Analysis of Covariance (ANCOVA)

Example 13.1 Regression of Income on Education and Racial–Ethnic Group

For a sample of adult Americans aged over 25, Table 13.1 shows Y = annual income (thousands of dollars), x = number of years of education (where 12 = high school graduate, 16 = college graduate), and z = racial–ethnic group (black, Hispanic, white). The data exhibit patterns of a much larger sample taken by the U.S. Bureau of the Census. The sample contains $n_1 = 16$ blacks, $n_2 = 14$ Hispanics, and $n_3 = 50$ whites, for a total sample size of $N = 80$.

Table 13.2 reports the mean income and education for these subjects. Although the mean incomes differ among the three groups, these differences could result from the differing educational levels. For instance, although white subjects had higher mean incomes than blacks or Hispanics, they also had higher mean education. Perhaps the differences would disappear if we could control for education, making comparisons among the racial–ethnic groups at fixed levels of education.

Table 13.1: Observations on Y = Annual Income (in Thousands of Dollars) and X = Number of Years of Education, for Three Racial–Ethnic Groups

Black		Hispanic		White		White		White	
y	x	y	x	y	x	y	x	y	x
16	10	32	16	30	14	62	16	50	16
18	7	16	11	48	14	24	10	50	14
26	9	20	10	40	7	50	13	22	11
16	11	58	16	84	18	32	10	26	12
34	14	30	12	50	10	34	16	46	16
22	12	26	10	38	12	52	18	22	9
42	16	20	8	30	12	24	12	24	9
42	16	40	12	76	16	22	14	64	14
16	9	32	10	48	16	20	13	28	12
20	10	22	11	36	11	30	14	32	12
66	16	20	10	40	11	24	13	38	14
26	12	56	14	44	12	120	18	44	12
20	10	32	12	30	10	22	10	22	12
30	15	30	11	60	15	82	16	18	10
20	10			24	9	18	12	24	12
30	19			88	17	26	12	56	20
				46	16	104	14		