Lecture Summary: Feb. 27, 2023

- Coefficient of partial determination

Some special cases:

1. $p = 1, q = 1$: SSE(no predictor)=SSTO, SSR(x_1|no predictor) $=$ SSR(x_1) $= SSR$ of fitting the simple linear regression. Thus $R^2_{Y,x_1|\text{no predictor}} =$ SSR/SSTO $= R^2$.

2. $p = 3, q = 1$: This is the same as $R^2_{Y,x_1|x_1,x_2}$.

- Polynomial regression

Example: In the model

$$Y = \beta_0 + \beta_1 x + \beta_2 x^2 + \epsilon,$$

the relation between Y and x is not linear.

Let $x_1 = x, x_2 = x^2$, then

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \epsilon,$$

which is a multiple linear regression model (the relation between Y and x_1, x_2 is linear).

In general, if

$$Y = \beta_0 + \beta_1 x + \cdots + \beta_{p-1} x^{p-1} + \epsilon,$$

by letting $x_1 = x, \ldots, x_{p-1} = x^{p-1}$, one has a multiple linear regression model,

$$Y = \beta_0 + \beta_1 x_1 + \cdots + \beta_{p-1} x_{p-1} + \epsilon.$$