)
3. (1 p.) In Model 1, test the following hypotheses:

   - The effect of income is the same in the two highest wage categories.

   - The effect of income is the same in the two lowest wage categories.
4. (2 p.) Model 2: Extend Model 1 by additionally modeling a quadratic effect of the variable 'periods_income'. Answer the following questions:

   - Is the quadratic effect significant?

   - Is the impact of 'periods_income' on the number of changes monotone?

   - What is the effect on the number of changes, if a person has had an income for two additional years (all other variables are kept fixed)?

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5. (2 p.) Model 3: Extend Model 2 by additionally modeling an interaction effect between the `occupation` and `gender` variables. Answer the following questions:

   - Is the interaction effect significant?

   - Interpret the effect of the variables `occupation` and `gender` on 'nchange'. Especially, do women change employers more often than men? Does the answer depend on whether the woman is a blue collar or a white collar worker?

6. (1 p.) For Model 3, predict the number of employer changes for a blue collar woman who was 35 years old in 1986, had a positive income in 11 years on the cut-off date, and the median of those incomes was in the second lowest wage category.

7. (1 p.) Compare the three regression models using AIC and Schwarz criterion.

   - Which model is preferable? Is your decision about the appropriate model clear or rather vague?

8. (1 p.) Create a residual diagnosis for the selected model. Especially:

   - Check the standard model assumptions.

   - Check if the error term is normally distributed.

   - What results do you trust on the basis of residual diagnosis? Do you find any problems?