Splines

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In many practical problems, the expected value of the response variable y may follow a complex form of the regressor x. An example is that $E(y \mid x)$ is linear in x in one interval of x and quadratic in x in other intervals.

How to model $E(y \mid x)$?

Refer to Section 7.2.2 of Textbook

Use of splines is a powerful method.

Use subscript + to define the knot; for example, + in $(x - t)_+$ implies

when $x > t$, $(x - t)_+ = x - t$, which is positive.
when $x \leq t$, $(x - t)_+ = 0$

Use superscript "power" to define the degree of the polynomial function (e.g., linear, quadratic), as shown in Mod05.

Thus, $when\ x > t$, $(x - t)^0_+ = (x - t)^0 = 1$; that is, any positive number to the 0th power is 1.

Define $(x - t)^0_+ = 0$, when $x \leq t$.

When $x > t$, $(x - t)^1_+ = (x - t)^1 = (x - t)$.
When $x \leq t$, $(x - t)^1_+ = 0$.
Likewise, for any $j \geq 2$,
when $x > t$, $(x - t)^j_+ = (x - t)^j$;
when $x \leq t$, $(x - t)^j_+ = 0$.