

Assignment 4

From the data set `assign4.dta`:

The study on bankruptcy firm employs the following regression model.

$$z_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} \quad (1)$$

The log-likelihood function of this model is as follows:

$$\ln L = \begin{cases} \ln \Phi(z_i) & \text{if } y_i = 1 \\ \ln \Phi(-z_i) & \text{if } y_i = 0 \end{cases} \quad (2)$$

where: y_i = 1 for bankruptcy firm and 0 otherwise.

x_{1i} = Debt coverage ratio of firm i

x_{2i} = Liquidity ratio of firm i

x_{3i} = Profitability index of firm i

x_{4i} = Solidity ratio of firm i

Let $\Phi(\cdot)$ = Logistic probability distribution function. $\Phi(z_i) = \frac{1}{1 + e^{-z_i}}$

From the given data set (`assign8-2.dta`):

- a. Estimate the above models using MLE with Newton-Raphson algorithm.
- b. Perform hypothesis testing whether $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ using LR-test and Wald test.
- c. Estimate the above models using MLE with BHHH algorithm, make comparison of the estimated result with the result from (1), and give explanation why are they different?

Let $\Phi(\cdot)$ = Cumulation standard normal probability distribution function and

$$z_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} \quad (3)$$

- d. Estimate the models using MLE with Newton-Raphson algorithm.

Assume that there exists heteroskedasticity in the model as: $\sigma_i^2 = \exp(\gamma x_{4i})^2$, then,

$\Phi(\cdot)$ = Cumulation standard normal probability distribution function $\Phi(z_i / \exp(\gamma x_{4i}))$

- e. Estimate the models with heteroskedasticity using MLE with Newton-Raphson algorithm. Perform LR-test whether there exists significant heteroskedasticity.