HW2 Jianguang Wang

Exercise 1

1.1

```
  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

     PPk_Stk PBB_Stk PFl_Stk PHse_Stk PGen_Stk PImp_Stk PSS_Tub PPk_Tub
PFl_Tub PHse_Tub
0%      0.19    0.19    0.95     0.19     0.25     0.33    0.50    0.98
0.69     0.33
25%     0.50    0.50    0.99     0.29     0.33     0.72    0.80    1.07
1.19     0.56
50%     0.58    0.58    0.99     0.45     0.33     0.75    0.85    1.09
1.19     0.59
75%     0.62    0.61    1.08     0.57     0.36     0.88    0.85    1.09
1.19     0.59
100%    0.67    1.01    1.16     0.64     0.55     2.30    0.98    1.24
1.47     1.27
```

1.2

```
[1] 4470

         1          2          3          4          5          6
7          8          9         10
0.39507830 0.15637584 0.05436242 0.13266219 0.07046980 0.01655481
0.07136465 0.04541387 0.05033557 0.00738255
```

[1] "Take the first product PPk_Stk as an example, the market share above the average price is 788 , while the one below the average price is 978"

1.3

```
Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                      3.16153    0.17665  17.897  < 2e-16 ***
as.matrix(ml[, 13:19])Income     0.01684    0.00256   6.578 5.31e-11 ***
as.matrix(ml[, 13:19])Fs3_4     -0.49721    0.16928  -2.937  0.00333 **
as.matrix(ml[, 13:19])Fs5.      -0.46214    0.31523  -1.466  0.14270
as.matrix(ml[, 13:19])Fam_Size  -0.01837    0.07880  -0.233  0.81568
as.matrix(ml[, 13:19])college   -0.28192    0.08809  -3.200  0.00138 **
as.matrix(ml[, 13:19])whtcollar  0.18854    0.08964   2.103  0.03550 *
as.matrix(ml[, 13:19])retired   -0.19207    0.11603  -1.655  0.09792 .
---
Signif. codes:  0 â€˜***â€™ 0.001 â€˜**â€™ 0.01 â€˜*â€™ 0.05 â€˜.â€™ 0.1
â€˜ â€™ 1
```

Exercise 2

```
          intercept       PPk_Stk       PBB_Stk       PFl_Stk
PHse_Stk      PGen_Stk      PImp_Stk       PSS_Tub
 [1,]     -7.687591 -2.142123e-01 -3.465691e-01      1.077890  3.533136e-
01     1.1474938 -8.734765e-01    -0.5562451
```

```
 [2,]      3.066850  5.555100e-01 -1.516935e-02     -3.686449  7.163273e-
01     0.4594645 -1.492602e-01    -0.7625654
 [3,]      6.061373  4.591728e-01 -1.702185e-01     -2.755009  1.818228e-
01     1.2445983 -9.749790e-01     0.5562329
 [4,] -11594.195705 -6.055769e+03 -6.300346e+03 -11779.782486 -
5.091915e+03 -4014.4229875 -9.092303e+03 -9558.7552945
 [5,]  -5057.902679 -2.622230e+03 -2.748579e+03  -5134.741293 -
2.212947e+03 -1747.6130145 -3.952645e+03 -4173.6166417
 [6,]     -3.151372  5.293865e-01  2.419779e-01      2.172655 -5.819054e-
01     1.4976629  3.630777e-01    -1.3920929
 [7,]      3.391943 -6.236309e-02 -4.152574e-01      1.428945  1.399220e-
01    -2.7202657 -1.135521e-01     0.1009127
 [8,]      0.259517  3.950505e-01  5.223682e-01     -1.484406  8.049017e-
02    -3.3160047  8.446832e-01    -0.3066587
 [9,]     -2.223809  2.512272e-01  3.559152e-01     -1.418408 -2.164919e-
02     3.4377459  8.844881e-02    -0.7371453
           PPk_Tub       PFl_Tub       PHse_Tub
 [1,] -1.987220e+00  7.251486e+00  8.708217e-02
 [2,] -6.980014e-01  3.081247e-01 -1.035703e+00
 [3,]  3.842540e+00 -7.169278e+00 -4.562421e-01
 [4,] -1.248035e+04 -1.378803e+04 -6.595133e+03
 [5,] -5.449105e+03 -6.015424e+03 -2.876797e+03
 [6,]  2.743781e+00 -2.781141e-01 -4.989042e-02
 [7,] -3.348237e+00 -6.845020e-01  4.924584e-01
 [8,] -1.568882e+00  2.882794e+00 -2.995455e-01
 [9,]  3.805258e+00 -2.815302e+00  3.274761e-02
```

[1] "The positive coefficient means increasing this variable, constumers tend to buy this product (repersented by this model) relative to the reference group (PPk_Stk), and vice versa."

Exercise 3

```
       intercept        Income
 [1,] -0.9968540  0.0018248575
 [2,] -0.6302355  0.4047480719
 [3,] -0.6639169  0.6150327981
 [4,]  0.1716006 -0.9821084086
 [5,] -0.5995711  0.3704371913
 [6,]  1.3705043  0.0027526936
 [7,] -0.4616849  0.0008165246
 [8,]  0.1773228 -0.0025881435
 [9,]  0.1773228 -0.0025881447
```

[1] "Take the first model as example, when family's income increase, since the parameter in our model is negative, they tend to buy the first product PPk_Stk relative to the second product PBB_Stk"

Exercise 4

[1] "The marginal effect at mean is 1.89054193397986"

```
           2            3            4            5            6
7            8            9           10
```

```
-0.003090411  0.014585718  0.004048980 -0.001252529  0.030610579 -
0.006934943  0.022885418  0.017742551  0.010774045
```

Exercise 5

```
       intercept    PBB_Stk    PFl_Stk    PHse_Stk   PGen_Stk   PImp_Stk
PSS_Tub    PPk_Tub     PFl_Tub    PHse_Tub
 [1,] -7.9366696 -0.3332403  1.0447100  0.27426573  1.1559012 -0.8983408
-0.58371605 -1.7664550  7.23776248  0.03899349
 [2,] -0.6302355  0.4047481  0.1466527 -0.66389616  0.8876787  0.8869499
-0.74168205  0.6668976 -0.06396297  0.09996748
 [3,] -0.6639169  0.6150328 -0.2301153 -0.34453137  0.2042013  0.2087881
-0.75073311 -0.4107982  0.15521984  0.26195855
 [4,]  0.1716006 -0.9821084 -0.4125208 -0.44525008  0.6271484 -0.4791445
0.44881179  0.8121843  0.89808044 -0.85371106
 [5,] -0.5995711  0.3704372  0.8337515 -0.43120109 -0.7906997  0.4021149
0.05591997  0.6158704  0.91300025 -0.77909396
 [6,] -2.7033235  0.2139670  2.1031401 -0.39783169  1.3070220  0.4728553
-1.23429451  2.2203024 -0.18742073  0.07050591
 [7,]  3.3114729 -0.4109533  1.4112690  0.11522964 -2.7280687 -0.1160907
0.09448528 -3.2838757 -0.68476672  0.47861309
 [8,]  0.7452027  0.4995896 -1.4428192  0.23057163 -3.3493252  0.8884848
-0.24415770 -1.9648543  2.87326555 -0.21072426
 [9,] -2.1092914  0.3533636 -1.4750788  0.06416955  3.3028097  0.1456458
-0.66670257  3.6097289 -2.77113150  0.09504243
             Income
 [1,]  0.0015919455
 [2,]  0.1053481339
 [3,]  0.0240317951
 [4,]  0.5093500540
 [5,] -0.4534301008
 [6,]  0.0024607005
 [7,]  0.0008458682
 [8,] -0.0022837139
 [9,]  0.0037100594
```

```
> HM
             [,1]       [,2]        [,3]         [,4]       [,5]
[,6]         [,7]        [,8]        [,9]
 [1,] -0.11425687 -0.9040172 -0.13431968  0.067465014  0.4236977
0.27584420 -0.033177077  0.20172562  0.11261713
 [2,] -0.90401724 -6.2106969 -0.13225281 -6.209891739 -4.9647981
2.52537359 -0.270358085  1.98036520  1.21744334
 [3,] -0.13431968 -0.1322528  1.05324388 -4.929380787 -2.6965896
0.42703961 -0.042363190  0.37437582  0.25266157
 [4,]  0.06746501 -6.2098917 -4.92938079 -4.441668881 -8.3424208
0.33460200  0.006997373  0.28855693  0.24816173
 [5,]  0.42369773 -4.9647981 -2.69658961 -8.342420846 -9.1024765 -
0.60178300  0.108868354 -0.41046936 -0.15549814
 [6,]  0.27584420  2.5253736  0.42703961  0.334601996 -0.6017830 -
0.68540121  0.080746648 -0.50309207 -0.28457382
 [7,] -0.03317708 -0.2703581 -0.04236319  0.006997373  0.1088684
0.08074665 -0.009652533  0.05916287  0.03317385
```

```
 [8,]  0.20172562  1.9803652  0.37437582  0.288556929 -0.4104694 -
0.50309207  0.059162870 -0.36854715 -0.20841178
 [9,]  0.11261713  1.2174433  0.25266157  0.248161727 -0.1554981 -
0.28457382  0.033173847 -0.20841178 -0.11836866

X-squared = 27.502, df = 64, p-value = 1

[1] "According to the result, we can conclude that the IIA doesn't hold."
```