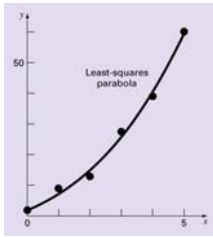
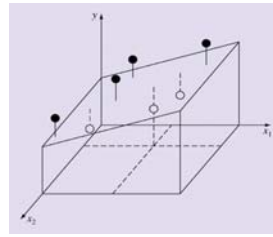


Chap. 15 비선형 회귀분석



- ❖ 다항식 회귀분석
- ❖ 다중 회귀분석



[Review] 선형 회귀분석

f(x) is in a linear form : $f(x) = ax + b$

Error (residual) : $S_r = \sum_{i=1}^n (ax_i + b - y_i)^2$

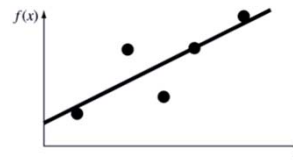
Is minimized when :

$$\frac{\partial S_r}{\partial a} = \sum 2(ax_i + b - y_i) \cdot x_i = 0$$

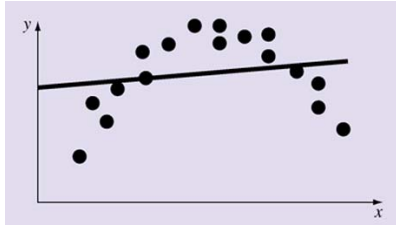
$$\frac{\partial S_r}{\partial b} = \sum 2(ax_i + b - y_i) \cdot 1 = 0$$

$$\begin{aligned} \rightarrow a \sum x_i^2 + b \sum x_i &= \sum x_i y_i \\ a \sum x_i + b \sum 1 &= \sum y_i \end{aligned}$$

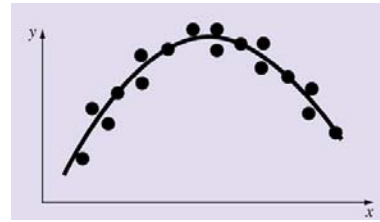
$$\rightarrow a = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{n \sum x_i^2 - (\sum x_i)^2}, b = \bar{y} - a\bar{x}$$



선형 회귀분석



비선형 회귀분석



$f(x)$ is in a quadratic form : $f(x) = ax^2+bx+c$ cf) $f(x) = a_0+a_1x+a_2x^2$

Error (residual) :

Is minimized when :

$$\frac{\partial S_r}{\partial a} = \sum 2(ax_i^2 + bx_i + c - y_i) \cdot x_i^2 = 0$$

$$\frac{\partial S_r}{\partial b} = \sum 2(ax_i^2 + bx_i + c - y_i) \cdot x_i = 0$$

$$\frac{\partial S_r}{\partial c} = \sum 2(ax_i^2 + bx_i + c - y_i) \cdot 1 = 0$$

→

P. 391 예제 15.1

다항식 회귀분석 (3차함수)

$f(x)$ is in a cubic form : $f(x) = ax^3 + bx^2 + cx + d$

Error (residual) :

Is minimized when :

다항식 회귀분석의 오차

m-th order polynomial :

Error (residual) :

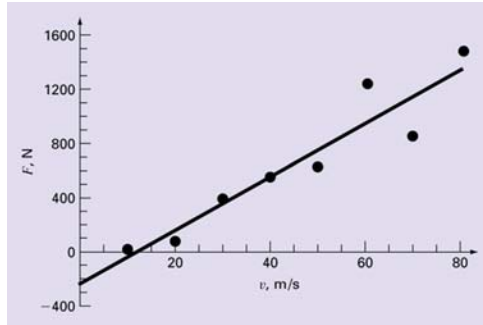
Is minimized when :

표준오차(standard error) :

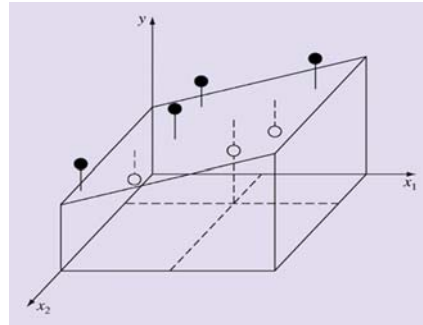
결정계수 (R^2) :

다중 회귀분석

$$y = ax + b$$



$$y = a_0 + a_1x_1 + a_2x_2 + e$$



다중 회귀분석

$f(x_1, x_2)$ is in a linear form : $y = a_0 + a_1x_1 + a_2x_2 + e$

Error (residual) : $S_r = \sum_{i=1}^n (y_i - a_0 - a_1x_{1i} - a_2x_{2i})^2$

Is minimized when :

→

P. 394 예제 15.2