

S1-S4 univariate skewness, r1-r4 univariate kurtosis

Cluster=1

Obs	S1	S2	S3	S4	R1	R2	R3	R4
1	-2.98341	0.23017	-0.58279	-0.44176	7.34280	-0.11646	0.57713	0.19078

Cluster=2

Obs	S1	S2	S3	S4	R1	R2	R3	R4
2	-0.80403	0.36947	0.58998	-0.88489	0.18182	-1.87107	0.13032	1.51587

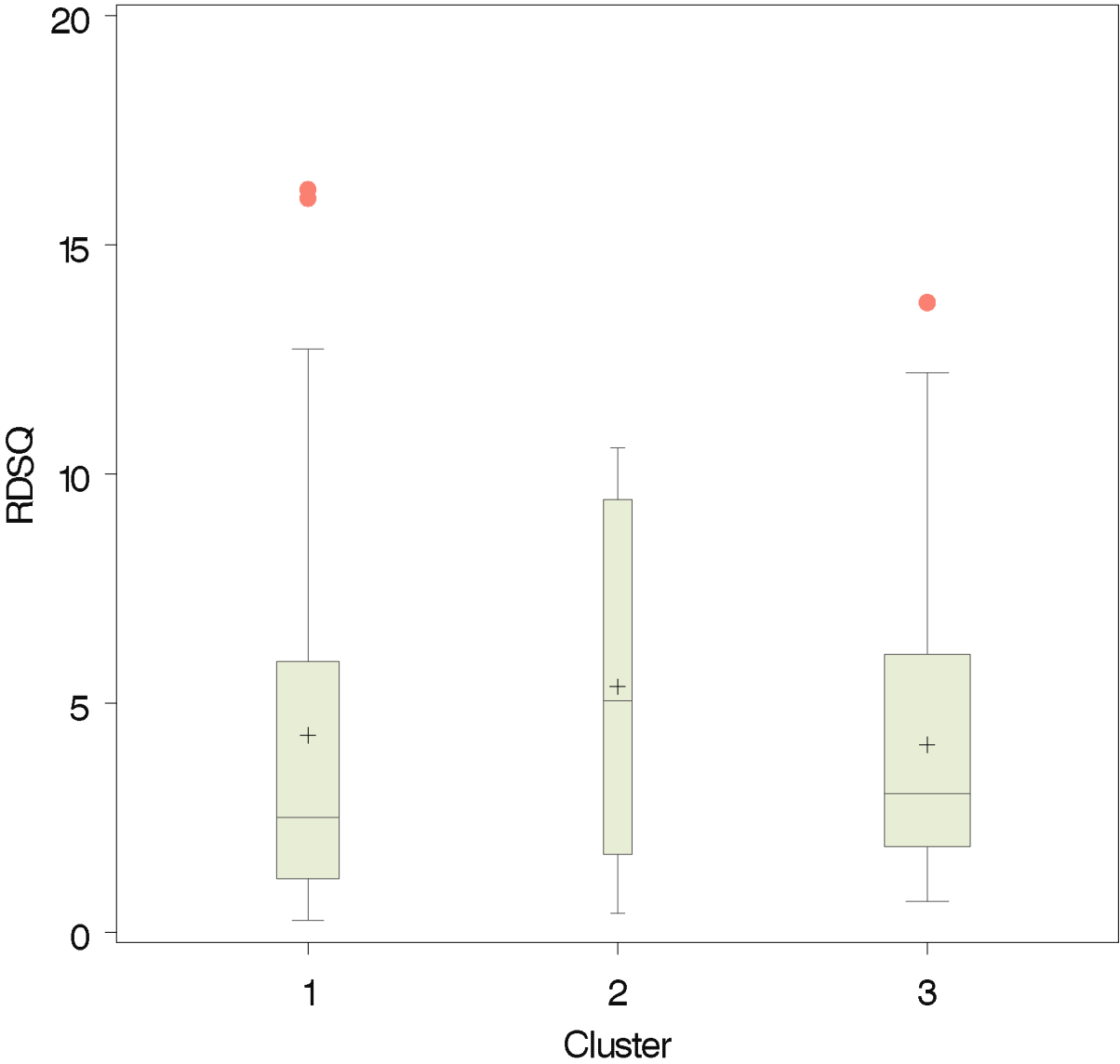
Cluster=3

Obs	S1	S2	S3	S4	R1	R2	R3	R4
3	0.093168	-0.13319	0.39040	0.16635	-0.53685	-0.090185	-0.62310	-1.04418

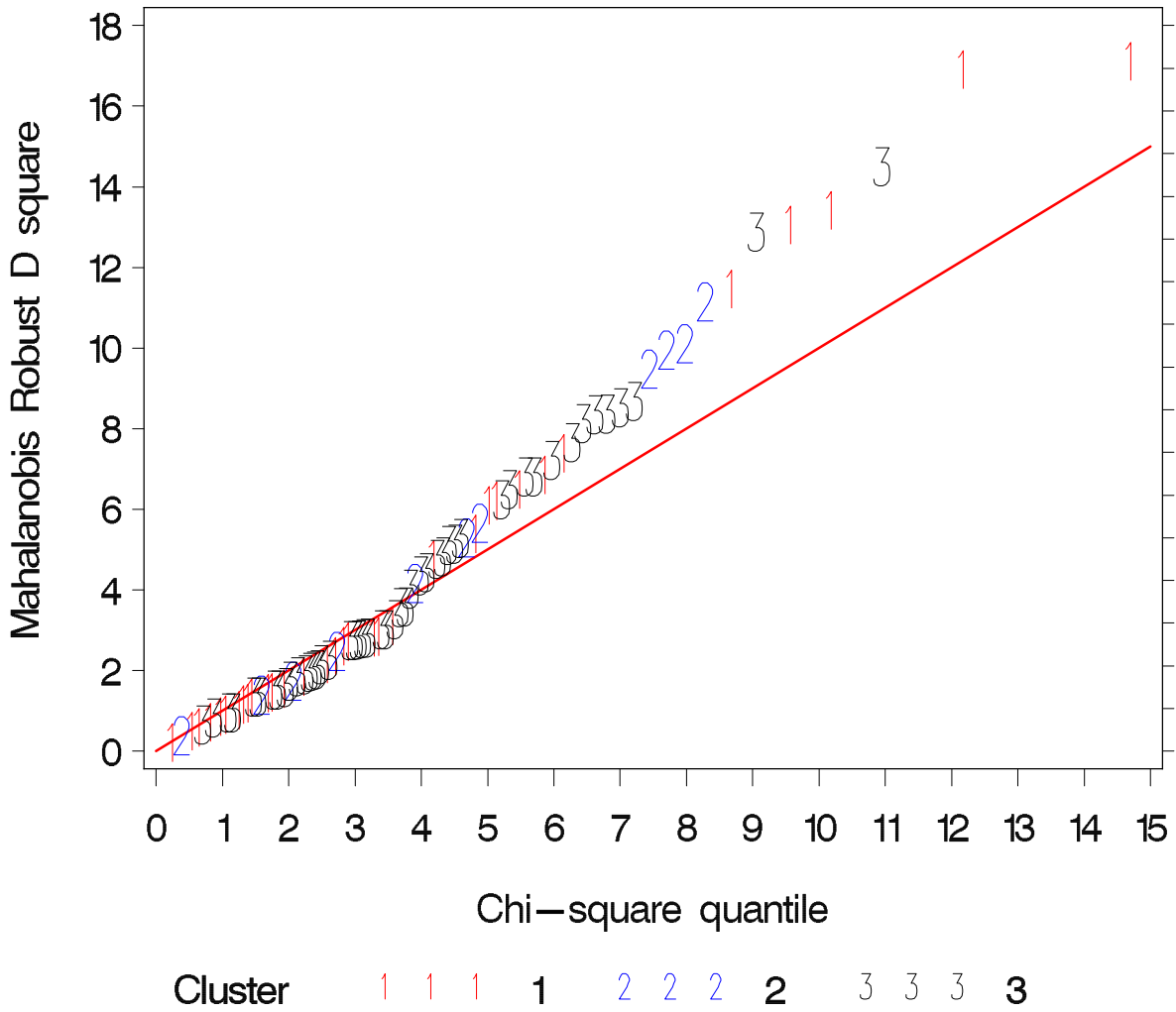
Influential/outlier observations (RDSQ > 2.5)

ID	RDSQ	CHISQ	DIFF
27	16.0182	12.1451	3.87308
76	12.2115	9.0532	3.15827
83	12.3691	9.5409	2.82814
37	13.7419	10.9463	2.79557
31	12.7215	10.1457	2.57581

Outlier – Influential observations by groups – cars93

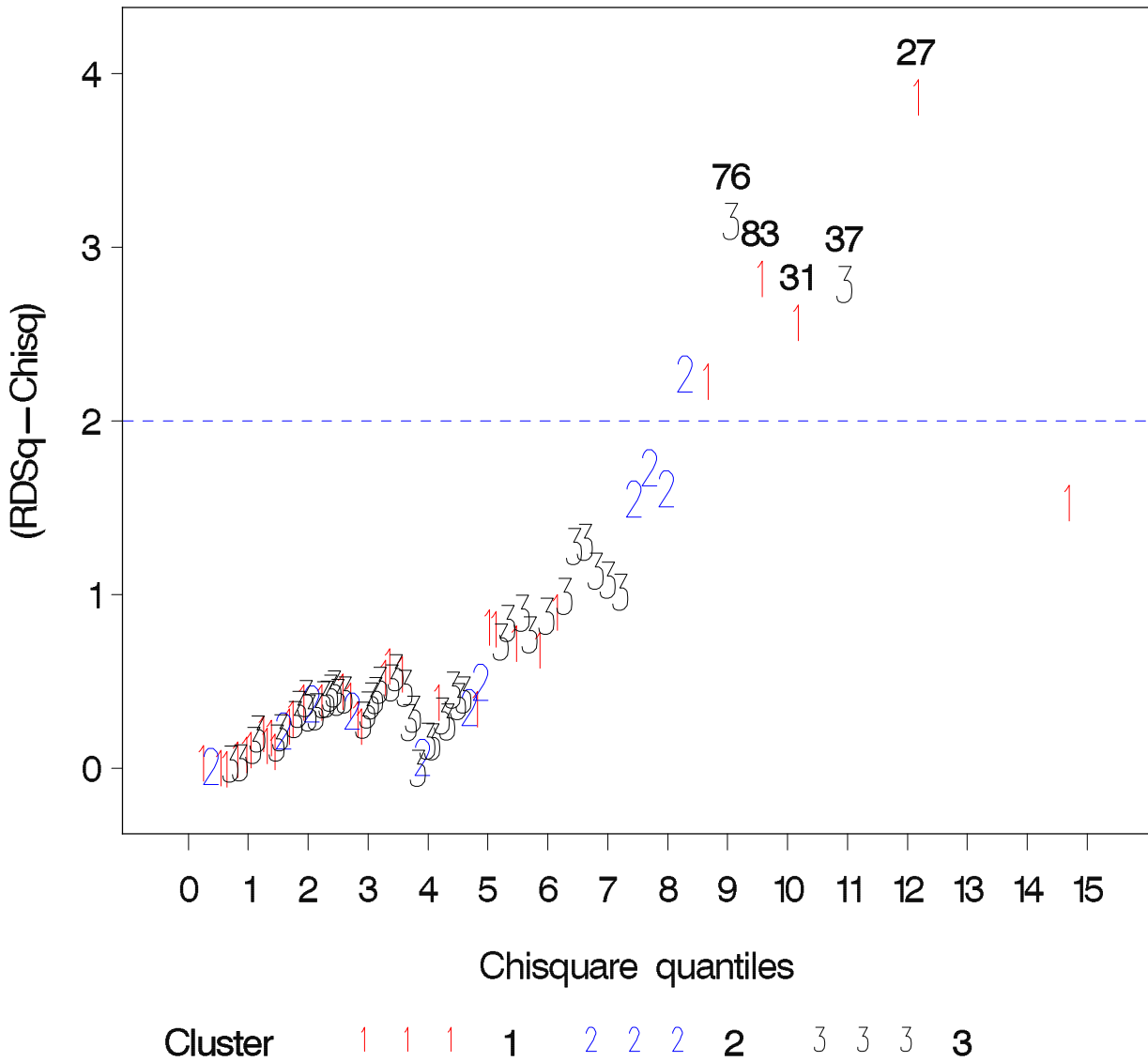


Q-Q plot checking for multivariate normality — cars93



Multivariate: Skewness= 1.627 P-value= 0.203 Kurtosis= 25.993 P-value= 0.168

Influential / outlier detection plot— data_



Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure

Observations	91	DF Total	90
Variables	4	DF Within Classes	88
Classes	3	DF Between Classes	2

Class Level Information					
CLUSTER	Variable Name	Frequency	Weight	Proportion	Prior Probability
1	_1	33	33.0000	0.362637	0.362637
2	_2	10	10.0000	0.109890	0.109890
3	_3	48	48.0000	0.527473	0.527473

Discriminant analysis assuming multivariate normal distribution-cars93

The DISCRIM Procedure
Simple Statistics

Total-Sample						
Variable	Label	N	Sum	Mean	Variance	Standard Deviation
X2	cyl	91	453.00000	4.97802	1.71062	1.3079
X4	hp	91	13039	143.28571	2624	51.2244
X11	width	91	6317	69.41758	14.46813	3.8037
X15	weight	91	280560	3083	349039	590.7955

CLUSTER = 1						
Variable	Label	N	Sum	Mean	Variance	Standard Deviation
X2	cyl	33	129.00000	3.90909	0.08523	0.2919
X4	hp	33	3234	98.00000	434.87500	20.8537
X11	width	33	2180	66.06061	4.87121	2.2071
X15	weight	33	81075	2457	96161	310.0978

CLUSTER = 2						
Variable	Label	N	Sum	Mean	Variance	Standard Deviation
X2	cyl	10	68.00000	6.80000	1.95556	1.3984
X4	hp	10	2433	243.30000	1938	44.0178
X11	width	10	722.00000	72.20000	5.95556	2.4404
X15	weight	10	37035	3704	53222	230.7000

CLUSTER = 3						
Variable	Label	N	Sum	Mean	Variance	Standard Deviation
X2	cyl	48	256.00000	5.33333	1.20567	1.0980
X4	hp	48	7372	153.58333	680.97163	26.0954
X11	width	48	3415	71.14583	10.63785	3.2616
X15	weight	48	162450	3384	142725	377.7898

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure

Total-Sample Standardized Class Means				
Variable	Label	1	2	3
X2	cyl	-0.817283222	1.393047795	0.271663925
X4	hp	-0.884065206	1.952473346	0.201029549
X11	width	-0.882555556	0.731502947	0.454360498
X15	weight	-1.060026265	1.050148626	0.509987093

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure
Test of Homogeneity of Within Covariance Matrices

Chi-Square	DF	Pr > ChiSq
102.525750	20	<.0001

Since the Chi-Square value is significant at the 0.1 level, the within covariance matrices will be used in the discriminant function.

Reference: Morrison, D.F. (1976) Multivariate Statistical Methods p252.

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure

Squared Distance to CLUSTER			
From CLUSTER	1	2	3
1	0	34.90103	10.89838
2	151.52715	0	14.47815
3	25.31290	6.14295	0

Discriminant analysis assuming multivariate normal distribution-cars93

The DISCRIM Procedure

Univariate Test Statistics								
F Statistics, Num DF=2, Den DF=88								
Variable	Label	Total Standard Deviation	Pooled Standard Deviation	Between Standard Deviation	R-Square	R-Square / (1-RSq)	F Value	Pr > F
X2	cyl	1.3079	0.9354	1.1263	0.4999	0.9996	43.98	<.0001
X4	hp	51.2244	26.8328	53.3691	0.7317	2.7272	120.00	<.0001
X11	width	3.8037	2.8394	3.1256	0.4552	0.8354	36.76	<.0001
X15	weight	590.7955	341.5244	590.4363	0.6733	2.0605	90.66	<.0001

Average R-Square	
Unweighted	0.5900025
Weighted by Variance	0.673681

Multivariate Statistics and F Approximations					
S=2 M=0.5 N=41.5					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.15221845	33.22	8	170	<.0001
Pillai's Trace	1.10514570	26.55	8	172	<.0001
Hotelling-Lawley Trace	3.87875060	40.93	8	119.13	<.0001
Roy's Greatest Root	3.37827116	72.63	4	86	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure
Canonical Discriminant Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approximate Standard Error	Squared Canonical Correlation	Eigenvalues of $\text{Inv}(E)*H$ = $\text{CanRsqr}/(1-\text{CanRsqr})$			
					Eigenvalue	Difference	Proportion	Cumulative
1	0.878407	0.873241	0.024076	0.771599	3.3783	2.8778	0.8710	0.8710
2	0.577535	0.569081	0.070250	0.333546	0.5005		0.1290	1.0000

Test of H0: The canonical correlations in the current row and all that follow are zero						
	Likelihood Ratio	Approximate F Value	Num DF	Den DF	Pr > F	
1	0.15221845	33.22	8	170	<.0001	
2	0.66645365	14.35	3	86	<.0001	

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure
Canonical Discriminant Analysis

Total Canonical Structure			
Variable	Label	CAN1	CAN2
X2	cyl	0.804745	0.024357
X4	hp	0.963123	-0.218761
X11	width	0.708384	0.451395
X15	weight	0.886488	0.447800

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure
Canonical Discriminant Analysis

Total-Sample Standardized Canonical Coefficients			
Variable	Label	CAN1	CAN2
X2	cyl	-0.012636305	-0.507211449
X4	hp	1.416647435	-1.378143329
X11	width	-0.543661381	0.485828302
X15	weight	1.240779289	1.569500784

Class Means on Canonical Variables		
CLUSTER	CAN1	CAN2
1	-2.077528530	-0.459578548
2	3.653676145	-1.393763981
3	0.667118334	0.606327748

Discriminant analysis assuming multivariate normal distribution-cars93

The DISCRIM Procedure
Classification Results for Calibration Data: WORK.DATA_
Cross-validation Results using Quadratic Discriminant Function

Posterior Probability of Membership in CLUSTER						
Obs	From CLUSTER	Classified into CLUSTER		1	2	3
9	1	3 *		0.1075	0.0009	0.8916
17	1	3 *		0.4057	0.0000	0.5943
25	1	3 *		0.3552	0.0000	0.6448
38	2	3 *		0.0000	0.3457	0.6543
40	2	3 *		0.0000	0.3981	0.6019
43	2	3 *		0.0000	0.4256	0.5744
44	2	3 *		0.0000	0.0000	1.0000
46	3	1 *		0.9228	0.0000	0.0772
47	3	1 *		0.6740	0.0000	0.3260
49	3	1 *		0.5411	0.0001	0.4588
50	3	1 *		0.8675	0.0000	0.1324
65	3	1 *		0.5048	0.0002	0.4950
69	3	1 *		0.5386	0.0001	0.4613
73	3	1 *		0.5953	0.0000	0.4047
81	3	2 *		0.0000	0.8929	0.1071
89	3	1 *		0.6959	0.0001	0.3041

** Misclassified observation*

Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure

*Classification Summary for Calibration Data: WORK.DATA_
Cross-validation Summary using Quadratic Discriminant Function*

Number of Observations and Percent Classified into CLUSTER				
From CLUSTER	1	2	3	Total
1	30 90.91	0 0.00	3 9.09	33 100.00
2	0 0.00	6 60.00	4 40.00	10 100.00
3	8 16.67	1 2.08	39 81.25	48 100.00
Total	38 41.76	7 7.69	46 50.55	91 100.00
Priors	0.36264	0.10989	0.52747	

Error Count Estimates for CLUSTER				
	1	2	3	Total
Rate	0.0909	0.4000	0.1875	0.1758
Priors	0.3626	0.1099	0.5275	

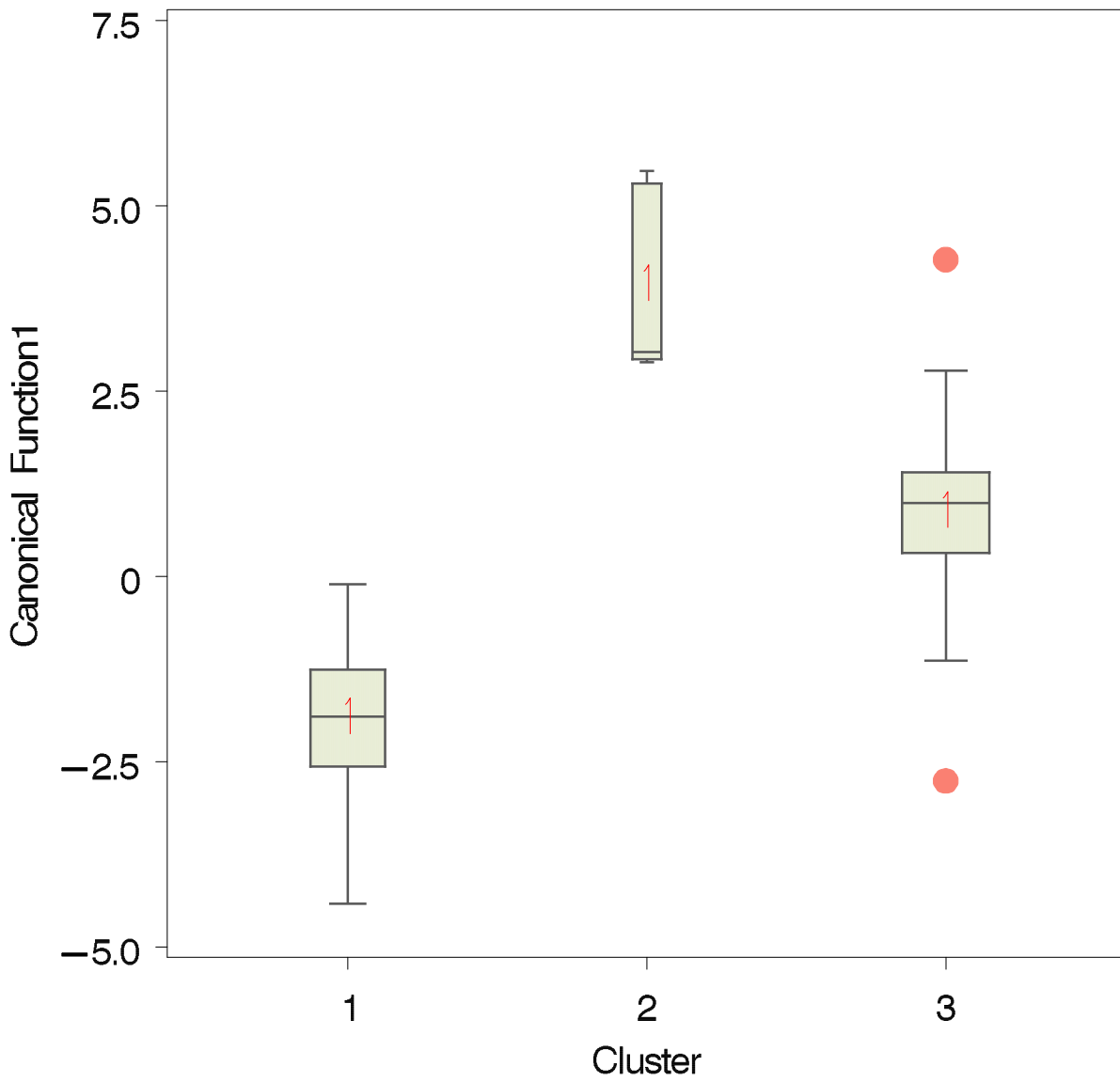
Discriminant analysis assuming multivariate normal
distribution-cars93

The DISCRIM Procedure
Classification Results for Calibration Data: WORK.DATA_
Cross-validation Results using Quadratic Discriminant Function

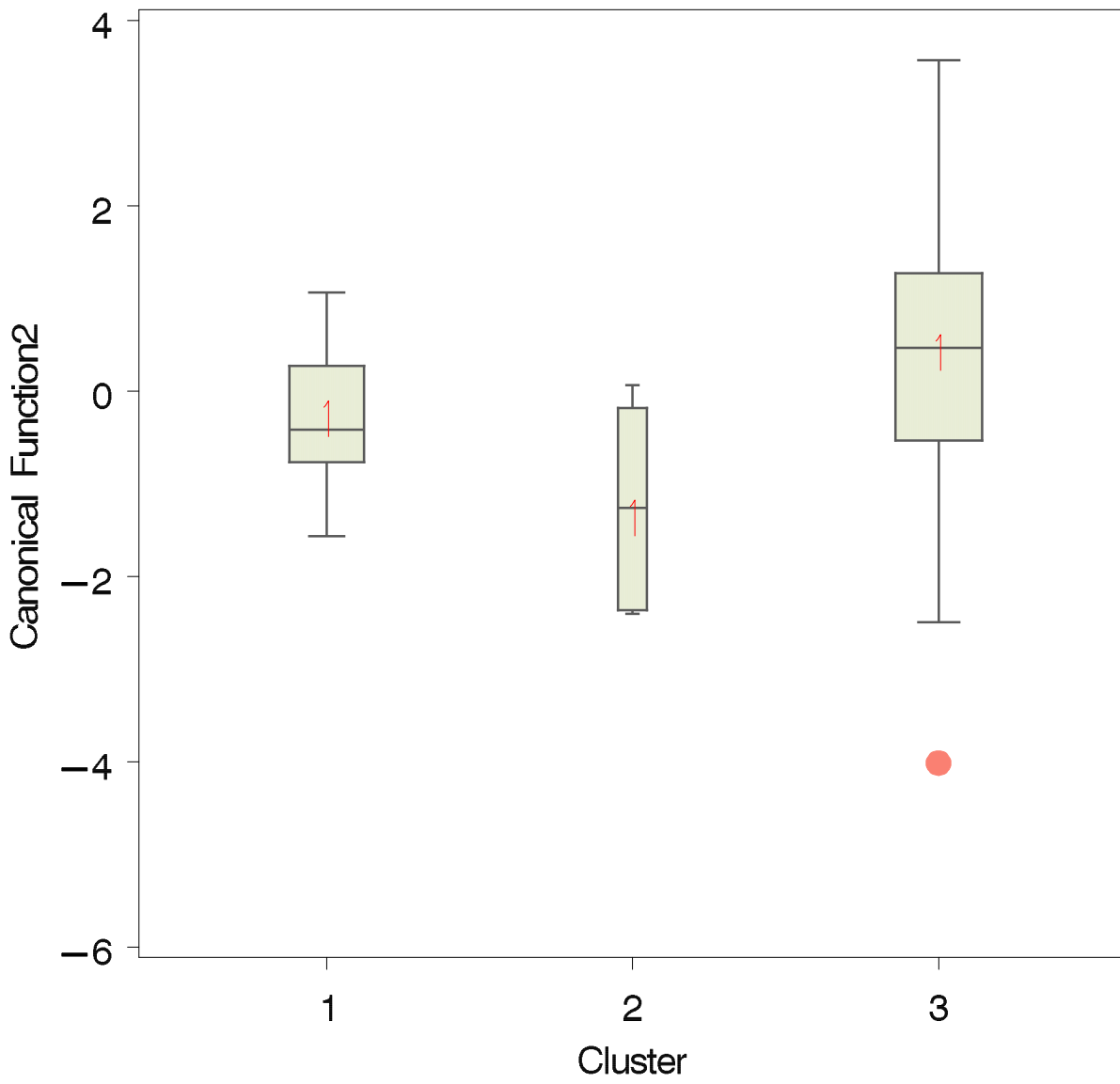
Number of Observations and Average Posterior Probabilities Classified into CLUSTER			
From CLUSTER	1	2	3
1	30 0.9674	0 .	3 0.7102
2	0 .	6 0.9558	4 0.7077
3	8 0.6675	1 0.8929	39 0.9277
Total	38 0.9042	7 0.9468	46 0.8944
Priors	0.36264	0.10989	0.52747

Posterior Probability Error Rate Estimates for CLUSTER				
Estimate	1	2	3	Total
Stratified	-0.0412	0.3372	0.1429	0.0975
Unstratified	-0.0412	0.3372	0.1429	0.0975
Priors	0.3626	0.1099	0.5275	

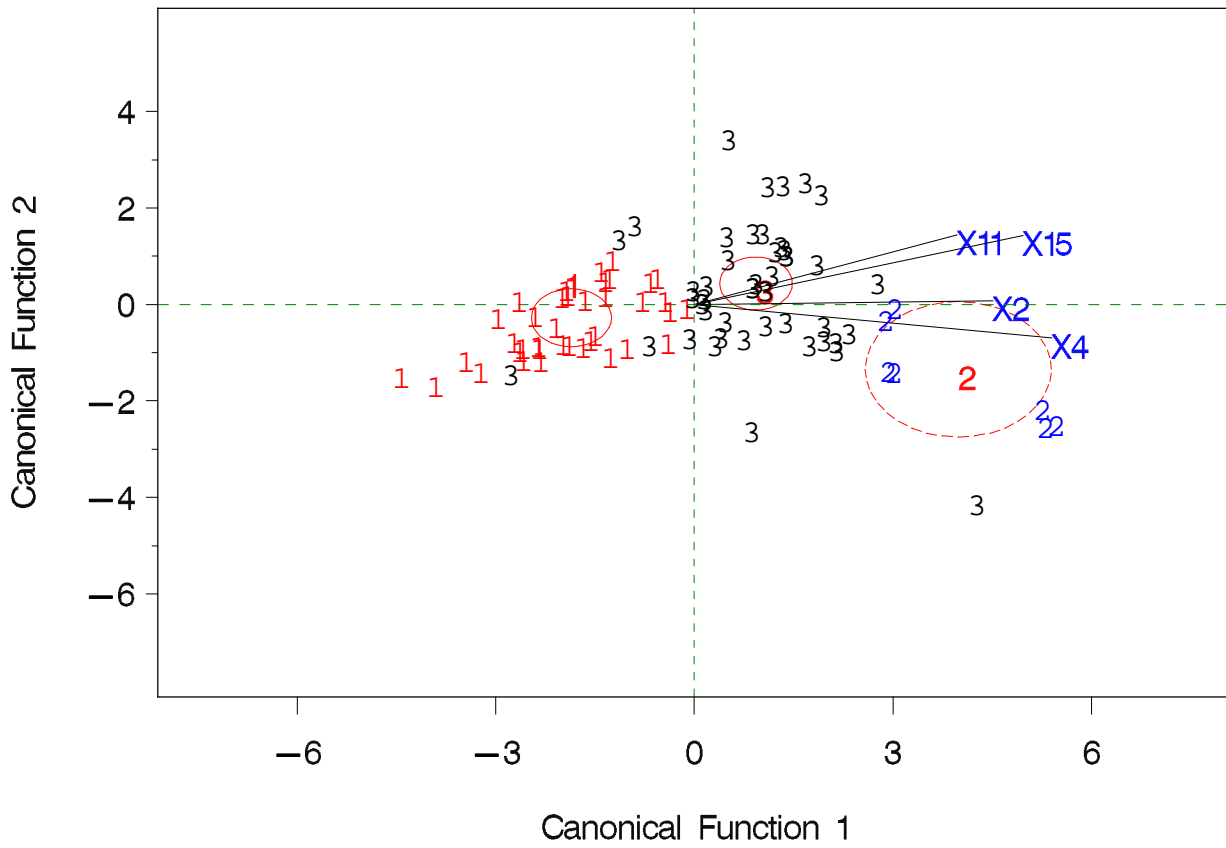
Group Discrimination based on Canonical Function1 — cars93



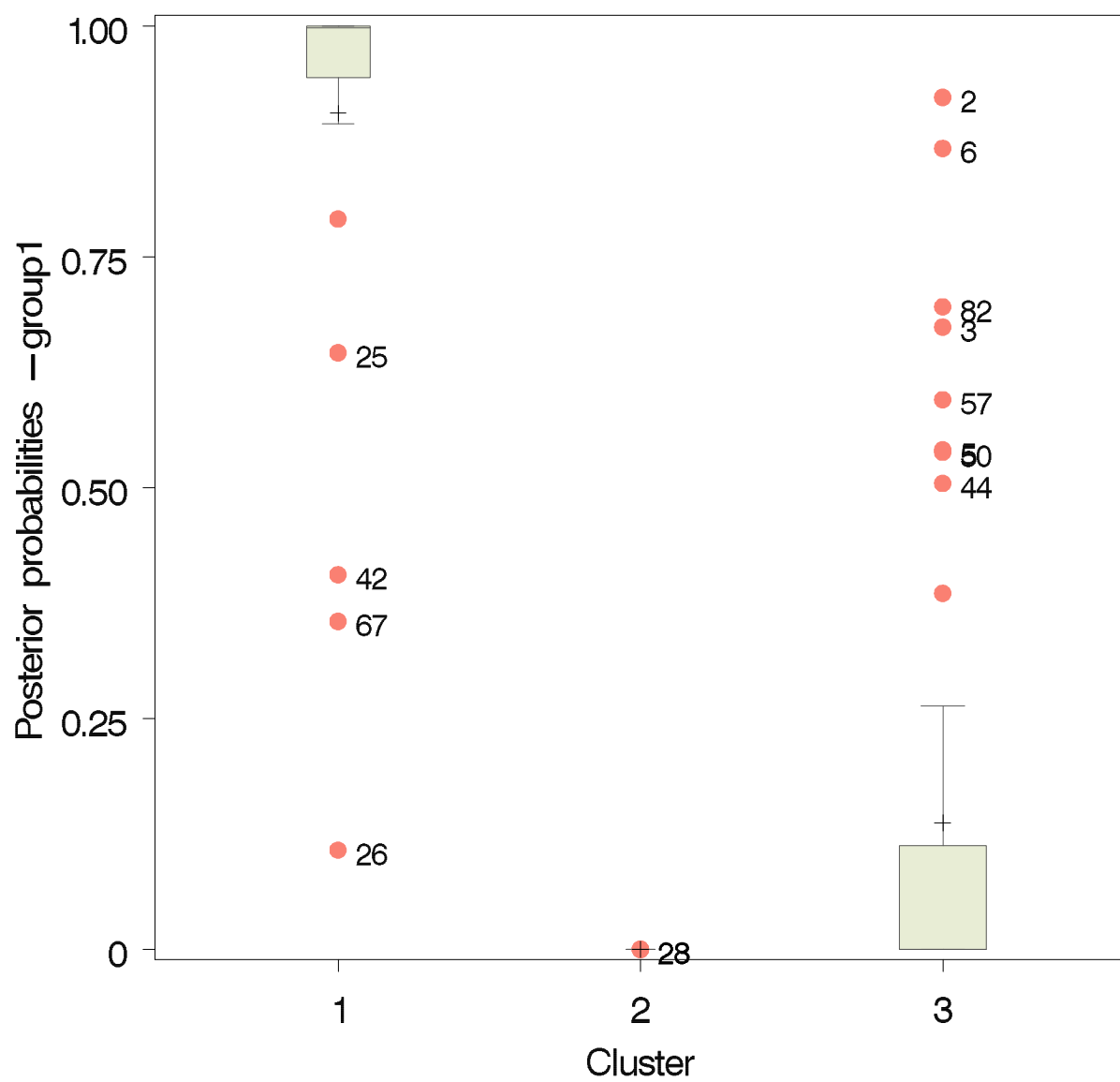
Group Discrimination based on Canonical Function2 — cars93



Plot of Canonical Discriminant Analysis— cars93



Discrimination (method= normal) based on Cross valid Posterior probability— Group1



Discrimination (method= normal) based on Cross valid Posterior probability— Group2

