Chapter 9 HBAT Cluster Analysis Example

Obs	ID	X6	X8	X12	X15	X18
1	1	8.5	2.5	6.0	4.3	3.7
2	2	8.2	5.1	3.1	4.0	4.9
3	3	9.2	5.6	5.8	4.6	4.5
4	4	6.4	7.0	4.5	3.6	3.0
5	5	9.0	5.2	4.5	4.5	3.5
6	6	6.5	3.1	3.7	9.5	3.3
7	7	6.9	5.0	5.4	2.5	2.0
8	8	6.2	3.9	5.1	4.8	3.7
9	9	5.8	5.1	5.8	4.4	4.6
10	10	6.4	5.1	5.7	5.3	4.4
11	11	8.7	4.6	4.6	7.5	4.0
12	12	6.1	6.3	6.4	5.9	3.2
13	13	9.5	4.6	6.6	5.3	4.4
14	14	9.2	5.7	4.8	3.0	4.2
15	15	6.3	4.7	5.9	5.4	5.2
16	16	8.7	4.0	3.8	5.0	4.5
17	17	5.7	6.7	5.1	5.4	4.5
18	18	5.9	5.5	5.5	6.3	4.8
19	19	5.6	5.1	5.6	6.1	4.5
20	20	9.1	3.6	7.1	6.7	4.4
21	21	5.2	7.1	5.0	4.6	3.3
22	22	9.6	6.8	7.8	6.5	4.3
23	23	8.6	7.4	4.7	6.0	4.0
24	24	9.3	2.6	4.5	4.2	4.5
25	25	6.0	5.3	5.3	3.9	4.0
26	26	6.4	6.6	5.3	3.7	3.9
27	27	8.5	7.2	3.7	6.7	4.4
28	28	7.0	5.4	4.2	5.9	3.7
29	29	8.5	5.7	3.7	6.0	4.4
30	30	7.6	3.0	4.6	7.2	3.5
31	31	6.9	8.5	4.7	3.3	3.3
32	32	8.1	7.2	3.8	6.1	3.0
33	33	6.7	6.5	4.9	4.2	3.4
34	34	8.0	6.1	4.7	3.8	4.2
35	35	6.7	5.2	6.8	6.0	3.5
36	36	8.7	6.1	2.9	6.5	2.5
37	37	9.0	5.9	4.5	4.3	3.5
38	38	9.6	6.2	5.5	4.4	4.9
39	39	8.2	3.9	5.0	7.1	4.5
40	40	6.1	3.0	6.4	6.8	3.2
41	41	8.3	3.3	5.2	1.7	3.9
42	42	9.4	4.7	4.9	6.2	4.1
43	43	9.3	4.6	6.3	4.1	4.3
44	44	5.1	6.6	7.8	5.2	4.5
45	45	8.0	4.7	3.0	3.9	4.7
46	46	5.9	5.7	5.5	5.1	4.8
47	47	10.0	7.1	4.5	3.7	3.5
48	48	5.7	6.8	6.0	4.8	5.2
49	49	9.9	3.7	6.7	7.2	3.9
50	50	7.9	4.3	5.8	3.6	4.3
51	51	6.7	5.9	4.8	5.3	2.8
52	52	8.2	3.7	3.1	5.0	4.9
53	53	9.4	4.8	4.6	9.2	4.6
54	54	6.9	5.7	4.7	4.4	3.3
55	55	8.0	3.8	4.7	4.2	4.2
56	56	9.3	7.3	5.5	5.9	3.4
57	57	7.4	4.8	6.9	7.4	5.5
58	58	7.6	5.2	5.4	6.4	4.0

59	59	10.0	5.3	4.5	4.5	3.5
60	60	9.9	7.2	3.5	7.0	4.0
61	61	8.7	8.4	3.8	4.5	4.5
62	62	8.4	6.7	5.9	4.2	3.6
63	63	8.8	3.8	4.8	7.2	2.9
64	64	7.7	6.3	3.4	4.7	2.6
65	65	6.6	5.8	4.8	3.9	2.8
66	66	5.7	3.5	6.0	5.0	5.2
67	67	5.7	7.9	5.1	6.4	4.5
68	68	5.5	4.7	4.9	2.5	4.3
69	69	7.5	3.8	4.5	5.2	3.4
70	70	6.4	2.7	5.3	5.5	3.9
71	71	9.1	6.1	7.1	5.7	4.4
72	72	6.7	3.0	4.5	2.5	3.1
73	73	6.5	2.7	6.0	6.3	4.6
74	74	9.9	7.5	6.7	4.6	3.9
75	75	8.5	5.3	6.0	3.6	3.7
76	76	9.9	6.8	4.8	7.6	3.8
77	77	7.6	7.6	5.0	6.6	3.9
78	78	9.4	7.0	4.9	2.4	4.1
79	79	9.3	6.3	5.9	3.1	4.6
80	80	7.1	4.9	5.9	3.5	2.7
81	81	9.9	7.4	4.8	6.9	3.8
82	82	8.7	6.4	4.6	5.1	4.0
83	83	8.6	5.8	4.0	4.0	3.0
84	84	6.4	6.7	5.0	6.5	1.6
85	85	7.7	6.7	4.3	4.1	4.3
86	86	7.5	4.1	4.5	2.8	3.4
87	87	5.0	1.3	4.9	7.6	3.1
88	88	7.7	8.0	4.3	7.7	4.3
89	89	9.1	5.5	4.6	4.1	3.9
90	90	5.5	7.7	8.2	4.9	4.9
91	91	9.1	7.0	5.4	4.6	3.3
92	92	7.1	4.1	4.5	3.5	2.4
93	93	9.2	4.6	4.8	6.6	4.2
94	94	9.3	5.4	5.9	4.9	4.6
95	95	9.3	4.0	5.5	4.8	3.4
96	96	8.6	5.6	5.7	3.6	3.6
97	97	7.4	2.6	4.8	6.4	3.7
98	98	8.7	3.3	2.9	4.3	2.5
99	99	7.8	5.8	7.1	5.7	3.9
100	100	7.9	4.4	4.8	5.8	3.5

Chapter 9 HBAT Cluster Analysis Example

Obs	ID	X6	X8	X12	X15	X18	MeanX6	MeanX8	MeanX12	MeanX15	MeanX18	X1	X2	X3	X4	X5	X7	X9	X10	X11	X13	X14	X16	X17	X19	X20	X21	X22	X23	X6C	X8C	X12C	X15C	X18C	X6CSQR	X8CSQR	X12CSQR	X15CSQR	X18CSQR	TotDiffSqr	SqrRootTot
1	87	5.0	1.3	4.9	7.6	3.1	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	3.6	3.0	3.5	4.2	8.2	4.3	2.4	4.8	5.2	5.5	6.0	48.1	0	-2.81	-4.065	-0.223	2.45	-0.786	7.8961	16.5242	0.04973	6.0025	0.61780	31.0903	5.57587
2	6	6.5	3.1	3.7	9.5	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	2.8	4.1	4.0	4.3	8.5	5.1	3.6	4.7	4.7	6.3	6.1	50.1	0	-1.31	-2.265	-1.423	4.35	-0.586	1.7161	5.1302	2.02493	18.9225	0.34340	28.1372	5.30445
3	90	5.5	7.7	8.2	4.9	4.9	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	5.5	7.0	5.6	5.7	6.3	7.4	5.5	6.7	8.2	7.6	9.3	59.1	1	-2.31	2.335	3.077	-0.25	1.014	5.3361	5.4522	9.46793	0.0625	1.02820	21.3470	4.62028
4	53	9.4	4.8	4.6	9.2	4.6	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	2.5	6.1	3.2	7.3	6.3	6.3	4.7	4.6	8.7	9.0	9.0	66.1	1	1.59	-0.565	-0.523	4.05	0.714	2.5281	0.3192	0.27353	16.4025	0.50980	20.0332	4.47584
5	44	5.1	6.6	7.8	5.2	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	1	5.1	6.9	4.4	5.4	5.9	7.2	4.9	6.3	7.6	7.9	8.4	55.1	1	-2.71	1.235	2.677	0.05	0.614	7.3441	1.5252	7.16633	0.0025	0.37700	16.4152	4.05156
6	41	8.3	3.3	5.2	1.7	3.9	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.4	5.5	3.1	4.6	9.1	4.1	4.6	5.8	7.0	7.5	8.4	61.1	1	0.49	-2.065	0.077	-3.45	0.014	0.2401	4.2642	0.00593	11.9025	0.00020	16.4129	4.05129
7	72	6.7	3.0	4.5	2.5	3.1	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.2	3.7	4.8	6.3	5.0	5.2	2.9	2.6	5.8	6.0	7.0	43.1	0	-1.11	-2.365	-0.623	-2.65	-0.786	1.2321	5.5932	0.38813	7.0225	0.61780	14.8537	3.85406
8	31	6.9	8.5	4.7	3.3	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.4	4.3	4.5	6.4	5.2	7.7	3.7	2.7	6.1	6.8	7.1	44.1	0	-0.91	3.135	-0.423	-1.85	-0.586	0.8281	9.8282	0.17893	3.4225	0.34340	14.6012	3.82115
9	22	9.6	6.8	7.8	6.5	4.3	7.81	5.365	5.123	5.15	3.886	3	1	1	1	1	5.7	5.9	5.4	8.3	4.5	6.4	4.3	3.0	9.9	9.6	9.9	70.1	1	1.79	1.435	2.677	1.35	0.414	3.2041	2.0592	7.16633	1.8225	0.17140	14.4236	3.79783
10	88	7.7	8.0	4.3	7.7	4.3	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.6	6.7	3.5	7.2	5.9	6.9	5.1	3.9	8.2	7.6	8.2	52.1	0	-0.11	2.635	-0.823	2.55	0.414	0.0121	6.9432	0.67733	6.5025	0.17140	14.3066	3.78240
11	49	9.9	3.7	6.7	7.2	3.9	7.81	5.365	5.123	5.15	3.886	3	0	0	1	1	3.7	6.1	4.2	7.0	6.8	5.9	4.5	3.4	8.7	8.1	8.5	67.1	1	2.09	-1.665	1.577	2.05	0.014	4.3681	2.7722	2.48693	4.2025	0.00020	13.8300	3.71886
12	60	9.9	7.2	3.5	7.0	4.0	7.81	5.365	5.123	5.15	3.886	3	1	1	1	0	2.8	6.9	2.6	5.8	5.4	6.2	5.6	4.9	7.9	8.5	8.5	61.1	1	2.09	1.835	-1.623	1.85	0.114	4.3681	3.3672	2.63413	3.4225	0.01300	13.8050	3.71550
13	40	6.1	3.0	6.4	6.8	3.2	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	4.9	4.8	5.1	3.9	8.2	5.1	4.5	4.9	6.0	5.5	5.8	53.1	0	-1.71	-2.365	1.277	1.65	-0.686	2.9241	5.5932	1.63073	2.7225	0.47060	13.3412	3.65255
14	68	5.5	4.7	4.9	2.5	4.3	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	3.7	5.4	4.3	5.3	6.0	5.6	4.5	5.9	6.1	6.3	8.2	48.1	0	-2.31	-0.665	-0.223	-2.65	0.414	5.3361	0.4422	0.04973	7.0225	0.17140	13.0219	3.60859
15	78	9.4	7.0	4.9	2.4	4.1	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.8	6.2	4.7	6.5	8.5	7.3	4.3	4.5	7.6	7.3	8.0	61.1	1	1.59	1.635	-0.223	-2.75	0.214	2.5281	2.6732	0.04973	7.5625	0.04580	12.8594	3.58599
16	67	5.7	7.9	5.1	6.4	4.5	7.81	5.365	5.123	5.15	3.886	2	1	0	1	0	4.0	6.4	2.7	5.5	6.2	7.5	5.0	6.2	6.4	5.6	6.2	50.1	0	-2.11	2.535	-0.023	1.25	0.614	4.4521	6.4262	0.00053	1.5625	0.37700	12.8184	3.58027
17	98	8.7	3.3	2.9	4.3	2.5	7.81	5.365	5.123	5.15	3.886	1	0	0	0	1	3.2	3.2	3.1	6.1	5.6	5.0	3.1	2.9	5.4	7.0	7.7	51.1	0	0.89	-2.065	-2.223	-0.85	-1.386	0.7921	4.2642	4.94173	0.7225	1.92100	12.6415	3.55550
18	61	8.7	8.4	3.8	4.5	4.5	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	6.1	2.8	7.8	4.9	7.2	5.4	3.9	6.6	6.9	7.2	71.1	1	0.89	3.035	-1.323	-0.65	0.614	0.7921	9.2112	1.75033	0.4225	0.37700	12.5532	3.54304
19	76	9.9	6.8	4.8	7.6	3.8	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	5.0	5.4	5.9	4.9	7.3	3.1	4.3	7.1	6.6	8.9	63.1	1	2.09	1.435	-0.323	2.45	-0.086	4.3681	2.0592	0.10433	6.0025	0.00740	12.5416	3.54141
20	74	9.9	7.5	6.7	4.6	3.9	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.7	4.7	5.6	7.0	6.8	7.2	4.1	3.4	8.6	8.8	9.8	66.1	1	2.09	2.135	1.577	-0.55	0.014	4.3681	4.5582	2.48693	0.3025	0.00020	11.7160	3.42286
21	81	9.9	7.4	4.8	6.9	3.8	7.81	5.365	5.123	5.15	3.886	3	0	1	0	0	3.0	4.8	4.0	5.9	4.9	5.9	3.2	4.3	7.1	7.9	8.8	63.1	0	2.09	2.035	-0.323	1.75	-0.086	4.3681	4.1412	0.10433	3.0625	0.00740	11.6836	3.41812
22	7	6.9	5.0	5.4	2.5	2.0	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.7	2.6	2.1	2.3	8.9	4.8	2.1	4.2	5.7	7.8	7.2	41.1	0	-0.91	-0.365	0.277	-2.65	-1.886	0.8281	0.1332	0.07673	7.0225	3.55700	11.6175	3.40845
23	24	9.3	2.6	4.5	4.2	4.5	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	2.4	7.2	2.2	7.2	6.2	6.4	6.7	4.4	8.6	8.1	8.0	65.1	1	1.49	-2.765	-0.623	-0.95	0.614	2.2201	7.6452	0.38813	0.9025	0.37700	11.5329	3.39602
24	73	6.5	2.7	6.0	6.3	4.6	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.3	6.6	6.5	6.3	8.7	4.7	4.6	5.6	7.9	6.6	7.9	66.1	0	-1.31	-2.665	0.877	1.15	0.714	1.7161	7.1022	0.76913	1.3225	0.50980	11.4197	3.37931
25	20	9.1	3.6	7.1	6.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	1	1	0	4.5	6.4	5.3	5.3	8.4	5.8	4.5	6.1	7.6	8.5	8.8	67.1	1	1.29	-1.765	1.977	1.55	0.514	1.6641	3.1152	3.90853	2.4025	0.26420	11.3546	3.36965
26	57	7.4	4.8	6.9	7.4	5.5	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	5.1	7.7	4.5	7.2	9.6	6.4	5.7	6.5	9.0	7.9	8.8	74.1	1	-0.41	-0.565	1.777	2.25	1.614	0.1681	0.3192	3.15773	5.0625	2.60500	11.3126	3.36341
27	84	6.4	6.7	5.0	6.5	1.6	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	3.2	3.6	2.2	2.9	8.4	7.3	2.0	3.7	5.0	5.1	6.5	37.1	0	-1.41	1.335	-0.123	1.35	-2.286	1.9881	1.7822	0.01513	1.8225	5.22580	10.8338	3.29147
28	21	5.2	7.1	5.0	4.6	3.3	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	3.8	5.2	3.9	4.3	8.4	7.1	3.3	4.9	5.4	5.5	7.0	50.1	0	-2.61	1.735	-0.123	-0.55	-0.586	6.8121	3.0102	0.01513	0.3025	0.34340	10.4834	3.23780
29	66	5.7	3.5	6.0	5.0	5.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.8	6.7	5.4	5.7	8.2	5.4	4.7	7.3	7.6	6.9	9.0	60.1	1	-2.11	-1.865	0.877	-0.15	1.314	4.4521	3.4782	0.76913	0.0225	1.72660	10.4485	3.23242
30	47	10.0	7.1	4.5	3.7	3.5	7.81	5.365	5.123	5.15	3.886	3	1	0	0	1	4.3	6.3	2.9	5.4	3.8	6.7	5.0	4.0	7.1	8.8	8.0	67.1	1	2.19	1.735	-0.623	-1.45	-0.386	4.7961	3.0102	0.38813	2.1025	0.14900	10.4460	3.23202
31	30	7.6	3.0	4.6	7.2	3.5	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.6	4.0	5.1	4.2	7.7	4.9	4.7	5.5	5.4	5.5	6.2	52.1	0	-0.21	-2.365	-0.523	2.05	-0.386	0.0441	5.5932	0.27353	4.2025	0.14900	10.2624	3.20349
32	1	8.5	2.5	6.0	4.3	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.9	5.9	4.8	4.9	6.8	4.7	5.0	5.1	8.2	8.0	8.4	65.1	1	0.69	-2.865	0.877	-0.85	-0.186	0.4761	8.2082	0.76913	0.7225	0.03460	10.2105	3.19540
33	36	8.7	6.1	2.9	6.5	2.5	7.81	5.365	5.123	5.15	3.886	1	0	0	0	0	3.2	4.3	3.5	6.1	5.6	6.1	3.1	2.9	5.4	4.6	7.1	51.1	0	0.89	0.735	-2.223	1.35	-1.386	0.7921	0.5402	4.94173	1.8225	1.92100	10.0176	3.16505
34	97	7.4	2.6	4.8	6.4	3.7	7.81	5.365	5.123	5.15	3.886	1	0	0	1	1	3.4	5.0	4.1	4.4	7.2	4.5	4.2	5.6	6.3	5.5	7.2	48.1	0	-0.41	-2.765	-0.323	1.25	-0.186	0.1681	7.6452	0.10433	1.5625	0.03460	9.5147	3.08460
35	70	6.4	2.7	5.3	5.5	3.9	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.6	5.3	3.9	3.9	7.1	5.2	4.7	6.6	6.6	6.6	8.0	58.1	1	-1.41	-2.665	0.177	0.35	0.014	1.9881	7.1022	0.03133	0.1225	0.00020	9.2443	3.04045
36	48	5.7	6.8	6.0	4.8	5.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.8	7.5	5.7	5.7	8.2	6.6	6.5	7.3	7.6	7.6	7.1	60.1	0	-2.11	1.435	0.877	-0.35	1.314	4.4521	2.0592	0.76913	0.1225	1.72660	9.1296	3.02151
37	63	8.8	3.8	4.8	7.2	2.9	7.81	5.365	5.123	5.15	3.886	1	0	0	0	1	3.9	5.1	4.3	4.7	5.8	5.0	4.4	3.7	6.3	5.5	8.0	44.1	0	0.99	-1.565	-0.323	2.05	-0.986	0.9801	2.4492	0.10433	4.2025	0.97220	8.7084	2.95099
38	27	8.5	7.2	3.7	6.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	5.8	4.1	7.6	4.8	6.9	5.3	3.8	6.3	7.1	7.0	70.1	0	0.69	1.835	-1.423	1.55	0.514	0.4761	3.3672	2.02493	2.4025	0.26420	8.5350	2.92146
39	79	9.3	6.3	5.9	3.1	4.6	7.81	5.365	5.123	5.15	3.886	3	0	0	0	1	3.5	7.6	5.5	7.5	4.6	6.6	5.2	4.1	8.9	7.3	8.1	72.1	1	1.49	0.935	0.777	-2.05	0.714	2.2201	0.8742	0.60373	4.2025	0.50980	8.4104	2.90006
40	4	6.4	7.0	4.5	3.6	3.0	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.3	3.7	4.7	4.7	8.8	7.0	4.3	4.1	4.8	6.0	7.2	40.1	0	-1.41	1.635	-0.623	-1.55	-0.886	1.9881	2.6732	0.38813	2.4025	0.78500	8.2369	2.87001
41	52	8.2	3.7	3.1	5.0	4.9	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.7	7.4	2.7	7.9	5.3	5.3	4.5	4.3	5.7	7.1	8.2	67.1	1	0.39	-1.665	-2.023	-0.15	1.014	0.1521	2.7722	4.09253	0.0225	1.02820	8.0675	2.84034
42	86	7.5	4.1	4.5	2.8	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.5	4.5	3.5	4.1	7.6	4.9	3.4	5.4	5.2	6.0	7.2	51.1	0	-0.31	-1.265	-0.623	-2.35	-0.486	0.0961	1.6002	0.38813	5.5225	0.23620	7.8431	2.80056
43	92	7.1	4.1	4.5	3.5	2.4	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	4.2	2.6	2.1	3.3	9.9	5.5	2.0	4.0	4.8	5.0	6.5	51.1	0	-0.71	-1.265	-0.623	-1.65	-1.486	0.5041	1.6002	0.38813	2.7225	2.20820	7.4231	2.72455
44	45	8.0	4.7	3.0	3.9	4.7	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.5	7.1	3.6	7.7	5.2	5.1	4.3	4.2	5.5	5.6	6.5	65.1	0	0.19	-0.665	-2.123	-1.25	0.814	0.0361	0.4422	4.50713	1.5625	0.66260	7.2105	2.68525
45	11	8.7	4.6	4.6	7.5	4.0	7.81	5.365	5.123	5.15	3.886	3	0	1	0	1	3.2	4.8	2.7	6.8	6.8	5.8	3.8	3.7	7.4	7.0	8.4	68.1	0	0.89	-0.765	-0.523	2.35	0.114	0.7921	0.5852	0.27353	5.5225	0.01300	7.1864	2.68074
46	77	7.6	7.6	5.0	6.6	3.9	7.81	5.365	5.123	5.15	3.886	1	0	0	1	1	3.6	4.6	4.7	4.6	7.4	8.1	4.5	5.8	6.4	6.9	7.5	49.1	0	-0.21	2.235	-0.123	1.45	0.014	0.0441	4.9952	0.01513	2.1025	0.00020	7.1572	2.67529
47	56	9.3	7.3	5.5	5.9	3.4	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.8	5.7	3.7	6.4	7.4	6.6	4.1	3.2	7.7	7.6	8.9	59.1	1	1.49	1.935	0.377	0.75	-0.486	2.2201	3.7442	0.14213	0.5625	0.23620	6.9052	2.62777
48	32	8.1	7.2	3.8	6.1	3.0	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	2.5	4.5	2.3	5.1	6.6	6.8	3.0	3.5	6.4	5.8	6.2	51.1	0	0.29	1.835	-1.323	0.95	-0.886	0.0841	3.3672	1.75033	0.9025	0.78500	6.8892	2.62472
49	14	9.2	5.7	4.8	3.0	4.2	7.81	5.365	5.123	5.15	3.886	3	1	0	0	1	3.9	5.5	2.4	8.4	7.1	6.7	4.5	2.6	7.6	6.9	8.2	72.1	1	1.39	0.335	-0.323	-2.15	0.314	1.9321	0.1122	0.10433	4.6225	0.09860	6.8697	2.62102
50	71	9.1	6.1	7.1	5.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	1	0	4.5	5.9	6.3	5.3	8.4	7.1	5.4	6.1	7.6	7.5	7.7	67.1	0	1.29	0.735	1.977	0.55	0.514	1.6641	0.5402	3.90853	0.3025	0.26420	6.6796	2.58448
51	17	5.7	6.7	5.1	5.4	4.5	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	4.0	6.0	3.3	5.5	6.2	6.7	4.2	6.2	6.4	7.5	7.2	50.1	1	-2.11	1.335	-0.023	0.25	0.614	4.4521	1.7822	0.00053	0.0625	0.37700	6.6744	2.58348
52	2	8.2	5.1	3.1	4.0	4.9	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.7	7.2	3.4	7.9	5.3	5.5	3.9	4.3	5.7	6.5	7.5	67.1	0	0.39	-0.265	-2.023	-1.15	1.014	0.1521	0.0702	4.09253	1.3225	1.02820	6.6655	2.58177
53	39	8.2	3.9	5.0	7.1	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.6	6.2	5.8	4.9	9.0	5.2	4.7	6.9	7.6	6.9	7.6	65.1	1	0.39	-1.465	-0.123	1.95	0.614	0.1521	2.1462	0.01513	3.8025	0.37700	6.4930	2.54813
54	12	6.1	6.3	6.4	5.9	3.2	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.9	3.9	4.4	3.9	8.2	5.8	3.0	4.9	6.0	6.3	6.6	53.1	0	-1.71	0.935	1.277	0.75	-0.686	2.9241	0.8742	1.63073	0.5625	0.47060	6.4622	2.54208
55	19	5.6	5.1	5.6	6.1	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.4	6.4	3.7	5.7	9.1	5.4	5.0	6.0	6.8	7.5	7.9	55.1	0	-2.21	-0.265	0.477	0.95	0.614	4.8841	0.0702	0.22753	0.9025	0.37700	6.4614	2.54192
56	18	5.9	5.5	5.5	6.3	4.8	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.1	7.2	3.5	6.4	8.4	6.2	5.7	5.8	7.4	6.9	8.2	58.1	1	-1.91	0.135	0.377	1.15	0.914	3.6481	0.0182	0.14213	1.3225	0.83540	5.9664	2.44261
57	13	9.5	4.6	6.6	5.3	4.4	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	5.6	6.9	5.0	6.9	7.6	6.5	5.1	4.5	8.4	8.4	7.9	58.1	1	1.69	-0.765	1.477	0.15	0.514	2.8561	0.5852	2.18153	0.0225	0.26420	5.9096	2.43096

58	59	10.0	5.3	4.5	4.5	3.5	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	4.3	3.7	4.2	5.4	3.8	6.7	3.7	4.0	7.1	6.5	7.0	67.1	0	2.19	-0.065	-0.623	-0.65	-0.386	4.7961	0.0042	0.38813	0.4225	0.14900	5.7600	2.39999
59	64	7.7	6.3	3.4	4.7	2.6	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	2.2	4.5	2.4	4.7	6.2	6.0	3.3	3.1	6.0	6.0	8.1	47.1	0	-0.11	0.935	-1.723	-0.45	-1.286	0.0121	0.8742	2.96873	0.2025	1.65380	5.7113	2.38984
60	23	8.6	7.4	4.7	6.0	4.0	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	3.6	5.1	3.5	7.3	3.7	6.7	4.8	3.4	7.0	7.1	8.1	60.1	0	0.79	2.035	-0.423	0.85	0.114	0.6241	4.1412	0.17893	0.7225	0.01300	5.6798	2.38322
61	26	6.4	6.6	5.3	3.7	3.9	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.6	6.1	4.0	3.9	7.1	6.1	5.6	6.6	6.6	6.8	7.0	58.1	0	-1.41	1.235	0.177	-1.45	0.014	1.9881	1.5252	0.03133	2.1025	0.00020	5.6473	2.37642
62	9	5.8	5.1	5.8	4.4	4.6	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.6	6.7	3.7	5.9	9.3	5.9	4.4	6.1	7.0	7.5	8.2	56.1	1	-2.01	-0.265	0.677	-0.75	0.714	4.0401	0.0702	0.45833	0.5625	0.50980	5.6409	2.37507
63	38	9.6	6.2	5.5	4.4	4.9	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	4.1	7.3	2.9	7.7	7.7	6.1	5.2	4.6	8.7	9.9	9.9	77.1	1	1.79	0.835	0.377	-0.75	1.014	3.2041	0.6972	0.14213	0.5625	1.02820	5.6342	2.37364
64	43	9.3	4.6	6.3	4.1	4.3	7.81	5.365	5.123	5.15	3.886	3	0	1	0	1	5.1	6.8	5.8	6.6	7.4	5.1	4.6	4.6	8.9	7.8	7.6	72.1	1	1.49	-0.765	1.177	-1.05	0.414	2.2201	0.5852	1.38533	1.1025	0.17140	5.4646	2.33764
65	80	7.1	4.9	5.9	3.5	2.7	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.4	4.1	4.0	5.0	7.8	6.1	2.6	3.1	5.7	5.8	7.6	44.1	0	-0.71	-0.465	0.777	-1.65	-1.186	0.5041	0.2162	0.60373	2.7225	1.40660	5.4531	2.33520
66	15	6.3	4.7	5.9	5.4	5.2	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	4.5	6.9	4.5	6.8	8.8	6.0	4.8	6.2	8.0	7.0	7.6	62.1	1	-1.51	-0.665	0.777	0.25	1.314	2.2801	0.4422	0.60373	0.0625	1.72660	5.1152	2.26167
67	91	9.1	7.0	5.4	4.6	3.3	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.7	4.1	4.4	6.3	7.3	7.5	4.4	3.0	7.4	7.9	7.9	58.1	1	1.29	1.635	0.277	-0.55	-0.586	1.6641	2.6732	0.07673	0.3025	0.34340	5.0600	2.24943
68	35	6.7	5.2	6.8	6.0	3.5	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.0	3.9	3.0	5.4	8.4	6.2	2.5	4.3	6.3	6.6	6.7	54.1	0	-1.11	-0.165	1.677	0.85	-0.386	1.2321	0.0272	2.81233	0.7225	0.14900	4.9432	2.22332
69	8	6.2	3.9	5.1	4.8	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.3	4.8	4.6	3.6	6.9	5.4	4.3	6.3	6.3	5.8	7.7	56.1	0	-1.61	-1.465	-0.023	-0.35	-0.186	2.5921	2.1462	0.00053	0.1225	0.03460	4.8959	2.21268
70	25	6.0	5.3	5.3	3.9	4.0	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	4.1	4.7	3.5	5.3	8.0	6.5	4.7	5.3	4.8	4.9	5.5	55.1	0	-1.81	-0.065	0.177	-1.25	0.114	3.2761	0.0042	0.03133	1.5625	0.01300	4.8871	2.21069
71	93	9.2	4.6	4.8	6.6	4.2	7.81	5.365	5.123	5.15	3.886	3	1	1	0	1	3.9	5.3	4.2	8.4	7.1	6.2	4.4	2.6	7.6	7.5	8.6	72.1	0	1.39	-0.765	-0.323	1.45	0.314	1.9321	0.5852	0.10433	2.1025	0.09860	4.8228	2.19608
72	16	8.7	4.0	3.8	5.0	4.5	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	6.8	3.2	7.8	4.9	6.1	4.3	3.9	6.6	6.4	7.1	71.1	0	0.89	-1.365	-1.323	-0.15	0.614	0.7921	1.8632	1.75033	0.0225	0.37700	4.8051	2.19207
73	46	5.9	5.7	5.5	5.1	4.8	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.1	5.9	5.8	6.4	8.4	6.4	5.2	5.8	7.4	8.6	7.7	58.1	1	-1.91	0.335	0.377	-0.05	0.914	3.6481	0.1122	0.14213	0.0025	0.83540	4.7404	2.17723
74	95	9.3	4.0	5.5	4.8	3.4	7.81	5.365	5.123	5.15	3.886	3	1	1	0	0	3.8	4.6	4.7	6.4	7.4	5.3	3.6	3.2	7.7	7.3	8.4	59.1	1	1.49	-1.365	0.377	-0.35	-0.486	2.2201	1.8632	0.14213	0.1225	0.23620	4.5841	2.14106
75	65	6.6	5.8	4.8	3.9	2.8	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	3.6	4.1	4.9	4.7	7.2	6.5	3.5	3.6	5.4	6.9	7.1	48.1	0	-1.21	0.435	-0.323	-1.25	-1.086	1.4641	0.1892	0.10433	1.5625	1.17940	4.4995	2.12121
76	99	7.8	5.8	7.1	5.7	3.9	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	4.9	5.3	5.2	5.3	7.9	6.0	4.3	4.9	6.4	7.1	7.4	61.1	0	-0.01	0.435	1.977	0.55	0.014	0.0001	0.1892	3.90853	0.3025	0.00020	4.4006	2.09775
77	83	8.6	5.8	4.0	4.0	3.0	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.9	3.9	2.9	5.6	6.3	6.1	2.7	3.0	6.6	6.1	8.5	53.1	0	0.79	0.435	-1.123	-1.15	-0.886	0.6241	0.1892	1.26113	1.3225	0.78500	4.1819	2.04498
78	50	7.9	4.3	5.8	3.6	4.3	7.81	5.365	5.123	5.15	3.886	3	1	1	0	1	3.9	5.8	4.4	6.9	4.7	5.2	4.1	4.2	8.6	7.8	7.6	61.1	1	0.09	-1.065	0.677	-1.55	0.414	0.0081	1.1342	0.45833	2.4025	0.17140	4.1745	2.04317
79	42	9.4	4.7	4.9	6.2	4.1	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.8	5.4	3.8	6.5	8.5	4.9	4.1	4.5	7.6	8.0	7.9	61.1	1	1.59	-0.665	-0.223	1.05	0.214	2.5281	0.4422	0.04973	1.1025	0.04580	4.1684	2.04165
80	85	7.7	6.7	4.3	4.1	4.3	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.6	6.6	1.9	7.2	5.9	6.5	4.7	3.9	8.2	7.5	7.7	52.1	1	-0.11	1.335	-0.823	-1.05	0.414	0.0121	1.7822	0.67733	1.1025	0.17140	3.7456	1.93534
81	62	8.4	6.7	5.9	4.2	3.6	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.8	5.0	4.5	4.7	6.7	5.1	2.7	5.0	8.0	7.6	8.8	63.1	1	0.59	1.335	0.777	-0.95	-0.286	0.3481	1.7822	0.60373	0.9025	0.08180	3.7184	1.92830
82	33	6.7	6.5	4.9	4.2	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.7	5.3	5.3	5.1	9.2	5.7	3.5	4.5	5.4	6.5	7.6	44.1	0	-1.11	1.135	-0.223	-0.95	-0.486	1.2321	1.2882	0.04973	0.9025	0.23620	3.7087	1.92581
83	75	8.5	5.3	6.0	3.6	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.9	5.5	5.0	4.9	6.8	5.7	4.4	5.1	8.2	7.0	8.4	65.1	1	0.69	-0.065	0.877	-1.55	-0.186	0.4761	0.0042	0.76913	2.4025	0.03460	3.6865	1.92004
84	55	8.0	3.8	4.7	4.2	4.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.3	5.8	3.2	4.6	8.7	5.3	4.9	6.6	7.3	8.1	8.1	62.1	1	0.19	-1.565	-0.423	-0.95	0.314	0.0361	2.4492	0.17893	0.9025	0.09860	3.6653	1.91451
85	29	8.5	5.7	3.7	6.0	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	6.0	2.3	7.6	4.8	5.8	5.7	3.8	6.3	6.9	7.2	70.1	0	0.69	0.335	-1.423	0.85	0.514	0.4761	0.1122	2.02493	0.7225	0.26420	3.6000	1.89735
86	96	8.6	5.6	5.7	3.6	3.6	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	4.8	5.3	2.3	6.0	6.7	5.8	4.9	3.6	7.3	8.1	8.1	50.1	1	0.79	0.235	0.577	-1.55	-0.286	0.6241	0.0552	0.33293	2.4025	0.08180	3.4965	1.86991
87	94	9.3	5.4	5.9	4.9	4.6	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.5	7.8	4.6	7.5	4.6	6.4	4.8	4.1	8.9	7.6	8.9	72.1	1	1.49	0.035	0.777	-0.25	0.714	2.2201	0.0012	0.60373	0.0625	0.50980	3.3974	1.84319
88	69	7.5	3.8	4.5	5.2	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.5	3.5	2.9	4.1	7.6	5.1	4.0	5.4	5.2	5.8	5.8	51.1	0	-0.31	-1.565	-0.623	0.05	-0.486	0.0961	2.4492	0.38813	0.0025	0.23620	3.1721	1.78105
89	3	9.2	5.6	5.8	4.6	4.5	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.4	5.6	5.4	7.4	4.5	6.2	5.4	4.0	8.9	8.4	9.0	72.1	1	1.39	0.235	0.677	-0.55	0.614	1.9321	0.0552	0.45833	0.3025	0.37700	3.1252	1.76781
90	89	9.1	5.5	4.6	4.1	3.9	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.6	5.4	4.2	6.2	8.3	6.5	4.6	4.3	7.3	6.5	7.4	59.1	0	1.29	0.135	-0.523	-1.05	0.014	1.6641	0.0182	0.27353	1.1025	0.00020	3.0585	1.74887
91	37	9.0	5.9	4.5	4.3	3.5	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	3.4	4.6	3.9	6.0	6.8	6.4	3.9	3.5	7.1	8.0	7.2	57.1	0	1.19	0.535	-0.623	-0.85	-0.386	1.4161	0.2862	0.38813	0.7225	0.14900	2.9620	1.72103
92	51	6.7	5.9	4.8	5.3	2.8	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	3.6	4.2	3.4	4.7	7.2	5.7	4.0	3.6	5.4	7.5	7.2	48.1	0	-1.11	0.535	-0.323	0.15	-1.086	1.2321	0.2862	0.10433	0.0225	1.17940	2.8246	1.68064
93	10	6.4	5.1	5.7	5.3	4.4	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.5	6.1	4.7	5.7	8.4	5.4	4.1	5.8	5.5	5.9	6.7	59.1	0	-1.41	-0.265	0.577	0.15	0.514	1.9881	0.0702	0.33293	0.0225	0.26420	2.6779	1.63644
94	34	8.0	6.1	4.7	3.8	4.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.3	5.7	5.5	4.6	8.7	5.9	4.7	6.6	7.3	7.5	9.0	62.1	1	0.19	0.735	-0.423	-1.35	0.314	0.0361	0.5402	0.17893	1.8225	0.09860	2.6763	1.63596
95	5	9.0	5.2	4.5	4.5	3.5	7.81	5.365	5.123	5.15	3.886	2	0	1	0	1	3.4	4.6	2.2	6.0	6.8	6.1	4.5	3.5	7.1	6.6	9.0	57.1	0	1.19	-0.165	-0.623	-0.65	-0.386	1.4161	0.0272	0.38813	0.4225	0.14900	2.4029	1.55015
96	82	8.7	6.4	4.6	5.1	4.0	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	4.9	2.4	6.8	6.8	6.3	4.3	3.7	7.4	7.3	8.0	68.1	1	0.89	1.035	-0.523	-0.05	0.114	0.7921	1.0712	0.27353	0.0025	0.01300	2.1524	1.46709
97	28	7.0	5.4	4.2	5.9	3.7	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	3.3	5.5	2.6	4.8	9.0	6.5	4.3	5.2	5.4	5.5	5.6	55.1	0	-0.81	0.035	-0.923	0.75	-0.186	0.6561	0.0012	0.85193	0.5625	0.03460	2.1064	1.45133
98	54	6.9	5.7	4.7	4.4	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.4	4.4	3.3	6.4	5.2	6.4	3.2	2.7	6.1	7.0	7.2	44.1	0	-0.91	0.335	-0.423	-0.75	-0.586	0.8281	0.1122	0.17893	0.5625	0.34340	2.0251	1.42308
99	58	7.6	5.2	5.4	6.4	4.0	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.6	5.8	5.6	6.6	4.4	6.7	4.6	3.9	8.2	7.5	7.5	58.1	1	-0.21	-0.165	0.277	1.25	0.114	0.0441	0.0272	0.07673	1.5625	0.01300	1.7236	1.31284
100	100	7.9	4.4	4.8	5.8	3.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.0	5.1	5.9	4.2	9.7	5.7	3.4	5.4	6.4	7.3	7.0	57.1	0	0.09	-0.965	-0.323	0.65	-0.386	0.0081	0.9312	0.10433	0.4225	0.14900	1.6151	1.27089

Chapter 9 HBAT Cluster Analysis Example

The CLUSTER Procedure
Ward's Minimum Variance Cluster Analysis

Variable	Mean	Standard Deviation	Skewness	Kurtosis	Bimodality
X6	7.8100	1.3963	-0.2445	-1.1318	0.5404
X8	5.3650	1.5305	-0.2033	-0.5482	0.4092
X12	5.1230	1.0723	0.3769	0.4095	0.3261
X15	5.1500	1.4930	0.2985	0.0164	0.3503
X18	3.8860	0.7344	-0.4631	0.2181	0.3668

Eigenvalues of the Covariance Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	2.50337024	0.29796793	0.3049	0.3049
2	2.20540231	0.30979182	0.2686	0.5735
3	1.89561049	0.75047323	0.2309	0.8044
4	1.14513726	0.68430401	0.1395	0.9439
5	0.46083325		0.0561	1.0000

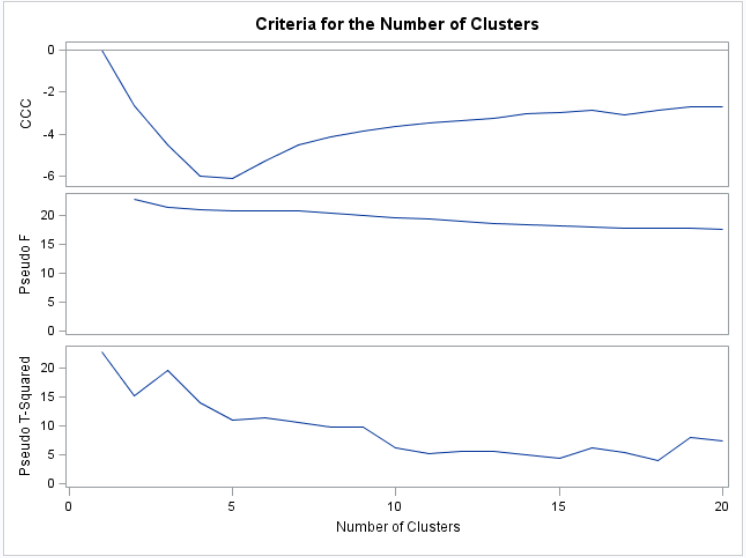
Root-Mean-Square Total-Sample Standard Deviation	1.281433

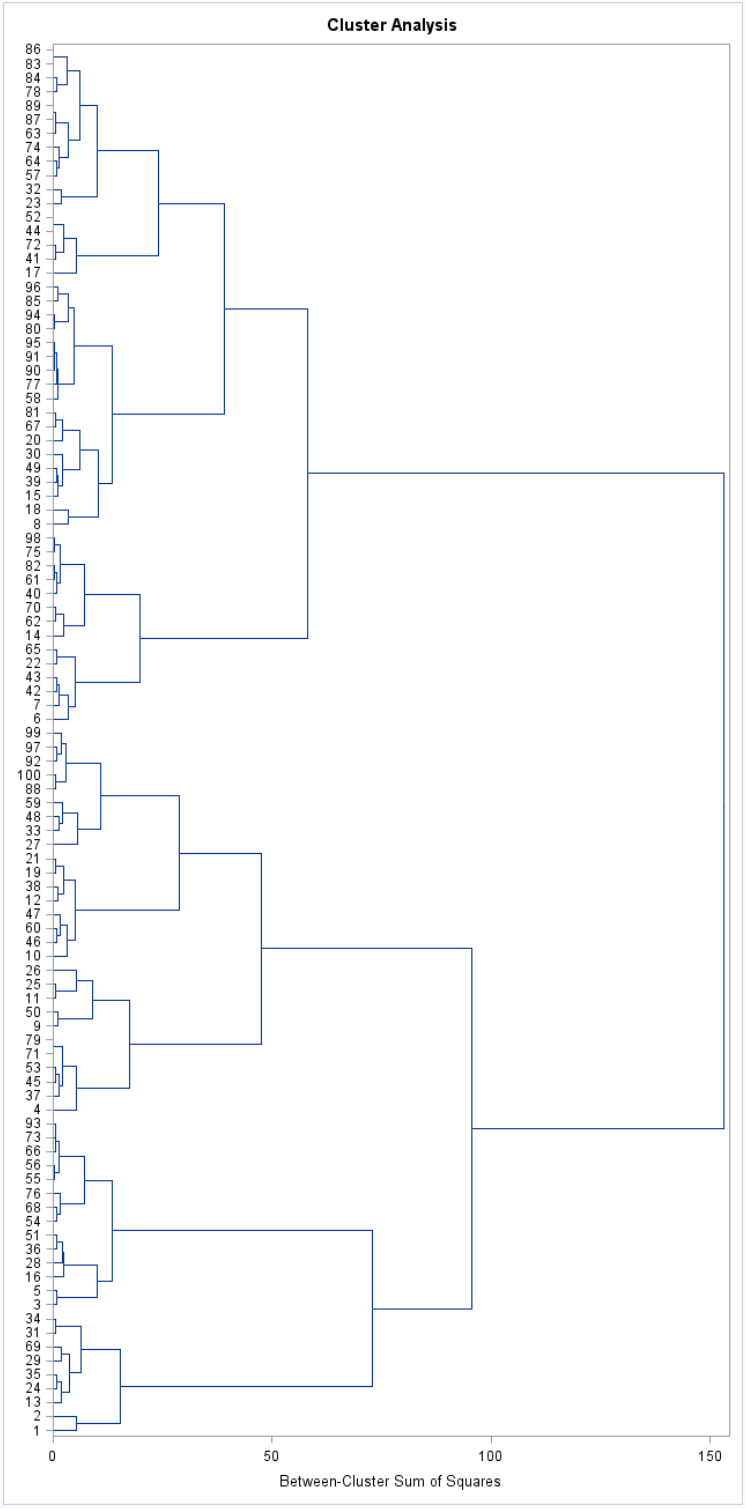
Cluster History

Number of Clusters	Clusters Joined		Freq	New Cluster RMS Std Dev	Semipartial R-Square	R-Square	Approximate Expected R-Square	Cubic Clustering Criterion	Pseudo F Statistic	Pseudo t-Squared	Between Cluster Sum of Squares	Tie
99	OB87	OB89	2	0.1265	0.0001	1.00	.	.	104	.	0.08	
98	OB83	OB86	2	0.1414	0.0001	1.00	.	.	93.1	.	0.1	
97	OB71	OB79	2	0.1517	0.0001	1.00	.	.	86.1	.	0.115	
96	OB44	OB52	2	0.1612	0.0002	.999	.	.	80.5	.	0.13	
95	OB90	OB91	2	0.1949	0.0002	.999	.	.	70.2	.	0.19	
94	OB55	OB56	2	0.1975	0.0002	.999	.	.	64.7	.	0.195	
93	CL95	OB95	3	0.2113	0.0003	.999	.	.	57.9	1.4	0.2567	
92	OB75	OB98	2	0.2470	0.0004	.998	.	.	52.0	.	0.305	
91	OB80	OB94	2	0.2665	0.0004	.998	.	.	47.0	.	0.355	
90	OB61	OB82	2	0.2757	0.0005	.997	.	.	43.2	.	0.38	
89	OB19	OB21	2	0.2915	0.0005	.997	.	.	40.0	.	0.425	T
88	OB73	OB93	2	0.2915	0.0005	.996	.	.	37.8	.	0.425	
87	OB31	OB34	2	0.3033	0.0006	.996	.	.	35.8	.	0.46	
86	OB62	OB70	2	0.3066	0.0006	.995	.	.	34.3	.	0.47	
85	OB88	OB100	2	0.3130	0.0006	.995	.	.	33.0	.	0.49	
84	OB41	OB72	2	0.3146	0.0006	.994	.	.	32.0	.	0.495	
83	OB67	OB81	2	0.3286	0.0007	.993	.	.	30.9	.	0.54	
82	OB63	CL99	3	0.2708	0.0008	.993	.	.	29.6	8.2	0.6533	
81	OB45	OB53	2	0.3619	0.0008	.992	.	.	28.5	.	0.655	T
80	OB11	OB25	2	0.3619	0.0008	.991	.	.	27.6	.	0.655	
79	OB66	CL88	3	0.3307	0.0008	.990	.	.	26.9	1.6	0.6683	
78	OB46	OB60	2	0.3873	0.0009	.989	.	.	26.1	.	0.75	
77	OB40	CL90	3	0.3367	0.0009	.988	.	.	25.5	2.0	0.7533	
76	OB77	CL93	4	0.2855	0.0010	.987	.	.	24.9	3.5	0.7758	
75	OB57	OB64	2	0.3975	0.0010	.986	.	.	24.4	.	0.79	
74	OB24	OB35	2	0.4037	0.0010	.985	.	.	23.9	.	0.815	
73	OB42	OB43	2	0.4062	0.0010	.984	.	.	23.5	.	0.825	
72	OB36	OB51	2	0.4087	0.0010	.983	.	.	23.2	.	0.835	
71	OB39	OB49	2	0.4183	0.0011	.982	.	.	22.9	.	0.875	
70	OB3	OB5	2	0.4219	0.0011	.981	.	.	22.6	.	0.89	
69	OB22	OB65	2	0.4231	0.0011	.980	.	.	22.4	.	0.895	
68	OB54	OB68	2	0.4278	0.0011	.979	.	.	22.1	.	0.915	
67	OB78	OB84	2	0.4290	0.0011	.978	.	.	22.0	.	0.92	
66	OB92	OB97	2	0.4324	0.0012	.977	.	.	21.8	.	0.935	
65	OB9	OB50	2	0.4336	0.0012	.975	.	.	21.7	.	0.94	
64	OB58	CL76	5	0.3382	0.0013	.974	.	.	21.5	2.6	1.0655	
63	OB12	OB38	2	0.4743	0.0014	.973	.	.	21.3	.	1.125	

62	OB85	OB96	2	0.4806	0.0014	.971	.	.	21.1	.	1.155
61	OB15	CL71	3	0.4509	0.0014	.970	.	.	20.9	1.3	1.1583
60	OB7	CL73	3	0.4669	0.0017	.968	.	.	20.7	1.6	1.355
59	CL94	CL79	5	0.3641	0.0017	.967	.	.	20.4	3.2	1.3637
58	OB33	OB48	2	0.5282	0.0017	.965	.	.	20.2	.	1.395
57	OB37	CL81	3	0.4575	0.0018	.963	.	.	20.0	2.2	1.4383
56	CL75	OB74	3	0.4740	0.0018	.961	.	.	19.9	1.8	1.4567
55	CL77	CL92	5	0.3821	0.0018	.959	.	.	19.7	3.1	1.4817
54	CL78	OB47	3	0.4824	0.0019	.958	.	.	19.6	2.1	1.5767
53	CL68	OB76	3	0.5132	0.0021	.955	.	.	19.4	1.9	1.7183
52	OB29	OB69	2	0.5925	0.0022	.953	.	.	19.2	.	1.755
51	OB23	OB32	2	0.5958	0.0022	.951	.	.	19.0	.	1.775
50	OB13	CL74	3	0.5106	0.0022	.949	.	.	18.9	2.2	1.7917
49	CL66	OB99	3	0.5279	0.0023	.947	.	.	18.8	2.0	1.8517
48	CL57	CL97	5	0.4620	0.0025	.944	.	.	18.7	2.8	2.0597
47	OB20	CL83	3	0.5099	0.0025	.942	.	.	18.5	3.8	2.06
46	CL58	OB59	3	0.5939	0.0026	.939	.	.	18.4	1.5	2.1317
45	OB28	CL72	3	0.5526	0.0027	.936	.	.	18.3	2.7	2.2183
44	CL61	OB30	4	0.5324	0.0027	.933	.	.	18.3	2.2	2.2192
43	CL63	CL89	4	0.5040	0.0028	.931	.	.	18.2	2.9	2.26
42	OB14	CL86	3	0.5329	0.0029	.928	.	.	18.2	5.0	2.37
41	CL84	CL96	4	0.4563	0.0031	.925	.	.	18.1	8.0	2.4975
40	OB16	CL45	4	0.6090	0.0031	.922	.	.	18.1	1.6	2.5092
39	CL85	CL49	5	0.5591	0.0037	.918	.	.	18.0	2.7	2.9753
38	CL67	CL98	4	0.5260	0.0039	.914	.	.	17.8	6.1	3.13
37	OB10	CL54	4	0.6036	0.0039	.910	.	.	17.7	2.7	3.1383
36	CL91	CL62	4	0.5704	0.0041	.906	.	.	17.6	4.5	3.37
35	OB6	CL60	4	0.6090	0.0042	.902	.	.	17.6	3.1	3.3825
34	OB8	OB18	2	0.8331	0.0043	.898	.	.	17.5	.	3.47
33	CL56	CL82	6	0.5100	0.0043	.893	.	.	17.5	4.7	3.5233
32	CL50	CL52	5	0.6344	0.0045	.889	.	.	17.5	2.5	3.6863
31	CL64	CL36	9	0.5435	0.0057	.883	.	.	17.4	4.5	4.6476
30	CL37	CL43	8	0.6368	0.0060	.877	.	.	17.2	3.2	4.9175
29	CL35	CL69	6	0.6762	0.0061	.871	.	.	17.1	3.1	4.9725
28	OB4	CL48	6	0.6144	0.0064	.865	.	.	17.0	4.8	5.1703
27	CL80	OB26	3	0.7633	0.0064	.858	.	.	17.0	7.9	5.1717
26	OB17	CL41	5	0.6467	0.0064	.852	.	.	17.0	5.0	5.2415
25	OB1	OB2	2	1.0286	0.0065	.845	.	.	17.1	.	5.29
24	OB27	CL46	4	0.7832	0.0070	.838	.	.	17.1	3.2	5.6733
23	CL33	CL38	10	0.6094	0.0075	.831	.	.	17.2	4.6	6.0607
22	CL44	CL47	7	0.6597	0.0076	.823	.	.	17.3	4.5	6.2018
21	CL32	CL87	7	0.7063	0.0079	.815	.	.	17.4	3.8	6.4577
20	CL42	CL55	8	0.6051	0.0087	.806	.831	-2.7	17.5	7.4	7.0563
19	CL53	CL59	8	0.5951	0.0087	.798	.823	-2.7	17.7	8.1	7.1109
18	CL65	CL27	5	0.8881	0.0111	.787	.815	-2.9	17.8	4.0	9.0093
17	CL51	CL23	12	0.7198	0.0123	.774	.806	-3.1	17.8	5.4	10.009
16	CL70	CL40	6	0.8124	0.0124	.762	.796	-2.9	17.9	6.2	10.046
15	CL34	CL22	9	0.8204	0.0128	.749	.786	-3.0	18.1	4.4	10.398
14	CL24	CL39	9	0.8121	0.0134	.736	.774	-3.0	18.4	5.0	10.93
13	CL15	CL31	18	0.7832	0.0165	.719	.762	-3.2	18.6	5.5	13.399
12	CL16	CL19	14	0.8085	0.0167	.703	.748	-3.3	18.9	5.6	13.59
11	CL25	CL21	9	0.9425	0.0188	.684	.733	-3.5	19.2	5.3	15.28
10	CL28	CL18	11	0.9234	0.0214	.662	.716	-3.6	19.6	6.2	17.42
9	CL29	CL20	14	0.8242	0.0245	.638	.696	-3.8	20.0	9.9	19.91
8	CL26	CL17	17	0.8722	0.0295	.608	.674	-4.1	20.4	9.8	23.997
7	CL30	CL14	17	0.9302	0.0352	.573	.647	-4.5	20.8	10.6	28.646
6	CL13	CL8	35	0.9459	0.0481	.525	.614	-5.3	20.8	11.4	39.106
5	CL10	CL7	28	1.0861	0.0583	.467	.573	-6.1	20.8	11.0	47.39
4	CL9	CL6	49	1.0293	0.0714	.395	.515	-6.0	20.9	13.9	58.007
3	CL11	CL12	23	1.1710	0.0896	.306	.405	-4.5	21.4	19.6	72.809

2	CL3	CL5	51	1.2736	0.1174	.188	.242	-2.7	22.7	15.1	95.442
1	CL2	CL4	100	1.2814	0.1883	.000	.000	0.00	.	22.7	153.04




Cluster Analysis
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Between-Cluster Sum of Squares

Chapter 9 HBAT Cluster Analysis Example

The CLUSTER Procedure
Ward's Minimum Variance Cluster Analysis

Variable	Mean	Standard Deviation	Skewness	Kurtosis	Bimodality
X6	7.8520	1.3744	-0.2564	-1.1340	0.5435
X8	5.4296	1.4708	-0.1078	-0.7401	0.4296
X12	5.1398	1.0733	0.3605	0.4126	0.3221
X15	5.0806	1.4189	0.1476	-0.2510	0.3593
X18	3.9000	0.7351	-0.5116	0.2955	0.3721

Eigenvalues of the Covariance Matrix

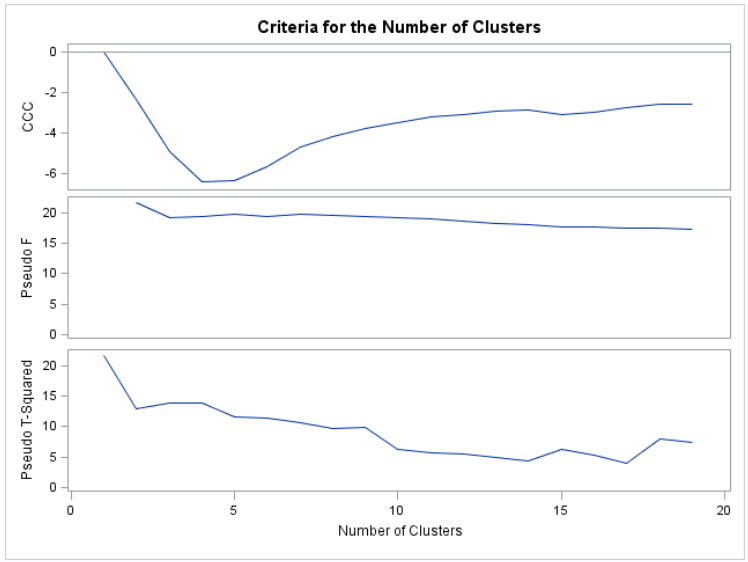
	Eigenvalue	Difference	Proportion	Cumulative
1	2.22759760	0.12519052	0.2871	0.2871
2	2.10240708	0.22195350	0.2710	0.5582
3	1.88045358	0.79748334	0.2424	0.8006
4	1.08297024	0.61870046	0.1396	0.9402
5	0.46426978		0.0598	1.0000

Root-Mean-Square Total-Sample Standard Deviation	1.245608

Cluster History

Number of Clusters	Clusters Joined		Freq	New Cluster RMS Std Dev	Semipartial R-Square	R-Square	Approximate Expected R-Square	Cubic Clustering Criterion	Pseudo F Statistic	Pseudo t-Squared	Between Cluster Sum of Squares	Tie
97	OB85	OB87	2	0.1265	0.0001	1.00	.	.	98.0	.	0.08	
96	OB81	OB84	2	0.1414	0.0001	1.00	.	.	88.0	.	0.1	
95	OB69	OB77	2	0.1517	0.0002	1.00	.	.	81.4	.	0.115	
94	OB42	OB50	2	0.1612	0.0002	.999	.	.	76.1	.	0.13	
93	OB88	OB89	2	0.1949	0.0003	.999	.	.	66.4	.	0.19	
92	OB53	OB54	2	0.1975	0.0003	.999	.	.	61.2	.	0.195	
91	CL93	OB93	3	0.2113	0.0003	.999	.	.	54.8	1.4	0.2567	
90	OB73	OB96	2	0.2470	0.0004	.998	.	.	49.2	.	0.305	
89	OB78	OB92	2	0.2665	0.0005	.998	.	.	44.5	.	0.355	
88	OB59	OB80	2	0.2757	0.0005	.997	.	.	40.9	.	0.38	
87	OB17	OB19	2	0.2915	0.0006	.997	.	.	37.9	.	0.425	T
86	OB71	OB91	2	0.2915	0.0006	.996	.	.	35.8	.	0.425	
85	OB29	OB32	2	0.3033	0.0006	.995	.	.	33.9	.	0.46	
84	OB60	OB68	2	0.3066	0.0006	.995	.	.	32.5	.	0.47	
83	OB86	OB98	2	0.3130	0.0007	.994	.	.	31.3	.	0.49	
82	OB39	OB70	2	0.3146	0.0007	.994	.	.	30.3	.	0.495	
81	OB65	OB79	2	0.3286	0.0007	.993	.	.	29.3	.	0.54	
80	OB61	CL97	3	0.2708	0.0009	.992	.	.	28.0	8.2	0.6533	
79	OB43	OB51	2	0.3619	0.0009	.991	.	.	27.0	.	0.655	T
78	OB9	OB23	2	0.3619	0.0009	.990	.	.	26.2	.	0.655	
77	OB64	CL86	3	0.3307	0.0009	.989	.	.	25.6	1.6	0.6683	
76	OB44	OB58	2	0.3873	0.0010	.988	.	.	24.8	.	0.75	
75	OB38	CL88	3	0.3367	0.0010	.987	.	.	24.2	2.0	0.7533	
74	OB75	CL91	4	0.2855	0.0010	.986	.	.	23.6	3.5	0.7758	
73	OB55	OB62	2	0.3975	0.0010	.985	.	.	23.2	.	0.79	
72	OB22	OB33	2	0.4037	0.0011	.984	.	.	22.7	.	0.815	
71	OB40	OB41	2	0.4062	0.0011	.983	.	.	22.4	.	0.825	
70	OB34	OB49	2	0.4087	0.0011	.982	.	.	22.1	.	0.835	
69	OB37	OB47	2	0.4183	0.0012	.981	.	.	21.8	.	0.875	
68	OB1	OB3	2	0.4219	0.0012	.980	.	.	21.5	.	0.89	
67	OB20	OB63	2	0.4231	0.0012	.978	.	.	21.3	.	0.895	
66	OB52	OB66	2	0.4278	0.0012	.977	.	.	21.1	.	0.915	
65	OB76	OB82	2	0.4290	0.0012	.976	.	.	20.9	.	0.92	
64	OB90	OB95	2	0.4324	0.0012	.975	.	.	20.8	.	0.935	
63	OB7	OB48	2	0.4336	0.0012	.973	.	.	20.7	.	0.94	
62	OB56	CL74	5	0.3382	0.0014	.972	.	.	20.5	2.6	1.0655	
61	OB10	OB36	2	0.4743	0.0015	.971	.	.	20.3	.	1.125	

60	OB83	OB94	2	0.4806	0.0015	.969	.	.	20.2	.	1.155
59	OB13	CL69	3	0.4509	0.0015	.967	.	.	20.0	1.3	1.1583
58	OB5	CL71	3	0.4669	0.0018	.966	.	.	19.8	1.6	1.355
57	CL92	CL77	5	0.3641	0.0018	.964	.	.	19.5	3.2	1.3637
56	OB31	OB46	2	0.5282	0.0019	.962	.	.	19.3	.	1.395
55	OB35	CL79	3	0.4575	0.0019	.960	.	.	19.2	2.2	1.4383
54	CL73	OB72	3	0.4740	0.0019	.958	.	.	19.0	1.8	1.4567
53	CL75	CL90	5	0.3821	0.0020	.956	.	.	18.9	3.1	1.4817
52	CL76	OB45	3	0.4824	0.0021	.954	.	.	18.8	2.1	1.5767
51	CL66	OB74	3	0.5132	0.0023	.952	.	.	18.6	1.9	1.7183
50	OB27	OB67	2	0.5925	0.0023	.949	.	.	18.4	.	1.755
49	OB21	OB30	2	0.5958	0.0024	.947	.	.	18.3	.	1.775
48	OB11	CL72	3	0.5106	0.0024	.945	.	.	18.2	2.2	1.7917
47	CL64	OB97	3	0.5279	0.0025	.942	.	.	18.1	2.0	1.8517
46	CL55	CL95	5	0.4620	0.0027	.940	.	.	18.0	2.8	2.0597
45	OB18	CL81	3	0.5099	0.0027	.937	.	.	17.9	3.8	2.06
44	CL56	OB57	3	0.5939	0.0028	.934	.	.	17.8	1.5	2.1317
43	OB26	CL70	3	0.5526	0.0029	.931	.	.	17.7	2.7	2.2183
42	CL59	OB28	4	0.5324	0.0029	.928	.	.	17.6	2.2	2.2192
41	CL61	CL87	4	0.5040	0.0030	.925	.	.	17.6	2.9	2.26
40	OB12	CL84	3	0.5329	0.0031	.922	.	.	17.6	5.0	2.37
39	CL82	CL94	4	0.4563	0.0033	.919	.	.	17.5	8.0	2.4975
38	OB14	CL43	4	0.6090	0.0033	.915	.	.	17.5	1.6	2.5092
37	CL83	CL47	5	0.5591	0.0040	.911	.	.	17.4	2.7	2.9753
36	CL65	CL96	4	0.5260	0.0042	.907	.	.	17.3	6.1	3.13
35	OB8	CL52	4	0.6036	0.0042	.903	.	.	17.3	2.7	3.1383
34	CL89	CL60	4	0.5704	0.0045	.899	.	.	17.2	4.5	3.37
33	OB4	CL58	4	0.6090	0.0045	.894	.	.	17.1	3.1	3.3825
32	OB6	OB16	2	0.8331	0.0046	.889	.	.	17.1	.	3.47
31	CL54	CL80	6	0.5100	0.0047	.885	.	.	17.1	4.7	3.5233
30	CL48	CL50	5	0.6344	0.0049	.880	.	.	17.2	2.5	3.6863
29	CL62	CL34	9	0.5435	0.0062	.874	.	.	17.0	4.5	4.6476
28	CL35	CL41	8	0.6368	0.0065	.867	.	.	16.9	3.2	4.9175
27	CL33	CL67	6	0.6762	0.0066	.861	.	.	16.8	3.1	4.9725
26	OB2	CL46	6	0.6144	0.0069	.854	.	.	16.8	4.8	5.1703
25	CL78	OB24	3	0.7633	0.0069	.847	.	.	16.8	7.9	5.1717
24	OB15	CL39	5	0.6467	0.0070	.840	.	.	16.9	5.0	5.2415
23	OB25	CL44	4	0.7832	0.0075	.832	.	.	16.9	3.2	5.6733
22	CL31	CL36	10	0.6094	0.0081	.824	.	.	17.0	4.6	6.0607
21	CL42	CL45	7	0.6597	0.0082	.816	.	.	17.1	4.5	6.2018
20	CL30	CL85	7	0.7063	0.0086	.807	.	.	17.2	3.8	6.4577
19	CL40	CL53	8	0.6051	0.0094	.798	.823	-2.6	17.3	7.4	7.0563
18	CL51	CL57	8	0.5951	0.0094	.789	.814	-2.6	17.6	8.1	7.1109
17	CL63	CL25	5	0.8881	0.0120	.777	.805	-2.8	17.6	4.0	9.0093
16	CL49	CL22	12	0.7198	0.0133	.763	.795	-3.0	17.6	5.4	10.009
15	CL68	CL38	6	0.8124	0.0134	.750	.785	-3.1	17.8	6.2	10.046
14	CL32	CL21	9	0.8204	0.0138	.736	.773	-2.9	18.0	4.4	10.398
13	CL23	CL37	9	0.8121	0.0145	.722	.761	-2.9	18.4	5.0	10.93
12	CL14	CL29	18	0.7832	0.0178	.704	.747	-3.1	18.6	5.5	13.399
11	CL15	CL18	14	0.8085	0.0181	.686	.731	-3.2	19.0	5.6	13.59
10	CL26	CL17	11	0.9234	0.0231	.663	.714	-3.5	19.2	6.2	17.42
9	CL27	CL19	14	0.8242	0.0265	.636	.694	-3.8	19.4	9.9	19.91
8	CL24	CL16	17	0.8722	0.0319	.604	.671	-4.2	19.6	9.8	23.997
7	CL28	CL13	17	0.9302	0.0381	.566	.644	-4.7	19.8	10.6	28.646
6	CL12	CL8	35	0.9459	0.0520	.514	.612	-5.6	19.5	11.4	39.106
5	CL10	CL20	18	1.0815	0.0556	.459	.570	-6.3	19.7	11.6	41.817
4	CL9	CL6	49	1.0293	0.0771	.382	.512	-6.4	19.3	13.9	58.007
3	CL5	CL7	35	1.1869	0.0942	.287	.395	-4.9	19.2	13.9	70.855
2	CL11	CL3	49	1.2239	0.1031	.184	.230	-2.3	21.7	12.9	77.547
1	CL2	CL4	98	1.2456	0.1843	.000	.000	0.00	.	21.7	138.71


Criteria for the Number of Clusters
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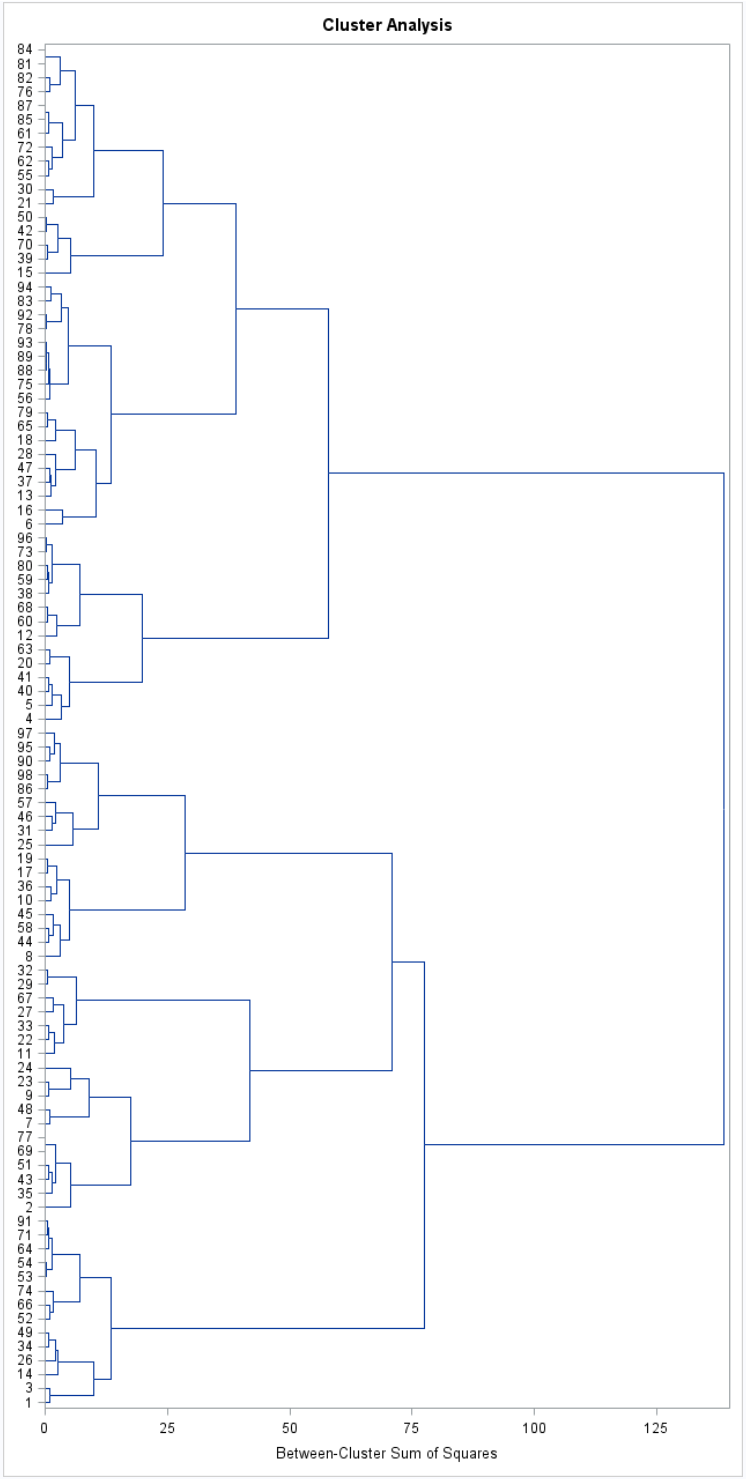
Number of Clusters


Cluster Analysis
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Between-Cluster Sum of Squares

Chapter 9 HBAT Cluster Analysis Example

The FASTCLUS Procedure
Replace=RANDOM Radius=0 Maxclusters=4 Maxiter=20 Converge=0.02

Initial Seeds

Cluster	X6	X8	X12	X15	X18
1	5.700000000	6.800000000	6.000000000	4.800000000	5.200000000
2	8.600000000	5.800000000	4.000000000	4.000000000	3.000000000
3	8.600000000	5.600000000	5.700000000	3.600000000	3.600000000
4	7.600000000	7.600000000	5.000000000	6.600000000	3.900000000

Minimum Distance Between Initial Seeds =	1.857418

Iteration History

Iteration	Criterion	Relative Change in Cluster Seeds			
		1	2	3	4
1	1.1589	0.9077	0.6978	0.5262	0.6736
2	0.9931	0.0816	0.0739	0.1348	0.1923
3	0.9864	0	0.1328	0.1196	0.0678
4	0.9811	0	0.1075	0.1261	0
5	0.9759	0	0.1864	0.1458	0.0912
6	0.9684	0.1262	0.1986	0	0.1569
7	0.9598	0.0673	0.0666	0.0620	0.0796
8	0.9571	0.0500	0.0867	0.0417	0.0821
9	0.9548	0	0	0.0763	0.0796
10	0.9537	0	0.0526	0.0950	0.0403
11	0.9505	0	0.0513	0.1319	0.0893
12	0.9468	0.0817	0.0455	0.0839	0.0842
13	0.9435	0	0.1246	0.1428	0
14	0.9391	0.0658	0.0801	0.0539	0
15	0.9374	0.0485	0.0590	0.0540	0.0599
16	0.9356	0.0985	0.0900	0	0
17	0.9325	0.1144	0.1211	0.0533	0.0811
18	0.9287	0.0703	0.0446	0	0.0536
19	0.9271	0.1009	0.0570	0	0.0764
20	0.9244	0.0690	0.0751	0	0

WARNING: Iteration limit reached without convergence.

Cluster Listing

Obs	Cluster	Distance from Seed
1	1	3.3416
2	4	2.6066
3	1	2.5508
4	2	2.6728
5	2	2.1947
6	3	3.2836
7	4	3.2562
8	4	2.7814
9	4	2.8879
10	4	2.4119
11	1	3.4608
12	2	2.9354
13	3	2.0847
14	1	2.5373
15	2	2.4740
16	3	2.6709
17	4	1.7894
18	3	2.2304
19	4	2.1200
20	2	2.9022
21	2	2.1827

22	2	3.0682
23	4	3.0372
24	4	2.9790
25	1	2.9068
26	1	1.9092
27	1	2.7482
28	3	1.6854
29	4	2.9513
30	2	2.0348
31	4	2.5983
32	2	2.5281
33	2	2.2046
34	1	1.7008
35	4	2.1669
36	4	2.0505
37	3	1.5646
38	1	2.4685
39	2	2.1966
40	2	1.4817
41	2	1.6475
42	2	2.1881
43	4	1.2351
44	4	2.2933
45	3	2.0925
46	4	2.4061
47	3	1.4627
48	3	2.4629
49	1	1.2550
50	2	2.4297
51	4	1.9000
52	1	1.3418
53	1	1.4386
54	1	1.4878
55	3	2.5148
56	3	1.6441
57	3	2.5720
58	4	2.0043
59	1	1.7073
60	1	1.3343
61	3	1.2534
62	3	2.0485
63	2	2.1368
64	1	1.7487
65	3	1.0767
66	1	1.7003
67	2	1.6261
68	1	1.4612
69	4	1.2061
70	2	1.7814
71	1	0.9263
72	2	1.9863
73	1	1.9780
74	1	2.2353
75	3	1.6041
76	2	1.4876
77	4	1.3612
78	3	1.6455
79	3	1.0502
80	1	1.5922
81	3	1.4680

82	2	0.5762
83	4	1.6060
84	3	1.1256
85	3	1.4983
86	2	1.0967
87	3	1.1510
88	3	0.9611
89	3	0.8654
90	1	1.5423
91	1	0.9329
92	3	1.1860
93	3	1.3257
94	3	1.0825
95	1	1.9128
96	1	1.5941
97	4	1.4117
98	2	1.7642

Criterion Based on Final Seeds =	0.9234

Cluster Summary

Cluster	Frequency	RMS Std Deviation	Maximum Distance from Seed to Observation	Radius Exceeded	Nearest Cluster	Distance Between Cluster Centroids
1	26	0.9248	3.4608		2	2.9175
2	23	0.9831	3.0682		3	2.8036
3	27	0.8184	3.2836		4	2.7622
4	22	1.0580	3.2562		3	2.7622

Statistics for Variables

Variable	Total STD	Within STD	R-Square	RSQ/(1-RSQ)
X6	1.37438	0.79577	0.675126	2.078120
X8	1.47076	1.15258	0.404862	0.680281
X12	1.07327	1.02455	0.116911	0.132389
X15	1.41892	0.94042	0.574323	1.349200
X18	0.73513	0.74092	0.015597	0.015844
OVER-ALL	1.24561	0.94284	0.444775	0.801071

Pseudo F Statistic =	25.10

Approximate Expected Over-All R-Squared =	0.50145

Cubic Clustering Criterion =	-2.981

WARNING: The two values above are invalid for correlated variables.

Cluster Means

Cluster	X6	X8	X12	X15	X18
1	6.165384615	5.873076923	5.669230769	5.180769231	3.950000000
2	7.643478261	3.791304348	4.686956522	4.186956522	3.747826087
3	8.929629630	6.225925926	5.188888889	4.244444444	3.900000000
4	8.740909091	5.640909091	4.927272727	6.922727273	4.000000000

Cluster Standard Deviations

Cluster	X6	X8	X12	X15	X18
1	0.606591993	1.137561495	0.981333473	0.912148773	0.905207159
2	0.989869636	0.825124257	0.959310523	1.258897190	0.816238359
3	0.728969143	0.995602868	0.937399567	0.797753255	0.557466798
4	0.843834271	1.570155919	1.224815562	0.721065229	0.631702160

Distance Between Cluster Centroids

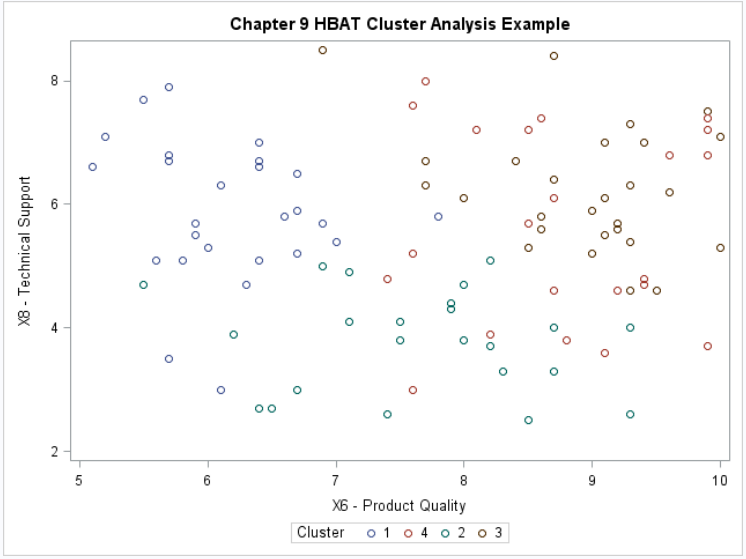
Nearest Cluster	1	2	3	4
1	.	2.917522677	2.979175279	3.205409144
2	2.917522677	.	2.803562989	3.497310008
3	2.979175279	2.803562989	.	2.762155329

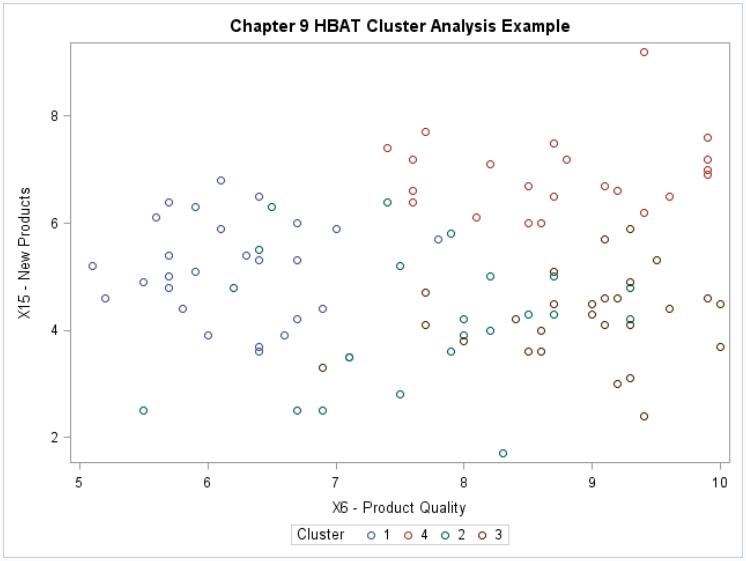
4	3.205409144	3.497310008	2.762155329	.

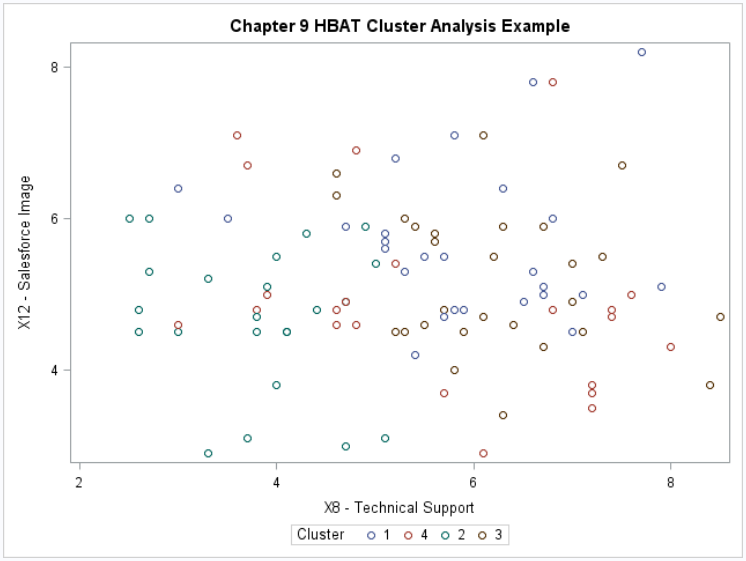
Chapter 9 HBAT Cluster Analysis Example

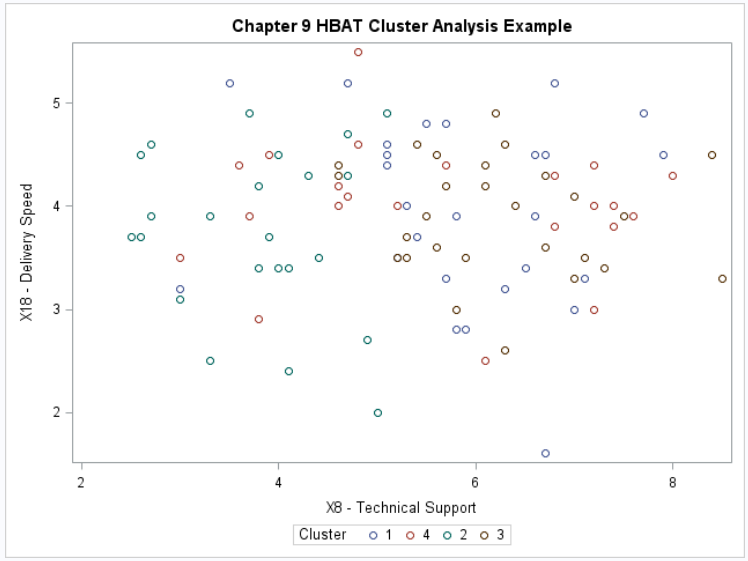
Obs	ID	X6	X8	X12	X15	X18	MeanX6	MeanX8	MeanX12	MeanX15	MeanX18	X1	X2	X3	X4	X5	X7	X9	X10	X11	X13	X14	X16	X17	X19	X20	X21	X22	X23	X6C	X8C	X12C	X15C	X18C	X6CSQR	X8CSQR	X12CSQR	X15CSQR	X18CSQR	TotDiffSqr	SqrRootTot	CLUSTER	DISTANCE
1	90	5.5	7.7	8.2	4.9	4.9	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	5.5	7.0	5.6	5.7	6.3	7.4	5.5	6.7	8.2	7.6	9.3	59.1	1	-2.31	2.335	3.077	-0.25	1.014	5.3361	5.45223	9.46793	0.0625	1.02820	21.3470	4.62028	1	3.34163
2	53	9.4	4.8	4.6	9.2	4.6	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	2.5	6.1	3.2	7.3	6.3	6.3	4.7	4.6	8.7	9.0	9.0	66.1	1	1.59	-0.565	-0.523	4.05	0.714	2.5281	0.31922	0.27353	16.4025	0.50980	20.0332	4.47584	4	2.60665
3	44	5.1	6.6	7.8	5.2	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	1	5.1	6.9	4.4	5.4	5.9	7.2	4.9	6.3	7.6	7.9	8.4	55.1	1	-2.71	1.235	2.677	0.05	0.614	7.3441	1.52523	7.16633	0.0025	0.37700	16.4152	4.05156	1	2.55079
4	41	8.3	3.3	5.2	1.7	3.9	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.4	5.5	3.1	4.6	9.1	4.1	4.6	5.8	7.0	7.5	8.4	61.1	1	0.49	-2.065	0.077	-3.45	0.014	0.2401	4.26422	0.00593	11.9025	0.00020	16.4129	4.05129	2	2.67277
5	72	6.7	3.0	4.5	2.5	3.1	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.2	3.7	4.8	6.3	5.0	5.2	2.9	2.6	5.8	6.0	7.0	43.1	0	-1.11	-2.365	-0.623	-2.65	-0.786	1.2321	5.59322	0.38813	7.0225	0.61780	14.8537	3.85406	2	2.19471
6	31	6.9	8.5	4.7	3.3	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.4	4.3	4.5	6.4	5.2	7.7	3.7	2.7	6.1	6.8	7.1	44.1	0	-0.91	3.135	-0.423	-1.85	-0.586	0.8281	9.82823	0.17893	3.4225	0.34340	14.6012	3.82115	3	3.28356
7	22	9.6	6.8	7.8	6.5	4.3	7.81	5.365	5.123	5.15	3.886	3	1	1	1	1	5.7	5.9	5.4	8.3	4.5	6.4	4.3	3.0	9.9	9.6	9.9	70.1	1	1.79	1.435	2.677	1.35	0.414	3.2041	2.05923	7.16633	1.8225	0.17140	14.4236	3.79783	4	3.25619
8	88	7.7	8.0	4.3	7.7	4.3	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.6	6.7	3.5	7.2	5.9	6.9	5.1	3.9	8.2	7.6	8.2	52.1	0	-0.11	2.635	-0.823	2.55	0.414	0.0121	6.94323	0.67733	6.5025	0.17140	14.3066	3.78240	4	2.78144
9	49	9.9	3.7	6.7	7.2	3.9	7.81	5.365	5.123	5.15	3.886	3	0	0	1	1	3.7	6.1	4.2	7.0	6.8	5.9	4.5	3.4	8.7	8.1	8.5	67.1	1	2.09	-1.665	1.577	2.05	0.014	4.3681	2.77222	2.48693	4.2025	0.00020	13.8300	3.71886	4	2.88792
10	60	9.9	7.2	3.5	7.0	4.0	7.81	5.365	5.123	5.15	3.886	3	1	1	1	0	2.8	6.9	2.6	5.8	5.4	6.2	5.6	4.9	7.9	8.5	8.5	61.1	1	2.09	1.835	-1.623	1.85	0.114	4.3681	3.36723	2.63413	3.4225	0.01300	13.8050	3.71550	4	2.41192
11	40	6.1	3.0	6.4	6.8	3.2	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	4.9	4.8	5.1	3.9	8.2	5.1	4.5	4.9	6.0	5.5	5.8	53.1	0	-1.71	-2.365	1.277	1.65	-0.686	2.9241	5.59322	1.63073	2.7225	0.47060	13.3412	3.65255	1	3.46082
12	68	5.5	4.7	4.9	2.5	4.3	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	3.7	5.4	4.3	5.3	6.0	5.6	4.5	5.9	6.1	6.3	8.2	48.1	0	-2.31	-0.665	-0.223	-2.65	0.414	5.3361	0.44222	0.04973	7.0225	0.17140	13.0219	3.60859	2	2.93536
13	78	9.4	7.0	4.9	2.4	4.1	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.8	6.2	4.7	6.5	8.5	7.3	4.3	4.5	7.6	7.3	8.0	61.1	1	1.59	1.635	-0.223	-2.75	0.214	2.5281	2.67323	0.04973	7.5625	0.04580	12.8594	3.58599	3	2.08468
14	67	5.7	7.9	5.1	6.4	4.5	7.81	5.365	5.123	5.15	3.886	2	1	0	1	0	4.0	6.4	2.7	5.5	6.2	7.5	5.0	6.2	6.4	5.6	6.2	50.1	0	-2.11	2.535	-0.023	1.25	0.614	4.4521	6.42623	0.00053	1.5625	0.37700	12.8184	3.58027	1	2.53733
15	98	8.7	3.3	2.9	4.3	2.5	7.81	5.365	5.123	5.15	3.886	1	0	0	0	1	3.2	3.2	3.1	6.1	5.6	5.0	3.1	2.9	5.4	7.0	7.7	51.1	0	0.89	-2.065	-2.223	-0.85	-1.386	0.7921	4.26422	4.94173	0.7225	1.92100	12.6415	3.55550	2	2.47400
16	61	8.7	8.4	3.8	4.5	4.5	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	6.1	2.8	7.8	4.9	7.2	5.4	3.9	6.6	6.9	7.2	71.1	1	0.89	3.035	-1.323	-0.65	0.614	0.7921	9.21123	1.75033	0.4225	0.37700	12.5532	3.54304	3	2.67089
17	76	9.9	6.8	4.8	7.6	3.8	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	5.0	5.4	5.9	4.9	7.3	3.1	4.3	7.1	6.6	8.9	63.1	1	2.09	1.435	-0.323	2.45	-0.086	4.3681	2.05923	0.10433	6.0025	0.00740	12.5416	3.54141	4	1.78938
18	74	9.9	7.5	6.7	4.6	3.9	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.7	4.7	5.6	7.0	6.8	7.2	4.1	3.4	8.6	8.8	9.8	66.1	1	2.09	2.135	1.577	-0.55	0.014	4.3681	4.55823	2.48693	0.3025	0.00020	11.7160	3.42286	3	2.23042
19	81	9.9	7.4	4.8	6.9	3.8	7.81	5.365	5.123	5.15	3.886	3	0	1	0	0	3.0	4.8	4.0	5.9	4.9	5.9	3.2	4.3	7.1	7.9	8.8	63.1	0	2.09	2.035	-0.323	1.75	-0.086	4.3681	4.14123	0.10433	3.0625	0.00740	11.6836	3.41812	4	2.12005
20	7	6.9	5.0	5.4	2.5	2.0	7.81	5.365	5.123	5.15	3.886	1	1	1	0	0	3.7	2.6	2.1	2.3	8.9	4.8	2.1	4.2	5.7	7.8	7.2	41.1	0	-0.91	-0.365	0.277	-2.65	-1.886	0.8281	0.13322	0.07673	7.0225	3.55700	11.6175	3.40845	2	2.90222
21	24	9.3	2.6	4.5	4.2	4.5	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	2.4	7.2	2.2	7.2	6.2	6.4	6.7	4.4	8.6	8.1	8.0	65.1	1	1.49	-2.765	-0.623	-0.95	0.614	2.2201	7.64522	0.38813	0.9025	0.37700	11.5329	3.39602	2	2.18270
22	73	6.5	2.7	6.0	6.3	4.6	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.3	6.6	6.5	6.3	8.7	4.7	4.6	5.6	7.9	6.6	7.9	66.1	0	-1.31	-2.665	0.877	1.15	0.714	1.7161	7.10222	0.76913	1.3225	0.50980	11.4197	3.37931	2	3.06818
23	20	9.1	3.6	7.1	6.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	1	1	0	4.5	6.4	5.3	5.3	8.4	5.8	4.5	6.1	7.6	8.5	8.8	67.1	1	1.29	-1.765	1.977	1.55	0.514	1.6641	3.11522	3.90853	2.4025	0.26420	11.3546	3.36965	4	3.03720
24	57	7.4	4.8	6.9	7.4	5.5	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	5.1	7.7	4.5	7.2	9.6	6.4	5.7	6.5	9.0	7.9	8.8	74.1	1	-0.41	-0.565	1.777	2.25	1.614	0.1681	0.31922	3.15773	5.0625	2.60500	11.3126	3.36341	4	2.97903
25	84	6.4	6.7	5.0	6.5	1.6	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	3.2	3.6	2.2	2.9	8.4	7.3	2.0	3.7	5.0	5.1	6.5	37.1	0	-1.41	1.335	-0.123	1.35	-2.286	1.9881	1.78223	0.01513	1.8225	5.22580	10.8338	3.29147	1	2.90682
26	21	5.2	7.1	5.0	4.6	3.3	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	3.8	5.2	3.9	4.3	8.4	7.1	3.3	4.9	5.4	5.5	7.0	50.1	0	-2.61	1.735	-0.123	-0.55	-0.586	6.8121	3.01023	0.01513	0.3025	0.34340	10.4834	3.23780	1	1.90918
27	66	5.7	3.5	6.0	5.0	5.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.8	6.7	5.4	5.7	8.2	5.4	4.7	7.3	7.6	6.9	9.0	60.1	1	-2.11	-1.865	0.877	-0.15	1.314	4.4521	3.47822	0.76913	0.0225	1.72660	10.4485	3.23242	1	2.74821
28	47	10.0	7.1	4.5	3.7	3.5	7.81	5.365	5.123	5.15	3.886	3	1	0	0	1	4.3	6.3	2.9	5.4	3.8	6.7	5.0	4.0	7.1	8.8	8.0	67.1	1	2.19	1.735	-0.623	-1.45	-0.386	4.7961	3.01023	0.38813	2.1025	0.14900	10.4460	3.23202	3	1.68543
29	30	7.6	3.0	4.6	7.2	3.5	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.6	4.0	5.1	4.2	7.7	4.9	4.7	5.5	5.4	5.5	6.2	52.1	0	-0.21	-2.365	-0.523	2.05	-0.386	0.0441	5.59322	0.27353	4.2025	0.14900	10.2624	3.20349	4	2.95128
30	1	8.5	2.5	6.0	4.3	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.9	5.9	4.8	4.9	6.8	4.7	5.0	5.1	8.2	8.0	8.4	65.1	1	0.69	-2.865	0.877	-0.85	-0.186	0.4761	8.20822	0.76913	0.7225	0.03460	10.2105	3.19540	2	2.03476
31	36	8.7	6.1	2.9	6.5	2.5	7.81	5.365	5.123	5.15	3.886	1	0	0	0	0	3.2	4.3	3.5	6.1	5.6	6.1	3.1	2.9	5.4	4.6	7.1	51.1	0	0.89	0.735	-2.223	1.35	-1.386	0.7921	0.54023	4.94173	1.8225	1.92100	10.0176	3.16505	4	2.59826
32	97	7.4	2.6	4.8	6.4	3.7	7.81	5.365	5.123	5.15	3.886	1	0	0	1	1	3.4	5.0	4.1	4.4	7.2	4.5	4.2	5.6	6.3	5.5	7.2	48.1	0	-0.41	-2.765	-0.323	1.25	-0.186	0.1681	7.64522	0.10433	1.5625	0.03460	9.5147	3.08460	2	2.52807
33	70	6.4	2.7	5.3	5.5	3.9	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.6	5.3	3.9	3.9	7.1	5.2	4.7	6.6	6.6	6.6	8.0	58.1	1	-1.41	-2.665	0.177	0.35	0.014	1.9881	7.10222	0.03133	0.1225	0.00020	9.2443	3.04045	2	2.20460
34	48	5.7	6.8	6.0	4.8	5.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.8	7.5	5.7	5.7	8.2	6.6	6.5	7.3	7.6	7.6	7.1	60.1	0	-2.11	1.435	0.877	-0.35	1.314	4.4521	2.05923	0.76913	0.1225	1.72660	9.1296	3.02151	1	1.70078
35	63	8.8	3.8	4.8	7.2	2.9	7.81	5.365	5.123	5.15	3.886	1	0	0	0	1	3.9	5.1	4.3	4.7	5.8	5.0	4.4	3.7	6.3	5.5	8.0	44.1	0	0.99	-1.565	-0.323	2.05	-0.986	0.9801	2.44922	0.10433	4.2025	0.97220	8.7084	2.95099	4	2.16691
36	27	8.5	7.2	3.7	6.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	5.8	4.1	7.6	4.8	6.9	5.3	3.8	6.3	7.1	7.0	70.1	0	0.69	1.835	-1.423	1.55	0.514	0.4761	3.36723	2.02493	2.4025	0.26420	8.5350	2.92146	4	2.05051
37	79	9.3	6.3	5.9	3.1	4.6	7.81	5.365	5.123	5.15	3.886	3	0	0	0	1	3.5	7.6	5.5	7.5	4.6	6.6	5.2	4.1	8.9	7.3	8.1	72.1	1	1.49	0.935	0.777	-2.05	0.714	2.2201	0.87423	0.60373	4.2025	0.50980	8.4104	2.90006	3	1.56464
38	4	6.4	7.0	4.5	3.6	3.0	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.3	3.7	4.7	4.7	8.8	7.0	4.3	4.1	4.8	6.0	7.2	40.1	0	-1.41	1.635	-0.623	-1.55	-0.886	1.9881	2.67323	0.38813	2.4025	0.78500	8.2369	2.87001	1	2.46849
39	52	8.2	3.7	3.1	5.0	4.9	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.7	7.4	2.7	7.9	5.3	5.3	4.5	4.3	5.7	7.1	8.2	67.1	1	0.39	-1.665	-2.023	-0.15	1.014	0.1521	2.77222	4.09253	0.0225	1.02820	8.0675	2.84034	2	2.19659
40	86	7.5	4.1	4.5	2.8	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.5	4.5	3.5	4.1	7.6	4.9	3.4	5.4	5.2	6.0	7.2	51.1	0	-0.31	-1.265	-0.623	-2.35	-0.486	0.0961	1.60022	0.38813	5.5225	0.23620	7.8431	2.80056	2	1.48171
41	92	7.1	4.1	4.5	3.5	2.4	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	4.2	2.6	2.1	3.3	9.9	5.5	2.0	4.0	4.8	5.0	6.5	51.1	0	-0.71	-1.265	-0.623	-1.65	-1.486	0.5041	1.60022	0.38813	2.7225	2.20820	7.4231	2.72455	2	1.64747
42	45	8.0	4.7	3.0	3.9	4.7	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.5	7.1	3.6	7.7	5.2	5.1	4.3	4.2	5.5	5.6	6.5	65.1	0	0.19	-0.665	-2.123	-1.25	0.814	0.0361	0.44222	4.50713	1.5625	0.66260	7.2105	2.68525	2	2.18807
43	11	8.7	4.6	4.6	7.5	4.0	7.81	5.365	5.123	5.15	3.886	3	0	1	0	1	3.2	4.8	2.7	6.8	6.8	5.8	3.8	3.7	7.4	7.0	8.4	68.1	0	0.89	-0.765	-0.523	2.35	0.114	0.7921	0.58522	0.27353	5.5225	0.01300	7.1864	2.68074	4	1.23512
44	77	7.6	7.6	5.0	6.6	3.9	7.81	5.365	5.123	5.15	3.886	1	0	0	1	1	3.6	4.6	4.7	4.6	7.4	8.1	4.5	5.8	6.4	6.9	7.5	49.1	0	-0.21	2.235	-0.123	1.45	0.014	0.0441	4.99523	0.01513	2.1025	0.00020	7.1572	2.67529	4	2.29328
45	56	9.3	7.3	5.5	5.9	3.4	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.8	5.7	3.7	6.4	7.4	6.6	4.1	3.2	7.7	7.6	8.9	59.1	1	1.49	1.935	0.377	0.75	-0.486	2.2201	3.74423	0.14213	0.5625	0.23620	6.9052	2.62777	3	2.09248
46	32	8.1	7.2	3.8	6.1	3.0	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	2.5	4.5	2.3	5.1	6.6	6.8	3.0	3.5	6.4	5.8	6.2	51.1	0	0.29	1.835	-1.323	0.95	-0.886	0.0841	3.36723	1.75033	0.9025	0.78500	6.8892	2.62472	4	2.40607
47	14	9.2	5.7	4.8	3.0	4.2	7.81	5.365	5.123	5.15	3.886	3	1	0	0	1	3.9	5.5	2.4	8.4	7.1	6.7	4.5	2.6	7.6	6.9	8.2	72.1	1	1.39	0.335	-0.323	-2.15	0.314	1.9321	0.11223	0.10433	4.6225	0.09860	6.8697	2.62102	3	1.46273
48	71	9.1	6.1	7.1	5.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	1	0	4.5	5.9	6.3	5.3	8.4	7.1	5.4	6.1	7.6	7.5	7.7	67.1	0	1.29	0.735	1.977	0.55	0.514	1.6641	0.54023	3.90853	0.3025	0.26420	6.6796	2.58448	3	2.46290
49	17	5.7	6.7	5.1	5.4	4.5	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	4.0	6.0	3.3	5.5	6.2	6.7	4.2	6.2	6.4	7.5	7.2	50.1	1	-2.11	1.335	-0.023	0.25	0.614	4.4521	1.78223	0.00053	0.0625	0.37700	6.6744	2.58348	1	1.25498
50	2	8.2	5.1	3.1	4.0	4.9	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.7	7.2	3.4	7.9	5.3	5.5	3.9	4.3	5.7	6.5	7.5	67.1	0	0.39	-0.265	-2.023	-1.15	1.014	0.1521	0.07022	4.09253	1.3225	1.02820	6.6655	2.58177	2	2.42967
51	39	8.2	3.9	5.0	7.1	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.6	6.2	5.8	4.9	9.0	5.2	4.7	6.9	7.6	6.9	7.6	65.1	1	0.39	-1.465	-0.123	1.95	0.614	0.1521	2.14622	0.01513	3.8025	0.37700	6.4930	2.54813	4	1.90002
52	12	6.1	6.3	6.4	5.9	3.2	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.9	3.9	4.4	3.9	8.2	5.8	3.0	4.9	6.0	6.3	6.6	53.1	0	-1.71	0.935	1.277	0.75	-0.686	2.9241	0.87423	1.63073	0.5625	0.47060	6.4622	2.54208	1	1.34177
53	19	5.6	5.1	5.6	6.1	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.4	6.4	3.7	5.7	9.1	5.4	5.0	6.0	6.8	7.5	7.9	55.1	0	-2.21	-0.265	0.477	0.95	0.614	4.8841	0.07022	0.22753	0.9025	0.37700	6.4614	2.54192	1	1.43861
54	18	5.9	5.5	5.5	6.3	4.8	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.1	7.2	3.5	6.4	8.4	6.2	5.7	5.8	7.4	6.9	8.2	58.1	1	-1.91	0.135	0.377	1.15	0.914	3.6481	0.01823	0.14213	1.3225	0.83540	5.9664	2.44261	1	1.48776
55	13	9.5	4.6	6.6	5.3	4.4	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	5.6	6.9	5.0	6.9	7.6	6.5	5.1	4.5	8.4	8.4	7.9	58.1	1	1.69	-0.765	1.477	0.15	0.514	2.8561	0.58522	2.18153	0.0225	0.26420	5.9096	2.43096	3	2.51483
56	59	10.0	5.3	4.5	4.5	3.5	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	4.3	3.7	4.2	5.4	3.8	6.7	3.7	4.0	7.1	6.5	7.0	67.1	0	2.19	-0.065	-0.623	-0.65	-0.386	4.7961	0.00422	0.38813	0.4225	0.14900	5.7600	2.39999	3	1.64405
57	64	7.7	6.3	3.4	4.7	2.6	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	2.2	4.5	2.4	4.7	6.2	6.0	3.3	3.1	6.0	6.0	8.1	47.1	0	-0.11	0.935	-1.723	-0.45	-1.286	0.0121	0.87423	2.96873	0.2025	1.65380	5.7113	2.38984	3	2.57199

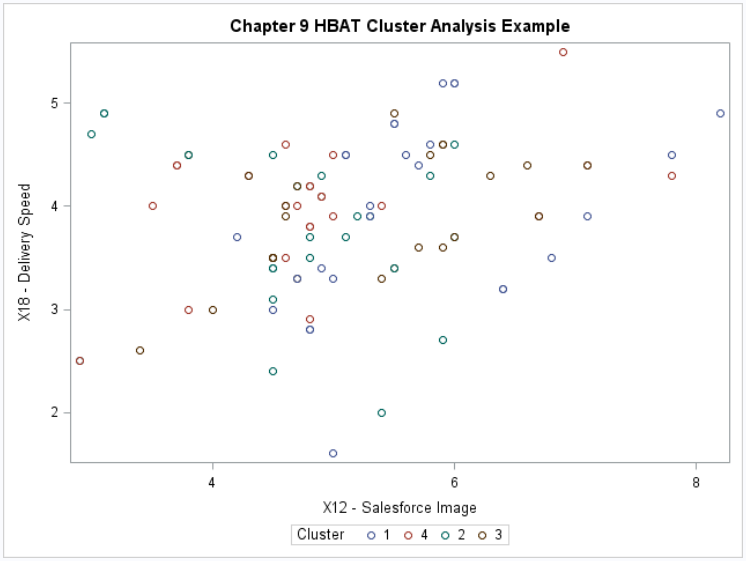
58	23	8.6	7.4	4.7	6.0	4.0	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	3.6	5.1	3.5	7.3	3.7	6.7	4.8	3.4	7.0	7.1	8.1	60.1	0	0.79	2.035	-0.423	0.85	0.114	0.6241	4.14123	0.17893	0.7225	0.01300	5.6798	2.38322	4	2.00433
59	26	6.4	6.6	5.3	3.7	3.9	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.6	6.1	4.0	3.9	7.1	6.1	5.6	6.6	6.6	6.8	7.0	58.1	0	-1.41	1.235	0.177	-1.45	0.014	1.9881	1.52523	0.03133	2.1025	0.00020	5.6473	2.37642	1	1.70733
60	9	5.8	5.1	5.8	4.4	4.6	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.6	6.7	3.7	5.9	9.3	5.9	4.4	6.1	7.0	7.5	8.2	56.1	1	-2.01	-0.265	0.677	-0.75	0.714	4.0401	0.07022	0.45833	0.5625	0.50980	5.6409	2.37507	1	1.33430
61	38	9.6	6.2	5.5	4.4	4.9	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	4.1	7.3	2.9	7.7	7.7	6.1	5.2	4.6	8.7	9.9	9.9	77.1	1	1.79	0.835	0.377	-0.75	1.014	3.2041	0.69723	0.14213	0.5625	1.02820	5.6342	2.37364	3	1.25342
62	43	9.3	4.6	6.3	4.1	4.3	7.81	5.365	5.123	5.15	3.886	3	0	1	0	1	5.1	6.8	5.8	6.6	7.4	5.1	4.6	4.6	8.9	7.8	7.6	72.1	1	1.49	-0.765	1.177	-1.05	0.414	2.2201	0.58522	1.38533	1.1025	0.17140	5.4646	2.33764	3	2.04847
63	80	7.1	4.9	5.9	3.5	2.7	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.4	4.1	4.0	5.0	7.8	6.1	2.6	3.1	5.7	5.8	7.6	44.1	0	-0.71	-0.465	0.777	-1.65	-1.186	0.5041	0.21622	0.60373	2.7225	1.40660	5.4531	2.33520	2	2.13680
64	15	6.3	4.7	5.9	5.4	5.2	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	4.5	6.9	4.5	6.8	8.8	6.0	4.8	6.2	8.0	7.0	7.6	62.1	1	-1.51	-0.665	0.777	0.25	1.314	2.2801	0.44222	0.60373	0.0625	1.72660	5.1152	2.26167	1	1.74873
65	91	9.1	7.0	5.4	4.6	3.3	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.7	4.1	4.4	6.3	7.3	7.5	4.4	3.0	7.4	7.9	7.9	58.1	1	1.29	1.635	0.277	-0.55	-0.586	1.6641	2.67323	0.07673	0.3025	0.34340	5.0600	2.24943	3	1.07666
66	35	6.7	5.2	6.8	6.0	3.5	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.0	3.9	3.0	5.4	8.4	6.2	2.5	4.3	6.3	6.6	6.7	54.1	0	-1.11	-0.165	1.677	0.85	-0.386	1.2321	0.02722	2.81233	0.7225	0.14900	4.9432	2.22332	1	1.70033
67	8	6.2	3.9	5.1	4.8	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.3	4.8	4.6	3.6	6.9	5.4	4.3	6.3	6.3	5.8	7.7	56.1	0	-1.61	-1.465	-0.023	-0.35	-0.186	2.5921	2.14622	0.00053	0.1225	0.03460	4.8959	2.21268	2	1.62609
68	25	6.0	5.3	5.3	3.9	4.0	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	4.1	4.7	3.5	5.3	8.0	6.5	4.7	5.3	4.8	4.9	5.5	55.1	0	-1.81	-0.065	0.177	-1.25	0.114	3.2761	0.00422	0.03133	1.5625	0.01300	4.8871	2.21069	1	1.46115
69	93	9.2	4.6	4.8	6.6	4.2	7.81	5.365	5.123	5.15	3.886	3	1	1	0	1	3.9	5.3	4.2	8.4	7.1	6.2	4.4	2.6	7.6	7.5	8.6	72.1	0	1.39	-0.765	-0.323	1.45	0.314	1.9321	0.58522	0.10433	2.1025	0.09860	4.8228	2.19608	4	1.20607
70	16	8.7	4.0	3.8	5.0	4.5	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	6.8	3.2	7.8	4.9	6.1	4.3	3.9	6.6	6.4	7.1	71.1	0	0.89	-1.365	-1.323	-0.15	0.614	0.7921	1.86322	1.75033	0.0225	0.37700	4.8051	2.19207	2	1.78137
71	46	5.9	5.7	5.5	5.1	4.8	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.1	5.9	5.8	6.4	8.4	6.4	5.2	5.8	7.4	8.6	7.7	58.1	1	-1.91	0.335	0.377	-0.05	0.914	3.6481	0.11223	0.14213	0.0025	0.83540	4.7404	2.17723	1	0.92631
72	95	9.3	4.0	5.5	4.8	3.4	7.81	5.365	5.123	5.15	3.886	3	1	1	0	0	3.8	4.6	4.7	6.4	7.4	5.3	3.6	3.2	7.7	7.3	8.4	59.1	1	1.49	-1.365	0.377	-0.35	-0.486	2.2201	1.86322	0.14213	0.1225	0.23620	4.5841	2.14106	2	1.98632
73	65	6.6	5.8	4.8	3.9	2.8	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	3.6	4.1	4.9	4.7	7.2	6.5	3.5	3.6	5.4	6.9	7.1	48.1	0	-1.21	0.435	-0.323	-1.25	-1.086	1.4641	0.18923	0.10433	1.5625	1.17940	4.4995	2.12121	1	1.97805
74	99	7.8	5.8	7.1	5.7	3.9	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	4.9	5.3	5.2	5.3	7.9	6.0	4.3	4.9	6.4	7.1	7.4	61.1	0	-0.01	0.435	1.977	0.55	0.014	0.0001	0.18923	3.90853	0.3025	0.00020	4.4006	2.09775	1	2.23529
75	83	8.6	5.8	4.0	4.0	3.0	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.9	3.9	2.9	5.6	6.3	6.1	2.7	3.0	6.6	6.1	8.5	53.1	0	0.79	0.435	-1.123	-1.15	-0.886	0.6241	0.18923	1.26113	1.3225	0.78500	4.1819	2.04498	3	1.60414
76	50	7.9	4.3	5.8	3.6	4.3	7.81	5.365	5.123	5.15	3.886	3	1	1	0	1	3.9	5.8	4.4	6.9	4.7	5.2	4.1	4.2	8.6	7.8	7.6	61.1	1	0.09	-1.065	0.677	-1.55	0.414	0.0081	1.13422	0.45833	2.4025	0.17140	4.1745	2.04317	2	1.48757
77	42	9.4	4.7	4.9	6.2	4.1	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.8	5.4	3.8	6.5	8.5	4.9	4.1	4.5	7.6	8.0	7.9	61.1	1	1.59	-0.665	-0.223	1.05	0.214	2.5281	0.44222	0.04973	1.1025	0.04580	4.1684	2.04165	4	1.36117
78	85	7.7	6.7	4.3	4.1	4.3	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.6	6.6	1.9	7.2	5.9	6.5	4.7	3.9	8.2	7.5	7.7	52.1	1	-0.11	1.335	-0.823	-1.05	0.414	0.0121	1.78223	0.67733	1.1025	0.17140	3.7456	1.93534	3	1.64552
79	62	8.4	6.7	5.9	4.2	3.6	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.8	5.0	4.5	4.7	6.7	5.1	2.7	5.0	8.0	7.6	8.8	63.1	1	0.59	1.335	0.777	-0.95	-0.286	0.3481	1.78223	0.60373	0.9025	0.08180	3.7184	1.92830	3	1.05019
80	33	6.7	6.5	4.9	4.2	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.7	5.3	5.3	5.1	9.2	5.7	3.5	4.5	5.4	6.5	7.6	44.1	0	-1.11	1.135	-0.223	-0.95	-0.486	1.2321	1.28823	0.04973	0.9025	0.23620	3.7087	1.92581	1	1.59216
81	75	8.5	5.3	6.0	3.6	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.9	5.5	5.0	4.9	6.8	5.7	4.4	5.1	8.2	7.0	8.4	65.1	1	0.69	-0.065	0.877	-1.55	-0.186	0.4761	0.00422	0.76913	2.4025	0.03460	3.6865	1.92004	3	1.46804
82	55	8.0	3.8	4.7	4.2	4.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.3	5.8	3.2	4.6	8.7	5.3	4.9	6.6	7.3	8.1	8.1	62.1	1	0.19	-1.565	-0.423	-0.95	0.314	0.0361	2.44922	0.17893	0.9025	0.09860	3.6653	1.91451	2	0.57618
83	29	8.5	5.7	3.7	6.0	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	6.0	2.3	7.6	4.8	5.8	5.7	3.8	6.3	6.9	7.2	70.1	0	0.69	0.335	-1.423	0.85	0.514	0.4761	0.11223	2.02493	0.7225	0.26420	3.6000	1.89735	4	1.60597
84	96	8.6	5.6	5.7	3.6	3.6	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	4.8	5.3	2.3	6.0	6.7	5.8	4.9	3.6	7.3	8.1	8.1	50.1	1	0.79	0.235	0.577	-1.55	-0.286	0.6241	0.05523	0.33293	2.4025	0.08180	3.4965	1.86991	3	1.12560
85	94	9.3	5.4	5.9	4.9	4.6	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.5	7.8	4.6	7.5	4.6	6.4	4.8	4.1	8.9	7.6	8.9	72.1	1	1.49	0.035	0.777	-0.25	0.714	2.2201	0.00123	0.60373	0.0625	0.50980	3.3974	1.84319	3	1.49825
86	69	7.5	3.8	4.5	5.2	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.5	3.5	2.9	4.1	7.6	5.1	4.0	5.4	5.2	5.8	5.8	51.1	0	-0.31	-1.565	-0.623	0.05	-0.486	0.0961	2.44922	0.38813	0.0025	0.23620	3.1721	1.78105	2	1.09675
87	3	9.2	5.6	5.8	4.6	4.5	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.4	5.6	5.4	7.4	4.5	6.2	5.4	4.0	8.9	8.4	9.0	72.1	1	1.39	0.235	0.677	-0.55	0.614	1.9321	0.05523	0.45833	0.3025	0.37700	3.1252	1.76781	3	1.15098
88	89	9.1	5.5	4.6	4.1	3.9	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.6	5.4	4.2	6.2	8.3	6.5	4.6	4.3	7.3	6.5	7.4	59.1	0	1.29	0.135	-0.523	-1.05	0.014	1.6641	0.01823	0.27353	1.1025	0.00020	3.0585	1.74887	3	0.96107
89	37	9.0	5.9	4.5	4.3	3.5	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	3.4	4.6	3.9	6.0	6.8	6.4	3.9	3.5	7.1	8.0	7.2	57.1	0	1.19	0.535	-0.623	-0.85	-0.386	1.4161	0.28623	0.38813	0.7225	0.14900	2.9620	1.72103	3	0.86535
90	51	6.7	5.9	4.8	5.3	2.8	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	3.6	4.2	3.4	4.7	7.2	5.7	4.0	3.6	5.4	7.5	7.2	48.1	0	-1.11	0.535	-0.323	0.15	-1.086	1.2321	0.28623	0.10433	0.0225	1.17940	2.8246	1.68064	1	1.54234
91	10	6.4	5.1	5.7	5.3	4.4	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.5	6.1	4.7	5.7	8.4	5.4	4.1	5.8	5.5	5.9	6.7	59.1	0	-1.41	-0.265	0.577	0.15	0.514	1.9881	0.07022	0.33293	0.0225	0.26420	2.6779	1.63644	1	0.93293
92	34	8.0	6.1	4.7	3.8	4.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.3	5.7	5.5	4.6	8.7	5.9	4.7	6.6	7.3	7.5	9.0	62.1	1	0.19	0.735	-0.423	-1.35	0.314	0.0361	0.54023	0.17893	1.8225	0.09860	2.6763	1.63596	3	1.18601
93	5	9.0	5.2	4.5	4.5	3.5	7.81	5.365	5.123	5.15	3.886	2	0	1	0	1	3.4	4.6	2.2	6.0	6.8	6.1	4.5	3.5	7.1	6.6	9.0	57.1	0	1.19	-0.165	-0.623	-0.65	-0.386	1.4161	0.02722	0.38813	0.4225	0.14900	2.4029	1.55015	3	1.32565
94	82	8.7	6.4	4.6	5.1	4.0	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	4.9	2.4	6.8	6.8	6.3	4.3	3.7	7.4	7.3	8.0	68.1	1	0.89	1.035	-0.523	-0.05	0.114	0.7921	1.07123	0.27353	0.0025	0.01300	2.1524	1.46709	3	1.08250
95	28	7.0	5.4	4.2	5.9	3.7	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	3.3	5.5	2.6	4.8	9.0	6.5	4.3	5.2	5.4	5.5	5.6	55.1	0	-0.81	0.035	-0.923	0.75	-0.186	0.6561	0.00123	0.85193	0.5625	0.03460	2.1064	1.45133	1	1.91280
96	54	6.9	5.7	4.7	4.4	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.4	4.4	3.3	6.4	5.2	6.4	3.2	2.7	6.1	7.0	7.2	44.1	0	-0.91	0.335	-0.423	-0.75	-0.586	0.8281	0.11223	0.17893	0.5625	0.34340	2.0251	1.42308	1	1.59409
97	58	7.6	5.2	5.4	6.4	4.0	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.6	5.8	5.6	6.6	4.4	6.7	4.6	3.9	8.2	7.5	7.5	58.1	1	-0.21	-0.165	0.277	1.25	0.114	0.0441	0.02722	0.07673	1.5625	0.01300	1.7236	1.31284	4	1.41166
98	100	7.9	4.4	4.8	5.8	3.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.0	5.1	5.9	4.2	9.7	5.7	3.4	5.4	6.4	7.3	7.0	57.1	0	0.09	-0.965	-0.323	0.65	-0.386	0.0081	0.93122	0.10433	0.4225	0.14900	1.6151	1.27089	2	1.76421


Chapter 9 HBAT Cluster Analysis Example
X8 - Technical Support
8
6
4
2
5
6
7
8
9
10
X6 - Product Quality
Cluster 1 4 2 3


Chapter 9 HBAT Cluster Analysis Example
X15 - New Products
8
6
4
2
5
6
7
8
9
10
X6 - Product Quality
Cluster 1 4 2 3


Chapter 9 HBAT Cluster Analysis Example
X12 - Salesforce Image
8
6
4
2
4
6
8
X8 - Technical Support
Cluster 1 4 2 3


Chapter 9 HBAT Cluster Analysis Example
X18 - Delivery Speed
5
4
3
2
2
4
6
8
X8 - Technical Support
Cluster 1 4 2 3


Chapter 9 HBAT Cluster Analysis Example
X18 - Delivery Speed
5
4
3
2
4
6
8
X12 - Salesforce Image
Cluster 1 4 2 3

Chapter 9 HBAT Cluster Analysis Example

Obs	ID	X15	X20	X21	X22	CLUSTER
1	1	4.3	8.0	8.4	65.1	2
2	2	4.0	6.5	7.5	67.1	2
3	3	4.6	8.4	9.0	72.1	3
4	4	3.6	6.0	7.2	40.1	1
5	5	4.5	6.6	9.0	57.1	3
6	7	2.5	7.8	7.2	41.1	2
7	8	4.8	5.8	7.7	56.1	2
8	9	4.4	7.5	8.2	56.1	1
9	10	5.3	5.9	6.7	59.1	1
10	11	7.5	7.0	8.4	68.1	4
11	12	5.9	6.3	6.6	53.1	1
12	13	5.3	8.4	7.9	58.1	3
13	14	3.0	6.9	8.2	72.1	3
14	15	5.4	7.0	7.6	62.1	1
15	16	5.0	6.4	7.1	71.1	2
16	17	5.4	7.5	7.2	50.1	1
17	18	6.3	6.9	8.2	58.1	1
18	19	6.1	7.5	7.9	55.1	1
19	20	6.7	8.5	8.8	67.1	4
20	21	4.6	5.5	7.0	50.1	1
21	22	6.5	9.6	9.9	70.1	4
22	23	6.0	7.1	8.1	60.1	4
23	24	4.2	8.1	8.0	65.1	2
24	25	3.9	4.9	5.5	55.1	1
25	26	3.7	6.8	7.0	58.1	1
26	27	6.7	7.1	7.0	70.1	4
27	28	5.9	5.5	5.6	55.1	1
28	29	6.0	6.9	7.2	70.1	4
29	30	7.2	5.5	6.2	52.1	4
30	31	3.3	6.8	7.1	44.1	3
31	32	6.1	5.8	6.2	51.1	4
32	33	4.2	6.5	7.6	44.1	1
33	34	3.8	7.5	9.0	62.1	3
34	35	6.0	6.6	6.7	54.1	1
35	36	6.5	4.6	7.1	51.1	4
36	37	4.3	8.0	7.2	57.1	3
37	38	4.4	9.9	9.9	77.1	3
38	39	7.1	6.9	7.6	65.1	4
39	40	6.8	5.5	5.8	53.1	1
40	41	1.7	7.5	8.4	61.1	2
41	42	6.2	8.0	7.9	61.1	4
42	43	4.1	7.8	7.6	72.1	3
43	44	5.2	7.9	8.4	55.1	1
44	45	3.9	5.6	6.5	65.1	2
45	46	5.1	8.6	7.7	58.1	1
46	47	3.7	8.8	8.0	67.1	3
47	48	4.8	7.6	7.1	60.1	1
48	49	7.2	8.1	8.5	67.1	4
49	50	3.6	7.8	7.6	61.1	2
50	51	5.3	7.5	7.2	48.1	1
51	52	5.0	7.1	8.2	67.1	2
52	53	9.2	9.0	9.0	66.1	4
53	54	4.4	7.0	7.2	44.1	1
54	55	4.2	8.1	8.1	62.1	2
55	56	5.9	7.6	8.9	59.1	3
56	57	7.4	7.9	8.8	74.1	4
57	58	6.4	7.5	7.5	58.1	4

58	59	4.5	6.5	7.0	67.1	3
59	60	7.0	8.5	8.5	61.1	4
60	61	4.5	6.9	7.2	71.1	3
61	62	4.2	7.6	8.8	63.1	3
62	63	7.2	5.5	8.0	44.1	4
63	64	4.7	6.0	8.1	47.1	3
64	65	3.9	6.9	7.1	48.1	1
65	66	5.0	6.9	9.0	60.1	1
66	67	6.4	5.6	6.2	50.1	1
67	68	2.5	6.3	8.2	48.1	2
68	69	5.2	5.8	5.8	51.1	2
69	70	5.5	6.6	8.0	58.1	2
70	71	5.7	7.5	7.7	67.1	3
71	72	2.5	6.0	7.0	43.1	2
72	73	6.3	6.6	7.9	66.1	2
73	74	4.6	8.8	9.8	66.1	3
74	75	3.6	7.0	8.4	65.1	3
75	76	7.6	6.6	8.9	63.1	4
76	77	6.6	6.9	7.5	49.1	4
77	78	2.4	7.3	8.0	61.1	3
78	79	3.1	7.3	8.1	72.1	3
79	80	3.5	5.8	7.6	44.1	2
80	81	6.9	7.9	8.8	63.1	4
81	82	5.1	7.3	8.0	68.1	3
82	83	4.0	6.1	8.5	53.1	3
83	84	6.5	5.1	6.5	37.1	1
84	85	4.1	7.5	7.7	52.1	3
85	86	2.8	6.0	7.2	51.1	2
86	88	7.7	7.6	8.2	52.1	4
87	89	4.1	6.5	7.4	59.1	3
88	90	4.9	7.6	9.3	59.1	1
89	91	4.6	7.9	7.9	58.1	3
90	92	3.5	5.0	6.5	51.1	2
91	93	6.6	7.5	8.6	72.1	4
92	94	4.9	7.6	8.9	72.1	3
93	95	4.8	7.3	8.4	59.1	2
94	96	3.6	8.1	8.1	50.1	3
95	97	6.4	5.5	7.2	48.1	2
96	98	4.3	7.0	7.7	51.1	2
97	99	5.7	7.1	7.4	61.1	1
98	100	5.8	7.3	7.0	57.1	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Class Level Information		
Class	Levels	Values
CLUSTER	4	1 2 3 4

Number of Observations Read	98
Number of Observations Used	98

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

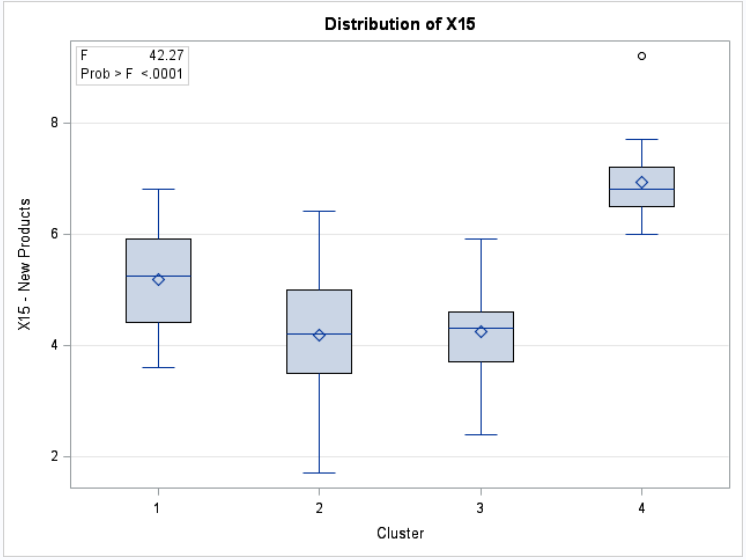
Dependent Variable: X15 X15 - New Products

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	112.1613887	37.3871296	42.27	<.0001
Error	94	83.1317746	0.8843806		
Corrected Total	97	195.2931633			

R-Square	Coeff Var	Root MSE	X15 Mean
0.574323	18.50988	0.940415	5.080612

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	3	112.1613887	37.3871296	42.27	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	3	112.1613887	37.3871296	42.27	<.0001



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

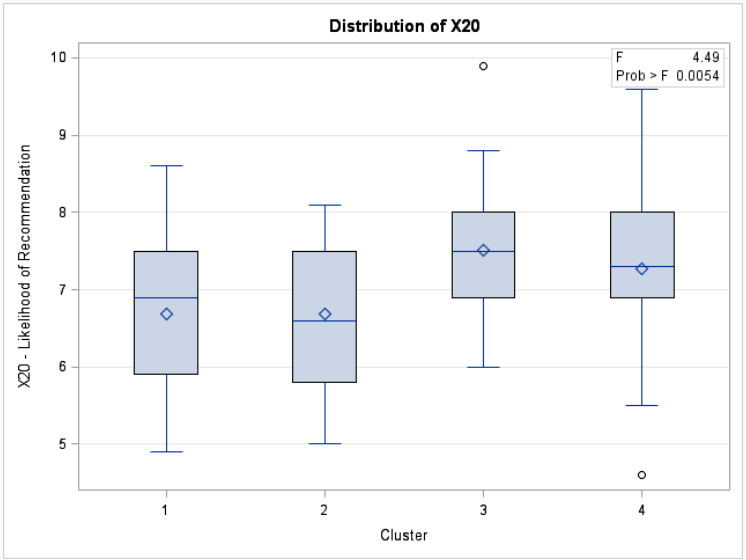
Dependent Variable: X20 X20 - Likelihood of Recommendation

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	13.1480885	4.3826962	4.49	0.0054
Error	94	91.7319115	0.9758714		
Corrected Total	97	104.8800000			

R-Square	Coeff Var	Root MSE	X20 Mean
0.125363	14.02644	0.987862	7.042857

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	3	13.14808852	4.38269617	4.49	0.0054

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	3	13.14808852	4.38269617	4.49	0.0054



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

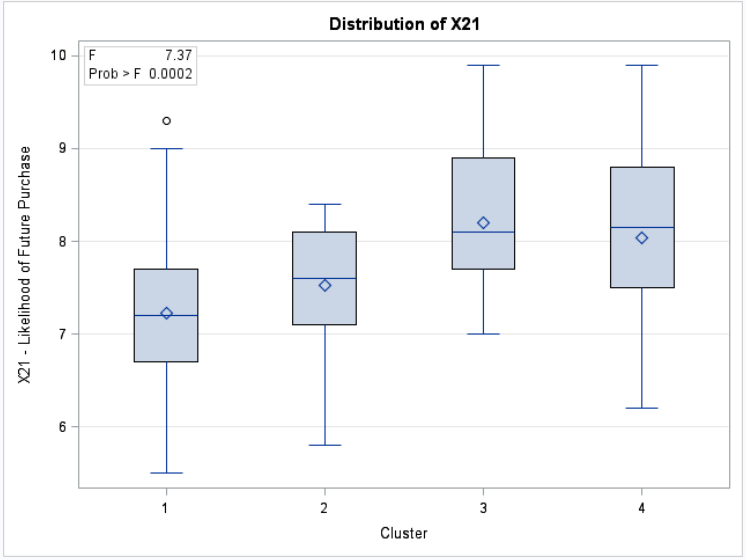
Dependent Variable: X21 X21 - Likelihood of Future Purchase

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	15.43650486	5.14550162	7.37	0.0002
Error	94	65.66757677	0.69859124		
Corrected Total	97	81.10408163			

R-Square	Coeff Var	Root MSE	X21 Mean
0.190330	10.78901	0.835818	7.746939

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	3	15.43650486	5.14550162	7.37	0.0002

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	3	15.43650486	5.14550162	7.37	0.0002



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

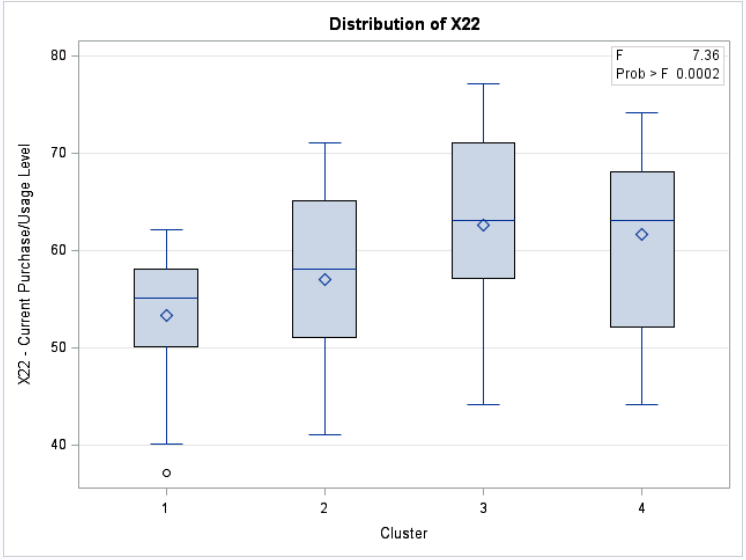
Dependent Variable: X22 X22 - Current Purchase/Usage Level

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1444.301199	481.433733	7.36	0.0002
Error	94	6150.188597	65.427538		
Corrected Total	97	7594.489796			

R-Square	Coeff Var	Root MSE	X22 Mean
0.190178	13.80570	8.088729	58.58980

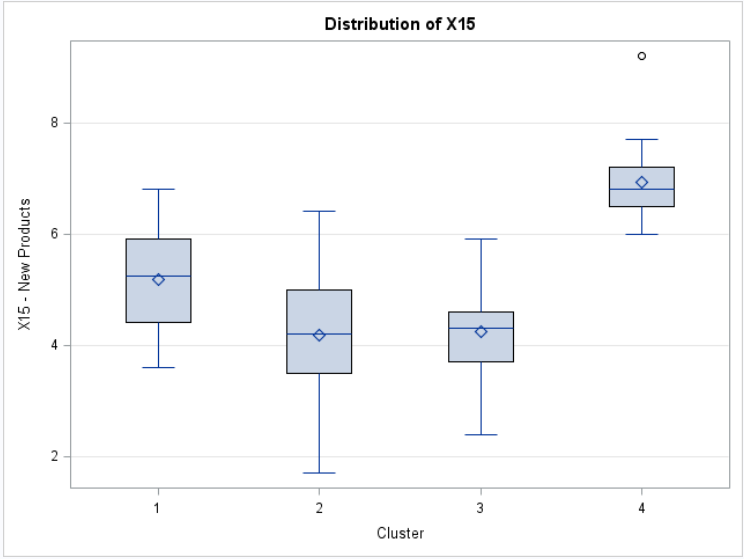
Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	3	1444.301199	481.433733	7.36	0.0002

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	3	1444.301199	481.433733	7.36	0.0002



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X15

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.884381
Critical Value of t	1.98552
Least Significant Difference	0.5354
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	6.9227	22	4
B	5.1808	26	1
C	4.2444	27	3
C			
C	4.1870	23	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X15

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.884381
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	.5354	.5634	.5820

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	6.9227	22	4
B	5.1808	26	1
C	4.2444	27	3
C			
C	4.1870	23	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X15

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.884381
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	0.5353922	0.64214	0.7052881

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	6.9227	22	4
B	5.1808	26	1
C	4.2444	27	3
C			
C	4.1870	23	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X15

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.884381
Critical Value of Studentized Range	3.69900
Minimum Significant Difference	0.7053
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	CLUSTER
A	6.9227	22	4
B	5.1808	26	1
C	4.2444	27	3
C			
C	4.1870	23	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X15

Note: This test controls the Type I experimentwise error rate.

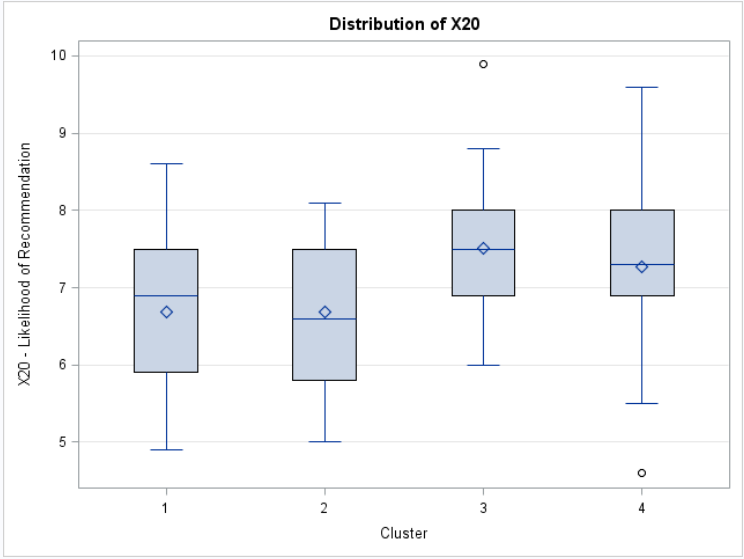
Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.884381
Critical Value of F	2.70145
Minimum Significant Difference	0.7676
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Scheffe Grouping	**Mean**	**N**	**CLUSTER**
A	6.9227	22	4
B	5.1808	26	1
C	4.2444	27	3
C			
C	4.1870	23	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X20

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.975871
Critical Value of t	1.98552
Least Significant Difference	0.5624
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	7.5037	27	3
A			
A	7.2727	22	4
B	6.6913	23	2
B			
B	6.6808	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X20

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.975871
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	.5624	.5918	.6114

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	7.5037	27	3
A			
A	7.2727	22	4
B	6.6913	23	2
B			
B	6.6808	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X20

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.975871
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	0.5624044	0.674538	0.7408721

Means with the same letter are not significantly different.

SNK Grouping		Mean	N	CLUSTER
	A	7.5037	27	3
	A			
B	A	7.2727	22	4
B				
B		6.6913	23	2
B				
B		6.6808	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X20

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.975871
Critical Value of Studentized Range	3.69900
Minimum Significant Difference	0.7409
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.				
Tukey Grouping		**Mean**	**N**	**CLUSTER**
	A	7.5037	27	3
	A			
B	A	7.2727	22	4
B				
B		6.6913	23	2
B				
B		6.6808	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X20

Note: This test controls the Type I experimentwise error rate.

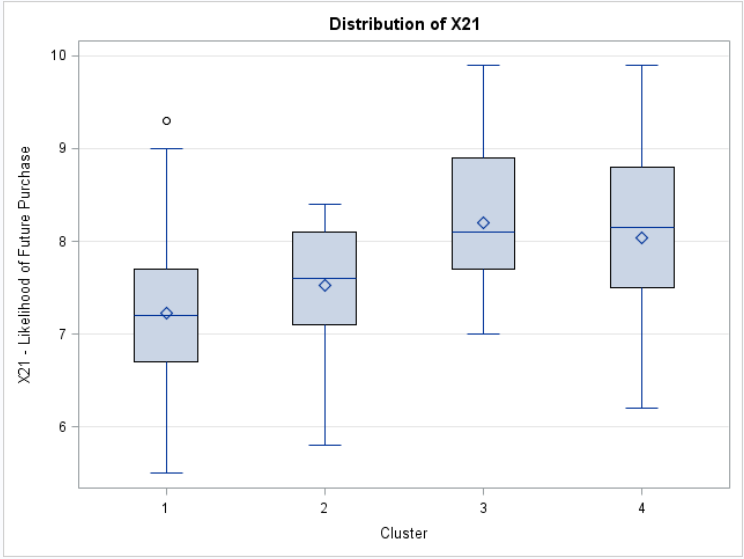
Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.975871
Critical Value of F	2.70145
Minimum Significant Difference	0.8064
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.				
Scheffe Grouping		**Mean**	**N**	**CLUSTER**
	A	7.5037	27	3
	A			
B	A	7.2727	22	4
B				
B		6.6913	23	2
B				
B		6.6808	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X21

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.698591
Critical Value of t	1.98552
Least Significant Difference	0.4758
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	8.2000	27	3
A			
A	8.0318	22	4
B	7.5304	23	2
B			
B	7.2269	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X21

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.698591
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	.4758	.5007	.5173

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	8.2000	27	3
A			
A	8.0318	22	4
B	7.5304	23	2
B			
B	7.2269	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X21

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.698591
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	2	3	4
Critical Range	0.4758433	0.5707182	0.6268426

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	8.2000	27	3
A			
A	8.0318	22	4
B	7.5304	23	2
B			
B	7.2269	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X21

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.698591
Critical Value of Studentized Range	3.69900
Minimum Significant Difference	0.6268
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.				
Tukey Grouping		**Mean**	**N**	**CLUSTER**
	A	8.2000	27	3
	A			
B	A	8.0318	22	4
B				
B	C	7.5304	23	2
	C			
	C	7.2269	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X21

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	0.698591
Critical Value of F	2.70145
Minimum Significant Difference	0.6823
Harmonic Mean of Cell Sizes	24.32626

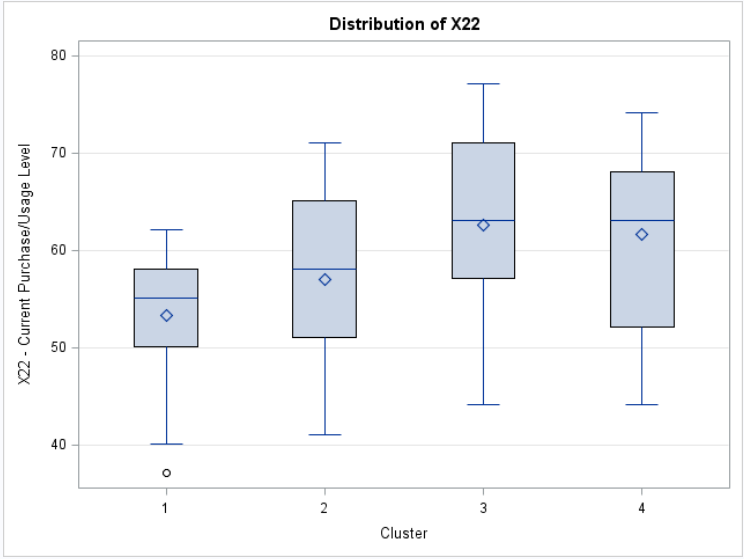
Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

Scheffe Grouping		Mean	N	CLUSTER
	A	8.2000	27	3
	A			
	A	8.0318	22	4
	A			
B	A	7.5304	23	2
B				
B		7.2269	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X22

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	65.42754
Critical Value of t	1.98552
Least Significant Difference	4.605
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	62.619	27	3
A			
A	61.645	22	4
B	56.970	23	2
B			
B	53.254	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X22

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	65.42754
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	4.605	4.846	5.006

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	62.619	27	3
A			
A	61.645	22	4
B	56.970	23	2
B			
B	53.254	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X22

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	65.42754
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Number of Means	**2**	**3**	**4**
Critical Range	4.6050325	5.5231958	6.0663467

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	62.619	27	3
A			
A	61.645	22	4
B	56.970	23	2
B			
B	53.254	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X22

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	65.42754
Critical Value of Studentized Range	3.69900
Minimum Significant Difference	6.0663
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.				
Tukey Grouping		**Mean**	**N**	**CLUSTER**
	A	62.619	27	3
	A			
	A	61.645	22	4
	A			
B	A	56.970	23	2
B				
B		53.254	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X22

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	94
Error Mean Square	65.42754
Critical Value of F	2.70145
Minimum Significant Difference	6.6026
Harmonic Mean of Cell Sizes	24.32626

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.				
Scheffe Grouping		**Mean**	**N**	**CLUSTER**
	A	62.619	27	3
	A			
	A	61.645	22	4
	A			
B	A	56.970	23	2
B				
B		53.254	26	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Levene's Test for Homogeneity of X15 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	14.5348	4.8449	3.44	0.0199
Error	94	132.4	1.4082		

Brown and Forsythe's Test for Homogeneity of X15 Variance ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	2.7931	0.9310	2.83	0.0424
Error	94	30.8819	0.3285		

Bartlett's Test for Homogeneity of X15 Variance

Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	3	8.2549	0.0410

Levene's Test for Homogeneity of X20 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	5.6018	1.8673	1.15	0.3321
Error	94	152.3	1.6200		

Brown and Forsythe's Test for Homogeneity of X20 Variance ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	0.8484	0.2828	0.77	0.5131
Error	94	34.4835	0.3668		

Bartlett's Test for Homogeneity of X20 Variance

Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	3	2.6427	0.4501

Levene's Test for Homogeneity of X21 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	2.7040	0.9013	1.01	0.3932
Error	94	84.1196	0.8949		

Brown and Forsythe's Test for Homogeneity of X21 Variance ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	0.5493	0.1831	0.66	0.5809
Error	94	26.2207	0.2789		

Bartlett's Test for Homogeneity of X21 Variance

Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	3	3.0279	0.3873

Levene's Test for Homogeneity of X22 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	16141.6	5380.5	1.03	0.3814
Error	94	489255	5204.8		

Brown and Forsythe's Test for Homogeneity of X22 Variance ANOVA of Absolute Deviations from Group Medians

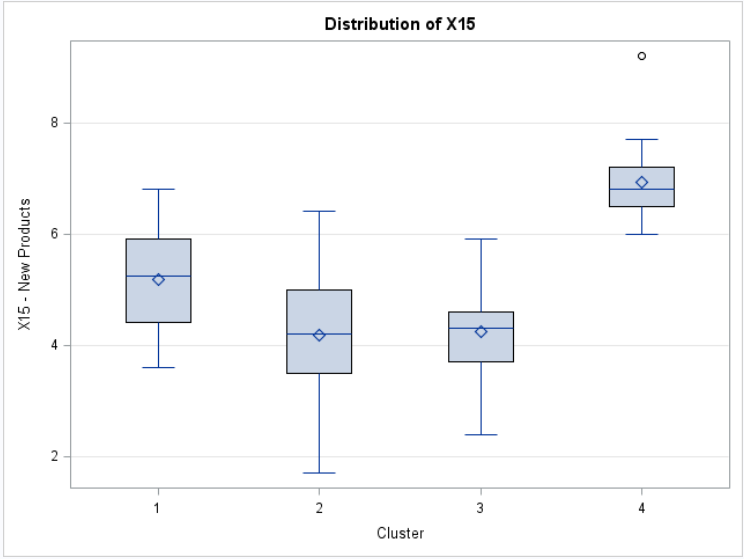
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	3	84.4650	28.1550	1.28	0.2863
Error	94	2070.0	22.0212		

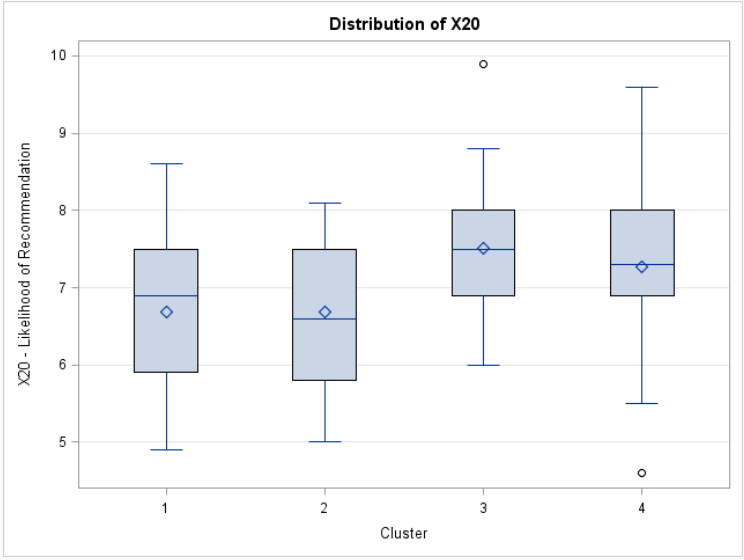
Bartlett's Test for Homogeneity of X22 Variance

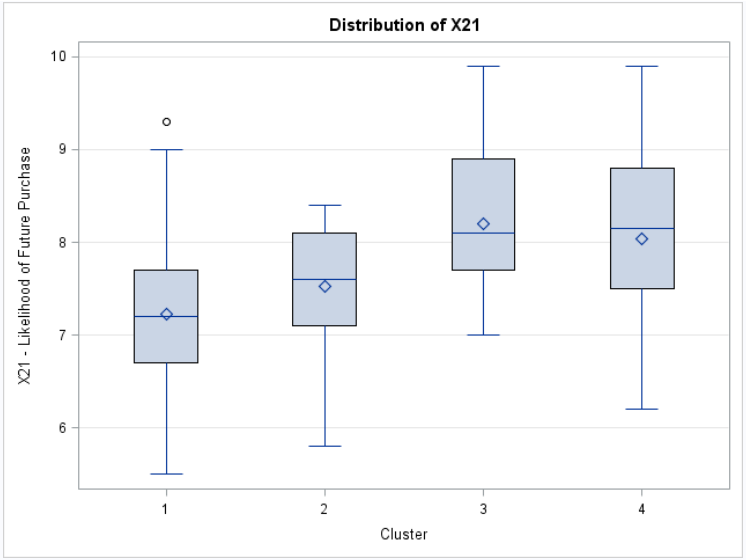
Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	3	2.3468	0.5036

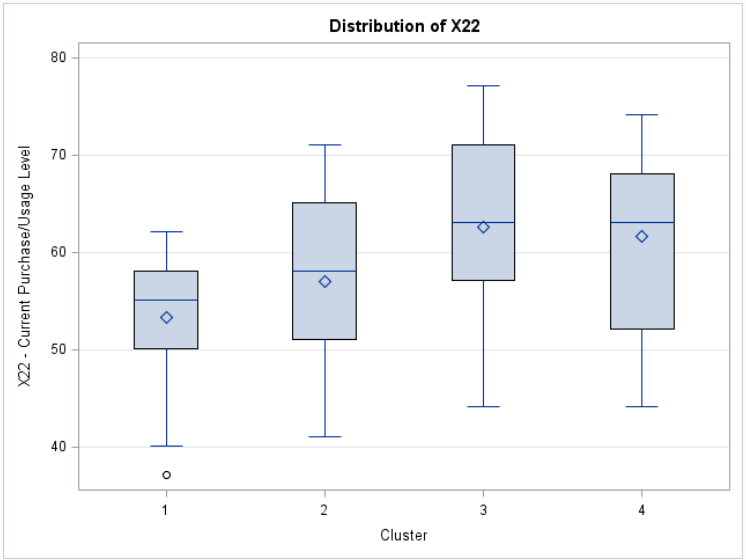
Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure





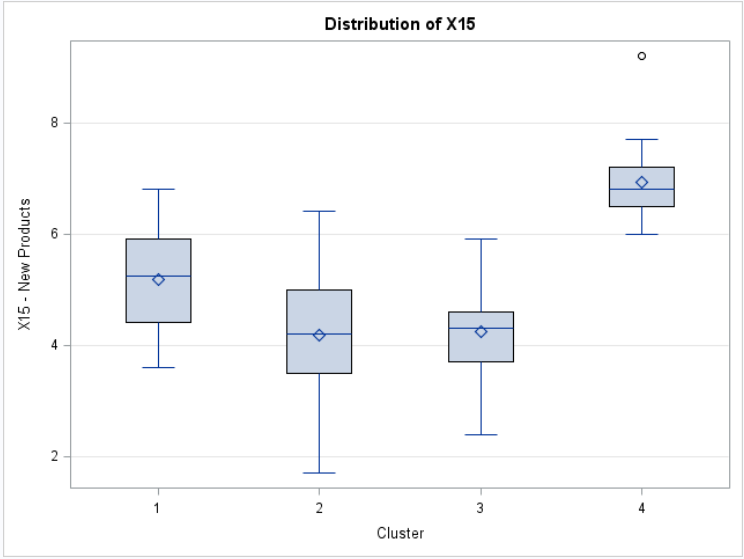


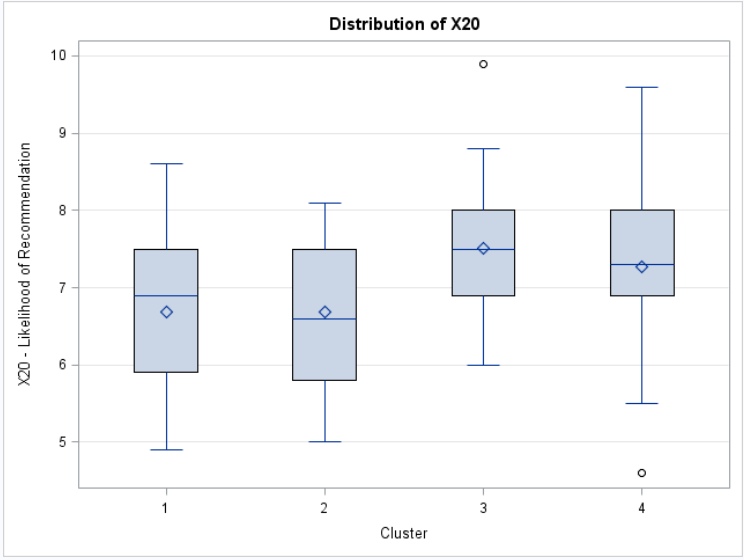


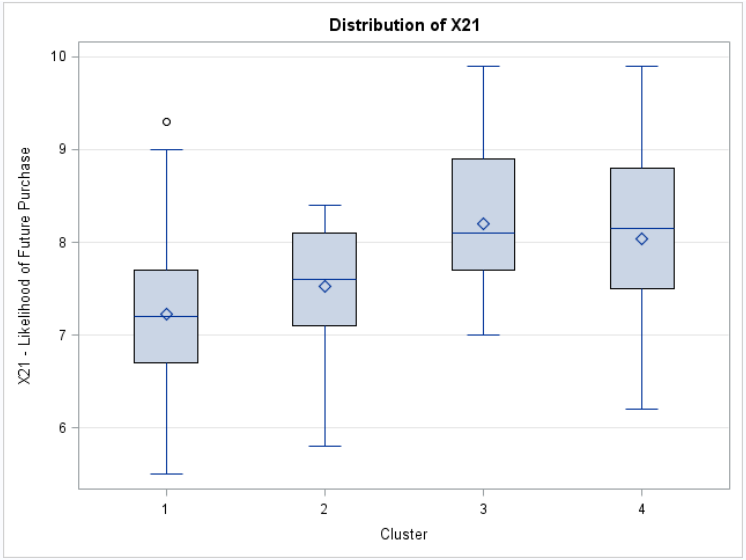
Level of CLUSTER	N	X15		X20		X21		X22	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
1	26	5.18076923	0.91214877	6.68076923	0.94573537	7.22692308	0.93874712	53.2538462	6.57079787
2	23	4.18695652	1.25889719	6.69130435	0.92682893	7.53043478	0.68519061	56.9695652	8.68281661
3	27	4.24444444	0.79775326	7.50370370	0.88251454	8.20000000	0.76761368	62.6185185	8.57263253
4	22	6.92272727	0.72106523	7.27272727	1.19967528	8.03181818	0.92550443	61.6454545	8.45563927

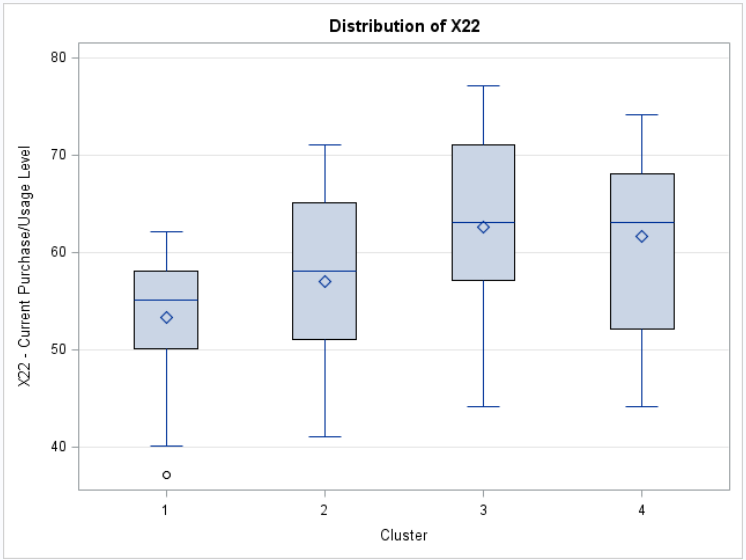
Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure









Level of CLUSTER	N	X15		X20		X21		X22	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
1	26	5.18076923	0.91214877	6.68076923	0.94573537	7.22692308	0.93874712	53.2538462	6.57079787
2	23	4.18695652	1.25889719	6.69130435	0.92682893	7.53043478	0.68519061	56.9695652	8.68281661
3	27	4.24444444	0.79775326	7.50370370	0.88251454	8.20000000	0.76761368	62.6185185	8.57263253
4	22	6.92272727	0.72106523	7.27272727	1.19967528	8.03181818	0.92550443	61.6454545	8.45563927

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure
Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for CLUSTER
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1			
		X15	X20	X21	X22
1.38320296	78.72	0.11156999	0.01045793	-0.00109877	-0.00236888
0.34951834	19.89	-0.00375799	-0.01225781	0.08289499	0.00819979
0.02446307	1.39	0.00131424	-0.13865974	0.05871754	0.00638782
0.00000000	0.00	-0.00128098	0.03556670	-0.12643207	0.00988392

MANOVA Tests for the Hypothesis of No Overall CLUSTER Effect
H = Type III SSCP Matrix for CLUSTER
E = Error SSCP Matrix

S=3 M=0 N=44.5

Statistic	Value	P-Value
Wilks' Lambda	0.30350362	<.0001
Pillai's Trace	0.86327042	<.0001
Hotelling-Lawley Trace	1.75718436	<.0001
Roy's Greatest Root	1.38320296	<.0001

Chapter 9 HBAT Cluster Analysis Example

Obs	ID	X1	X2	X3	X4	X5	CLUSTER
1	1	2	0	1	1	1	2
2	2	3	1	0	0	0	2
3	3	3	0	1	1	1	3
4	4	1	1	1	1	0	1
5	5	2	0	1	0	1	3
6	7	1	1	1	1	0	2
7	8	2	0	1	1	0	2
8	9	2	1	1	1	0	1
9	10	1	0	1	1	0	1
10	11	3	0	1	0	1	4
11	12	1	0	1	1	0	1
12	13	1	1	0	0	1	3
13	14	3	1	0	0	1	3
14	15	2	0	1	1	1	1
15	16	3	0	0	0	0	2
16	17	2	1	0	1	1	1
17	18	2	0	1	1	0	1
18	19	2	1	1	1	0	1
19	20	3	0	1	1	0	4
20	21	1	0	0	1	0	1
21	22	3	1	1	1	1	4
22	23	2	0	0	0	1	4
23	24	3	0	1	1	1	2
24	25	1	0	0	1	0	1
25	26	2	0	1	1	0	1
26	27	3	0	0	0	0	4
27	28	1	1	0	1	0	1
28	29	3	0	0	0	0	4
29	30	1	1	1	1	0	4
30	31	1	1	0	0	1	3
31	32	1	0	1	1	0	4
32	33	1	1	1	1	0	1
33	34	2	1	1	1	0	3
34	35	1	0	1	1	0	1
35	36	1	0	0	0	0	4
36	37	2	0	0	0	1	3
37	38	3	0	1	1	1	3
38	39	2	1	1	1	0	4
39	40	1	0	0	1	0	1
40	41	2	1	1	1	0	2
41	42	2	1	0	0	1	4
42	43	3	0	1	0	1	3
43	44	2	1	1	1	1	1
44	45	3	1	0	0	0	2
45	46	2	0	1	1	0	1
46	47	3	1	0	0	1	3
47	48	2	1	1	1	0	1
48	49	3	0	0	1	1	4
49	50	3	1	1	0	1	2
50	51	1	0	1	1	0	1
51	52	3	1	0	0	0	2
52	53	3	0	1	1	1	4
53	54	1	1	0	0	1	1
54	55	2	1	1	1	0	2
55	56	3	1	0	0	0	3
56	57	2	0	1	1	1	4
57	58	3	1	0	0	0	4

58	59	3	1	0	0	0	3
59	60	3	1	1	1	0	4
60	61	3	0	0	0	0	3
61	62	2	0	1	1	1	3
62	63	1	0	0	0	1	4
63	64	1	0	1	1	0	3
64	65	1	0	1	1	0	1
65	66	2	1	1	1	0	1
66	67	2	1	0	1	0	1
67	68	2	1	0	1	1	2
68	69	1	1	1	1	0	2
69	70	2	0	1	1	0	2
70	71	3	0	0	1	0	3
71	72	1	1	0	0	1	2
72	73	2	0	1	1	0	2
73	74	3	0	1	1	1	3
74	75	2	0	1	1	1	3
75	76	3	0	0	0	0	4
76	77	1	0	0	1	1	4
77	78	2	1	0	0	1	3
78	79	3	0	0	0	1	3
79	80	1	1	1	1	0	2
80	81	3	0	1	0	0	4
81	82	3	0	0	0	0	3
82	83	2	0	0	0	1	3
83	84	1	1	0	1	0	1
84	85	2	0	0	0	1	3
85	86	1	1	1	1	0	2
86	88	2	0	0	0	1	4
87	89	2	1	0	0	1	3
88	90	2	1	0	1	1	1
89	91	3	1	0	0	0	3
90	92	1	1	0	1	0	2
91	93	3	1	1	0	1	4
92	94	3	0	1	1	1	3
93	95	3	1	1	0	0	2
94	96	1	1	0	0	1	3
95	97	1	0	0	1	1	2
96	98	1	0	0	0	1	2
97	99	2	1	0	1	1	1
98	100	2	1	1	1	0	2

Chapter 9 HBAT Cluster Analysis Example

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of CLUSTER by X1			
	X1(X1 - Customer Type)			
CLUSTER(Cluster)	1	2	3	Total
1	13	13	0	26
	13.27	13.27	0.00	26.53
	50.00	50.00	0.00	
	43.33	37.14	0.00	
2	8	8	7	23
	8.16	8.16	7.14	23.47
	34.78	34.78	30.43	
	26.67	22.86	21.21	
3	4	9	14	27
	4.08	9.18	14.29	27.55
	14.81	33.33	51.85	
	13.33	25.71	42.42	
4	5	5	12	22
	5.10	5.10	12.24	22.45
	22.73	22.73	54.55	
	16.67	14.29	36.36	
Total	30	35	33	98
	30.61	35.71	33.67	100.00

Chapter 9 HBAT Cluster Analysis Example

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of CLUSTER by X3		
	X3(X3 - Firm Size)		
CLUSTER(Cluster)	0	1	Total
1	10	16	26
	10.20	16.33	26.53
	38.46	61.54	
	21.28	31.37	
2	9	14	23
	9.18	14.29	23.47
	39.13	60.87	
	19.15	27.45	
3	17	10	27
	17.35	10.20	27.55
	62.96	37.04	
	36.17	19.61	
4	11	11	22
	11.22	11.22	22.45
	50.00	50.00	
	23.40	21.57	
Total	47	51	98
	47.96	52.04	100.00

Chapter 9 HBAT Cluster Analysis Example

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of CLUSTER by X5		
	X5(X5 - Distribution System)		
CLUSTER(Cluster)	0	1	Total
1	20	6	26
	20.41	6.12	26.53
	76.92	23.08	
	36.36	13.95	
2	16	7	23
	16.33	7.14	23.47
	69.57	30.43	
	29.09	16.28	
3	8	19	27
	8.16	19.39	27.55
	29.63	70.37	
	14.55	44.19	
4	11	11	22
	11.22	11.22	22.45
	50.00	50.00	
	20.00	25.58	
Total	55	43	98
	56.12	43.88	100.00

Chapter 9 HBAT Cluster Analysis Example

The FASTCLUS Procedure
Replace=RANDOM Radius=0 Maxclusters=3 Maxiter=20 Converge=0.02

Initial Seeds

Cluster	X6	X8	X12	X15	X18
1	8.200000000	3.700000000	3.100000000	5.000000000	4.900000000
2	7.400000000	4.800000000	6.900000000	7.400000000	5.500000000
3	5.900000000	5.500000000	5.500000000	6.300000000	4.800000000

Minimum Distance Between Initial Seeds =	2.529822

Iteration History

Iteration	Criterion	Relative Change in Cluster Seeds		
		1	2	3
1	1.4166	0.9098	0.9105	0.7102
2	1.0400	0.1310	0.1835	0.0787
3	1.0244	0.0807	0.1437	0.0769
4	1.0150	0.0259	0.0871	0.0801
5	1.0114	0.0558	0.0316	0.1085
6	1.0066	0.0610	0.0472	0.0925
7	1.0022	0	0.0511	0.0452
8	1.0014	0	0	0

Convergence criterion is satisfied.

Cluster Listing

Obs	Cluster	Distance from Seed
1	3	3.5486
2	2	2.8422
3	3	2.7187
4	1	3.0041
5	1	3.3275
6	3	3.5942
7	2	3.0950
8	2	2.9899
9	2	2.7364
10	2	2.6615
11	3	3.3737
12	3	2.8839
13	1	2.5642
14	3	2.7554
15	1	3.0226
16	1	3.4776
17	2	2.0178
18	1	3.3189
19	2	2.2711
20	1	2.9287
21	1	2.8146
22	3	3.3189
23	2	2.8056
24	2	2.8442
25	3	3.0210
26	3	1.9761
27	3	2.5614
28	1	2.4495
29	2	2.8980
30	1	2.9583
31	2	2.7586
32	2	3.2465
33	3	3.0036
34	3	1.8280

35	2	2.1357
36	2	2.2608
37	1	2.0827
38	3	2.4480
39	1	2.7512
40	1	1.9974
41	1	2.3748
42	1	2.1672
43	2	1.3583
44	2	2.3449
45	2	2.1356
46	2	2.5001
47	1	1.3402
48	2	2.3292
49	3	1.3847
50	1	2.0768
51	2	1.8377
52	3	1.5676
53	3	1.4124
54	3	1.5380
55	2	2.3894
56	1	1.6019
57	1	2.4411
58	2	2.0417
59	3	1.6898
60	3	1.1455
61	1	1.9799
62	1	1.8257
63	1	2.1946
64	3	1.6523
65	1	2.1257
66	3	1.7928
67	3	1.8376
68	3	1.2305
69	2	1.1455
70	1	2.0036
71	3	0.8825
72	1	1.8071
73	3	1.8544
74	2	2.3709
75	1	1.3058
76	1	1.6021
77	2	1.2288
78	1	1.8789
79	1	1.8785
80	3	1.5768
81	1	1.2444
82	1	1.5718
83	2	1.6801
84	1	1.0576
85	1	1.7924
86	1	2.1928
87	1	1.5439
88	1	0.6809
89	1	0.9980
90	3	1.5272
91	3	0.8113
92	1	1.1539
93	1	0.8155
94	1	1.6748

95	3	1.8463
96	3	1.4652
97	2	1.1991
98	2	1.7417

Criterion Based on Final Seeds =	1.0014

Cluster Summary

Cluster	Frequency	RMS Std Deviation	Maximum Distance from Seed to Observation	Radius Exceeded	Nearest Cluster	Distance Between Cluster Centroids
1	40	0.9820	3.4776		2	2.7460
2	28	1.0720	3.2465		1	2.7460
3	30	1.0108	3.5942		1	2.7802

Statistics for Variables

Variable	Total STD	Within STD	R-Square	RSQ/(1-RSQ)
X6	1.37438	0.76235	0.698662	2.318537
X8	1.47076	1.47225	0.018632	0.018986
X12	1.07327	1.04097	0.078684	0.085404
X15	1.41892	0.89105	0.613777	1.589177
X18	0.73513	0.73867	0.011161	0.011287
OVER-ALL	1.24561	1.01705	0.347064	0.531545

Pseudo F Statistic =	25.25

Approximate Expected Over-All R-Squared =	0.38256

Cubic Clustering Criterion =	-1.747

WARNING: The two values above are invalid for correlated variables.

Cluster Means

Cluster	X6	X8	X12	X15	X18
1	8.555000000	5.195000000	4.827500000	3.985000000	3.807500000
2	8.689285714	5.532142857	5.153571429	6.682142857	3.975000000
3	6.133333333	5.646666667	5.543333333	5.046666667	3.953333333

Cluster Standard Deviations

Cluster	X6	X8	X12	X15	X18
1	0.851529544	1.400540189	0.969003586	0.811946064	0.732535988
2	0.845177731	1.567033898	1.257122565	0.805101131	0.589805367
3	0.513496018	1.475251781	0.903129934	1.053968963	0.861327497

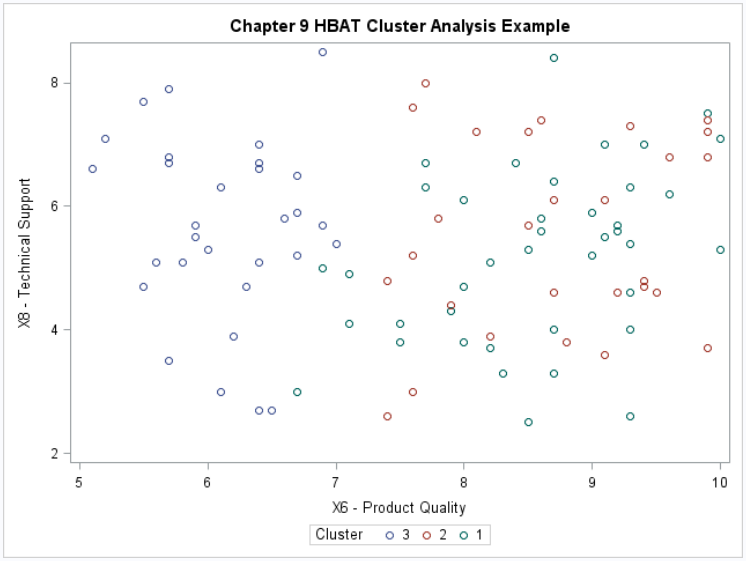
Distance Between Cluster Centroids

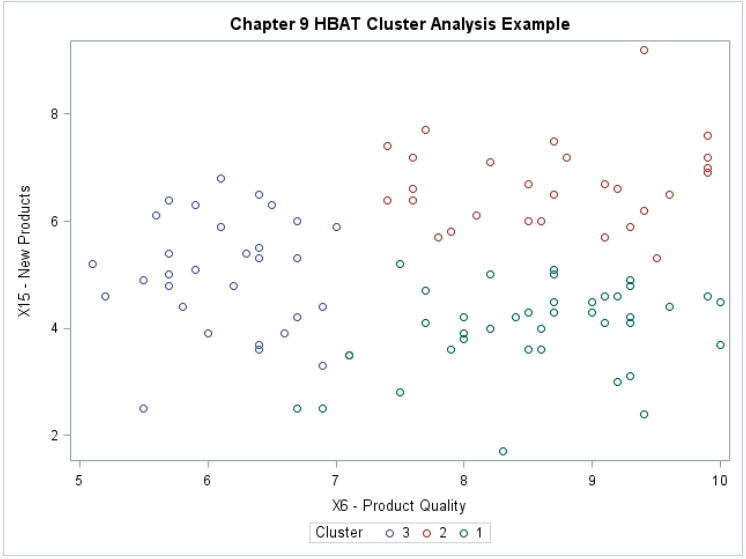
Nearest Cluster	1	2	3
1	.	2.746025560	2.780160617
2	2.746025560	.	3.061564050
3	2.780160617	3.061564050	.

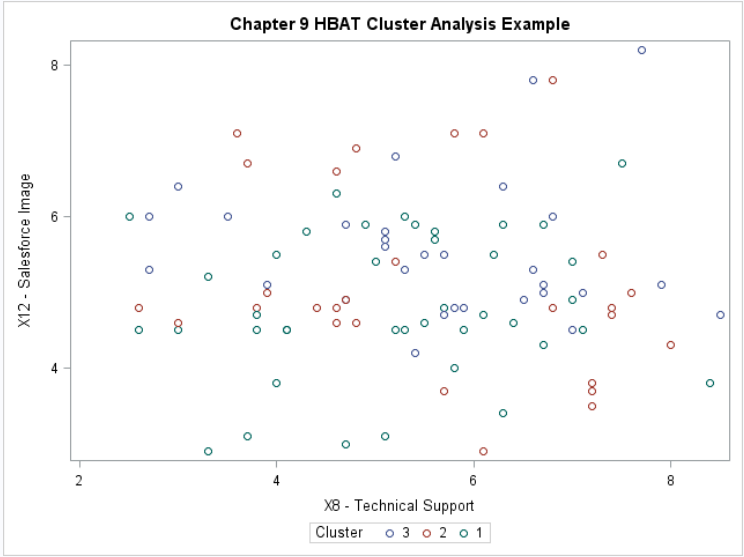
Chapter 9 HBAT Cluster Analysis Example

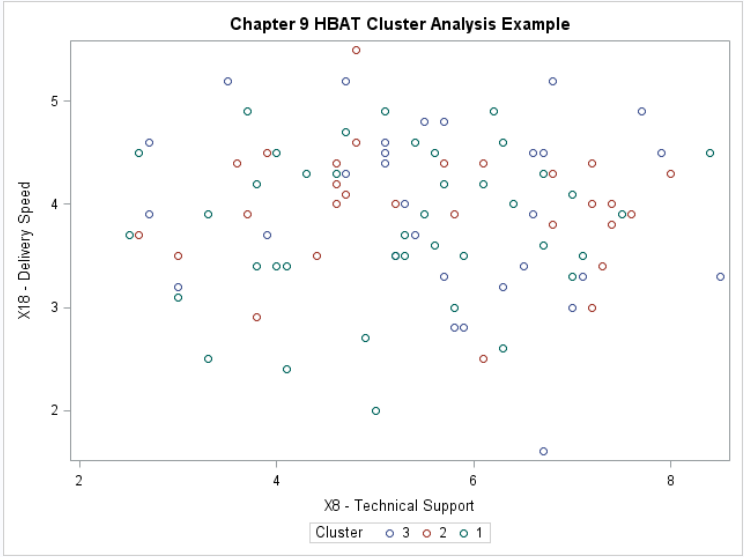
Obs	ID	X6	X8	X12	X15	X18	MeanX6	MeanX8	MeanX12	MeanX15	MeanX18	X1	X2	X3	X4	X5	X7	X9	X10	X11	X13	X14	X16	X17	X19	X20	X21	X22	X23	X6C	X8C	X12C	X15C	X18C	X6CSQR	X8CSQR	X12CSQR	X15CSQR	X18CSQR	TotDiffSqr	SqrRootTot	CLUSTER	DISTANCE
1	90	5.5	7.7	8.2	4.9	4.9	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	5.5	7.0	5.6	5.7	6.3	7.4	5.5	6.7	8.2	7.6	9.3	59.1	1	-2.31	2.335	3.077	-0.25	1.014	5.3361	5.45223	9.46793	0.0625	1.02820	21.3470	4.62028	3	3.54864
2	53	9.4	4.8	4.6	9.2	4.6	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	2.5	6.1	3.2	7.3	6.3	6.3	4.7	4.6	8.7	9.0	9.0	66.1	1	1.59	-0.565	-0.523	4.05	0.714	2.5281	0.31922	0.27353	16.4025	0.50980	20.0332	4.47584	2	2.84215
3	44	5.1	6.6	7.8	5.2	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	1	5.1	6.9	4.4	5.4	5.9	7.2	4.9	6.3	7.6	7.9	8.4	55.1	1	-2.71	1.235	2.677	0.05	0.614	7.3441	1.52523	7.16633	0.0025	0.37700	16.4152	4.05156	3	2.71874
4	41	8.3	3.3	5.2	1.7	3.9	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.4	5.5	3.1	4.6	9.1	4.1	4.6	5.8	7.0	7.5	8.4	61.1	1	0.49	-2.065	0.077	-3.45	0.014	0.2401	4.26422	0.00593	11.9025	0.00020	16.4129	4.05129	1	3.00410
5	72	6.7	3.0	4.5	2.5	3.1	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.2	3.7	4.8	6.3	5.0	5.2	2.9	2.6	5.8	6.0	7.0	43.1	0	-1.11	-2.365	-0.623	-2.65	-0.786	1.2321	5.59322	0.38813	7.0225	0.61780	14.8537	3.85406	1	3.32747
6	31	6.9	8.5	4.7	3.3	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.4	4.3	4.5	6.4	5.2	7.7	3.7	2.7	6.1	6.8	7.1	44.1	0	-0.91	3.135	-0.423	-1.85	-0.586	0.8281	9.82823	0.17893	3.4225	0.34340	14.6012	3.82115	3	3.59419
7	22	9.6	6.8	7.8	6.5	4.3	7.81	5.365	5.123	5.15	3.886	3	1	1	1	1	5.7	5.9	5.4	8.3	4.5	6.4	4.3	3.0	9.9	9.6	9.9	70.1	1	1.79	1.435	2.677	1.35	0.414	3.2041	2.05923	7.16633	1.8225	0.17140	14.4236	3.79783	2	3.09504
8	88	7.7	8.0	4.3	7.7	4.3	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.6	6.7	3.5	7.2	5.9	6.9	5.1	3.9	8.2	7.6	8.2	52.1	0	-0.11	2.635	-0.823	2.55	0.414	0.0121	6.94323	0.67733	6.5025	0.17140	14.3066	3.78240	2	2.98986
9	49	9.9	3.7	6.7	7.2	3.9	7.81	5.365	5.123	5.15	3.886	3	0	0	1	1	3.7	6.1	4.2	7.0	6.8	5.9	4.5	3.4	8.7	8.1	8.5	67.1	1	2.09	-1.665	1.577	2.05	0.014	4.3681	2.77222	2.48693	4.2025	0.00020	13.8300	3.71886	2	2.73639
10	60	9.9	7.2	3.5	7.0	4.0	7.81	5.365	5.123	5.15	3.886	3	1	1	1	0	2.8	6.9	2.6	5.8	5.4	6.2	5.6	4.9	7.9	8.5	8.5	61.1	1	2.09	1.835	-1.623	1.85	0.114	4.3681	3.36723	2.63413	3.4225	0.01300	13.8050	3.71550	2	2.66149
11	40	6.1	3.0	6.4	6.8	3.2	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	4.9	4.8	5.1	3.9	8.2	5.1	4.5	4.9	6.0	5.5	5.8	53.1	0	-1.71	-2.365	1.277	1.65	-0.686	2.9241	5.59322	1.63073	2.7225	0.47060	13.3412	3.65255	3	3.37365
12	68	5.5	4.7	4.9	2.5	4.3	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	3.7	5.4	4.3	5.3	6.0	5.6	4.5	5.9	6.1	6.3	8.2	48.1	0	-2.31	-0.665	-0.223	-2.65	0.414	5.3361	0.44222	0.04973	7.0225	0.17140	13.0219	3.60859	3	2.88390
13	78	9.4	7.0	4.9	2.4	4.1	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.8	6.2	4.7	6.5	8.5	7.3	4.3	4.5	7.6	7.3	8.0	61.1	1	1.59	1.635	-0.223	-2.75	0.214	2.5281	2.67323	0.04973	7.5625	0.04580	12.8594	3.58599	1	2.56419
14	67	5.7	7.9	5.1	6.4	4.5	7.81	5.365	5.123	5.15	3.886	2	1	0	1	0	4.0	6.4	2.7	5.5	6.2	7.5	5.0	6.2	6.4	5.6	6.2	50.1	0	-2.11	2.535	-0.023	1.25	0.614	4.4521	6.42623	0.00053	1.5625	0.37700	12.8184	3.58027	3	2.75539
15	98	8.7	3.3	2.9	4.3	2.5	7.81	5.365	5.123	5.15	3.886	1	0	0	0	1	3.2	3.2	3.1	6.1	5.6	5.0	3.1	2.9	5.4	7.0	7.7	51.1	0	0.89	-2.065	-2.223	-0.85	-1.386	0.7921	4.26422	4.94173	0.7225	1.92100	12.6415	3.55550	1	3.02260
16	61	8.7	8.4	3.8	4.5	4.5	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	6.1	2.8	7.8	4.9	7.2	5.4	3.9	6.6	6.9	7.2	71.1	1	0.89	3.035	-1.323	-0.65	0.614	0.7921	9.21123	1.75033	0.4225	0.37700	12.5532	3.54304	1	3.47758
17	76	9.9	6.8	4.8	7.6	3.8	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	5.0	5.4	5.9	4.9	7.3	3.1	4.3	7.1	6.6	8.9	63.1	1	2.09	1.435	-0.323	2.45	-0.086	4.3681	2.05923	0.10433	6.0025	0.00740	12.5416	3.54141	2	2.01777
18	74	9.9	7.5	6.7	4.6	3.9	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.7	4.7	5.6	7.0	6.8	7.2	4.1	3.4	8.6	8.8	9.8	66.1	1	2.09	2.135	1.577	-0.55	0.014	4.3681	4.55823	2.48693	0.3025	0.00020	11.7160	3.42286	1	3.31890
19	81	9.9	7.4	4.8	6.9	3.8	7.81	5.365	5.123	5.15	3.886	3	0	1	0	0	3.0	4.8	4.0	5.9	4.9	5.9	3.2	4.3	7.1	7.9	8.8	63.1	0	2.09	2.035	-0.323	1.75	-0.086	4.3681	4.14123	0.10433	3.0625	0.00740	11.6836	3.41812	2	2.27108
20	7	6.9	5.0	5.4	2.5	2.0	7.81	5.365	5.123	5.15	3.886	1	1	1	0	0	3.7	2.6	2.1	2.3	8.9	4.8	2.1	4.2	5.7	7.8	7.2	41.1	0	-0.91	-0.365	0.277	-2.65	-1.886	0.8281	0.13322	0.07673	7.0225	3.55700	11.6175	3.40845	1	2.92867
21	24	9.3	2.6	4.5	4.2	4.5	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	2.4	7.2	2.2	7.2	6.2	6.4	6.7	4.4	8.6	8.1	8.0	65.1	1	1.49	-2.765	-0.623	-0.95	0.614	2.2201	7.64522	0.38813	0.9025	0.37700	11.5329	3.39602	1	2.81462
22	73	6.5	2.7	6.0	6.3	4.6	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.3	6.6	6.5	6.3	8.7	4.7	4.6	5.6	7.9	6.6	7.9	66.1	0	-1.31	-2.665	0.877	1.15	0.714	1.7161	7.10222	0.76913	1.3225	0.50980	11.4197	3.37931	3	3.31886
23	20	9.1	3.6	7.1	6.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	1	1	0	4.5	6.4	5.3	5.3	8.4	5.8	4.5	6.1	7.6	8.5	8.8	67.1	1	1.29	-1.765	1.977	1.55	0.514	1.6641	3.11522	3.90853	2.4025	0.26420	11.3546	3.36965	2	2.80560
24	57	7.4	4.8	6.9	7.4	5.5	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	5.1	7.7	4.5	7.2	9.6	6.4	5.7	6.5	9.0	7.9	8.8	74.1	1	-0.41	-0.565	1.777	2.25	1.614	0.1681	0.31922	3.15773	5.0625	2.60500	11.3126	3.36341	2	2.84416
25	84	6.4	6.7	5.0	6.5	1.6	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	3.2	3.6	2.2	2.9	8.4	7.3	2.0	3.7	5.0	5.1	6.5	37.1	0	-1.41	1.335	-0.123	1.35	-2.286	1.9881	1.78223	0.01513	1.8225	5.22580	10.8338	3.29147	3	3.02096
26	21	5.2	7.1	5.0	4.6	3.3	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	3.8	5.2	3.9	4.3	8.4	7.1	3.3	4.9	5.4	5.5	7.0	50.1	0	-2.61	1.735	-0.123	-0.55	-0.586	6.8121	3.01023	0.01513	0.3025	0.34340	10.4834	3.23780	3	1.97607
27	66	5.7	3.5	6.0	5.0	5.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.8	6.7	5.4	5.7	8.2	5.4	4.7	7.3	7.6	6.9	9.0	60.1	1	-2.11	-1.865	0.877	-0.15	1.314	4.4521	3.47822	0.76913	0.0225	1.72660	10.4485	3.23242	3	2.56142
28	47	10.0	7.1	4.5	3.7	3.5	7.81	5.365	5.123	5.15	3.886	3	1	0	0	1	4.3	6.3	2.9	5.4	3.8	6.7	5.0	4.0	7.1	8.8	8.0	67.1	1	2.19	1.735	-0.623	-1.45	-0.386	4.7961	3.01023	0.38813	2.1025	0.14900	10.4460	3.23202	1	2.44951
29	30	7.6	3.0	4.6	7.2	3.5	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.6	4.0	5.1	4.2	7.7	4.9	4.7	5.5	5.4	5.5	6.2	52.1	0	-0.21	-2.365	-0.523	2.05	-0.386	0.0441	5.59322	0.27353	4.2025	0.14900	10.2624	3.20349	2	2.89802
30	1	8.5	2.5	6.0	4.3	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.9	5.9	4.8	4.9	6.8	4.7	5.0	5.1	8.2	8.0	8.4	65.1	1	0.69	-2.865	0.877	-0.85	-0.186	0.4761	8.20822	0.76913	0.7225	0.03460	10.2105	3.19540	1	2.95831
31	36	8.7	6.1	2.9	6.5	2.5	7.81	5.365	5.123	5.15	3.886	1	0	0	0	0	3.2	4.3	3.5	6.1	5.6	6.1	3.1	2.9	5.4	4.6	7.1	51.1	0	0.89	0.735	-2.223	1.35	-1.386	0.7921	0.54023	4.94173	1.8225	1.92100	10.0176	3.16505	2	2.75862
32	97	7.4	2.6	4.8	6.4	3.7	7.81	5.365	5.123	5.15	3.886	1	0	0	1	1	3.4	5.0	4.1	4.4	7.2	4.5	4.2	5.6	6.3	5.5	7.2	48.1	0	-0.41	-2.765	-0.323	1.25	-0.186	0.1681	7.64522	0.10433	1.5625	0.03460	9.5147	3.08460	2	3.24653
33	70	6.4	2.7	5.3	5.5	3.9	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.6	5.3	3.9	3.9	7.1	5.2	4.7	6.6	6.6	6.6	8.0	58.1	1	-1.41	-2.665	0.177	0.35	0.014	1.9881	7.10222	0.03133	0.1225	0.00020	9.2443	3.04045	3	3.00358
34	48	5.7	6.8	6.0	4.8	5.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.8	7.5	5.7	5.7	8.2	6.6	6.5	7.3	7.6	7.6	7.1	60.1	0	-2.11	1.435	0.877	-0.35	1.314	4.4521	2.05923	0.76913	0.1225	1.72660	9.1296	3.02151	3	1.82798
35	63	8.8	3.8	4.8	7.2	2.9	7.81	5.365	5.123	5.15	3.886	1	0	0	0	1	3.9	5.1	4.3	4.7	5.8	5.0	4.4	3.7	6.3	5.5	8.0	44.1	0	0.99	-1.565	-0.323	2.05	-0.986	0.9801	2.44922	0.10433	4.2025	0.97220	8.7084	2.95099	2	2.13574
36	27	8.5	7.2	3.7	6.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	5.8	4.1	7.6	4.8	6.9	5.3	3.8	6.3	7.1	7.0	70.1	0	0.69	1.835	-1.423	1.55	0.514	0.4761	3.36723	2.02493	2.4025	0.26420	8.5350	2.92146	2	2.26084
37	79	9.3	6.3	5.9	3.1	4.6	7.81	5.365	5.123	5.15	3.886	3	0	0	0	1	3.5	7.6	5.5	7.5	4.6	6.6	5.2	4.1	8.9	7.3	8.1	72.1	1	1.49	0.935	0.777	-2.05	0.714	2.2201	0.87423	0.60373	4.2025	0.50980	8.4104	2.90006	1	2.08269
38	4	6.4	7.0	4.5	3.6	3.0	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.3	3.7	4.7	4.7	8.8	7.0	4.3	4.1	4.8	6.0	7.2	40.1	0	-1.41	1.635	-0.623	-1.55	-0.886	1.9881	2.67323	0.38813	2.4025	0.78500	8.2369	2.87001	3	2.44803
39	52	8.2	3.7	3.1	5.0	4.9	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.7	7.4	2.7	7.9	5.3	5.3	4.5	4.3	5.7	7.1	8.2	67.1	1	0.39	-1.665	-2.023	-0.15	1.014	0.1521	2.77222	4.09253	0.0225	1.02820	8.0675	2.84034	1	2.75120
40	86	7.5	4.1	4.5	2.8	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.5	4.5	3.5	4.1	7.6	4.9	3.4	5.4	5.2	6.0	7.2	51.1	0	-0.31	-1.265	-0.623	-2.35	-0.486	0.0961	1.60022	0.38813	5.5225	0.23620	7.8431	2.80056	1	1.99740
41	92	7.1	4.1	4.5	3.5	2.4	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	4.2	2.6	2.1	3.3	9.9	5.5	2.0	4.0	4.8	5.0	6.5	51.1	0	-0.71	-1.265	-0.623	-1.65	-1.486	0.5041	1.60022	0.38813	2.7225	2.20820	7.4231	2.72455	1	2.37478
42	45	8.0	4.7	3.0	3.9	4.7	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.5	7.1	3.6	7.7	5.2	5.1	4.3	4.2	5.5	5.6	6.5	65.1	0	0.19	-0.665	-2.123	-1.25	0.814	0.0361	0.44222	4.50713	1.5625	0.66260	7.2105	2.68525	1	2.16716
43	11	8.7	4.6	4.6	7.5	4.0	7.81	5.365	5.123	5.15	3.886	3	0	1	0	1	3.2	4.8	2.7	6.8	6.8	5.8	3.8	3.7	7.4	7.0	8.4	68.1	0	0.89	-0.765	-0.523	2.35	0.114	0.7921	0.58522	0.27353	5.5225	0.01300	7.1864	2.68074	2	1.35829
44	77	7.6	7.6	5.0	6.6	3.9	7.81	5.365	5.123	5.15	3.886	1	0	0	1	1	3.6	4.6	4.7	4.6	7.4	8.1	4.5	5.8	6.4	6.9	7.5	49.1	0	-0.21	2.235	-0.123	1.45	0.014	0.0441	4.99523	0.01513	2.1025	0.00020	7.1572	2.67529	2	2.34490
45	56	9.3	7.3	5.5	5.9	3.4	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.8	5.7	3.7	6.4	7.4	6.6	4.1	3.2	7.7	7.6	8.9	59.1	1	1.49	1.935	0.377	0.75	-0.486	2.2201	3.74423	0.14213	0.5625	0.23620	6.9052	2.62777	2	2.13557
46	32	8.1	7.2	3.8	6.1	3.0	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	2.5	4.5	2.3	5.1	6.6	6.8	3.0	3.5	6.4	5.8	6.2	51.1	0	0.29	1.835	-1.323	0.95	-0.886	0.0841	3.36723	1.75033	0.9025	0.78500	6.8892	2.62472	2	2.50014
47	14	9.2	5.7	4.8	3.0	4.2	7.81	5.365	5.123	5.15	3.886	3	1	0	0	1	3.9	5.5	2.4	8.4	7.1	6.7	4.5	2.6	7.6	6.9	8.2	72.1	1	1.39	0.335	-0.323	-2.15	0.314	1.9321	0.11223	0.10433	4.6225	0.09860	6.8697	2.62102	1	1.34018
48	71	9.1	6.1	7.1	5.7	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	1	0	4.5	5.9	6.3	5.3	8.4	7.1	5.4	6.1	7.6	7.5	7.7	67.1	0	1.29	0.735	1.977	0.55	0.514	1.6641	0.54023	3.90853	0.3025	0.26420	6.6796	2.58448	2	2.32915
49	17	5.7	6.7	5.1	5.4	4.5	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	4.0	6.0	3.3	5.5	6.2	6.7	4.2	6.2	6.4	7.5	7.2	50.1	1	-2.11	1.335	-0.023	0.25	0.614	4.4521	1.78223	0.00053	0.0625	0.37700	6.6744	2.58348	3	1.38475
50	2	8.2	5.1	3.1	4.0	4.9	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	2.7	7.2	3.4	7.9	5.3	5.5	3.9	4.3	5.7	6.5	7.5	67.1	0	0.39	-0.265	-2.023	-1.15	1.014	0.1521	0.07022	4.09253	1.3225	1.02820	6.6655	2.58177	1	2.07680
51	39	8.2	3.9	5.0	7.1	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.6	6.2	5.8	4.9	9.0	5.2	4.7	6.9	7.6	6.9	7.6	65.1	1	0.39	-1.465	-0.123	1.95	0.614	0.1521	2.14622	0.01513	3.8025	0.37700	6.4930	2.54813	2	1.83769
52	12	6.1	6.3	6.4	5.9	3.2	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.9	3.9	4.4	3.9	8.2	5.8	3.0	4.9	6.0	6.3	6.6	53.1	0	-1.71	0.935	1.277	0.75	-0.686	2.9241	0.87423	1.63073	0.5625	0.47060	6.4622	2.54208	3	1.56765
53	19	5.6	5.1	5.6	6.1	4.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.4	6.4	3.7	5.7	9.1	5.4	5.0	6.0	6.8	7.5	7.9	55.1	0	-2.21	-0.265	0.477	0.95	0.614	4.8841	0.07022	0.22753	0.9025	0.37700	6.4614	2.54192	3	1.41239
54	18	5.9	5.5	5.5	6.3	4.8	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.1	7.2	3.5	6.4	8.4	6.2	5.7	5.8	7.4	6.9	8.2	58.1	1	-1.91	0.135	0.377	1.15	0.914	3.6481	0.01823	0.14213	1.3225	0.83540	5.9664	2.44261	3	1.53803
55	13	9.5	4.6	6.6	5.3	4.4	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	5.6	6.9	5.0	6.9	7.6	6.5	5.1	4.5	8.4	8.4	7.9	58.1	1	1.69	-0.765	1.477	0.15	0.514	2.8561	0.58522	2.18153	0.0225	0.26420	5.9096	2.43096	2	2.38940
56	59	10.0	5.3	4.5	4.5	3.5	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	4.3	3.7	4.2	5.4	3.8	6.7	3.7	4.0	7.1	6.5	7.0	67.1	0	2.19	-0.065	-0.623	-0.65	-0.386	4.7961	0.00422	0.38813	0.4225	0.14900	5.7600	2.39999	1	1.60190
57	64	7.7	6.3	3.4	4.7	2.6	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	2.2	4.5	2.4	4.7	6.2	6.0	3.3	3.1	6.0	6.0	8.1	47.1	0	-0.11	0.935	-1.723	-0.45	-1.286	0.0121	0.87423	2.96873	0.2025	1.65380	5.7113	2.38984	1	2.44112

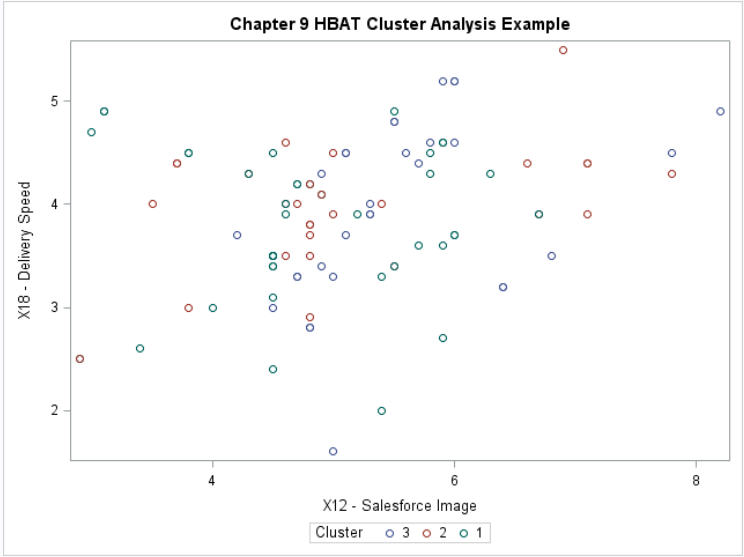
58	23	8.6	7.4	4.7	6.0	4.0	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	3.6	5.1	3.5	7.3	3.7	6.7	4.8	3.4	7.0	7.1	8.1	60.1	0	0.79	2.035	-0.423	0.85	0.114	0.6241	4.14123	0.17893	0.7225	0.01300	5.6798	2.38322	2	2.04170
59	26	6.4	6.6	5.3	3.7	3.9	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.6	6.1	4.0	3.9	7.1	6.1	5.6	6.6	6.6	6.8	7.0	58.1	0	-1.41	1.235	0.177	-1.45	0.014	1.9881	1.52523	0.03133	2.1025	0.00020	5.6473	2.37642	3	1.68983
60	9	5.8	5.1	5.8	4.4	4.6	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.6	6.7	3.7	5.9	9.3	5.9	4.4	6.1	7.0	7.5	8.2	56.1	1	-2.01	-0.265	0.677	-0.75	0.714	4.0401	0.07022	0.45833	0.5625	0.50980	5.6409	2.37507	3	1.14551
61	38	9.6	6.2	5.5	4.4	4.9	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	4.1	7.3	2.9	7.7	7.7	6.1	5.2	4.6	8.7	9.9	9.9	77.1	1	1.79	0.835	0.377	-0.75	1.014	3.2041	0.69723	0.14213	0.5625	1.02820	5.6342	2.37364	1	1.97992
62	43	9.3	4.6	6.3	4.1	4.3	7.81	5.365	5.123	5.15	3.886	3	0	1	0	1	5.1	6.8	5.8	6.6	7.4	5.1	4.6	4.6	8.9	7.8	7.6	72.1	1	1.49	-0.765	1.177	-1.05	0.414	2.2201	0.58522	1.38533	1.1025	0.17140	5.4646	2.33764	1	1.82567
63	80	7.1	4.9	5.9	3.5	2.7	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.4	4.1	4.0	5.0	7.8	6.1	2.6	3.1	5.7	5.8	7.6	44.1	0	-0.71	-0.465	0.777	-1.65	-1.186	0.5041	0.21622	0.60373	2.7225	1.40660	5.4531	2.33520	1	2.19456
64	15	6.3	4.7	5.9	5.4	5.2	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	4.5	6.9	4.5	6.8	8.8	6.0	4.8	6.2	8.0	7.0	7.6	62.1	1	-1.51	-0.665	0.777	0.25	1.314	2.2801	0.44222	0.60373	0.0625	1.72660	5.1152	2.26167	3	1.65233
65	91	9.1	7.0	5.4	4.6	3.3	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.7	4.1	4.4	6.3	7.3	7.5	4.4	3.0	7.4	7.9	7.9	58.1	1	1.29	1.635	0.277	-0.55	-0.586	1.6641	2.67323	0.07673	0.3025	0.34340	5.0600	2.24943	1	2.12570
66	35	6.7	5.2	6.8	6.0	3.5	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.0	3.9	3.0	5.4	8.4	6.2	2.5	4.3	6.3	6.6	6.7	54.1	0	-1.11	-0.165	1.677	0.85	-0.386	1.2321	0.02722	2.81233	0.7225	0.14900	4.9432	2.22332	3	1.79282
67	8	6.2	3.9	5.1	4.8	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	3.3	4.8	4.6	3.6	6.9	5.4	4.3	6.3	6.3	5.8	7.7	56.1	0	-1.61	-1.465	-0.023	-0.35	-0.186	2.5921	2.14622	0.00053	0.1225	0.03460	4.8959	2.21268	3	1.83762
68	25	6.0	5.3	5.3	3.9	4.0	7.81	5.365	5.123	5.15	3.886	1	0	0	1	0	4.1	4.7	3.5	5.3	8.0	6.5	4.7	5.3	4.8	4.9	5.5	55.1	0	-1.81	-0.065	0.177	-1.25	0.114	3.2761	0.00422	0.03133	1.5625	0.01300	4.8871	2.21069	3	1.23052
69	93	9.2	4.6	4.8	6.6	4.2	7.81	5.365	5.123	5.15	3.886	3	1	1	0	1	3.9	5.3	4.2	8.4	7.1	6.2	4.4	2.6	7.6	7.5	8.6	72.1	0	1.39	-0.765	-0.323	1.45	0.314	1.9321	0.58522	0.10433	2.1025	0.09860	4.8228	2.19608	2	1.14547
70	16	8.7	4.0	3.8	5.0	4.5	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	6.8	3.2	7.8	4.9	6.1	4.3	3.9	6.6	6.4	7.1	71.1	0	0.89	-1.365	-1.323	-0.15	0.614	0.7921	1.86322	1.75033	0.0225	0.37700	4.8051	2.19207	1	2.00364
71	46	5.9	5.7	5.5	5.1	4.8	7.81	5.365	5.123	5.15	3.886	2	0	1	1	0	4.1	5.9	5.8	6.4	8.4	6.4	5.2	5.8	7.4	8.6	7.7	58.1	1	-1.91	0.335	0.377	-0.05	0.914	3.6481	0.11223	0.14213	0.0025	0.83540	4.7404	2.17723	3	0.88253
72	95	9.3	4.0	5.5	4.8	3.4	7.81	5.365	5.123	5.15	3.886	3	1	1	0	0	3.8	4.6	4.7	6.4	7.4	5.3	3.6	3.2	7.7	7.3	8.4	59.1	1	1.49	-1.365	0.377	-0.35	-0.486	2.2201	1.86322	0.14213	0.1225	0.23620	4.5841	2.14106	1	1.80709
73	65	6.6	5.8	4.8	3.9	2.8	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	3.6	4.1	4.9	4.7	7.2	6.5	3.5	3.6	5.4	6.9	7.1	48.1	0	-1.21	0.435	-0.323	-1.25	-1.086	1.4641	0.18923	0.10433	1.5625	1.17940	4.4995	2.12121	3	1.85442
74	99	7.8	5.8	7.1	5.7	3.9	7.81	5.365	5.123	5.15	3.886	2	1	0	1	1	4.9	5.3	5.2	5.3	7.9	6.0	4.3	4.9	6.4	7.1	7.4	61.1	0	-0.01	0.435	1.977	0.55	0.014	0.0001	0.18923	3.90853	0.3025	0.00020	4.4006	2.09775	2	2.37095
75	83	8.6	5.8	4.0	4.0	3.0	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.9	3.9	2.9	5.6	6.3	6.1	2.7	3.0	6.6	6.1	8.5	53.1	0	0.79	0.435	-1.123	-1.15	-0.886	0.6241	0.18923	1.26113	1.3225	0.78500	4.1819	2.04498	1	1.30579
76	50	7.9	4.3	5.8	3.6	4.3	7.81	5.365	5.123	5.15	3.886	3	1	1	0	1	3.9	5.8	4.4	6.9	4.7	5.2	4.1	4.2	8.6	7.8	7.6	61.1	1	0.09	-1.065	0.677	-1.55	0.414	0.0081	1.13422	0.45833	2.4025	0.17140	4.1745	2.04317	1	1.60206
77	42	9.4	4.7	4.9	6.2	4.1	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.8	5.4	3.8	6.5	8.5	4.9	4.1	4.5	7.6	8.0	7.9	61.1	1	1.59	-0.665	-0.223	1.05	0.214	2.5281	0.44222	0.04973	1.1025	0.04580	4.1684	2.04165	2	1.22881
78	85	7.7	6.7	4.3	4.1	4.3	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	2.6	6.6	1.9	7.2	5.9	6.5	4.7	3.9	8.2	7.5	7.7	52.1	1	-0.11	1.335	-0.823	-1.05	0.414	0.0121	1.78223	0.67733	1.1025	0.17140	3.7456	1.93534	1	1.87885
79	62	8.4	6.7	5.9	4.2	3.6	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.8	5.0	4.5	4.7	6.7	5.1	2.7	5.0	8.0	7.6	8.8	63.1	1	0.59	1.335	0.777	-0.95	-0.286	0.3481	1.78223	0.60373	0.9025	0.08180	3.7184	1.92830	1	1.87845
80	33	6.7	6.5	4.9	4.2	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.7	5.3	5.3	5.1	9.2	5.7	3.5	4.5	5.4	6.5	7.6	44.1	0	-1.11	1.135	-0.223	-0.95	-0.486	1.2321	1.28823	0.04973	0.9025	0.23620	3.7087	1.92581	3	1.57677
81	75	8.5	5.3	6.0	3.6	3.7	7.81	5.365	5.123	5.15	3.886	2	0	1	1	1	3.9	5.5	5.0	4.9	6.8	5.7	4.4	5.1	8.2	7.0	8.4	65.1	1	0.69	-0.065	0.877	-1.55	-0.186	0.4761	0.00422	0.76913	2.4025	0.03460	3.6865	1.92004	1	1.24442
82	55	8.0	3.8	4.7	4.2	4.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.3	5.8	3.2	4.6	8.7	5.3	4.9	6.6	7.3	8.1	8.1	62.1	1	0.19	-1.565	-0.423	-0.95	0.314	0.0361	2.44922	0.17893	0.9025	0.09860	3.6653	1.91451	1	1.57181
83	29	8.5	5.7	3.7	6.0	4.4	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.0	6.0	2.3	7.6	4.8	5.8	5.7	3.8	6.3	6.9	7.2	70.1	0	0.69	0.335	-1.423	0.85	0.514	0.4761	0.11223	2.02493	0.7225	0.26420	3.6000	1.89735	2	1.68012
84	96	8.6	5.6	5.7	3.6	3.6	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	4.8	5.3	2.3	6.0	6.7	5.8	4.9	3.6	7.3	8.1	8.1	50.1	1	0.79	0.235	0.577	-1.55	-0.286	0.6241	0.05523	0.33293	2.4025	0.08180	3.4965	1.86991	1	1.05763
85	94	9.3	5.4	5.9	4.9	4.6	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.5	7.8	4.6	7.5	4.6	6.4	4.8	4.1	8.9	7.6	8.9	72.1	1	1.49	0.035	0.777	-0.25	0.714	2.2201	0.00123	0.60373	0.0625	0.50980	3.3974	1.84319	1	1.79237
86	69	7.5	3.8	4.5	5.2	3.4	7.81	5.365	5.123	5.15	3.886	1	1	1	1	0	3.5	3.5	2.9	4.1	7.6	5.1	4.0	5.4	5.2	5.8	5.8	51.1	0	-0.31	-1.565	-0.623	0.05	-0.486	0.0961	2.44922	0.38813	0.0025	0.23620	3.1721	1.78105	1	2.19285
87	3	9.2	5.6	5.8	4.6	4.5	7.81	5.365	5.123	5.15	3.886	3	0	1	1	1	3.4	5.6	5.4	7.4	4.5	6.2	5.4	4.0	8.9	8.4	9.0	72.1	1	1.39	0.235	0.677	-0.55	0.614	1.9321	0.05523	0.45833	0.3025	0.37700	3.1252	1.76781	1	1.54389
88	89	9.1	5.5	4.6	4.1	3.9	7.81	5.365	5.123	5.15	3.886	2	1	0	0	1	3.6	5.4	4.2	6.2	8.3	6.5	4.6	4.3	7.3	6.5	7.4	59.1	0	1.29	0.135	-0.523	-1.05	0.014	1.6641	0.01823	0.27353	1.1025	0.00020	3.0585	1.74887	1	0.68087
89	37	9.0	5.9	4.5	4.3	3.5	7.81	5.365	5.123	5.15	3.886	2	0	0	0	1	3.4	4.6	3.9	6.0	6.8	6.4	3.9	3.5	7.1	8.0	7.2	57.1	0	1.19	0.535	-0.623	-0.85	-0.386	1.4161	0.28623	0.38813	0.7225	0.14900	2.9620	1.72103	1	0.99804
90	51	6.7	5.9	4.8	5.3	2.8	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	3.6	4.2	3.4	4.7	7.2	5.7	4.0	3.6	5.4	7.5	7.2	48.1	0	-1.11	0.535	-0.323	0.15	-1.086	1.2321	0.28623	0.10433	0.0225	1.17940	2.8246	1.68064	3	1.52715
91	10	6.4	5.1	5.7	5.3	4.4	7.81	5.365	5.123	5.15	3.886	1	0	1	1	0	4.5	6.1	4.7	5.7	8.4	5.4	4.1	5.8	5.5	5.9	6.7	59.1	0	-1.41	-0.265	0.577	0.15	0.514	1.9881	0.07022	0.33293	0.0225	0.26420	2.6779	1.63644	3	0.81129
92	34	8.0	6.1	4.7	3.8	4.2	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.3	5.7	5.5	4.6	8.7	5.9	4.7	6.6	7.3	7.5	9.0	62.1	1	0.19	0.735	-0.423	-1.35	0.314	0.0361	0.54023	0.17893	1.8225	0.09860	2.6763	1.63596	1	1.15394
93	5	9.0	5.2	4.5	4.5	3.5	7.81	5.365	5.123	5.15	3.886	2	0	1	0	1	3.4	4.6	2.2	6.0	6.8	6.1	4.5	3.5	7.1	6.6	9.0	57.1	0	1.19	-0.165	-0.623	-0.65	-0.386	1.4161	0.02722	0.38813	0.4225	0.14900	2.4029	1.55015	1	0.81553
94	82	8.7	6.4	4.6	5.1	4.0	7.81	5.365	5.123	5.15	3.886	3	0	0	0	0	3.2	4.9	2.4	6.8	6.8	6.3	4.3	3.7	7.4	7.3	8.0	68.1	1	0.89	1.035	-0.523	-0.05	0.114	0.7921	1.07123	0.27353	0.0025	0.01300	2.1524	1.46709	1	1.67484
95	28	7.0	5.4	4.2	5.9	3.7	7.81	5.365	5.123	5.15	3.886	1	1	0	1	0	3.3	5.5	2.6	4.8	9.0	6.5	4.3	5.2	5.4	5.5	5.6	55.1	0	-0.81	0.035	-0.923	0.75	-0.186	0.6561	0.00123	0.85193	0.5625	0.03460	2.1064	1.45133	3	1.84631
96	54	6.9	5.7	4.7	4.4	3.3	7.81	5.365	5.123	5.15	3.886	1	1	0	0	1	3.4	4.4	3.3	6.4	5.2	6.4	3.2	2.7	6.1	7.0	7.2	44.1	0	-0.91	0.335	-0.423	-0.75	-0.586	0.8281	0.11223	0.17893	0.5625	0.34340	2.0251	1.42308	3	1.46522
97	58	7.6	5.2	5.4	6.4	4.0	7.81	5.365	5.123	5.15	3.886	3	1	0	0	0	3.6	5.8	5.6	6.6	4.4	6.7	4.6	3.9	8.2	7.5	7.5	58.1	1	-0.21	-0.165	0.277	1.25	0.114	0.0441	0.02722	0.07673	1.5625	0.01300	1.7236	1.31284	2	1.19909
98	100	7.9	4.4	4.8	5.8	3.5	7.81	5.365	5.123	5.15	3.886	2	1	1	1	0	3.0	5.1	5.9	4.2	9.7	5.7	3.4	5.4	6.4	7.3	7.0	57.1	0	0.09	-0.965	-0.323	0.65	-0.386	0.0081	0.93122	0.10433	0.4225	0.14900	1.6151	1.27089	2	1.74170


Chapter 9 HBAT Cluster Analysis Example
X8 - Technical Support
8
6
4
2
5
6
7
8
9
10
X6 - Product Quality
Cluster 3 2 1


Chapter 9 HBAT Cluster Analysis Example
X15 - New Products
8
6
4
2
5
6
7
8
9
10
X6 - Product Quality
Cluster 3 2 1


Chapter 9 HBAT Cluster Analysis Example
X12 - Salesforce Image
8
6
4
2
4
6
8
X8 - Technical Support
Cluster 3 2 1


Chapter 9 HBAT Cluster Analysis Example
X18 - Delivery Speed
5
4
3
2
2
4
6
8
X8 - Technical Support
Cluster 3 2 1


Chapter 9 HBAT Cluster Analysis Example
X18 - Delivery Speed
5
4
3
2
4
6
8
X12 - Salesforce Image
Cluster 3 2 1

Chapter 9 HBAT Cluster Analysis Example

Obs	ID	X15	X20	X21	X22	CLUSTER
1	1	4.3	8.0	8.4	65.1	1
2	2	4.0	6.5	7.5	67.1	1
3	3	4.6	8.4	9.0	72.1	1
4	4	3.6	6.0	7.2	40.1	3
5	5	4.5	6.6	9.0	57.1	1
6	7	2.5	7.8	7.2	41.1	1
7	8	4.8	5.8	7.7	56.1	3
8	9	4.4	7.5	8.2	56.1	3
9	10	5.3	5.9	6.7	59.1	3
10	11	7.5	7.0	8.4	68.1	2
11	12	5.9	6.3	6.6	53.1	3
12	13	5.3	8.4	7.9	58.1	2
13	14	3.0	6.9	8.2	72.1	1
14	15	5.4	7.0	7.6	62.1	3
15	16	5.0	6.4	7.1	71.1	1
16	17	5.4	7.5	7.2	50.1	3
17	18	6.3	6.9	8.2	58.1	3
18	19	6.1	7.5	7.9	55.1	3
19	20	6.7	8.5	8.8	67.1	2
20	21	4.6	5.5	7.0	50.1	3
21	22	6.5	9.6	9.9	70.1	2
22	23	6.0	7.1	8.1	60.1	2
23	24	4.2	8.1	8.0	65.1	1
24	25	3.9	4.9	5.5	55.1	3
25	26	3.7	6.8	7.0	58.1	3
26	27	6.7	7.1	7.0	70.1	2
27	28	5.9	5.5	5.6	55.1	3
28	29	6.0	6.9	7.2	70.1	2
29	30	7.2	5.5	6.2	52.1	2
30	31	3.3	6.8	7.1	44.1	3
31	32	6.1	5.8	6.2	51.1	2
32	33	4.2	6.5	7.6	44.1	3
33	34	3.8	7.5	9.0	62.1	1
34	35	6.0	6.6	6.7	54.1	3
35	36	6.5	4.6	7.1	51.1	2
36	37	4.3	8.0	7.2	57.1	1
37	38	4.4	9.9	9.9	77.1	1
38	39	7.1	6.9	7.6	65.1	2
39	40	6.8	5.5	5.8	53.1	3
40	41	1.7	7.5	8.4	61.1	1
41	42	6.2	8.0	7.9	61.1	2
42	43	4.1	7.8	7.6	72.1	1
43	44	5.2	7.9	8.4	55.1	3
44	45	3.9	5.6	6.5	65.1	1
45	46	5.1	8.6	7.7	58.1	3
46	47	3.7	8.8	8.0	67.1	1
47	48	4.8	7.6	7.1	60.1	3
48	49	7.2	8.1	8.5	67.1	2
49	50	3.6	7.8	7.6	61.1	1
50	51	5.3	7.5	7.2	48.1	3
51	52	5.0	7.1	8.2	67.1	1
52	53	9.2	9.0	9.0	66.1	2
53	54	4.4	7.0	7.2	44.1	3
54	55	4.2	8.1	8.1	62.1	1
55	56	5.9	7.6	8.9	59.1	2
56	57	7.4	7.9	8.8	74.1	2
57	58	6.4	7.5	7.5	58.1	2

58	59	4.5	6.5	7.0	67.1	1
59	60	7.0	8.5	8.5	61.1	2
60	61	4.5	6.9	7.2	71.1	1
61	62	4.2	7.6	8.8	63.1	1
62	63	7.2	5.5	8.0	44.1	2
63	64	4.7	6.0	8.1	47.1	1
64	65	3.9	6.9	7.1	48.1	3
65	66	5.0	6.9	9.0	60.1	3
66	67	6.4	5.6	6.2	50.1	3
67	68	2.5	6.3	8.2	48.1	3
68	69	5.2	5.8	5.8	51.1	1
69	70	5.5	6.6	8.0	58.1	3
70	71	5.7	7.5	7.7	67.1	2
71	72	2.5	6.0	7.0	43.1	1
72	73	6.3	6.6	7.9	66.1	3
73	74	4.6	8.8	9.8	66.1	1
74	75	3.6	7.0	8.4	65.1	1
75	76	7.6	6.6	8.9	63.1	2
76	77	6.6	6.9	7.5	49.1	2
77	78	2.4	7.3	8.0	61.1	1
78	79	3.1	7.3	8.1	72.1	1
79	80	3.5	5.8	7.6	44.1	1
80	81	6.9	7.9	8.8	63.1	2
81	82	5.1	7.3	8.0	68.1	1
82	83	4.0	6.1	8.5	53.1	1
83	84	6.5	5.1	6.5	37.1	3
84	85	4.1	7.5	7.7	52.1	1
85	86	2.8	6.0	7.2	51.1	1
86	88	7.7	7.6	8.2	52.1	2
87	89	4.1	6.5	7.4	59.1	1
88	90	4.9	7.6	9.3	59.1	3
89	91	4.6	7.9	7.9	58.1	1
90	92	3.5	5.0	6.5	51.1	1
91	93	6.6	7.5	8.6	72.1	2
92	94	4.9	7.6	8.9	72.1	1
93	95	4.8	7.3	8.4	59.1	1
94	96	3.6	8.1	8.1	50.1	1
95	97	6.4	5.5	7.2	48.1	2
96	98	4.3	7.0	7.7	51.1	1
97	99	5.7	7.1	7.4	61.1	2
98	100	5.8	7.3	7.0	57.1	2

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Class Level Information		
Class	Levels	Values
CLUSTER	3	1 2 3

Number of Observations Read	98
Number of Observations Used	98

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

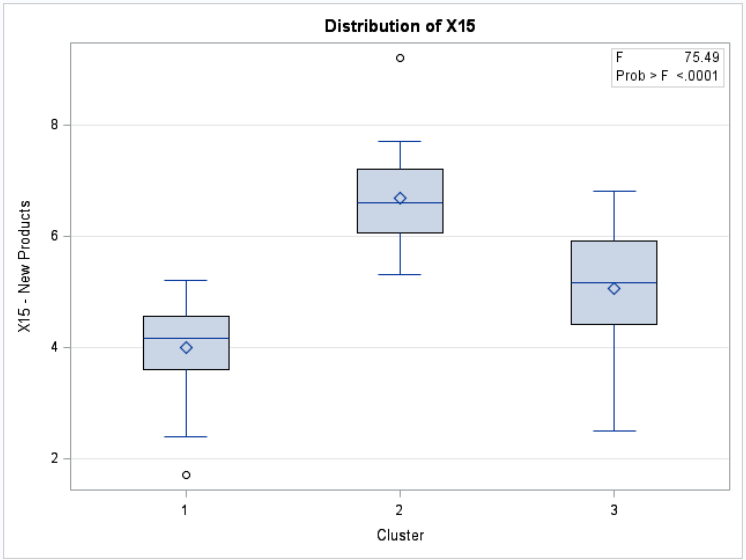
Dependent Variable: X15 X15 - New Products

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	119.8664252	59.9332126	75.49	<.0001
Error	95	75.4267381	0.7939657		
Corrected Total	97	195.2931633			

R-Square	Coeff Var	Root MSE	X15 Mean
0.613777	17.53819	0.891048	5.080612

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	2	119.8664252	59.9332126	75.49	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	2	119.8664252	59.9332126	75.49	<.0001



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

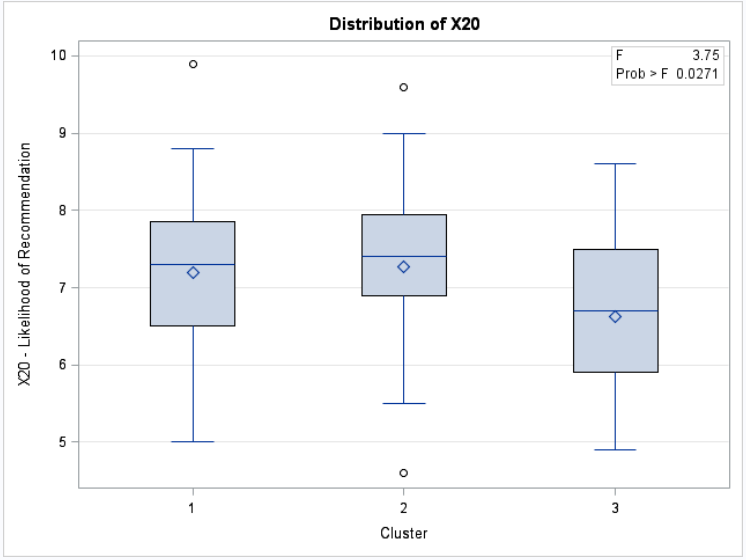
Dependent Variable: X20 X20 - Likelihood of Recommendation

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	7.6722976	3.8361488	3.75	0.0271
Error	95	97.2077024	1.0232390		
Corrected Total	97	104.8800000			

R-Square	Coeff Var	Root MSE	X20 Mean
0.073153	14.36282	1.011553	7.042857

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	2	7.67229762	3.83614881	3.75	0.0271

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	2	7.67229762	3.83614881	3.75	0.0271



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

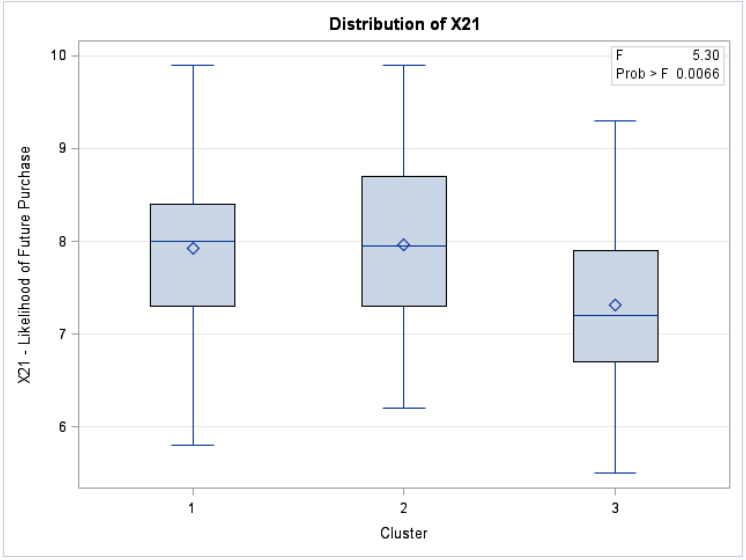
Dependent Variable: X21 X21 - Likelihood of Future Purchase

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	8.14584354	4.07292177	5.30	0.0066
Error	95	72.95823810	0.76798145		
Corrected Total	97	81.10408163			

R-Square	Coeff Var	Root MSE	X21 Mean
0.100437	11.31215	0.876346	7.746939

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	2	8.14584354	4.07292177	5.30	0.0066

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	2	8.14584354	4.07292177	5.30	0.0066



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

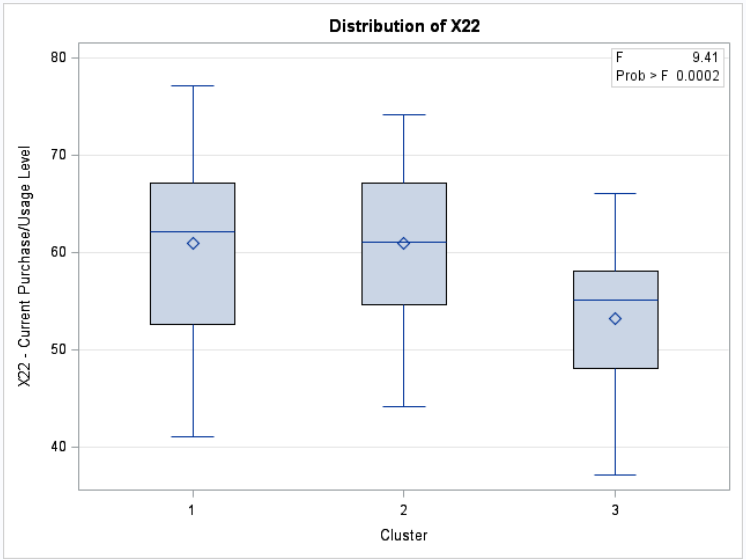
Dependent Variable: X22 X22 - Current Purchase/Usage Level

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1255.986224	627.993112	9.41	0.0002
Error	95	6338.503571	66.721090		
Corrected Total	97	7594.489796			

R-Square	Coeff Var	Root MSE	X22 Mean
0.165381	13.94150	8.168298	58.58980

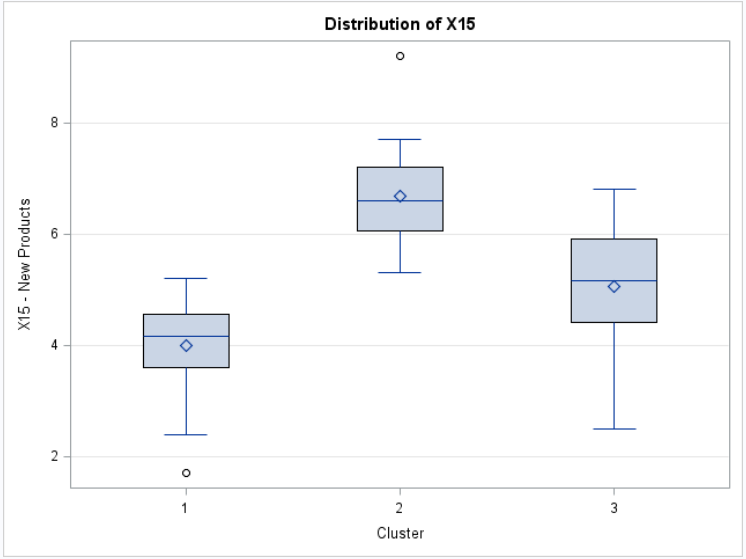
Source	DF	Type I SS	Mean Square	F Value	Pr > F
CLUSTER	2	1255.986224	627.993112	9.41	0.0002

Source	DF	Type III SS	Mean Square	F Value	Pr > F
CLUSTER	2	1255.986224	627.993112	9.41	0.0002



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X15

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.793966
Critical Value of t	1.98525
Least Significant Difference	0.4429
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	6.6821	28	2
B	5.0467	30	3
C	3.9850	40	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X15

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.793966
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	.4429	.4661

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	6.6821	28	2
B	5.0467	30	3
C	3.9850	40	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X15

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.793966
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	0.4429397	0.5312373

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	6.6821	28	2
B	5.0467	30	3
C	3.9850	40	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X15

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.793966
Critical Value of Studentized Range	3.36724
Minimum Significant Difference	0.5312
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Tukey Grouping	**Mean**	**N**	**CLUSTER**
A	6.6821	28	2
B	5.0467	30	3
C	3.9850	40	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X15

Note: This test controls the Type I experimentwise error rate.

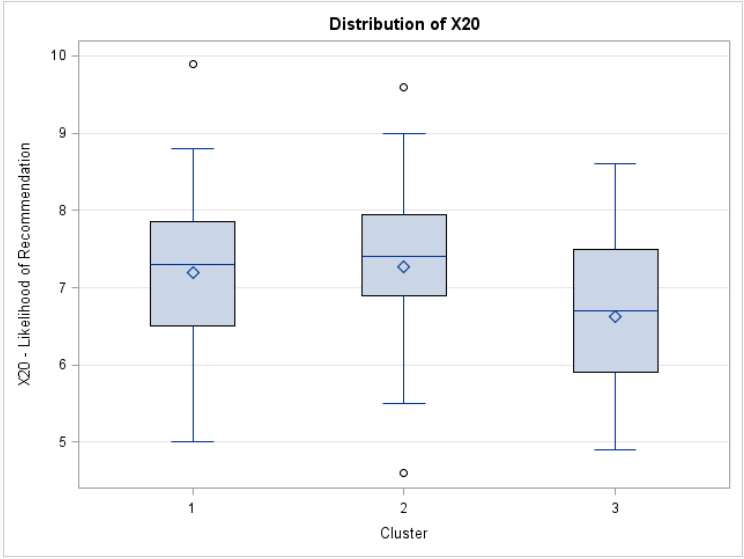
Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.793966
Critical Value of F	3.09222
Minimum Significant Difference	0.5549
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Scheffe Grouping	**Mean**	**N**	**CLUSTER**
A	6.6821	28	2
B	5.0467	30	3
C	3.9850	40	1

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X20

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	1.023239
Critical Value of t	1.98525
Least Significant Difference	0.5028
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	7.2643	28	2
A			
A	7.2025	40	1
B	6.6233	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X20

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	1.023239
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	.5028	.5292

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	7.2643	28	2
A			
A	7.2025	40	1
B	6.6233	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X20

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	1.023239
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	0.5028428	0.6030819

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	7.2643	28	2
A			
A	7.2025	40	1
B	6.6233	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X20

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	1.023239
Critical Value of Studentized Range	3.36724
Minimum Significant Difference	0.6031
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.				
Tukey Grouping		**Mean**	**N**	**CLUSTER**
	A	7.2643	28	2
	A			
B	A	7.2025	40	1
B				
B		6.6233	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X20

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	1.023239
Critical Value of F	3.09222
Minimum Significant Difference	0.6299
Harmonic Mean of Cell Sizes	31.89873

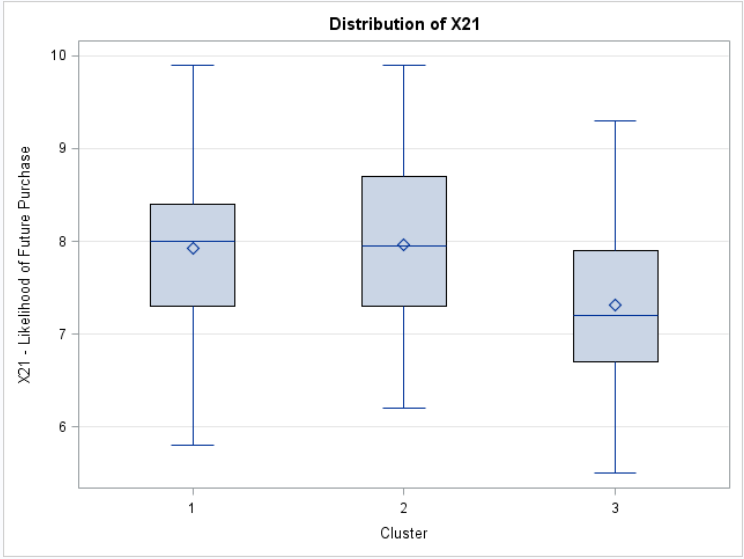
Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

Scheffe Grouping		Mean	N	CLUSTER
	A	7.2643	28	2
	A			
B	A	7.2025	40	1
B				
B		6.6233	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X21

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.767981
Critical Value of t	1.98525
Least Significant Difference	0.4356
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	7.9571	28	2
A			
A	7.9250	40	1
B	7.3133	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X21

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.767981
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	.4356	.4584

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	7.9571	28	2
A			
A	7.9250	40	1
B	7.3133	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X21

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.767981
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	0.4356313	0.5224721

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	7.9571	28	2
A			
A	7.9250	40	1
B	7.3133	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X21

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.767981
Critical Value of Studentized Range	3.36724
Minimum Significant Difference	0.5225
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Tukey Grouping	**Mean**	**N**	**CLUSTER**
A	7.9571	28	2
A			
A	7.9250	40	1
B	7.3133	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X21

Note: This test controls the Type I experimentwise error rate.

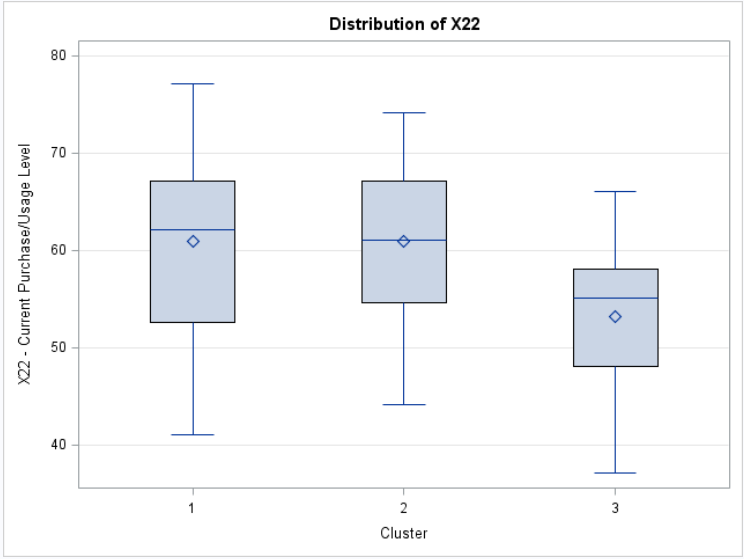
Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	0.767981
Critical Value of F	3.09222
Minimum Significant Difference	0.5457
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Scheffe Grouping	**Mean**	**N**	**CLUSTER**
A	7.9571	28	2
A			
A	7.9250	40	1
B	7.3133	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure



Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

t Tests (LSD) for X22

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	66.72109
Critical Value of t	1.98525
Least Significant Difference	4.0605
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.

t Grouping	Mean	N	CLUSTER
A	60.975	40	1
A			
A	60.957	28	2
B	53.200	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Duncan's Multiple Range Test for X22

Note: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	66.72109
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	4.060	4.273

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	CLUSTER
A	60.975	40	1
A			
A	60.957	28	2
B	53.200	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Student-Newman-Keuls Test for X22

Note: This test controls the Type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	66.72109
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Number of Means	**2**	**3**
Critical Range	4.0604606	4.8698916

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	CLUSTER
A	60.975	40	1
A			
A	60.957	28	2
B	53.200	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Tukey's Studentized Range (HSD) Test for X22

Note: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	66.72109
Critical Value of Studentized Range	3.36724
Minimum Significant Difference	4.8699
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Tukey Grouping	**Mean**	**N**	**CLUSTER**
A	60.975	40	1
A			
A	60.957	28	2
B	53.200	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Scheffe's Test for X22

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	95
Error Mean Square	66.72109
Critical Value of F	3.09222
Minimum Significant Difference	5.0864
Harmonic Mean of Cell Sizes	31.89873

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Scheffe Grouping	**Mean**	**N**	**CLUSTER**
A	60.975	40	1
A			
A	60.957	28	2
B	53.200	30	3

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure

Levene's Test for Homogeneity of X15 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	4.0051	2.0025	1.44	0.2412
Error	95	131.8	1.3870		

Brown and Forsythe's Test for Homogeneity of X15 Variance ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	1.1274	0.5637	1.74	0.1810
Error	95	30.7726	0.3239		

Bartlett's Test for Homogeneity of X15 Variance

Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	2	2.9465	0.2292

Levene's Test for Homogeneity of X20 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	3.2851	1.6425	0.81	0.4475
Error	95	192.4	2.0258		

Brown and Forsythe's Test for Homogeneity of X20 Variance ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	0.2862	0.1431	0.36	0.7010
Error	95	38.1208	0.4013		

Bartlett's Test for Homogeneity of X20 Variance

Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	2	1.6198	0.4449

Levene's Test for Homogeneity of X21 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	0.1667	0.0834	0.07	0.9284
Error	95	106.4	1.1205		

Brown and Forsythe's Test for Homogeneity of X21 Variance ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	0.1017	0.0508	0.17	0.8443
Error	95	28.4790	0.2998		

Bartlett's Test for Homogeneity of X21 Variance

Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	2	0.1625	0.9219

Levene's Test for Homogeneity of X22 Variance ANOVA of Squared Deviations from Group Means

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	24545.9	12272.9	2.02	0.1378
Error	95	576151	6064.7		

Brown and Forsythe's Test for Homogeneity of X22 Variance ANOVA of Absolute Deviations from Group Medians

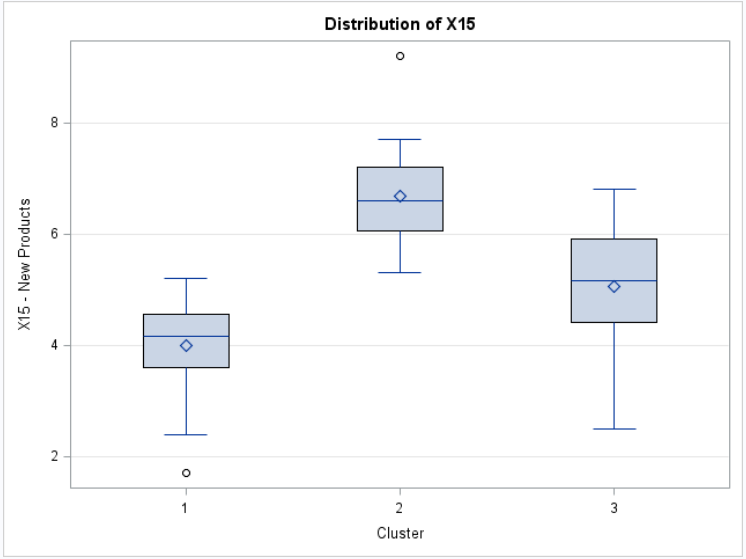
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
CLUSTER	2	82.3481	41.1741	1.71	0.1865
Error	95	2288.1	24.0857		

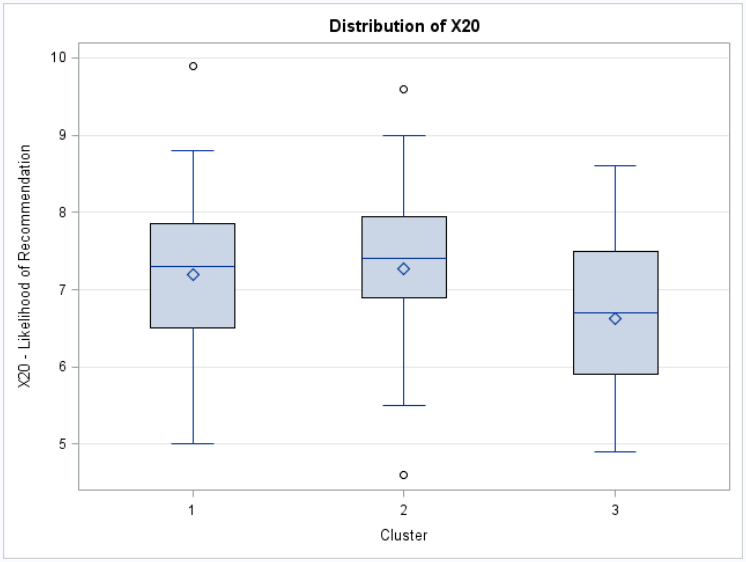
Bartlett's Test for Homogeneity of X22 Variance

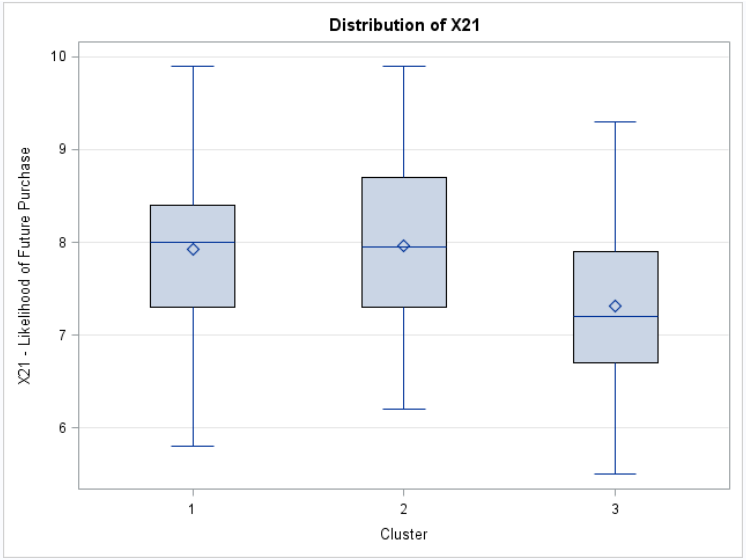
Source	DF	Chi-Square	Pr > ChiSq
CLUSTER	2	2.9221	0.2320

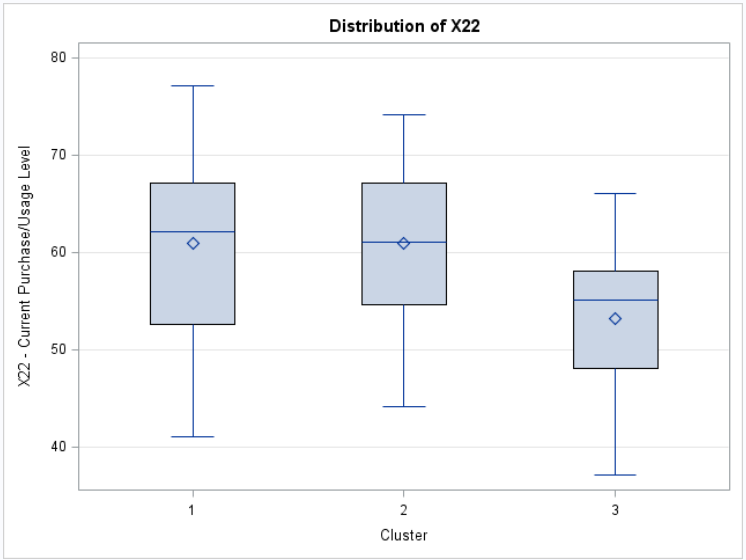
Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure





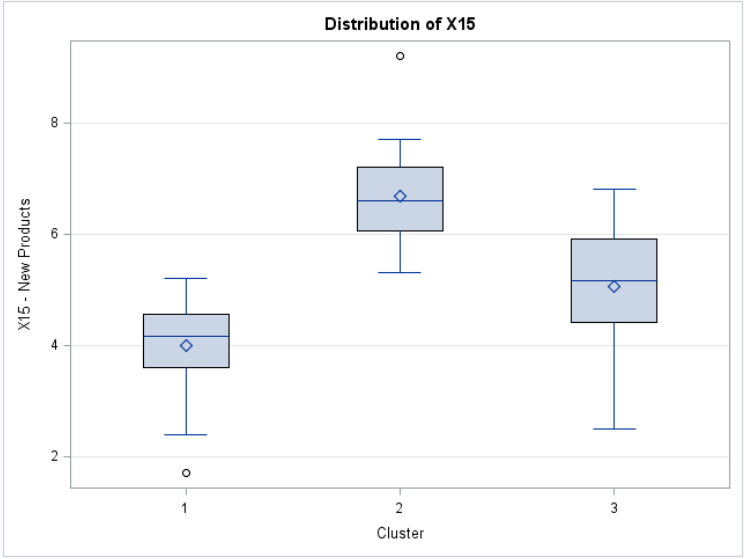


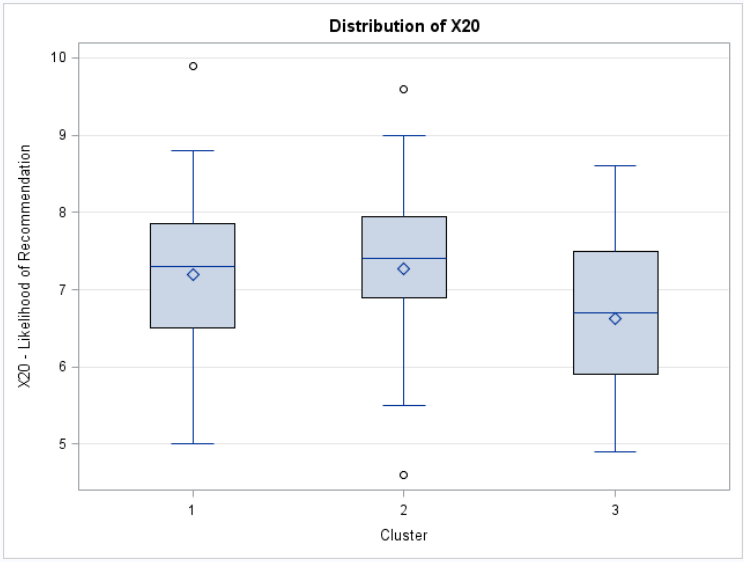


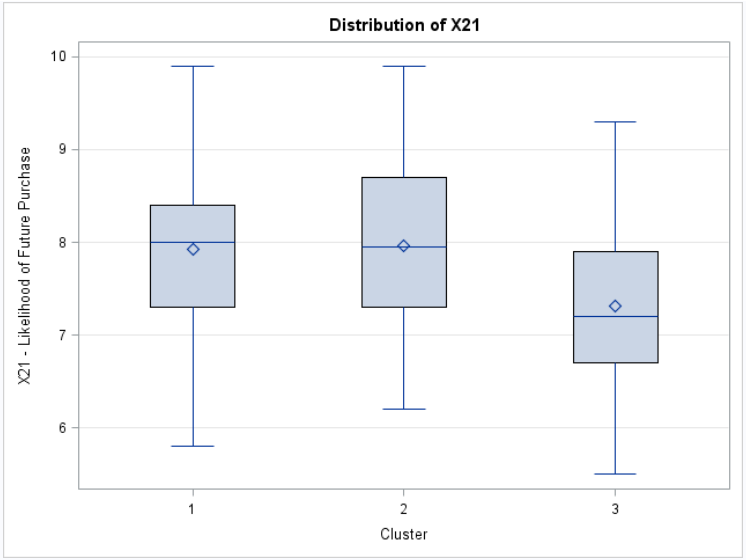
Level of CLUSTER	N	X15		X20		X21		X22	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
1	40	3.98500000	0.81194606	7.20250000	1.00447397	7.92500000	0.84845259	60.9750000	9.16007922
2	28	6.68214286	0.80510113	7.26428571	1.13568850	7.95714286	0.87915303	60.9571429	8.03102450
3	30	5.04666667	1.05396896	6.62333333	0.89121511	7.31333333	0.90999558	53.2000000	6.75864708

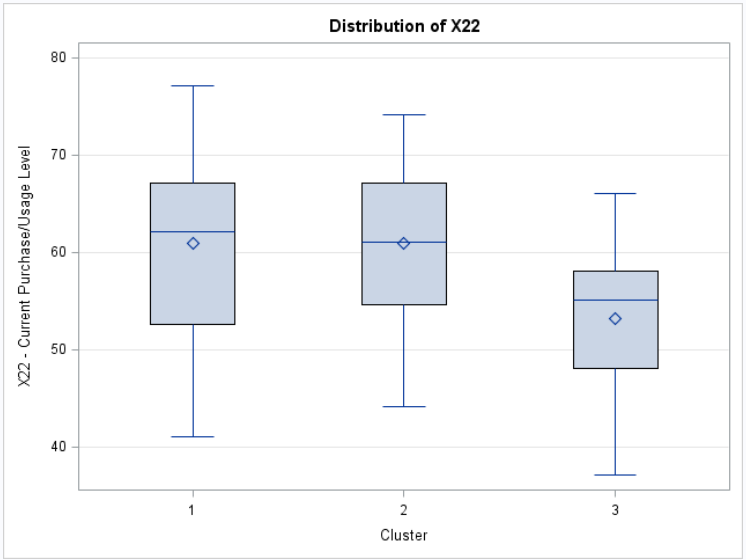
Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure









Level of CLUSTER	N	X15		X20		X21		X22	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
1	40	3.98500000	0.81194606	7.20250000	1.00447397	7.92500000	0.84845259	60.9750000	9.16007922
2	28	6.68214286	0.80510113	7.26428571	1.13568850	7.95714286	0.87915303	60.9571429	8.03102450
3	30	5.04666667	1.05396896	6.62333333	0.89121511	7.31333333	0.90999558	53.2000000	6.75864708

Chapter 9 HBAT Cluster Analysis Example

The GLM Procedure
Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for CLUSTER
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1			
		X15	X20	X21	X22
1.71971997	88.30	0.11919695	0.01425144	-0.00413410	-0.00415350
0.22791272	11.70	0.00270772	-0.00665787	0.05079070	0.00985191
0.00000000	0.00	0.00048829	-0.09966635	0.14828812	-0.00417506
0.00000000	0.00	0.00259088	-0.10072476	-0.01861024	0.00932094

MANOVA Tests for the Hypothesis of No Overall CLUSTER Effect
H = Type III SSCP Matrix for CLUSTER
E = Error SSCP Matrix

S=2 M=0.5 N=45

Statistic	Value	P-Value
Wilks' Lambda	0.29943896	<.0001
Pillai's Trace	0.81792496	<.0001
Hotelling-Lawley Trace	1.94763269	<.0001
Roy's Greatest Root	1.71971997	<.0001

Chapter 9 HBAT Cluster Analysis Example

Obs	ID	X1	X2	X3	X4	X5	CLUSTER
1	1	2	0	1	1	1	1
2	2	3	1	0	0	0	1
3	3	3	0	1	1	1	1
4	4	1	1	1	1	0	3
5	5	2	0	1	0	1	1
6	7	1	1	1	1	0	1
7	8	2	0	1	1	0	3
8	9	2	1	1	1	0	3
9	10	1	0	1	1	0	3
10	11	3	0	1	0	1	2
11	12	1	0	1	1	0	3
12	13	1	1	0	0	1	2
13	14	3	1	0	0	1	1
14	15	2	0	1	1	1	3
15	16	3	0	0	0	0	1
16	17	2	1	0	1	1	3
17	18	2	0	1	1	0	3
18	19	2	1	1	1	0	3
19	20	3	0	1	1	0	2
20	21	1	0	0	1	0	3
21	22	3	1	1	1	1	2
22	23	2	0	0	0	1	2
23	24	3	0	1	1	1	1
24	25	1	0	0	1	0	3
25	26	2	0	1	1	0	3
26	27	3	0	0	0	0	2
27	28	1	1	0	1	0	3
28	29	3	0	0	0	0	2
29	30	1	1	1	1	0	2
30	31	1	1	0	0	1	3
31	32	1	0	1	1	0	2
32	33	1	1	1	1	0	3
33	34	2	1	1	1	0	1
34	35	1	0	1	1	0	3
35	36	1	0	0	0	0	2
36	37	2	0	0	0	1	1
37	38	3	0	1	1	1	1
38	39	2	1	1	1	0	2
39	40	1	0	0	1	0	3
40	41	2	1	1	1	0	1
41	42	2	1	0	0	1	2
42	43	3	0	1	0	1	1
43	44	2	1	1	1	1	3
44	45	3	1	0	0	0	1
45	46	2	0	1	1	0	3
46	47	3	1	0	0	1	1
47	48	2	1	1	1	0	3
48	49	3	0	0	1	1	2
49	50	3	1	1	0	1	1
50	51	1	0	1	1	0	3
51	52	3	1	0	0	0	1
52	53	3	0	1	1	1	2
53	54	1	1	0	0	1	3
54	55	2	1	1	1	0	1
55	56	3	1	0	0	0	2
56	57	2	0	1	1	1	2
57	58	3	1	0	0	0	2

58	59	3	1	0	0	0	1
59	60	3	1	1	1	0	2
60	61	3	0	0	0	0	1
61	62	2	0	1	1	1	1
62	63	1	0	0	0	1	2
63	64	1	0	1	1	0	1
64	65	1	0	1	1	0	3
65	66	2	1	1	1	0	3
66	67	2	1	0	1	0	3
67	68	2	1	0	1	1	3
68	69	1	1	1	1	0	1
69	70	2	0	1	1	0	3
70	71	3	0	0	1	0	2
71	72	1	1	0	0	1	1
72	73	2	0	1	1	0	3
73	74	3	0	1	1	1	1
74	75	2	0	1	1	1	1
75	76	3	0	0	0	0	2
76	77	1	0	0	1	1	2
77	78	2	1	0	0	1	1
78	79	3	0	0	0	1	1
79	80	1	1	1	1	0	1
80	81	3	0	1	0	0	2
81	82	3	0	0	0	0	1
82	83	2	0	0	0	1	1
83	84	1	1	0	1	0	3
84	85	2	0	0	0	1	1
85	86	1	1	1	1	0	1
86	88	2	0	0	0	1	2
87	89	2	1	0	0	1	1
88	90	2	1	0	1	1	3
89	91	3	1	0	0	0	1
90	92	1	1	0	1	0	1
91	93	3	1	1	0	1	2
92	94	3	0	1	1	1	1
93	95	3	1	1	0	0	1
94	96	1	1	0	0	1	1
95	97	1	0	0	1	1	2
96	98	1	0	0	0	1	1
97	99	2	1	0	1	1	2
98	100	2	1	1	1	0	2

Chapter 9 HBAT Cluster Analysis Example

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of CLUSTER by X1			
	X1(X1 - Customer Type)			
CLUSTER(Cluster)	1	2	3	Total
1	9 9.18 22.50 30.00	12 12.24 30.00 34.29	19 19.39 47.50 57.58	40 40.82
2	7 7.14 25.00 23.33	7 7.14 25.00 20.00	14 14.29 50.00 42.42	28 28.57
3	14 14.29 46.67 46.67	16 16.33 53.33 45.71	0 0.00 0.00 0.00	30 30.61
Total	30 30.61	35 35.71	33 33.67	98 100.00

Chapter 9 HBAT Cluster Analysis Example

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of CLUSTER by X4		
	X4(X4 - Region)		
CLUSTER(Cluster)	0	1	Total
1	23	17	40
	23.47	17.35	40.82
	57.50	42.50	
	58.97	28.81	
2	14	14	28
	14.29	14.29	28.57
	50.00	50.00	
	35.90	23.73	
3	2	28	30
	2.04	28.57	30.61
	6.67	93.33	
	5.13	47.46	
Total	39	59	98
	39.80	60.20	100.00

Chapter 9 HBAT Cluster Analysis Example

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of CLUSTER by X5		
	X5(X5 - Distribution System)		
CLUSTER(Cluster)	0	1	Total
1	18	22	40
	18.37	22.45	40.82
	45.00	55.00	
	32.73	51.16	
2	14	14	28
	14.29	14.29	28.57
	50.00	50.00	
	25.45	32.56	
3	23	7	30
	23.47	7.14	30.61
	76.67	23.33	
	41.82	16.28	
Total	55	43	98
	56.12	43.88	100.00