

**ESTIMASI PARAMETER PADA MODEL REGRESI
TERPOTONG KIRI DENGAN MENGGUNAKAN
MAXIMUM LIKELIHOOD ESTIMATOR**

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PRA

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SKRIPSI



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ABSTRAK

Skripsi ini bertujuan untuk menentukan estimator parameter model regresi terpotong kiri menggunakan metode *Maximum Likelihood Estimator*. Model regresi terpotong kiri yang digunakan dalam skripsi ini adalah model regresi linier sederhana dengan variabel tak bebas mengalami pemotongan disebelah kiri dari suatu nilai yang telah ditentukan. Pemotongan dilakukan pada variabel tak bebas, karena variabel ini yang memiliki distribusi, sehingga diperoleh fungsi kepadatan peluang distribusi terpotong adalah :

$$f(y | y > c) = \frac{f(y)}{\text{Prob}(y > c)}.$$

Berdasarkan metode *Maximum Likelihood*, estimator parameter regresi terpotong kiri diperoleh dengan cara menyelesaikan secara numerik sistem persamaan :

$$\sum_{i=1}^n \left(\frac{y_i - (\beta_0 + \beta_1 x_i)}{\sigma^2} - \frac{\frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma} \right)^2}}{c - (\beta_0 + \beta_1 x_i)} \right) \left(1 - \int_{-\infty}^{\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma}} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} z^2} dz \right) = 0,$$

$$\sum_{i=1}^n \left(\frac{y_i x_i - \beta_0 x_i - \beta_1 (x_i)^2}{\sigma^2} - \frac{\frac{x_i}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma} \right)^2}}{c - (\beta_0 + \beta_1 x_i)} \right) \left(1 - \int_{-\infty}^{\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma}} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} z^2} dz \right) = 0,$$

$$\sum_{i=1}^n \left(-\frac{1}{\sigma} + \frac{(y_i - (\beta_0 + \beta_1 x_i))^2}{\sigma^3} - \frac{\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma^2} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma} \right)^2}}{c - (\beta_0 + \beta_1 x_i)} \right) \left(1 - \int_{-\infty}^{\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma}} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} z^2} dz \right) = 0.$$

Penerapan regresi terpotong kiri pada data NEM (Y) dan Nilai NEM Matematika Siswa (X) di SMAN 1 Balong Ponorogo, diperoleh dugaan regresi terpotong kiri pada $c = 23.99$:

$$\hat{Y}_i = 1.16123 + 2.66666 x_i \quad \text{dengan } \varepsilon_i \sim N(0, 1.754432703)$$

Kata Kunci : Estimasi Parameter, *Maximum Likelihood Estimator* , Regresi Terpotong Kiri

Ika Kumala Pramasari. 2008. **Parameter Estimation of Left Truncated Regression Model by Maximum Likelihood Estimator Method.** This *skripsi* is under guidance of Drs. Ardi Kurniawan, M.Si and Toha Saifudin, S.Si, M.Si. Departement of Mathematics, Faculty of Science and Technology, Airlangga University.

ABSTRACT

The aim of this *Skripsi* writing is to determine the parameter estimation of left truncated regression model by Maximum Likelihood Estimator method. Left truncated regression models that used in this *skripsi* is simple linier regression models with truncating independent variable in left side from the value that has been obtained. Truncating be done to independent, because this variable has a distribution, so obtained probability density function at truncated distribution is :

$$f(y | y > c) = \frac{f(y)}{\text{Prob}(y > c)}.$$

According to Maximum Likelihood method, estimator parameter left truncated regression has obtained by finishing equation numeric system :

$$\sum_{i=1}^n \left(\frac{y_i - (\beta_0 + \beta_1 x_i)}{\sigma^2} - \frac{\frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma} \right)^2}}{c - (\beta_0 + \beta_1 x_i)} \right) = 0,$$

$$\sum_{i=1}^n \left(\frac{y_i x_i - \beta_0 x_i - \beta_1 (x_i)^2}{\sigma^2} - \frac{\frac{x_i}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma} \right)^2}}{c - (\beta_0 + \beta_1 x_i)} \right) = 0,$$

$$\sum_{i=1}^n \left(-\frac{1}{\sigma} + \frac{(y_i - (\beta_0 + \beta_1 x_i))^2}{\sigma^3} - \frac{\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma^2} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{c - (\beta_0 + \beta_1 x_i)}{\sigma} \right)^2}}{c - (\beta_0 + \beta_1 x_i)} \right) = 0.$$

Application left truncated regression at NEM data (Y) and Mathematics value from NEM data of student (X) at SMAN 1 Balong Ponorogo, obtained estimation left truncated regression to $c = 23.99$:

$$\hat{Y}_i = 1.16123 + 2.66666 x_i \text{ with } \varepsilon_i \sim N(0, 1.754432703)$$

Keyword : Parameter Estimation, Maximum Likelihood Estimator, Left Truncated Regression.