APPENDIX B

DATA SETS FOR EXERCISES

Introduction to Linear Regression Analysis, Fifth Edition. Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining.

TABLE B.1 National Football League 1976 Team Performance

Team	y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
Washington	10	2113	1985	38.9	64.7	+4	868	59.7	2205	1917
Minnesota	11	2003	2855	38.8	61.3	+3	615	55.0	2096	1575
New England	11	2957	1737	40.1	60.0	+14	914	65.6	1847	2175
Oakland	13	2285	2905	41.6	45.3	−4	957	61.4	1903	2476
Pittsburgh	10	2971	1666	39.2	53.8	+15	836	66.1	1457	1866
Baltimore	11	2309	2927	39.7	74.1	+8	786	61.0	1848	2339
Los Angeles	10	2528	2341	38.1	65.4	+12	754	66.1	1564	2092
Dallas	11	2147	2737	37.0	78.3	−1	761	58.0	1821	1909
Atlanta	4	1689	1414	42.1	47.6	−3	714	57.0	2577	2001
Buffalo	2	2566	1838	42.3	54.2	−1	797	58.9	2476	2254
Chicago	7	2363	1480	37.3	48.0	+19	984	67.5	1984	2217
Cincinnati	10	2109	2191	39.5	51.9	+6	700	57.2	1917	1758
Cleveland	9	2295	2229	37.4	53.6	−5	1037	58.8	1761	2032
Denver	9	1932	2204	35.1	71.4	+3	986	58.6	1709	2025
Detroit	6	2213	2140	38.8	58.3	+6	819	59.2	1901	1686
Green Bay	5	1722	1730	36.6	52.6	−19	791	54.4	2288	1835
Houston	5	1498	2072	35.3	59.3	−5	776	49.6	2072	1914
Kansas City	5	1873	2929	41.1	55.3	+10	789	54.3	2861	2496
Miami	6	2118	2268	38.2	69.6	+6	582	58.7	2411	2670
New Orleans	4	1775	1983	39.3	78.3	+7	901	51.7	2289	2202
New York Giants	3	1904	1792	39.7	38.1	−9	734	61.9	2203	1988
New York Jets	3	1929	1606	39.7	68.8	−21	627	52.7	2592	2324
Philadelphia	4	2080	1492	35.5	68.8	−8	722	57.8	2053	2550
St. Louis	10	2301	2835	35.3	74.1	+2	683	59.7	1979	2110
San Diego	6	2040	2416	38.7	50.0	0	576	54.9	2048	2628
San Francisco	8	2447	1638	39.9	57.1	−8	848	65.3	1786	1776
Seattle	2	1416	2649	37.4	56.3	−22	684	43.8	2876	2524
Tampa Bay	0	1503	1503	39.3	47.0	−9	875	53.5	2560	2241

y: Games won (per 14-game season)
x_1: Rushing yards (season)
x_2: Passing yards (season)
x_3: Punting average (yards/punt)
x_4: Field goal percentage (FGs made/FGs attempted 2season)
x_5: Turnover differential (turnovers acquired–turnovers lost)
x_6: Penalty yards (season)
x_7: Percent rushing (rushing plays/total plays)
x_8: Opponents' rushing yards (season)
x_9: Opponents' passing yards (season)

TABLE B.2 Solar Thermal Energy Test Data

y	x_1	x_2	x_3	x_4	x_5
271.8	783.35	33.53	40.55	16.66	13.20
264.0	748.45	36.50	36.19	16.46	14.11
238.8	684.45	34.66	37.31	17.66	15.68
230.7	827.80	33.13	32.52	17.50	10.53
251.6	860.45	35.75	33.71	16.40	11.00
257.9	875.15	34.46	34.14	16.28	11.31
263.9	909.45	34.60	34.85	16.06	11.96
266.5	905.55	35.38	35.89	15.93	12.58
229.1	756.00	35.85	33.53	16.60	10.66
239.3	769.35	35.68	33.79	16.41	10.85
258.0	793.50	35.35	34.72	16.17	11.41
257.6	801.65	35.04	35.22	15.92	11.91
267.3	819.65	34.07	36.50	16.04	12.85
267.0	808.55	32.20	37.60	16.19	13.58
259.6	774.95	34.32	37.89	16.62	14.21
240.4	711.85	31.08	37.71	17.37	15.56
227.2	694.85	35.73	37.00	18.12	15.83
196.0	638.10	34.11	36.76	18.53	16.41
278.7	774.55	34.79	34.62	15.54	13.10
272.3	757.90	35.77	35.40	15.70	13.63
267.4	753.35	36.44	35.96	16.45	14.51
254.5	704.70	37.82	36.26	17.62	15.38
224.7	666.80	35.07	36.34	18.12	16.10
181.5	568.55	35.26	35.90	19.05	16.73
227.5	653.10	35.56	31.84	16.51	10.58
253.6	704.05	35.73	33.16	16.02	11.28
263.0	709.60	36.46	33.83	15.89	11.91
265.8	726.90	36.26	34.89	15.83	12.65
263.8	697.15	37.20	36.27	16.71	14.06

y: Total heat flux (kwatts)
x_1: Insolation (watts/m^2)
x_2: Position of focal point in east direction (inches)
x_3: Position of focal point in south direction (inches)
x_4: Position of focal point in north direction (inches)
x_5: Time of day

TABLE B.3 Gasoline Mileage Performance for 32 Antomobiles

Automobile	y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
Apollo	18.90	350	165	260	8.0:1	2.56:1	4	3	200.3	69.9	3910	A
Omega	17.00	350	170	275	8.5:1	2.56:1	4	3	199.6	72.9	2860	A
Nova	20.00	250	105	185	8.25:1	2.73:1	1	3	196.7	72.2	3510	A
Monarch	18.25	351	143	255	8.0:1	3.00:1	2	3	199.9	74.0	3890	A
Duster	20.07	225	95	170	8.4:1	2.76:1	1	3	194.1	71.8	3365	M
Jenson Conv.	11.2	440	215	330	8.2:1	2.88:1	4	3	184.5	69	4215	A
Skyhawk	22.12	231	110	175	8.0:1	2.56:1	2	3	179.3	65.4	3020	A
Monza	21.47	262	110	200	8.5:1	2.56:1	2	3	179.3	65.4	3180	A
Scirocco	34.70	89.7	70	81	8.2:1	3.90:1	2	4	155.7	64	1905	M
Corolla SR-5	30.40	96.9	75	83	9.0:1	4.30:1	2	5	165.2	65	2320	M
Camaro	16.50	350	155	250	8.5:1	3.08:1	4	3	195.4	74.4	3885	A
Datsun B210	36.50	85.3	80	83	8.5:1	3.89:1	2	4	160.6	62.2	2009	M
Capri II	21.50	171	109	146	8.2:1	3.22:1	2	4	170.4	66.9	2655	M
Pacer	19.70	258	110	195	8.0:1	3.08:1	1	3	171.5	77	3375	A
Babcat	20.30	140	83	109	8.4:1	3.40:1	2	4	168.8	69.4	2700	M
Granada	17.80	302	129	220	8.0:1	3.0:1	2	3	199.9	74	3890	A
Eldorado	14.39	500	190	360	8.5:1	2.73:1	4	3	224.1	79.8	5290	A
Imperial	14.89	440	215	330	8.2:1	2.71:1	4	3	231.0	79.7	5185	A
Nova LN	17.80	350	155	250	8.5:1	3.08:1	4	3	196.7	72.2	3910	A
Valiant	16.41	318	145	255	8.5:1	2.45:1	2	3	197.6	71	3660	A
Starfire	23.54	231	110	175	8.0:1	2.56:1	2	3	179.3	65.4	3050	A
Cordoba	21.47	360	180	290	8.4:1	2.45:1	2	3	214.2	76.3	4250	A
Trans AM	16.59	400	185	NA	7.6:1	3.08:1	4	3	196	73	3850	A
Corolla E-5	31.90	96.9	75	83	9.0:1	4.30:1	2	5	165.2	61.8	2275	M
Astre	29.40	140	86	NA	8.0:1	2.92:1	2	4	176.4	65.4	2150	M
Mark IV	13.27	460	223	366	8.0:1	3.00:1	4	3	228	79.8	5430	A
Celica GT	23.90	133.6	96	120	8.4:1	3.91:1	2	5	171.5	63.4	2535	M
Charger SE	19.73	318	140	255	8.5:1	2.71:1	2	3	215.3	76.3	4370	A
Cougar	13.90	351	148	243	8.0:1	3.25:1	2	3	215.5	78.5	4540	A
Elite	13.27	351	148	243	8.0:1	3.26:1	2	3	216.1	78.5	4715	A
Matador	13.77	360	195	295	8.25:1	3.15:1	4	3	209.3	77.4	4215	A
Corvette	16.50	350	165	255	8.5:1	2.73:1	4	3	185.2	69	3660	A

y: Miles/gallon
x_1: Displacement (cubic in.)
x_2: Horsepower (ft-lb)
x_3: Torqne (ft-lb)
x_4: Compression ratio
x_5: Rear axle ratio
Source: *Motor Trend*, 1975.

x_6: Carburetor (barrels)
x_7: No. of transmission speeds
x_8: Overall length (in.)
x_9: Width (in.)
x_{10}: Weight (lb)
x_{11}: Type of transmission (A automatic; M manual)

TABLE B.4 Property Valuation Data

y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
25.9	4.9176	1.0	3.4720	0.9980	1.0	7	4	42	0
29.5	5.0208	1.0	3.5310	1.5000	2.0	7	4	62	0
27.9	4.5429	1.0	2.2750	1.1750	1.0	6	3	40	0
25.9	4.5573	1.0	4.0500	1.2320	1.0	6	3	54	0
29.9	5.0597	1.0	4.4550	1.1210	1.0	6	3	42	0
29.9	3.8910	1.0	4.4550	0.9880	1.0	6	3	56	0
30.9	5.8980	1.0	5.8500	1.2400	1.0	7	3	51	1
28.9	5.6039	1.0	9.5200	1.5010	0.0	6	3	32	0
35.9	5.8282	1.0	6.4350	1.2250	2.0	6	3	32	0
31.5	5.3003	1.0	4.9883	1.5520	1.0	6	3	30	0
31.0	6.2712	1.0	5.5200	0.9750	1.0	5	2	30	0
30.9	5.9592	1.0	6.6660	1.1210	2.0	6	3	32	0
30.0	5.0500	1.0	5.0000	1.0200	0.0	5	2	46	1
36.9	8.2464	1.5	5.1500	1.6640	2.0	8	4	50	0
41.9	6.6969	1.5	6.9020	1.4880	1.5	7	3	22	1
40.5	7.7841	1.5	7.1020	1.3760	1.0	6	3	17	0
43.9	9.0384	1.0	7.8000	1.5000	15	7	3	23	0
37.5	5.9894	1.0	5.5200	1.2560	2.0	6	3	40	1
37.9	7.5422	1.5	5.0000	1.6900	1.0	6	3	22	0
44.5	8.7951	1.5	9.8900	1.8200	2.0	8	4	50	1
37.9	6.0831	1.5	6.7265	1.6520	1.0	6	3	44	0
38.9	8.3607	1.5	9.1500	1.7770	2.0	8	4	48	1
36.9	8.1400	1.0	8.0000	1.5040	2.0	7	3	3	0
45.8	9.1416	1.5	7.3262	1.8310	1.5	8	4	31	0

y: Sale price of the house/1000
x_1: Taxes (local, school, county)/1000
x_2: Number of baths
x_3: Lot size (sq ft $\times$ 1000)
x_4: Living space (sq ft $\times$ 1000)
x_5: Number of garage stalls
x_6: Number of rooms
x_7: Number of bedrooms
x_8: Age of the home (years)
x_9: Number of fireplaces

Source: "Prediction, Linear Regression and Minimum Sum of Relative Errors," by S. C. Narula and J. F. Wellington, *Technometrics*, **19**, 1977. Also see "Letter to the Editor," *Technometrics*, **22**, 1980.

TABLE B.5 Belle Ayr Liquefaction Runs

Run No.	y	x_1	x_2	x_3	x_4	x_5	x_6	x_7
1	36.98	5.1	400	51.37	4.24	1484.83	2227.25	2.06
2	13.74	26.4	400	72.33	30.87	289.94	434.90	1.33
3	10.08	23.8	400	71.44	33.01	320.79	481.19	0.97
4	8.53	46.4	400	79.15	44.61	164.76	247.14	0.62
5	36.42	7.0	450	80.47	33.84	1097.26	1645.89	0.22
6	26.59	12.6	450	89.90	41.26	605.06	907.59	0.76
7	19.07	18.9	450	91.48	41.88	405.37	608.05	1.71
8	5.96	30.2	450	98.6	70.79	253.70	380.55	3.93
9	15.52	53.8	450	98.05	66.82	142.27	213.40	1.97
10	56.61	5.6	400	55.69	8.92	1362.24	2043.36	5.08
11	26.72	15.1	400	66.29	17.98	507.65	761.48	0.60
12	20.80	20.3	400	58.94	17.79	377.60	566.40	0.90
13	6.99	48.4	400	74.74	33.94	158.05	237.08	0.63
14	45.93	5.8	425	63.71	11.95	130.66	1961.49	2.04
15	43.09	11.2	425	67.14	14.73	682.59	1023.89	1.57
16	15.79	27.9	425	77.65	34.49	274.20	411.30	2.38
17	21.60	5.1	450	67.22	14.48	1496.51	2244.77	0.32
18	35.19	11.7	450	81.48	29.69	652.43	978.64	0.44
19	26.14	16.7	450	83.88	26.33	458.42	687.62	8.82
20	8.60	24.8	450	89.38	37.98	312.25	468.28	0.02
21	11.63	24.9	450	79.77	25.66	307.08	460.62	1.72
22	9.59	39.5	450	87.93	22.36	193.61	290.42	1.88
23	4.42	29.0	450	79.50	21.52	155.96	233.95	1.43
24	38.89	5.5	460	72.73	17.86	1392.08	2088.12	1.35
25	11.19	11.5	450	77.88	25.20	663.09	994.63	1.61
26	75.62	5.2	470	75.50	8.66	1464.11	2196.17	4.78
27	36.03	10.6	470	83.15	22.39	720.07	1080.11	5.88

y: CO_2
x_1: Space time, min.
x_2: Temperature, °C
x_3: Percent solvation
x_4: Oil yield (g/100 g MAF)
x_5: Coal total
x_6: Solvent total
x_7: Hydrogen consumption

Source: "Belle Ayr Liquefaction Runs with Solvent," *Industrial Chemical Process Design Development.* **17**, No. 3, 1978.

TABLE B.6 Tube-Flow Reactor Data

Run No.	y	x_1	x_2	x_3	x_4
1	0.000450	0.0105	90.9	0.0164	0.0177
2	0.000450	0.0110	84.6	0.0165	0.0172
3	0.000473	0.0106	88.9	0.0164	0.0157
4	0.000507	0.0116	488.7	0.0187	0.0082
5	0.000457	0.0121	454.4	0.0187	0.0070
6	0.000452	0.0123	439.2	0.0187	0.0065
7	0.000453	0.0122	447.1	0.0186	0.0071
8	0.000426	0.0122	451.6	0.0187	0.0062
9	0.001215	0.0123	487.8	0.0192	0.0153
10	0.001256	0.0122	467.6	0.0192	0.0129
11	0.001145	0.0094	95.4	0.0163	0.0354
12	0.001085	0.0100	87.1	0.0162	0.0342
13	0.001066	0.0101	82.7	0.0162	0.0323
14	0.001111	0.0099	87.0	0.0163	0.0337
15	0.001364	0.0110	516.4	0.0190	0.0161
16	0.001254	0.0117	488.0	0.0189	0.0149
17	0.001396	0.0110	534.5	0.0189	0.0163
18	0.001575	0.0104	542.3	0.0189	0.0164
19	0.001615	0.0067	98.8	0.0163	0.0379
20	0.001733	0.0066	84.8	0.0162	0.0360
21	0.002753	0.0044	69.6	0.0163	0.0327
22	0.003186	0.0073	436.9	0.0189	0.0263
23	0.003227	0.0078	406.3	0.0192	0.0200
24	0.003469	0.0067	447.9	0.0192	0.0197
25	0.001911	0.0091	58.5	0.0164	0.0331
26	0.002588	0.0079	394.3	0.0177	0.0674
27	0.002635	0.0068	461.0	0.0174	0.0770
28	0.002725	0.0065	469.2	0.0173	0.0780

y: $NbOCl_3$ concentration (g-mol/l)
x_1: $COCl_2$ concentration (g-mol/l)
x_2: Space time (sec)
x_3: Molar density (g-mol/l)
x_4: Mole fraction CO_2

Source: "Kinetics of Chlorination of Niobium Oxychloride by Phosgene in a Tube-Flow Reactor," *Industrial and Engineering Chemistry, Process Design Development*, **11**, No. 2, 1972.

TABLE B.7 Oil Extraction from Peanuts Data

Pressure (bars)	Temp. (°C)	Moisture (% by weight)	Flow Rate (L/min)	Particle Size (mm)	Yield
415	25	5	40	1.28	63
550	25	5	40	4.05	21
415	95	5	40	4.05	36
550	95	5	40	1.28	99
415	25	15	40	4.05	24
550	25	15	40	1.28	66
415	95	15	40	1.28	71
550	95	15	40	4.05	54
415	25	5	60	4.05	23
550	25	5	60	1.28	74
415	95	5	60	1.28	80
550	95	5	60	4.05	33
415	25	15	60	1.28	63
550	25	15	60	4.05	21
415	95	15	60	4.05	44
550	95	15	60	1.28	96

Source: "An Application of Fractional Experimental Designs," by M. B. Kilgo, *Quality Engineering*, **1**, pp. 19–23.

TABLE B.8 Clathrate Formation Data

x_1	x_2	y	x_1	x_2	y
0	10	7.5	0.02	30	19
0	50	15	0.02	60	26.4
0	85	22	0.02	90	28.5
0	110	28.6	0.02	120	29
0	140	31.6	0.02	210	35
0	170	34	0.02	30	15.1
0	200	35	0.02	60	26.4
0	230	35.5	0.02	120	27
0	260	36.5	0.02	150	29
0	290	385	0.05	20	21
0	10	12.3	0.05	40	27.3
0	30	18	0.05	130	48.5
0	62	20.8	0.05	190	50.4
0	90	25.7	0.05	250	52.5
0	150	32.5	0.05	60	34.4
0	210	34	0.05	90	46.5
0	270	35	0.05	120	50
0.02	10	14.4	0.05	150	51.9

y: Clathrate formation (mass %)
x_1: Amount of surfactant (mass %)
x_2: Time (minutes)

Source: "Study on a Cool Storage System Using HCFC (Hydro-chloro-fluoro-carbon)-14 lb (1,1-dichloro-1-fluoro-ethane) Clathrate," by T. Tanii, M. Minemoto, K. Nakazawa, and Y. Ando, *Canadian Journal of Chemical Engineering*, **75**, 353–360.

TABLE B.9 Pressure Drop Data

x_1	x_2	x_3	x_4	y
2.14	10	034	1	28.9
4.14	10	0.34	1	31
8.15	10	0.34	1	26.4
2.14	10	0.34	0.246	27.2
4.14	10	0.34	0.379	26.1
8.15	10	0.34	0.474	23.2
2.14	10	0.34	0.141	19.7
4.14	10	0.34	0.234	22.1
8.15	10	0.34	0.311	22.8
2.14	10	0.34	0.076	29.2
4.14	10	0.34	0.132	23.6
8.15	10	0.34	0.184	23.6
2.14	2.63	0.34	0.679	24.2
4.14	2.63	0.34	0.804	22.1
8.15	2.63	0.34	0.89	20.9
2.14	2.63	0.34	0.514	17.6
4.14	2.63	0.34	0.672	15.7
8.15	2.63	0.34	0.801	15.8
2.14	2.63	0.34	0.346	14
4.14	2.63	0.34	0.506	17.1
8.15	2.63	0.34	0.669	18.3
2.14	2.63	0.34	1	33.8
4.14	2.63	0.34	1	31.7
8.15	2.63	0.34	1	28.1
5.6	1.25	0.34	0.848	18.1
5.6	1.25	0.34	0.737	16.5
5.6	1.25	0.34	0.651	15.4
5.6	1.25	0.34	0.554	15
4.3	2.63	0.34	0.748	19.1
4.3	2.63	0.34	0.682	16.2
4.3	2.63	0.34	0.524	16.3
4.3	2.63	0.34	0.472	15.8
4.3	2.63	0.34	0.398	15.4
5.6	10.1	0.25	0.789	19.2
5.6	10.1	0.25	0.677	8.4
5.6	10.1	0.25	0.59	15
5.6	10.1	0.25	0.523	12
5.6	10.1	0.34	0.789	21.9
5.6	10.1	0.34	0.677	21.3
5.6	10.1	0.34	0.59	21.6
5.6	10.1	0.34	0.523	19.8
4.3	10.1	0.34	0.741	21.6
4.3	10.1	0.34	0.617	17.3
4.3	10.1	0.34	0.524	20
4.3	10.1	0.34	0.457	18.6
2.4	10.1	0.34	0.615	22.1
2.4	10.1	0.34	0.473	14.7
2.4	10.1	0.34	0.381	15.8
2.4	10.1	0.34	0.32	13.2

(*Continued*)

TABLE B.9 (*Continued*)

x_1	x_2	x_3	x_4	y
5.6	10.1	0.55	0.789	30.8
5.6	10.1	0.55	0.677	27.5
5.6	10.1	0.55	0.59	25.2
5.6	10.1	0.55	0.523	22.8
2.14	112	0.34	0.68	41.7
4.14	112	0.34	0.803	33.7
8.15	112	0.34	0.889	29.7
2.14	112	0.34	0.514	41.8
4.14	112	0.34	0.672	37.1
8.15	112	0.34	0.801	40.1
2.14	112	0.34	0.306	42.7
4.14	112	0.34	0.506	48.6
8.15	112	0.34	0.668	42.4

y: Dimensionless factor for the pressure drop through a bubble cap
x_1: Superficial fluid velocity of the gas (cm/s)
x_2: Kinematic viscosity
x_3: Mesh opening (cm)
x_4: Dimensionless number relating the superficial fluid velocity of the gas to the superficial fluid velocity of the liquid

Source: "A Correlation of Two-Phase Pressure Drops in Screen-plate Bubble Column," by C. H. Liu, M. Kan, and B. H. Chen, *Canadian Journal of Chemical Engineering*, **71**, 460–463.

TABLE B.10 Kinematic Viscosity Data

x_1	x_2	y
0.9189	−10	3.128
0.9189	0	2.427
0.9189	10	1.94
0.9189	20	1.586
0.9189	30	1.325
0.9189	40	1.126
0.9189	50	0.9694
0.9189	60	0.8473
0.9189	70	0.7481
0.9189	80	0.6671
0.7547	−10	2.27
0.7547	0	1.819
0.7547	10	1.489
0.7547	20	1.246
0.7547	30	1.062
0.7547	40	0.916
0.7547	50	0.8005
0.7547	60	0.7091
0.7547	70	0.6345
0.7547	80	0.5715
0.5685	−10	1.593
0.5685	0	1.324
0.5685	10	1.118
0.5685	20	0.9576
0.5685	30	0.8302
0.5685	40	0.7282
0.5685	50	0.647
0.5685	60	0.5784
0.5685	70	0.5219
0.5685	80	0.4735
0.361	−10	1.161
0.361	0	0.9925
0.361	10	0.8601
0.361	20	0.7523
0.361	30	0.6663
0.361	40	0.594
0.361	50	0.5338
0.361	60	0.4804
0.361	70	0.4361
0.361	80	0.4016

y: Kinematic viscosity (10^{-6} m^2/s).
x_1: Ratio of 2-methoxyethanol to 1,2-dimethoxyethane (dimensionless).
x_2: Temperature (°C).

Source: "Viscosimetric Studies on 2-Methoxyethanol + 1, 2-Dimethoxyethane Binary Mixtures from −10 to 80°C," *Canadian Journal of Chemical Engineering*, **75**, 494–501.

TABLE B.11 Wine Quality Data (Found in Minitab)

Clarity, x_1	Aroma, x_2	Body, x_3	Flavor, x_4	Oakiness, x_5	Quality, y	Region
1	3.3	2.8	3.1	4.1	9.8	1
1	4.4	4.9	3.5	3.9	12.6	1
1	3.9	5.3	4.8	4.7	11.9	1
1	3.9	2.6	3.1	3.6	11.1	1
1	5.6	5.1	5.5	5.1	13.3	1
1	4.6	4.7	5	4.1	12.8	1
1	4.8	4.8	4.8	3.3	12.8	1
1	5.3	4.5	4.3	5.2	12	1
1	4.3	4.3	3.9	2.9	13.6	3
1	4.3	3.9	4.7	3.9	13.9	1
1	5.1	4.3	4.5	3.6	14.4	3
0.5	3.3	5.4	4.3	3.6	12.3	2
0.8	5.9	5.7	7	4.1	16.1	3
0.7	7.7	6.6	6.7	3.7	16.1	3
1	7.1	4.4	5.8	4.1	15.5	3
0.9	5.5	5.6	5.6	4.4	15.5	3
1	6.3	5.4	4.8	4.6	13.8	3
1	5	5.5	5.5	4.1	13.8	3
1	4.6	4.1	4.3	3.1	11.3	1
0.9	3.4	5	3.4	3.4	7.9	2
0.9	6.4	5.4	6.6	4.8	15.1	3
1	5.5	5.3	5.3	3.8	13.5	3
0.7	4.7	4.1	5	3.7	10.8	2
0.7	4.1	4	4.1	4	9.5	2
1	6	5.4	5.7	4.7	12.7	3
1	4.3	4.6	4.7	4.9	11.6	2
1	3.9	4	5.1	5.1	11.7	1
1	5.1	4.9	5	5.1	11.9	2
1	3.9	4.4	5	4.4	10.8	2
1	4.5	3.7	2.9	3.9	8.5	2
1	5.2	4.3	5	6	10.7	2
0.8	4.2	3.8	3	4.7	9.1	1
1	3.3	3.5	4.3	4.5	12.1	1
1	6.8	5	6	5.2	14.9	3
0.8	5	5.7	5.5	4.8	13.5	1
0.8	3.5	4.7	4.2	3.3	12.2	1
0.8	4.3	5.5	3.5	5.8	10.3	1
0.8	5.2	4.8	5.7	3.5	13.2	1

The wine type here is Pinot Noir. Region refers to distinct geographic regions.

TABLE B.12 Heat Treating Data

Temp	Soaktime	Soakpct	Difftime	Diffpct	Pitch
1650	0.58	1.10	0.25	0.90	0.013
1650	0.66	1.10	0.33	0.90	0.016
1650	0.66	1.10	0.33	0.90	0.015
1650	0.66	1.10	0.33	0.95	0.016
1600	0.66	1.15	0.33	1.00	0.015
1600	0.66	1.15	0.33	1.00	0.016
1650	1.00	1.10	0.50	0.80	0.014
1650	1.17	1.10	0.58	0.80	0.021
1650	1.17	1.10	0.58	0.80	0.018
1650	1.17	1.10	0.58	0.80	0.019
1650	1.17	1.10	0.58	0.90	0.021
1650	1.17	1.10	0.58	0.90	0.019
1650	1.17	1.15	0.58	0.90	0.021
1650	1.20	1.15	1.10	0.80	0.025
1650	2.00	1.15	1.00	0.80	0.025
1650	2.00	1.10	1.10	0.80	0.026
1650	2.20	1.10	1.10	0.80	0.024
1650	2.20	1.10	1.10	0.80	0.025
1650	2.20	1.15	1.10	0.80	0.024
1650	2.20	1.10	1.10	0.90	0.025
1650	2.20	1.10	1.10	0.90	0.027
1650	2.20	1.10	1.50	0.90	0.026
1650	3.00	1.15	1.50	0.80	0.029
1650	3.00	1.10	1.50	0.70	0.030
1650	3.00	1.10	1.50	0.75	0.028
1650	3.00	1.15	1.66	0.85	0.032
1650	3.33	1.10	1.50	0.80	0.033
1700	4.00	1.10	1.50	0.70	0.039
1650	4.00	1.10	1.50	0.70	0.040
1650	4.00	1.15	1.50	0.85	0.035
1700	12.50	1.00	1.50	0.70	0.056
1700	18.50	1.00	1.50	0.70	0.068

y = PITCH: Results of the pitch carbon analysis test
TEMP: Furnace temperature
SOAKTIME: Duration of the carburizing cycle
SOAKPCT: Carbon concentration
DIFFTIME: Duration of the diffuse cycle
DIFFPCT: Carbon concentration of the diffuse cycle

TABLE B.13 Jet Turbine Engine Thrust Data

Observation Number	y	x_1	x_2	x_3	x_4	x_5	x_6
1	4540	2140	20640	30250	205	1732	99
2	4315	2016	20280	30010	195	1697	100
3	4095	1905	19860	29780	184	1662	97
4	3650	1675	18980	29330	164	1598	97
5	3200	1474	18100	28960	144	1541	97
6	4833	2239	20740	30083	216	1709	87
7	4617	2120	20305	29831	206	1669	87
8	4340	1990	19961	29604	196	1640	87
9	3820	1702	18916	29088	171	1572	85
10	3368	1487	18012	28675	149	1522	85
11	4445	2107	20520	30120	195	1740	101
12	4188	1973	20130	29920	190	1711	100
13	3981	1864	19780	29720	180	1682	100
14	3622	1674	19020	29370	161	1630	100
15	3125	1440	18030	28940	139	1572	101
16	4560	2165	20680	30160	208	1704	98
17	4340	2048	20340	29960	199	1679	96
18	4115	1916	19860	29710	187	1642	94
19	3630	1658	18950	29250	164	1576	94
20	3210	1489	18700	28890	145	1528	94
21	4330	2062	20500	30190	193	1748	101
22	4119	1929	20050	29960	183	1713	100
23	3891	1815	19680	29770	173	1684	100
24	3467	1595	18890	29360	153	1624	99
25	3045	1400	17870	28960	134	1569	100
26	4411	2047	20540	30160	193	1746	99
27	4203	1935	20160	29940	184	1714	99
28	3968	1807	19750	29760	173	1679	99
29	3531	1591	18890	29350	153	1621	99
30	3074	1388	17870	28910	133	1561	99
31	4350	2071	20460	30180	198	1729	102
32	4128	1944	20010	29940	186	1692	101
33	3940	1831	19640	29750	178	1667	101
34	3480	1612	18710	29360	156	1609	101
35	3064	1410	17780	28900	136	1552	101
36	4402	2066	20520	30170	197	1758	100
37	4180	1954	20150	29950	188	1729	99
38	3973	1835	19750	29740	178	1690	99
39	3530	1616	18850	29320	156	1616	99
40	3080	1407	17910	28910	137	1569	100

y: Thrust
x_1: Primary speed of rotation
x_2: Secondary speed of rotation
x_3: Fuel flow rate
x_4: Pressure
x_5: Exhaust temperature
x_6: Ambient temperature at time of test

TABLE B.14 Electronic Inverter Data

Observation Number	x_1	x_2	x_3	x_4	x_5	y
1	3	3	3	3	0	0.787
2	8	30	8	8	0	0.293
3	3	6	6	6	0	1.710
4	4	4	4	12	0	0.203
5	8	7	6	5	0	0.806
6	10	20	5	5	0	4.713
7	8	6	3	3	25	0.607
8	6	24	4	4	25	9.107
9	4	10	12	4	25	9.210
10	16	12	8	4	25	1.365
11	3	10	8	8	25	4.554
12	8	3	3	3	25	0.293
13	3	6	3	3	50	2.252
14	3	8	8	3	50	9.167
15	4	8	4	8	50	0.694
16	5	2	2	2	50	0.379
17	2	2	2	3	50	0.485
18	10	15	3	3	50	3.345
19	15	6	2	3	50	0.208
20	15	6	2	3	75	0.201
21	10	4	3	3	75	0.329
22	3	8	2	2	75	4.966
23	6	6	6	4	75	1.362
24	2	3	8	6	75	1.515
25	3	3	8	8	75	0.751

y: Transient point (volts) of PMOS-NMOS inverters
x_1: Width of the NMOS device
x_2: Length of the NMOS device
x_3: Width of the PMOS device
x_4: Length of the PMOS device

TABLE B.15 Air Pollution and Mortality Data

City	Mort	Precip	Educ	Nonwhite	Nox	SO2
San Jose, CA	790.73	13.00	12.20	3.00	32.00	3.00
Wichita, KS	823.76	28.00	12.10	7.50	2.00	1.00
San Diego, CA	839.71	10.00	12.10	5.90	66.00	20.00
Lancaster, PA	844.05	43.00	9.50	2.90	7.00	32.00
Minneapolis, MN	857.62	25.00	12.10	3.00	11.00	26.00
Dallas, TX	860.10	35.00	11.80	14.80	1.00	1.00
Miami, FL	861.44	60.00	11.50	11.50	1.00	1.00
Los Angeles, CA	861.83	11.00	12.10	7.80	319.00	130.00
Grand Rapids, MI	871.34	31.00	10.90	5.10	3.00	10.00
Denver, CO	871.77	15.00	12.20	4.70	8.00	28.00
Rochester, NY	874.28	32.00	11.10	5.00	4.00	18.00
Hartford, CT	887.47	43.00	11.50	7.20	3.00	10.00
Fort Worth, TX	891.71	31.00	11.40	11.50	1.00	1.00

(Continued)

TABLE B.15 (*Continued*)

City	Mort	Precip	Educ	Nonwhite	Nox	SO2
Portland, OR	893.99	37.00	12.00	3.60	21.00	44.00
Worcester, MA	895.70	45.00	11.10	1.00	3.00	8.00
Seattle, WA	899.26	35.00	12.20	5.70	7.00	20.00
Bridgeport, CT	899.53	45.00	10.60	5.30	4.00	4.00
Springfield, MA	904.16	45.00	11.10	3.40	4.00	20.00
San Francisco, CA	911.70	18.00	12.20	13.70	171.00	86.00
York, PA	911.82	42.00	9.00	4.80	8.00	49.00
Utica, NY	912.20	40.00	10.30	2.50	2.00	11.00
Canton, OH	912.35	36.00	10.70	6.70	7.00	20.00
Kansas City, MO	919.73	35.00	12.00	12.60	4.00	4.00
Akron, OH	921.87	36.00	11.40	8.80	15.00	59.00
New Haven, CT	923.23	46.00	11.30	8.80	3.00	8.00
Milwasukee, WI	929.15	30.00	11.10	5.80	23.00	125.00
Boston, MA	934.70	43.00	12.10	3.50	32.00	62.00
Dayton, OH	936.23	36.00	11.40	12.40	4.00	16.00
Providence, RI	938.50	42.00	10.10	2.20	4.00	18.00
Flint, MI	941.18	30.00	10.80	13.10	4.00	11.00
Reading, PA	946.18	41.00	9.60	2.70	11.00	89.00
Syracuse, NY	950.67	38.00	11.40	3.80	5.00	25.00
Houston, TX	952.53	46.00	11.40	21.00	5.00	1.00
Saint Louis, MO	953.56	34.00	9.70	17.20	15.00	68.00
Youngstown, OH	954.44	38.00	10.70	11.70	13.00	39.00
Columbus, OH	958.84	37.00	11.90	13.10	9.00	15.00
Detroit, MI	959.22	31.00	10.80	15.80	35.00	124.00
Nashville, TN	961.01	45.00	10.10	21.00	14.00	78.00
Allentown, PA	962.35	44.00	9.80	0.80	6.00	33.00
Washington, DC	967.80	41.00	12.30	25.90	28.00	102.00
Indianapolis, IN	968.66	39.00	11.40	15.60	7.00	33.00
Cincinnati, OH	970.47	40.00	10.20	13.00	26.00	146.00
Greensboro, NC	971.12	42.00	10.40	22.70	3.00	5.00
Toledo, OH	972.46	31.00	10.70	9.50	7.00	25.00
Atlanta, GA	982.29	47.00	11.10	27.10	8.00	24.00
Cleveland, OH	985.95	35.00	11.10	14.70	21.00	64.00
Louisville, KY	989.27	30.00	9.90	13.10	37.00	193.00
Pittsburgh, PA	991.29	36.00	10.60	8.10	59.00	263.00
New York, NY	994.65	42.00	10.70	11.30	26.00	108.00
Albany, NY	997.88	35.00	11.00	3.50	10.00	39.00
Buffalo, NY	1001.90	36.00	10.50	8.10	12.00	37.00
Wilmington, DE	1003.50	45.00	11.30	12.10	11.00	42.00
Memphis, TE	1006.49	50.00	10.40	36.70	18.00	34.00
Philadelphia, PA	1015.02	42.00	10.50	17.50	32.00	161.00
Chattanooga, TN	1017.61	52.00	9.60	22.20	8.00	27.00
Chicago, IL	1024.89	33.00	10.90	16.30	63.00	278.00
Richmond, VA	1025.50	44.00	11.00	28.60	9.00	48.00
Birmingham, AL	1030.38	53.00	10.20	38.50	32.00	72.00
Baltimore, MD	1071.29	43.00	9.60	24.40	38.00	206.00
New Orleans, LA	1113.06	54.00	9.70	31.40	17.00	1.00

TABLE B.16 Life Expectancy Data

Country	LifeExp	People-per-TV	People-per-Dr	LifeExpMale	LifeExpFemale
Argentina	70.5	4	370	74	67
Bangladesh	53.5	315	6,166	53	54
Brazil	65	4	684	68	62
Canada	76.5	1.7	449	80	73
China	70	8	643	72	68
Colombia	71	5.6	1,551	74	68
Egypt	60.5	15	616	61	60
Ethiopia	51.5	503	36,660	53	50
France	78	2.6	403	82	74
Germany	76	2.6	346	79	73
India	57.5	44	2,471	58	57
Indonesia	61	24	7,427	63	59
Iran	64.5	23	2,992	65	64
Italy	78.5	3.8	233	82	75
Japan	79	1.8	609	82	76
Kenya	61	96	7,615	63	59
Korea, North	70	90	370	73	67
Korea, South	70	4.9	1,066	73	67
Mexico	72	6.6	600	76	68
Morocco	64.5	21	4,873	66	63
Burma	54.5	592	3,485	56	53
Pakistan	56.5	73	2,364	57	56
Peru	64.5	14	1,016	67	62
Philippines	64.5	8.8	1,062	67	62
Poland	73	3.9	480	77	69
Romania	72	6	559	75	69
Russia	69	3.2	259	74	64
South Africa	64	11	1,340	67	61
Spain	78.5	2.6	275	82	75
Sudan	53	23	12,550	54	52
Taiwan	75	3.2	965	78	72
Thailand	68.5	11	4,883	73	66
Turkey	70	5	1,189	72	68
Ukraine	70.5	3	226	75	66
United Kingdom	76	3	611	79	73
United States	75.5	1.3	404	79	72
Venezuela	74.5	5.6	576	78	71
Vietnam	65	29	3,096	67	63

Table B.17 Patient Satisfaction Data

Satisfaction	Age	Severity	Surgical-Medical	Anxiety
68	55	50	0	2.1
77	46	24	1	2.8
96	30	46	1	3.3
80	35	48	1	4.5
43	59	58	0	2
44	61	60	0	5.1
26	74	65	1	5.5
88	38	42	1	3.2
75	27	42	0	3.1
57	51	50	1	2.4
56	53	38	1	2.2
88	41	30	0	2.1
88	37	31	0	1.9
102	24	34	0	3.1
88	42	30	0	3
70	50	48	1	4.2
82	58	61	1	4.6
43	60	71	1	5.3
46	62	62	0	7.2
56	68	38	0	7.8
59	70	41	1	7
26	79	66	1	6.2
52	63	31	1	4.1
83	39	42	0	3.5
75	49	40	1	2.1

TABLE B.18 Fuel Consumption Data

y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
343	0	52.8	811.7	2.11	220	261	87	1.8
356	1	52.8	811.7	2.11	220	261	87	1.8
344	0	50.0	821.3	2.11	223	260	87	16.6
356	1	50.0	821.3	2.11	223	260	87	16.6
352	0	47.2	832.0	2.09	221	261	92	23.0
361	1	47.2	832.0	2.09	221	261	92	23.0
372	0	47.0	831.3	2.26	190	323	75	25.1
355	1	47.0	831.3	2.26	190	323	75	25.1
375	0	48.3	836.8	2.47	180	364	71	26.1
359	1	48.3	836.8	2.47	180	364	71	26.1
364	0	44.7	808.3	1.41	180	300	64	20.0
357	1	44.7	808.3	1.41	180	300	64	20.0
368	0	55.7	808.7	1.44	176	299	64	20.5
360	1	55.7	808.7	1.44	176	299	64	20.5
372	0	52.8	813.2	1.96	175	301	75	17.3
352	1	52.8	813.2	1.96	175	301	75	17.3

y: fuel consumption (g/km)
x_1: vehicle (0—bus, 1—truck)
x_2: cetane number
x_3: density (g/L, 15°C)
x_4: viscosity (KV, 40°C)
x_5: initial boiling point (degrees C)
x_6: final boiling point (degrees C)
x_7: flash point (degrees C)
x_8: total aromatics (percent)

Source: "A Multivariate Statistical Analysis of Fuel-Related Polycyclic Aromatic Hydrocarbon Emissions from Heavy-Duty Diesel Vehicles," by R. Westerholm and H. Li, *Environmental Science and Technology*, **28**, 965–972.

TABLE B.19 Wine Quality of Young Red Wines

y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
19.2	0	3.85	66	9.35	5.65	2.40	3.25	0.33	19	0.065
18.3	0	3.73	79	11.15	6.95	3.15	3.80	0.36	21	0.076
17.1	0	3.88	73	9.40	5.75	2.10	3.65	0.40	18	0.073
17.3	0	3.86	99	12.85	7.70	3.90	3.80	0.35	22	0.076
16.8	0	3.98	75	8.55	5.05	2.05	3.00	0.49	12	0.060
16.5	0	3.85	61	10.30	6.20	2.50	3.70	0.38	20	0.074
15.8	0	3.93	66	4.90	2.75	1.20	1.55	0.29	11	0.031
15.2	0	3.66	86	6.40	4.00	1.50	2.50	0.27	19	0.050
15.2	0	3.91	78	5.80	3.30	1.40	1.90	0.40	9	0.038
14.0	0	3.47	178	3.60	2.25	0.75	1.50	0.37	8	0.030
14.0	0	3.91	81	3.90	2.15	1.00	1.15	0.32	7	0.023
13.8	0	3.75	108	5.80	3.20	1.60	1.60	0.38	8	0.032
13.6	0	3.90	92	5.40	2.85	1.55	1.30	0.44	6	0.026
12.8	0	3.92	96	5.00	2.70	1.40	1.30	0.35	7	0.026
18.5	1	3.87	89	9.15	5.60	1.95	3.65	0.46	16	0.073
17.3	1	3.97	59	10.25	6.10	2.40	3.70	0.40	19	0.074
16.3	1	3.76	22	8.20	5.00	1.85	3.15	0.25	25	0.063
16.3	1	3.76	77	8.35	5.05	1.90	3.15	0.37	17	0.063
16.0	1	3.98	58	10.15	6.00	2.60	3.40	0.38	18	0.068
16.0	1	3.88	85	6.85	4.10	1.50	2.60	0.33	16	0.052
15.7	1	3.75	120	8.80	5.50	1.85	3.65	0.39	19	0.073
15.5	1	3.98	94	5.45	3.05	1.50	1.55	0.41	8	0.031
15.3	1	3.69	122	8.00	5.05	1.90	3.15	0.27	23	0.063
15.3	1	3.77	144	5.60	3.35	1.10	2.25	0.36	12	0.045
14.8	1	3.74	10	7.90	4.75	1.95	2.80	0.25	23	0.056
14.3	1	3.76	100	5.55	3.25	1.15	2.10	0.34	12	0.042
14.3	1	3.91	73	4.65	2.70	0.95	1.75	0.36	10	0.035
14.2	1	3.60	301	4.25	2.40	1.25	1.15	0.42	6	0.023
14.0	1	3.76	104	8.70	5.10	2.25	2.85	0.34	17	0.057
13.8	1	3.90	67	7.40	4.40	1.60	2.80	0.45	13	0.056
12.5	1	3.80	89	5.35	3.15	1.20	1.95	0.32	12	0.039
11.5	1	3.65	192	6.35	3.90	1.25	2.65	0.63	8	0.053

y: quality rating (20 maximum)
x_1: wine varietal (0—Cabernet Sauvignon, 1—Shiraz)
x_2: pH
x_3: Total SO_2 (ppm)
x_4: color density
x_5: wine color
x_6: polymeric pigment color
x_7: anthocyanin color
x_8: total anthocyanins (g/L)
x_9: degree of ionization of anthocyanins (percent)
x_{10}: ionized anthocyanins (percent)

Source: “Wine Quality: Correlations with Colour Density and Anthocyanin Equilibria in a Group of Young Red Wines,” by T. C. Somers and M. E. Evans, *Journal of the Science of Food and Agriculture*, **25**, 1369–1379.

TABLE B.20 Methanol Oxidation in Supercritical Water

x_1	x_2	x_3	x_4	x_5	y
0	454	8.8	3.90	1.30	1.1
0	474	8.2	3.68	1.16	4.2
0	524	7.0	2.78	1.25	94.2
0	503	7.4	2.27	1.57	20.7
0	493	7.6	2.40	1.55	15.7
0	493	7.6	1.28	2.71	15.9
0	493	7.5	5.68	0.54	14.7
0	493	7.6	4.65	0.74	10.8
0	493	7.4	3.30	1.01	9.6
0	493	7.4	2.52	1.12	12.7
0	493	7.5	2.44	0.86	7.1
0	493	7.5	2.47	0.45	9.0
1	530	6.7	1.97	1.74	96.0
1	522	6.9	2.03	0.94	78.4
1	522	6.9	2.05	0.93	78.3
1	503	7.3	2.16	0.94	71.4
1	453	8.7	2.76	0.90	0.5
1	483	7.7	2.42	0.91	3.1

x_1: reactor system
x_2: temperature (degrees C)
x_3: reactor residence time (seconds)
x_4: inlet concentration of methanol
x_5: ratio of inlet oxygen to inlet methanol
y: percent conversion

Source: "Revised Global Kinetic Measurements of Methanol Oxidation in Supercritical Water," by J. W. Tester, P. A. Webley, and H. R. Holgate, *Industrial and Engineering Chemical Research*, **32**, 236–239.

TABLE B.21 Hald Cement Data

Observation					
i	y_i	x_{i1}	x_{i2}	x_{i3}	x_{i4}
1	78.5	7	26	6	60
2	74.3	1	29	15	52
3	104.3	11	56	8	20
4	87.6	11	31	8	47
5	95.9	7	52	6	33
6	109.2	11	55	9	22
7	102.7	3	71	17	6
8	72.5	1	31	22	44
9	93.1	2	54	18	22
10	115.9	21	47	4	26
11	83.8	1	40	23	34
12	113.3	11	66	9	12
13	109.4	10	68	8	12

Source: Hald, A. [1952], *Statistical Theory with Engineering Applications*, Wiley, New York.