

## Exercise 1

### Average and distribution

```
> data = margarine$choicePrice
> #Average
> apply(as.matrix(margarine$choicePrice[,c(3:12)]),2,mean)
  PPk_Stk  PBB_Stk  PFl_Stk PHse_Stk PGen_Stk PImp_Stk  PSS_Tub  PPk_Tub  PFl_Tub PHse_Tub
0.5184362 0.5432103 1.0150201 0.4371477 0.3452819 0.7807785 0.8250895 1.0774094 1.1893758 0.5686734
> #dispersion
> apply(as.matrix(margarine$choicePrice[,c(3:12)]),2,sd)
  PPk_Stk  PBB_Stk  PFl_Stk PHse_Stk PGen_Stk PImp_Stk  PSS_Tub  PPk_Tub  PFl_Tub PHse_Tub
0.15051740 0.12033186 0.04289519 0.11883123 0.03516605 0.11464607 0.06121159 0.02972613 0.01405451
  PHse_Tub
0.07245500
> apply(as.matrix(margarine$choicePrice[,c(3:12)]),2,range)
> apply(as.matrix(margarine$choicePrice[,c(3:12)]),2,range)
  PPk_Stk PBB_Stk PFl_Stk PHse_Stk PGen_Stk PImp_Stk  PSS_Tub  PPk_Tub  PFl_Tub PHse_Tub
[1,]    0.19    0.19    0.95    0.19    0.25    0.33    0.50    0.98    0.69    0.33
[2,]    0.67    1.01    1.16    0.64    0.55    2.30    0.98    1.24    1.47    1.27
> apply(as.matrix(margarine$choicePrice[,c(3:12)]),2,var)
  PPk_Stk  PBB_Stk  PFl_Stk  PHse_Stk  PGen_Stk  PImp_Stk  PSS_Tub
0.0226554865 0.0144797566 0.0018399974 0.0141208621 0.0012366513 0.0131437214 0.0037468593
  PPk_Tub  PFl_Tub  PHse_Tub
0.0008836431 0.0001975293 0.0052497277
> |
```

### market share by choice frequency

```
> nrow(data)
[1] 4470
>
> tb_share <- table(data$choice)
> names(tb_share) <- colnames(data)[3:12][as.numeric(names(tb_share))]
> tb_share
  PPk_Stk  PBB_Stk  PFl_Stk PHse_Stk PGen_Stk PImp_Stk  PSS_Tub  PPk_Tub  PFl_Tub PHse_Tub
1766      699      243      593      315       74      319      203      225       33
> |
```

### market share by product characteristics

	PPk_Stk	PBB_Stk	PFl_Stk	PHse_Stk	PGen_Stk	PImp_Stk	PSS_Tub	PPk_Tub	PFl_Tub
tb_share	1766	699	243	593	315	74	319	203	225
over_average	987	395	53	296	140	18	241	116	116
below_average	779	304	190	297	175	56	78	87	109

## Exercise 2

```
> model1$par
[1] -0.9308820 -2.0630575 -1.0782910 -1.6961247 -3.2144830 -1.7605220 -2.2529288 -2.1679492
[9] -3.9881459 0.1603935
> |
```

## Exercise 3

```
> model[["par"]]
[1] -5.596641 -5.620484 -5.648544 -5.623534 -5.644846 -5.684287 -5.645966 -5.651042 -5.649926
[10] -5.734747
>
>
```