

Seminar 2. Quantile regression

Task 1. IBM returns

File: *ibmdaily.txt*

File consists daily log returns of IBM and SP 500.

1. Try to consider a quantile regression of any form
2. Compare results with different levels of alpha.

Task 2. Productivity analysis

File: *productivity.txt*

This problem set concerns predicting productivity of new workers in a large USA manufacturing firm. There are five variables:

- y_i – an observed standardized physical productivity measure for the i th worker after the initial training period,
- sex_i – a dummy variable for the workers' sex (males are 1),
- dex_i – a score on a physical dexterity exam administered before the worker was hired,
- lex_i – the number of years of education of the worker,
- $quit_i$ – whether the person quit within the first six months (quitters are 1).
- job_tenure_i – actual duration of employment
- censored – censoring indicator, if the censoring indicator is 0 then the corresponding duration is censored.

1. Estimate the model $y = \alpha_0 + \alpha_1 sex + \alpha_2 dex + \alpha_3 lex + \alpha_4 lex^2 + u$.
2. Test the hypotheses: $H_0 : \alpha_3 = \alpha_4 = 0$ and $H_0 : \alpha_4 = 0$. Interpret the results of the tests in economic terms.
3. Given the results draw a diagram illustrating the dependence of "mean productivity" on education. Set dexterity at its mean and $sex = 0$. Interpret the picture. How does it change for men? Suppose you thought the whole shape of the education effect was different for men and women; reestimate your respecified model. Does this improve things?
4. Now consider the possibility that the dispersion and perhaps even the shape of the conditional density of productivity depends on the sex – dex – lex variables. Propose a quantile regression model of this type, estimate and interpret it. For this purpose, redoing the prior plots of mean productivity for several quantiles would be helpful.
5. Admitting that the whole distribution of productivity changes with the observable covariates leads to a much more complex, and richer, view of the employers decision problem. Suppose that the firm chooses a cutoff of 14 for productivity so that workers who do not achieve this level after one year on the job are dismissed. What proportion of the workers at various education levels (assume mean dexterity scores) would be retained? How would this be likely to affect hiring decisions?
6. Now suppose that it is very difficult to fire less productive workers, and that the employer want to hire workers to maximize the probability that they would be able to achieve productivity. Suggest a hiring strategy. This question is quite similar to the

decision problem faced by many public universities who have to decide on admission policies for diverse applicants who have somewhat predictable performance.

Task 3. Monetary policy. Consider the model, which describes the increase in monetary base (in %) by such factors as:

- Increase in GDP (%)
 - Government size (budget expenses/GDP)
 - Technology improvement (exponential trend)
1. Estimate OLS regression. Check all necessary tests.
 2. Estimate quantile regression with 0.05, 0.25, 0.50, 0.75, 0.90, 0.95 quantiles. Check all necessary tests.
 3. Compare the results. What can say about the coefficients of the model? Provide an economic analysis of the models.

Use any European country for the analysis:

Task 4. Productivity analysis

Consider Lithuanian GDP per capita depending on some macroeconomic variables (on your choice).

1. Try to obtain the best linear regression.
2. Reestimate the model, using quantile regression technique for each alpha (0.1 -0.9).
3. Compare the results, define the influence of the financial crisis on GDP.