

# Econometrics-Damodar N. Gujarati / Chapter 7

Furkan Zengin

17 08 2021

*Multiple Regression Analysis : The Problem of Estimation*

*Assumptions*

$$Y_i = \beta_1 + \beta_2 x_{2i} + \beta_3 x_{3i} + u_i \quad (7.1.1)$$

$$E[u \mid X_{2i}, X_{3i}] = 0 \quad (7.1.4)$$

$$\text{Var}(u_i) = \sigma^2 \quad (7.1.5)$$

```
options(scipen = 999)

library(gujarati)

library(ggplot2)

fix(Table6_4)

MODEL1 = lm(Table6_4$CM ~ Table6_4$FLR)

summary(MODEL1)

plot(Table6_4$FLR, Table6_4$CM, xlab = "Female Literacy",
      ylab = "Child Mortality")
abline(MODEL1)
```

$$\hat{CM}_i = 263.8635 - 2.3905 FLR_i \quad (7.3.1)$$

(12.2250)    (0.2133)

```
options(scipen = 999
```

```
MODEL2 = lm(Table6_4$CM ~ Table6_4$PGNP + Table6_4$FLR)
summary(MODEL2)
```

$$\hat{CM}_i = \underset{(11.593179)}{263.64} - \underset{(0.002003)}{0.005647}PGNP_i - \underset{(0.209947)}{2.231586}FLR_i \quad (7.6.2)$$

$$R^2 = 1 - \frac{\sum_i (\hat{u}_i^2)}{\sum_i (\hat{y}_i^2)} \quad (7.8.1)$$

```
options(scipen = 999
```

```
fix(Table7_1)
```

```
MODEL3 = lm(Table7_1$Y ~ Table7_1$X)
```

```
summary(MODEL3)
```

```
MODEL4 = lm(log(Table7_1$Y) ~ log(Table7_1$X))
```

```
summary(MODEL4)
```

$$\hat{Y}_t = \underset{(0.1216)}{2.6911} - \underset{(0.1140)}{0.4795}X_t \quad R^2 = 0.6628 \quad (7.8.8)$$

$$\hat{Y}_t = \underset{(0.01524)}{0.77742} - \underset{(0.04937)}{0.25305} X_t \quad R^2 = 0.7448 \quad (7.8.9)$$

*The Cobb– Douglas Production Function : More on Functional Form*

$$Y_i = \beta_1 \beta_2^{\beta_2} x_{2i} \beta_3^{\beta_3} x_{3i} e_i^u \quad (7.9.1)$$

```
options(scipen = 999)

fix(Table7_3)

#Name them as ValueAd, LaborIn and CapitalIn Respectively

MODEL5 = lm(log(Table7_3$ValueAd) ~ log(Table7_3$LaborIn) + log(Table7_3$CapitalIn))

summary(MODEL5)
```

$$\ln \hat{Y}_i = \underset{(0.39623)}{3.88760} + \underset{(0.04937)}{0.46833} \ln X_{2i} + \underset{(0.09689)}{0.52128} \ln X_{3i} \quad R^2 = 0.9642 \quad (7.9.4)$$

*Polynomial Regression Models*

$$Y_i = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_{2i}^2 + \cdots + \hat{\beta}_k X_{ki}^k + e_i \quad (7.10.3)$$

```

options(scipen = 999)

fix(Table7_4)

x1 = Table7_4$X
x2 = (Table7_4$X)^2
x3 = (Table7_4$X)^3

MODEL6 = lm(Table7_4$Y ~ x1 + x2 +x3)

summary(MODEL6)

plot(x1, Table7_4$Y)

```

$$\hat{Y}_i = \underset{(6.37532)}{141.76667} + \underset{(4.77861)}{63.4776}X_i - \underset{(0.98566)}{12.96154}X_i^2 + \underset{(0.05911)}{0.93959}X_i^3 \quad R^2 = 0.9983 \quad (7.10.6)$$