

1) Khattree and Naik (1999, p. 118,123-125) describes a one way MANOVA model. Samples were tested in 3 laboratories (groups) using $X_1 =$ method 1 and $X_2 =$ method 2. There were $n_i = 4$ samples for $i = 1, 2, 3$. Suppose $t_0 = 22.246$ and $pvalue = 0.0001$. Do a 4 step one way MANOVA test.

$$H_0 \mu_1 = \mu_2 = \mu_3 \quad H_1 \text{ not } H_0$$

$$t_0 = 22.246$$

$$pval = 0.0001$$

reject H_0 , the mean methods of
the 3 labs are different
(not the same)

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2) Suppose the 15 units are 1 Adatorwovor, 2 Adhikari, 3 Alanzi, 4 Alsibiani, 5 Al-Talib, 6 Fan, 7 Kuo, 8 Lamsal, 9 Liu, 10 Meyer, 11 Peiris, 12 Rathnayake, 13 Rupasinghe, 14 Schroepel and 15 Watagoda. Use the following output to allocate the 15 units to three groups of 5. Show the three groups.

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> sample(15)
 7  9  3 12 11 / 1  5 13 15  2 / 10  6  4 14  8
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group 1 Kuo, Liu, Alanzi, Rathnayake, Peiris

group 2 Adatorwovor, Al Talib, Rupasinghe, watagoda, Adhikari

group 3 Meyer, Fan, Alsibiani, Schroepel, Lamsal

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Uniquenesses:

age	breadth	cephalic	circum	headht	height	len	size	cbrainy
0.005	0.005	0.005	0.142	0.005	0.303	0.005	0.005	0.366

Loadings:

	Factor1	Factor2	Factor3	Factor4
log(age)		1.026		
breadth	0.874		0.461	-0.142
cephalic	-0.115		1.020	
circum	0.849	0.113		
headht				0.965
height	0.202	0.597		0.204
len	1.109		-0.363	-0.156
size	0.805			0.231
brainwt	0.642	-0.262		0.296

← the blanks are 0's

	Factor1	Factor2	Factor3	Factor4
SS loadings	3.833	1.491	1.389	1.161
Proportion Var	0.426	0.166	0.154	0.129
Cumulative Var	0.426	0.592	0.746	0.875

←

3) The above output is for the factor analysis of the Gladstone (1905-6) data. The variables included $\log(\text{age})$ and height and 7 head measurements breadth, cephalic, circum, headht, len, size, and brain weight.

a) What is the cumulative variance explained by the 4 factors?

0.875

b) Which factor has a nonzero loading for $\log(\text{age})$?

Factor 2

c) Explain Factor 3.

a linear combination of
breadth, cephalic and len

(0.461 breadth + 1.02 cephalic - 0.363 len)

(ceph + breadth - len) - 2

cephalic - 3

no cephalic - 5

11.3

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