9.1

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(1)

Based on Equation 9.9 in the text, we calculate a series of conditional indices as follows.

[8]:
```
lambda <- c(4.603, 1.175, 0.203, 0.015, 0.003, 0.001)
names(lambda) <- c("lambda1","lambda2","lambda3",
                   "lambda4", "lambda5", "lambda6")
lambda
```

lambda1 4.603 **lambda2** 1.175 **lambda3** 0.203 **lambda4** 0.015 **lambda5** 0.003 **lambda6** 0.001

[9]:
```
k <- c()
for (i in 1:length(lambda)) {
  lambda_tmp <- lambda[1:i]
  k[i] <- sqrt(max(lambda_tmp)/min(lambda_tmp))
}
names(k) <- c("k1","k2","k3", "k4", "k5", "k6")
print(round(k, 2))
```

```
   k1    k2    k3    k4    k5    k6
 1.00  1.98  4.76 17.52 39.17 67.85
```

There are three large condition indices (k4, k5, and k6), which indicates there are three sets of collinearity.

(2)

$\lambda_4 = -0.793\widetilde{X_1} + 0.122\widetilde{X_2} - .008\widetilde{X_3} + 0.077\widetilde{X_4} + 0.590\widetilde{X_5} + 0.052\widetilde{X_6}$
This equation can be simplified into: $\$0.793\ \widetilde{X_1} = 0.122\widetilde{X_2} + 0.590\widetilde{X_5}\$$
X1, X2 and X5 are varaibles involved in this set of collinearity.

$\lambda_5 = 0.338\widetilde{X_1} - 0.150\widetilde{X_2} + .009\widetilde{X_3} + 0.024\widetilde{X_4} + 0.549\widetilde{X_5} - 0.750\widetilde{X_6}$
This equation can be simplified into: $\$0.150\ \widetilde{X_2} + 0.750\widetilde{X_6} = 0.338\widetilde{X_1} + 0.549\widetilde{X_5}\$$
X1, X2, X5 and X6 are varaibles involved in this set of collinearity.

$\lambda_6 = -0.135\widetilde{X_1} + 0.818\widetilde{X_2} + .107\widetilde{X_3} + 0.018\widetilde{X_4} - 0.312\widetilde{X_5} - 0.450\widetilde{X_6}$
This equation can be simplified into: $\$0.135\ \widetilde{X_1} + 0.312\widetilde{X_5} + 0.450\widetilde{X_6} = 0.818\widetilde{X_2} + .107\widetilde{X_3}\$$
X1, X2, X3, X5 and X6 are varaibles involved in this set of collinearity.