Регресионен анализ със SAS.

Чрез регресионният анализ се изучават и оценяват възможните функционални зависимости между две или повече случайни величини. Търси се отговор на въпроса: съществува ли функционална зависимост между две зависими случайни величини и ако да — да се намери функция, която я описва достатъчно точно.

Регресионният анализ не дава отговор на въпроса какви са причините.Той показва взаимните отношения между променливите, които в контекста на разглежданата задача могат да бъдат интерпретирани като причинно-следствени. Предназначен е за решаване на общи задачи — относно вида на зависимостта, определяне функцията на тази зависимост, количествено определяне параметрите на избраната функция. Променливите, чиито изменение искаме да обясним или предскажем, се наричат зависими. Независимата променлива се явява причината. От друга страна корелационният анализ показва взаимозависимостта, а регресионният причинно-следствените връзки между повече от две променливи. Може да се приемат повече променливи като независими и да търсим тяхното влияние върху една зависима. Изследователят определя кои променливи ще бъдат зависими и кои независими. Коефициент на регресия обикновено се бележи се с β. При интерпретация, когато β>0, повишаването на значението на едната променлива води до повишаване значението на другата. Важна е силата на тази връзка. Когато β<0, повишаването на стойността на независимата води до понижаване на стойността на зависимата. Могат да се използват няколко зависими променливи, възможно е да се използва като допълнителен коефициент ΔR2 — Adjusted R Square. Той показва какъв процент от случаите ще доведат до промени в зависимата. Може само една независима да доведе до промяна в зависимата. Тогава ΔR2 ще се отнася до нея. Ако са повече, той ще се отнася общо за тях.

Programme 1

```
data quartet;
  input x1 y1 y2 y3 x4 y4 ;
  x2=x1 ;
  x3=x1 ;
  cards;
10  8.04  9.14  7.46    8  6.58
 8  6.95  8.14  6.77    8  5.76
13  7.58  8.74 12.74    8  7.71
 9  8.81  8.77  7.11    8  8.84
11  8.33  9.26  7.81    8  8.47
14  9.96  8.10  8.84    8  7.04
 6  7.24  6.13  6.08    8  5.25
 4  4.26  3.10  5.39   19 12.50
12 10.84  9.13  8.15    8  5.56
 7  4.82  7.26  6.42    8  7.91
 5  5.68  4.74  5.73    8  6.89
;
run;
proc means;
run;
proc reg data=quartet;
  model y1=x1;
  plot y1*x1 /vaxis=(0 to 15 by 5) haxis=(0 to 20 by 5);
  label x1='x value for dataset 1';
```

```
  label y1 ='y value for dataset 1';
run;
quit;
proc reg data=quartet;
  model y2=x2;
  plot y2*x2 /vaxis=(0 to 15 by 5) haxis=(0 to 20 by 5);
  label x2='x value for dataset 2';
  label y2 ='y value for dataset 2';
run;
quit;
proc reg data=quartet;
  model y3=x3;
  plot y3*x3 /vaxis=(0 to 15 by 5) haxis=(0 to 20 by 5);
  label x3='x value for dataset 3';
  label y3 ='y value for dataset 3';
run;
quit;
proc reg data=quartet;
  model y4=x4;
  plot y4*x4 /vaxis=(0 to 15 by 5) haxis=(0 to 20 by 5);
  label x4='x value for dataset 4';
  label y4 ='y value for dataset 4';
run;
quit;
```

Programme 2

```
data prestige;
 length occtitle $ 25 occ $ 4 ;
  input occtitle educat income percwomn prestige occ_code occ ;
  cards;
GOV_ADMINISTRATORS            13.11 12351 11.16 68.8  1113  prof
GENERAL_MANAGERS              12.26 25879  4.02 69.1  1130  prof
ACCOUNTANTS                   12.77  9271 15.70 63.4  1171  prof
PURCHASING_OFFICERS           11.42  8865  9.11 56.8  1175  prof
CHEMISTS                      14.62  8403 11.68 73.5  2111  prof
PHYSICISTS                    15.64 11030  5.13 77.6  2113  prof
BIOLOGISTS                    15.09  8258 25.65 72.6  2133  prof
ARCHITECTS                    15.44 14163  2.69 78.1  2141  prof
CIVIL_ENGINEERS               14.52 11377  1.03 73.1  2143  prof
MINING_ENGINEERS              14.64 11023  0.94 68.8  2153  prof
SURVEYORS                     12.39  5902  1.91 62.0  2161  prof
DRAUGHTSMEN                   12.30  7059  7.83 60.0  2163  prof
COMPUTER_PROGRAMERS           13.83  8425 15.33 53.8  2183  prof
ECONOMISTS                    14.44  8049 57.31 62.2  2311  prof
PSYCHOLOGISTS                 14.36  7405 48.28 74.9  2315  prof
SOCIAL_WORKERS                14.21  6336 54.77 55.1  2331  prof
LAWYERS                       15.77 19263  5.13 82.3  2343  prof
LIBRARIANS                    14.15  6112 77.10 58.1  2351  prof
VOCATIONAL_COUNSELLORS        15.22  9593 34.89 58.3  2391  prof
MINISTERS                     14.50  4686  4.14 72.8  2511  prof
UNIVERSITY_TEACHERS           15.97 12480 19.59 84.6  2711  prof
```

PRIMARY_SCHOOL_TEACHERS	13.62	5648	83.78	59.6	2731	prof
SECONDARY_SCHOOL_TEACHERS	15.08	8034	46.80	66.1	2733	prof
PHYSICIANS	15.96	25308	10.56	87.2	3111	prof
VETERINARIANS	15.94	14558	4.32	66.7	3115	prof
OSTEOPATHS_CHIROPRACTORS	14.71	17498	6.91	68.4	3117	prof
NURSES	12.46	4614	96.12	64.7	3131	prof
NURSING_AIDES	9.45	3485	76.14	34.9	3135	bc
PHYSIO_THERAPSTS	13.62	5092	82.66	72.1	3137	prof
PHARMACISTS	15.21	10432	24.71	69.3	3151	prof
MEDICAL_TECHNICIANS	12.79	5180	76.04	67.5	3156	wc
COMMERCIAL_ARTISTS	11.09	6197	21.03	57.2	3314	prof
RADIO_TV_ANNOUNCERS	12.71	7562	11.15	57.6	3337	wc
ATHLETES	11.44	8206	8.13	54.1	3373	?
SECRETARIES	11.59	4036	97.51	46.0	4111	wc
TYPISTS	11.49	3148	95.97	41.9	4113	wc
BOOKKEEPERS	11.32	4348	68.24	49.4	4131	wc
TELLERS_CASHIERS	10.64	2448	91.76	42.3	4133	wc
COMPUTER_OPERATORS	11.36	4330	75.92	47.7	4143	wc
SHIPPING_CLERKS	9.17	4761	11.37	30.9	4153	wc
FILE_CLERKS	12.09	3016	83.19	32.7	4161	wc
RECEPTIONSTS	11.04	2901	92.86	38.7	4171	wc
MAIL_CARRIERS	9.22	5511	7.62	36.1	4172	wc
POSTAL_CLERKS	10.07	3739	52.27	37.2	4173	wc
TELEPHONE_OPERATORS	10.51	3161	96.14	38.1	4175	wc
COLLECTORS	11.20	4741	47.06	29.4	4191	wc
CLAIM_ADJUSTORS	11.13	5052	56.10	51.1	4192	wc
TRAVEL_CLERKS	11.43	6259	39.17	35.7	4193	wc
OFFICE_CLERKS	11.00	4075	63.23	35.6	4197	wc
SALES_SUPERVISORS	9.84	7482	17.04	41.5	5130	wc
COMMERCIAL_TRAVELLERS	11.13	8780	3.16	40.2	5133	wc
SALES_CLERKS	10.05	2594	67.82	26.5	5137	wc
NEWSBOYS	9.62	918	7.00	14.8	5143	?
SERVICE_STATION_ATTENDANT	9.93	2370	3.69	23.3	5145	bc
INSURANCE__AGENTS	11.60	8131	13.09	47.3	5171	wc
REAL_ESTATE_SALESMEN	11.09	6992	24.44	47.1	5172	wc
BUYERS	11.03	7956	23.88	51.1	5191	wc
FIREFIGHTERS	9.47	8895	0.00	43.5	6111	bc
POLICEMEN	10.93	8891	1.65	51.6	6112	bc
COOKS	7.74	3116	52.00	29.7	6121	bc
BARTENDERS	8.50	3930	15.51	20.2	6123	bc
FUNERAL_DIRECTORS	10.57	7869	6.01	54.9	6141	bc
BABYSITTERS	9.46	611	96.53	25.9	6147	?
LAUNDERERS	7.33	3000	69.31	20.8	6162	bc
JANITORS	7.11	3472	33.57	17.3	6191	bc
ELEVATOR_OPERATORS	7.58	3582	30.08	20.1	6193	bc
FARMERS	6.84	3643	3.60	44.1	7112	?
FARM_WORKERS	8.60	1656	27.75	21.5	7182	bc
ROTARY_WELL_DRILLERS	8.88	6860	0.00	35.3	7711	bc
BAKERS	7.54	4199	33.30	38.9	8213	bc
SLAUGHTERERS_1	7.64	5134	17.26	25.2	8215	bc
SLAUGHTERERS_2	7.64	5134	17.26	34.8	8215	bc
CANNERS	7.42	1890	72.24	23.2	8221	bc
TEXTILE_WEAVERS	6.69	4443	31.36	33.3	8267	bc
TEXTILE_LABOURERS	6.74	3485	39.48	28.8	8278	bc
TOOL_DIE_MAKERS	10.09	8043	1.50	42.5	8311	bc

```
MACHINISTS                 8.81  6686  4.28 44.2  8313  bc
SHEET_METAL_WORKERS        8.40  6565  2.30 35.9  8333  bc
WELDERS                    7.92  6477  5.17 41.8  8335  bc
AUTO_WORKERS               8.43  5811 13.62 35.9  8513  bc
AIRCRAFT_WORKERS           8.78  6573  5.78 43.7  8515  bc
ELECTRONIC_WORKERS         8.76  3942 74.54 50.8  8534  bc
RADIO_TV_REPAIRMEN        10.29  5449  2.92 37.2  8537  bc
SEWING_MACH_OPERATORS      6.38  2847 90.67 28.2  8563  bc
AUTO_REPAIRMEN             8.10  5795  0.81 38.1  8581  bc
AIRCRAFT_REPAIRMEN        10.10  7716  0.78 50.3  8582  bc
RAILWAY_SECTIONMEN         6.67  4696  0.00 27.3  8715  bc
ELECTRICAL_LINEMEN         9.05  8316  1.34 40.9  8731  bc
ELECTRICIANS               9.93  7147  0.99 50.2  8733  bc
CONSTRUCTION_FOREMEN       8.24  8880  0.65 51.1  8780  bc
CARPENTERS                 6.92  5299  0.56 38.9  8781  bc
MASONS                     6.60  5959  0.52 36.2  8782 bc
HOUSE_PAINTERS             7.81  4549  2.46 29.9  8785  bc
PLUMBERS                   8.33  6928  0.61 42.9  8791  bc
CONSTRUCTION_LABOURERS     7.52  3910  1.09 26.5  8798  bc
PILOTS                    12.27 14032  0.58 66.1  9111  bc
TRAIN_ENGINEERS            8.49  8845  0.00 48.9  9131  bc
BUS_DRIVERS                7.58  5562  9.47 35.9  9171  bc
TAXI_DRIVERS               7.93  4224  3.59 25.1  9173  bc
LONGSHOREMEN               8.37  4753  0.00 26.1  9313  bc
TYPESETTERS               10.00  6462 13.58 42.2  9511  bc
BOOKBINDERS                8.55  3617 70.87 35.2  9517  bc
;
run;
axis1 order=(0 to 30000 by 5000);
axis2 order=(0 to 15.0 by 2.5);
proc capability data=prestige noprint;
  histogram income / midpoints=500 to 29000 by 1000
  haxis=axis1
  cfill=green;
  label income='Average Income';
run;
quit;
axis1 order=(0 to 30000 by 5000);
axis2 order=(0 to 15.0 by 2.5);

proc capability data=prestige noprint;
  histogram income/ midpoints=1000 to 29000 by 1000
  haxis=axis1 cfill=green;
  label income='Average Income';
run;
quit;
proc univariate data=prestige plots  plotsize=30;
  var income;
run;
proc kde data=prestige out=pkde;
  var income;
run;
data pkdeout;
```

```
  set pkde;
  if count ne 0 then mycount=0.00001;
run;

proc sort data=pkdeout;
  by income;
run;
axis2 order=(0 to 0.00015 by 0.00005);
symbol1 c=blue i=join v=none height=1;
symbol2 c=black i=none v=star height=0.5;
proc gplot data=pkdeout;
  plot density*income=1 mycount*income=2 / haxis=axis1 vaxis=axis2
overlay;
run;
quit;
data mypre;
  set prestige;
  a=1; * our second variable to plot by ;
run;

proc boxplot data=mypre;
  plot income*a / boxstyle=schematicid boxwidth=10;
  id occ;
  label a='Boxplot for income';
run;
quit;
```

Programme 3

```
data vocab;
 input obs educ vocab ;
  * obs   "Observation number" ;
  * educ  "Years of Education" ;
  * vocab "Vocabulary Test Score" ;
cards;
           1           0           5
           2           1           1
           3           3           1
           4           3           3
           5           4           1
           6           4           0
           7           4           1
           8           4           2
           9           4           4
          10           4           5
          11           5           2
          12           5           2
          13           5           2
          14           5           4
          15           6           4
          16           6           1
          17           6           1
```

18	6	4
19	6	3
20	6	5
21	6	5
22	7	8
23	7	2
24	7	8
25	7	5
26	7	4
27	7	0
28	7	7
29	7	0
30	7	3
31	7	5
32	7	4
33	8	3
34	8	6
35	8	0
36	8	3
37	8	4
38	8	3
39	8	2
40	8	1
41	8	5
42	8	10
43	8	0
44	8	8
45	8	2
46	8	5
47	8	7
48	8	3
49	8	1
50	8	3
51	8	4
52	8	7
53	8	5
54	8	0
55	8	4
56	8	5
57	8	0
58	8	5
59	8	3
60	8	8
61	8	5
62	8	6
63	8	7
64	8	6
65	8	5
66	8	6
67	8	6
68	8	7
69	8	5
70	8	5
71	8	1
72	8	4

73	8	3
74	8	5
75	8	7
76	8	5
77	9	6
78	9	5
79	9	5
80	9	3
81	9	2
82	9	1
83	9	5
84	9	3
85	9	5
86	9	6
87	9	5
88	9	4
89	9	5
90	9	4
91	9	4
92	9	1
93	9	5
94	9	7
95	9	7
96	9	3
97	9	7
98	9	3
99	9	7
100	9	6
101	9	7
102	9	2
103	9	2
104	9	6
105	9	3
106	9	3
107	9	1
108	9	2
109	9	5
110	9	4
111	10	1
112	10	5
113	10	9
114	10	2
115	10	7
116	10	7
117	10	7
118	10	7
119	10	0
120	10	1
121	10	7
122	10	2
123	10	4
124	10	4
125	10	4
126	10	3
127	10	4

128	10	3
129	10	6
130	10	6
131	10	1
132	10	4
133	10	3
134	10	5
135	10	4
136	10	5
137	10	1
138	10	6
139	10	6
140	10	4
141	10	6
142	10	6
143	10	4
144	10	6
145	10	6
146	10	2
147	10	8
148	10	6
149	10	5
150	10	2
151	10	3
152	11	3
153	11	4
154	11	5
155	11	6
156	11	6
157	11	1
158	11	7
159	11	0
160	11	6
161	11	7
162	11	6
163	11	8
164	11	7
165	11	6
166	11	7
167	11	4
168	11	4
169	11	3
170	11	5
171	11	3
172	11	7
173	11	6
174	11	4
175	11	4
176	11	2
177	11	6
178	11	6
179	11	3
180	11	8
181	11	2
182	11	5

183	11	5
184	11	7
185	11	4
186	11	4
187	11	2
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189	11	2
190	11	5
191	11	6
192	11	6
193	11	7
194	11	1
195	11	4
196	11	2
197	11	8
198	11	4
199	11	7
200	11	5
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202	11	2
203	11	6
204	11	4
205	11	2
206	11	4
207	11	5
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209	11	2
210	12	4
211	12	5
212	12	4
213	12	6
214	12	9
215	12	1
216	12	2
217	12	0
218	12	0
219	12	4
220	12	6
221	12	6
222	12	7
223	12	7
224	12	6
225	12	8
226	12	9
227	12	4
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235	12	5
236	12	5
237	12	4

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245	12	7
246	12	6
247	12	7
248	12	6
249	12	2
250	12	7
251	12	6
252	12	6
253	12	8
254	12	8
255	12	7
256	12	7
257	12	4
258	12	5
259	12	7
260	12	9
261	12	5
262	12	6
263	12	5
264	12	5
265	12	6
266	12	7
267	12	10
268	12	1
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270	12	7
271	12	7
272	12	7
273	12	5
274	12	9
275	12	6
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284	12	6
285	12	8
286	12	10
287	12	6
288	12	5
289	12	8
290	12	4
291	12	5
292	12	6

293	12	6
294	12	7
295	12	7
296	12	6
297	12	6
298	12	6
299	12	9
300	12	7
301	12	6
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303	12	6
304	12	6
305	12	4
306	12	5
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317	12	4
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319	12	7
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322	12	4
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325	12	8
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336	12	2
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339	12	6
340	12	3
341	12	10
342	12	5
343	12	6
344	12	9
345	12	9
346	12	7
347	12	2

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350	12	5
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353	12	8
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355	12	3
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357	12	3
358	12	5
359	12	4
360	12	3
361	12	5
362	12	0
363	12	7
364	12	6
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366	12	6
367	12	7
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369	12	6
370	12	6
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375	12	3
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427	12	6
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429	12	4
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435	12	7
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449	12	7
450	12	6
451	12	6
452	12	9
453	12	8
454	12	8
455	12	6
456	12	5
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732	15	2

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787	16	10

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795	16	3
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810	16	8
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813	16	8
814	16	5
815	16	10
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827	16	8
828	16	8
829	16	8
830	16	7
831	16	5
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833	16	10
834	16	10
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836	16	6
837	16	9
838	16	10
839	16	10
840	16	9
841	16	9
842	16	10

843	16	5
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845	16	10
846	16	8
847	16	6
848	16	7
849	16	9
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897	17	10

898	17	6
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938	18	10
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942	19	10
943	19	10
944	19	9
945	19	9
946	19	6
947	19	8
948	19	10
949	19	10
950	19	10
951	19	7
952	19	6

```
          953          20          10
          954          20           9
          955          20           4
          956          20           4
          957          20          10
          958          20           9
          959          20           8
          960          20          10
          961          20          10
          962          20          10
          963          20           9
          964          20           4
          965          20          10
          966          20           7
          967          20           8
          968          20           9
run;

proc means;
run;
axis1 order=(0 to 20 by 5);
axis2 order=(0 to 10 by 5)label=(r=0 a=90);
symbol c=black i=none v=circle height=0.8;
proc reg data=vocab;
  model vocab=educ;
  plot vocab*educ/haxis=(0 to 20 by 5) vaxis=(0 to 10 by 5);
  label educ='Year of Education';
  label vocab='Vocabulary Test Score';
run;
quit;
data Jitter;
  set vocab;
  retain seed 0;
  educ=educ+1.2*(Ranuni(seed)-0.5); /* Add Some Random Noise */
  vocab=vocab+4*(ranuni(seed)-0.5);
run;
axis1 order=(0 to 20 by 5);
axis2 order=(0 to 10 by 5)label=(r=0 a=90);

proc gplot data=Jitter;
  plot vocab*educ / haxis=axis1 vaxis=axis2;
  label educ='Years of Education';
  label vocab='Vocabulary Score';
run;
```

Programme 4

```
data ornstein;
  length sector nation $ 3;
  input firmno assets sector nation intrlcks ;
  * firmno   "Firm number, ranked by assets" ;
  * assets   "Assets in millions of dollars" ;
```

Регресионен анализ със SAS.

```
  * sector   "Industrial Sector" ;
  * nation   "Nation of Control" ;
  * intrlcks "Number interlocking director and executive positions" ;
cards;
```

1	147670	BNK	CAN	87
2	133000	BNK	CAN	107
3	113230	BNK	CAN	94
4	85418	BNK	CAN	48
5	75477	BNK	CAN	66
6	40742	FIN	CAN	69
7	40140	TRN	CAN	46
8	26866	BNK	CAN	16
9	24500	TRN	CAN	77
10	23700	MIN	US	6
11	23482	FIN	CAN	18
12	21512	FIN	CAN	29
13	20780	MIN	US	36
14	18688	FIN	CAN	20
15	18286	BNK	CAN	13
16	17910	MIN	US	6
17	17784	FIN	CAN	31
18	16631	FIN	CAN	27
19	16458	FIN	CAN	23
20	15280	MIN	US	13
21	15140	FIN	CAN	32
22	14362	FIN	CAN	28
23	14163	AGR	CAN	4
24	13820	HLD	CAN	42
25	13787	FIN	CAN	17
26	12810	TRN	CAN	40
27	12080	MIN	US	29
28	11250	MIN	CAN	29
29	11090	MAN	US	21
30	10580	MIN	OTH	3
31	10570	MAN	CAN	32
32	10568	FIN	CAN	29
33	10320	MIN	CAN	40
34	10110	TRN	US	5
35	9044	WOD	CAN	33
36	8395	FIN	CAN	21
37	8182	FIN	US	18
38	7994	TRN	US	18
39	7930	FIN	CAN	13
40	7877	MAN	US	2
41	7564	FIN	US	22
42	7510	FIN	US	13
43	7287	FIN	US	2
44	7018	BNK	CAN	0
45	6629	MIN	US	18
46	6571	FIN	CAN	9
47	6498	TRN	CAN	31
48	6407	AGR	CAN	16
49	6286	MIN	CAN	28
50	5932	FIN	CAN	34
51	5704	MIN	CAN	33

52	5479	MER	CAN	7
53	5437	TRN	US	12
54	5429	MER	US	15
55	5366	TRN	US	13
56	5035	MIN	US	16
57	5021	MIN	OTH	27
58	4980	AGR	CAN	12
59	4838	TRN	CAN	11
60	4634	MIN	US	0
61	4592	TRN	US	16
62	4390	TRN	CAN	17
63	4304	WOD	CAN	55
64	4298	AGR	OTH	15
65	4227	FIN	CAN	44
66	4210	MIN	US	18
67	4154	FIN	OTH	20
68	4100	MAN	US	19
69	4099	MAN	US	9
70	4088	FIN	CAN	12
71	3960	CON	OTH	17
72	3896	AGR	CAN	15
73	3879	WOD	CAN	27
74	3673	MER	CAN	30
75	3654	MIN	OTH	27
76	3631	TRN	US	12
77	3606	MIN	UK	11
78	3570	MER	CAN	28
79	3561	MIN	US	8
80	3274	TRN	CAN	12
81	3152	MAN	US	18
82	3058	WOD	UK	23
83	2958	WOD	CAN	51
84	2927	MIN	OTH	35
85	2878	MER	CAN	8
86	2814	AGR	CAN	43
87	2807	MIN	CAN	4
88	2801	WOD	CAN	18
89	2786	AGR	OTH	20
90	2757	MIN	UK	13
91	2667	MIN	UK	22
92	2625	AGR	UK	10
93	2566	MER	US	1
94	2549	HLD	US	6
95	2488	AGR	CAN	30
96	2285	MIN	US	6
97	2281	WOD	US	11
98	2182	AGR	US	20
99	2165	MIN	US	7
100	2164	MIN	OTH	13
101	2141	MIN	US	0
102	2108	MAN	UK	14
103	2086	MIN	US	19
104	2025	AGR	CAN	4
105	1881	AGR	CAN	2
106	1876	MER	CAN	2

107	1841	WOD	US	7
108	1656	MIN	OTH	25
109	1655	MER	CAN	29
110	1612	MER	CAN	5
111	1603	MIN	US	12
112	1601	WOD	CAN	25
113	1591	AGR	US	2
114	1583	HLD	CAN	25
115	1561	MIN	US	2
116	1520	MAN	US	16
117	1511	WOD	US	3
118	1487	MIN	OTH	9
119	1482	MAN	US	1
120	1477	MAN	US	0
121	1469	MIN	US	1
122	1434	MIN	US	1
123	1427	HLD	CAN	1
124	1416	MER	CAN	6
125	1378	MIN	US	12
126	1372	MIN	US	5
127	1343	WOD	UK	5
128	1337	MIN	US	0
129	1335	MAN	CAN	4
130	1315	MIN	OTH	5
131	1235	MAN	CAN	33
132	1172	AGR	CAN	11
133	1154	MAN	US	3
134	1154	HLD	CAN	3
135	1112	AGR	US	5
136	1060	AGR	CAN	25
137	1027	MIN	OTH	14
138	984	MER	US	1
139	978	MAN	US	0
140	953	MIN	US	12
141	950	WOD	CAN	18
142	943	MER	US	11
143	904	MIN	CAN	39
144	898	AGR	UK	3
145	888	WOD	CAN	2
146	848	WOD	CAN	8
147	844	MAN	US	0
148	839	TRN	CAN	11
149	832	AGR	CAN	13
150	830	MIN	UK	1
151	816	MIN	CAN	10
152	809	MAN	UK	0
153	802	MAN	CAN	0
154	798	AGR	CAN	11
155	789	MIN	UK	9
156	789	MAN	US	6
157	782	MER	CAN	11
158	780	MAN	US	1
159	779	MER	CAN	14
160	761	WOD	US	1
161	751	AGR	CAN	8

162	742	AGR	CAN	7
163	727	AGR	CAN	1
164	707	AGR	US	9
165	704	HLD	CAN	10
166	702	MAN	CAN	3
167	690	WOD	OTH	0
168	677	MAN	CAN	12
169	638	MAN	US	6
170	637	AGR	US	1
171	636	MIN	US	0
172	614	CON	CAN	2
173	590	MAN	US	2
174	589	MIN	OTH	23
175	586	TRN	CAN	10
176	575	AGR	CAN	1
177	566	AGR	US	0
178	559	MAN	US	7
179	558	AGR	CAN	14
180	552	AGR	CAN	7
181	548	MIN	US	5
182	540	MAN	CAN	6
183	539	AGR	CAN	9
184	533	TRN	CAN	5
185	523	MAN	US	8
186	519	MAN	US	8
187	519	AGR	CAN	0
188	516	TRN	CAN	5
189	511	HLD	CAN	0
190	510	MAN	CAN	11
191	508	MAN	OTH	1
192	497	AGR	CAN	4
193	495	MAN	CAN	0
194	494	MER	CAN	8
195	488	MAN	CAN	1
196	487	MAN	CAN	8
197	471	MER	US	0
198	456	MIN	US	5
199	456	MAN	US	0
200	444	AGR	US	1
201	438	MAN	UK	18
202	432	MAN	US	1
203	432	MAN	CAN	3
204	422	WOD	US	11
205	407	MIN	US	6
206	402	MAN	US	0
207	391	AGR	CAN	28
208	387	MER	CAN	11
209	386	CON	OTH	2
210	379	MAN	US	16
211	376	MER	CAN	5
212	375	MAN	US	8
213	372	AGR	US	8
214	370	AGR	UK	3
215	364	TRN	US	5
216	361	MIN	US	2

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217                359          AGR                US                  0
218                358          AGR                US                  0
219                352          WOD                CAN                21
220                350          MAN                US                  1
221                345          MER                US                  8
222                332          MAN                US                  0
223                326          AGR                CAN                 3
224                326          AGR                US                  0
225                326          MAN                CAN                28
226                325          MAN                OTH                 0
227                318          AGR                CAN                 2
228                312          MAN                US                  2
229                305          AGR                UK                  4
230                304          MER                US                  4
231                303          WOD                UK                  3
232                297          CON                CAN                 2
233                276          MIN                CAN                 9
234                270          MAN                CAN                 4
235                261          CON                UK                  1
236                256          MAN                US                  1
237                245          MIN                CAN                11
238                241          MIN                US                  3
239                225          AGR                US                  6
240                225          MIN                UK                  8
241                220          AGR                US                  0
242                201          AGR                US                  5
243                200          MAN                US                  0
244                188          MAN                US                  0
245                160          AGR                CAN                 0
246                158          AGR                CAN                 5
247                119          AGR                CAN                 6
248                 62          MIN                US                  0
;
run;

proc means ;
run;

proc freq ;
  tables sector nation;
run;
proc sort data=ornstein;
  by nation;
run;

proc boxplot data=ornstein;
  plot intrlcks*nation / boxstyle=schematic idsymbol=circle;
run;
quit;


Programme 5

data davis;
```

```
  input subject sex $ measwt measht reptwt reptht ;
  * subject  = "subject number" ;
  * sex      = "Gender of person" ;
  * measwt   = "Measured Weight" ;
  * measht   = "Measured Height" ;
  * reptwt   = "Reported Weight" ;
  * reptht   = "Reported Height" ;
  male = -1 ;
  if sex = "F" then male = 0;
  if sex = "M" then male = 1;
cards;
   1 M  77 182  77 180
   2 F  58 161  51 159
   3 F  53 161  54 158
   4 M  68 177  70 175
   5 F  59 157  59 155
   6 M  76 170  76 165
   7 M  76 167  77 165
   8 M  69 186  73 180
   9 M  71 178  71 175
  10 M  65 171  64 170
  11 M  70 175  75 174
  12 F 166  57  56 163
  13 F  51 161  52 158
  14 F  64 168  64 165
  15 F  52 163  57 160
  16 F  65 166  66 165
  17 M  92 187 101 185
  18 F  62 168  62 165
  19 M  76 197  75 200
  20 F  61 175  61 171
  21 M 119 180 124 178
  22 F  61 170  61 170
  23 M  65 175  66 173
  24 M  66 173  70 170
  25 F  54 171  59 168
  26 F  50 166  50 165
  27 F  63 169  61 168
  28 F  58 166  60 160
  29 F  39 157  41 153
  30 M 101 183 100 180
  31 F  71 166  71 165
  32 M  75 178  73 175
  33 M  79 173  76 173
  34 F  52 164  52 161
  35 F  68 169  63 170
  36 M  64 176  65 175
  37 F  56 166  54 165
  38 M  69 174  69 171
  39 M  88 178  86 175
  40 M  65 187  67 188
  41 F  54 164  53 160
  42 M  80 178  80 178
```

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43 F  63 163  59 159
44 M  78 183  80 180
45 M  85 179  82 175
46 F  54 160  55 158
47 M  73 180   .   .
48 F  49 161   .   .
49 F  54 174  56 173
50 F  75 162  75 158
51 M  82 182  85 183
52 F  56 165  57 163
53 M  74 169  73 170
54 M 102 185 107 185
55 M  64 177   .   .
56 M  65 176  64 172
57 F  66 170  65   .
58 M  73 183  74 180
59 M  75 172  70 169
60 M  57 173  58 170
61 M  68 165  69 165
62 M  71 177  71 170
63 M  71 180  76 175
64 F  78 173  75 169
65 M  97 189  98 185
66 F  60 162  59 160
67 F  64 165  63 163
68 F  64 164  62 161
69 F  52 158  51 155
70 M  80 178  76 175
71 F  62 175  61 171
72 M  66 173  66 175
73 F  55 165  54 163
74 F  56 163  57 159
75 F  50 166  50 161
76 F  50 171   .   .
77 F  50 160  55 150
78 F  63 160  64 158
79 M  69 182  70 180
80 M  69 183  70 183
81 F  61 165  60 163
82 M  55 168  56 170
83 F  53 169  52 175
84 F  60 167  55 163
85 F  56 170  56 170
86 M  59 182  61 183
87 M  62 178  66 175
88 F  53 165  53 165
89 F  57 163  59 160
90 F  57 162  56 160
91 M  70 173  68 170
92 F  56 161  56 161
93 M  84 184  86 183
94 M  69 180  71 180
95 M  88 189  87 185
96 F  56 165  57 160
97 M 103 185 101 182
```

```
 98 F  50 169  50 165
 99 F  52 159  52 153
100 F  55 155   . 154
101 F  55 164  55 163
102 M  63 178  63 175
103 F  47 163  47 160
104 F  45 163  45 160
105 F  62 175  63 173
106 F  53 164  51 160
107 F  52 152  51 150
108 F  57 167  55 164
109 F  64 166  64 165
110 F  59 166  55 163
111 M  84 183  90 183
112 M  79 179  79 171
113 F  55 174  57 171
114 M  67 179  67 179
115 F  76 167  77 165
116 F  62 168  62 163
117 M  83 184  83 181
118 M  96 184  94 183
119 M  75 169  76 165
120 M  65 178  66 178
121 M  78 178  77 175
122 M  69 167  73 165
123 F  68 178  68 175
124 F  55 165  55 163
125 M  67 179   .   .
126 F  52 169  56   .
127 F  47 153   . 154
128 F  45 157  45 153
129 F  68 171  68 169
130 F  44 157  44 155
131 F  62 166  61 163
132 M  87 185  89 185
133 F  56 160  53 158
134 F  50 148  47 148
135 M  83 177  84 175
136 F  53 162  53 160
137 F  64 172  62 168
138 F  62 167   .   .
139 M  90 188  91 185
140 M  85 191  83 188
141 M  66 175  68 175
142 F  52 163  53 160
143 F  53 165  55 163
144 F  54 176  55 176
145 F  64 171  66 171
146 F  55 160  55 155
147 F  55 165  55 165
148 F  59 157  55 158
149 F  70 173  67 170
150 M  88 184  86 183
151 F  57 168  58 165
152 F  47 162  47 160
```

```
 153 F  47 150  45 152
 154 F  55 162   .   .
 155 F  48 163  44 160
 156 M  54 169  58 165
 157 M  69 172  68 174
 158 F  59 170   .   .
 159 F  58 169   .   .
 160 F  57 167  56 165
 161 F  51 163  50 160
 162 F  54 161  54 160
 163 F  53 162  52 158
 164 F  59 172  58 171
 165 M  56 163  58 161
 166 F  59 159  59 155
 167 F  63 170  62 168
 168 F  66 166  66 165
 169 M  96 191  95 188
 170 F  53 158  50 155
 171 M  76 169  75 165
 172 F  54 163   .   .
 173 M  61 170  61 170
 174 M  82 176   .   .
 175 M  62 168  64 168
 176 M  71 178  68 178
 177 F  60 174   .   .
 178 M  66 170  67 165
 179 M  81 178  82 175
 180 M  68 174  68 173
 181 M  80 176  78 175
 182 F  43 154   .   .
 183 M  82 181   .   .
 184 F  63 165  59 160
 185 M  70 173  70 173
 186 F  56 162  56 160
 187 F  60 172  55 168
 188 F  58 169  54 166
 189 M  76 183  75 180
 190 F  50 158  49 155
 191 M  88 185  93 188
 192 M  89 173  86 173
 193 F  59 164  59 165
 194 F  51 156  51 158
 195 F  62 164  61 161
 196 M  74 175  71 175
 197 M  83 180  80 180
 198 M  81 175   .   .
 199 M  90 181  91 178
 200 M  79 177  81 178
;
run;

proc means;
run;
```

```
proc freq ;
  tables sex*male;
  run;
data davisSep;
  set davis;
  if male =1 then mmeaswt=measwt;
  else if male =0 then fmeaswt=measwt;
run;
symbol1 c=black i=none v=circle height=1;
symbol2 c=blue i =none v=star height=1;
symbol3 c=green i =join v=none height=1;
axis1 order=(40 to 140 by 20);
axis2 order=(0 to 200 by 50)label=(r=0 a=90);
proc gplot data=davisSep;
  plot  fmeaswt*reptwt =1  mmeaswt*reptwt=2
  reptwt*reptwt=3/overlay haxis=axis1 vaxis=axis2;
  label reptwt='Reported Weight';
  label fmeaswt='Measured Weight';
run;
quit;
```

Programme 6

```
data duncan;
  length occtitle $ 40 occtype $ 4 ;
  input occtitle occtype income educ prestige ;
  * occtitle = "occupation title" ;
  * occ_type = "Occupation type, Professional/Manag, White Collar, Blue
Collar" ;
  * income   = "% of males in occupation earning $3500 or more in 1950"
;
  * educ     = "% of males in occupation in 1950 who were high-school
graduates" ;
  * prestige = "% of raters in NORC study rating occupation as
excellent or good in prestige" ;
cards;
accountant_for_a_large_business     prof 62  86 82
airline_pilot                       prof 72  76 83
architect                           prof 75  92 90
author_of_novels                    prof 55  90 76
chemist                             prof 64  86 90
minister                            prof 21  84 87
college_professor                   prof 64  93 93
dentist                             prof 80 100 90
reporter_on_a_daily_newspaper       wc   67  87 52
civil_engineer                      prof 72  86 88
undertaker                          prof 42  74 57
lawyer                              prof 76  98 89
physician                           prof 76  97 97
welfare_worker_for_city_government  prof 41  84 59
instructor_in_the_public_schools    prof 48  91 73
```

```
railroad_conductor                  wc   76  34 38
building_contractor                 prof 53  45 76
owner_of_a_factory_employing_100    prof 60  56 81
manager_of_a_small_store_in_a_city  prof 42  44 45
banker                              prof 78  82 92
bookkeeper                          wc   29  72 39
mail_carrier                        wc   48  55 34
insurance_agent                     wc   55  71 41
clerk_in_a_store                    wc   29  50 16
carpenter                           bc   21  23 33
electrician                         bc   47  39 53
railroad_engineer                   bc   81  28 67
trained_machinist                   bc   36  32 57
automobile_repairman                bc   22  22 26
plumber                             bc   44  25 29
filling-station_attendant           bc   15  29 10
coal_miner                          bc    7   7 15
streetcar_motorman                  bc   42  26 19
taxi-driver                         bc    9  19 10
truck-driver                        bc   21  15 13
machine-operator_in_a_factory       bc   21  20 24
barber                              bc   16  26 20
bartender                           bc   16  28  7
shoe-shiner                         bc    9  17  3
restaurant_cook                     bc   14  22 16
soda_fountain_clerk                 bc   12  30  6
night_watchman                      bc   17  25 11
janitor                             bc    7  20  8
policeman                           bc   34  47 41
restaurant_waiter                   bc    8  32 10
;
run;
symbol1 c=black i=none v=circle height=1;

proc g3d data=duncan;
  scatter educ* income = prestige / noneedle rotate=30;
run;
```