Answer Key for Problem Set 9

계량경제학 남 준우 교수

1. 식 (A)의 결과에서 남자의 경우 $\hat{Y}_i = 1.2 + 0.7X_i$, 여자의 경우 $\hat{Y}_i = -0.8 + 0.5X_i$가 된다.

식 (B)의 결과에서는 남자의 경우 $\hat{Y}_i = b_1 + b_3 X_i$, 여자의 경우 $\hat{Y}_i = (b_1 + b_2) + (b_3 + b_4)X_i$

따라서 $b_1 = 1.2, b_2 = -2, b_3 = 0.7, b_4 = -0.2$

2. (1) $\overline{R^2} = 1 - (1 - R^2)\frac{n-1}{n-k} = 1 - (1 - 0.512)\frac{93-1}{93-6} = 0.483$

(2) $H_0 : R^2 = 0$를 검정하기 위한 통계량은

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)} = \frac{0.512/(6-1)}{(1-0.512)/(93-6)} = 18.25$$

를 구한다. 이는 5% 유의수준에서 5와 87의 자유도를 갖는 F-분포의 임계치 2.37보다 크므로 귀무가설을 기각한다.

(3) $H_0 : \beta_2 = 0$의 가설에 대한 통계량은 $t = \frac{b_2}{s_{b_2}} = \frac{660.0}{215.66} = 3.06$은 5% 유의수준에서 87의 자유도를 갖는 t-분포의 임계치 2.00보다 크므로 기각한다.

(4) $H_0 : \beta_6 = 0$의 가설에 대한 통계량은 $t = \frac{b_6}{s_{b_6}} = \frac{3.92}{1.32} = 2.42$은 5% 유의수준에서 87의 자유도를 갖는 t-분포의 임계치 2.00보다 크므로 기각한다.

(5) $H_0 : \beta_2 = \beta_6 = 0$의 가설을 검정하기 위한 통계량은 식 5.19에 의해 $F = \frac{(R_U^2 - R_R^2)/J}{(1-R_U^2)/(n-k)} = \frac{(0.512 - 0.302)/2}{(1-0.512)/(93-6)} = 18.72$를 구한다.

이는 5% 유의수준에서 2와 87의 자유도를 갖는 F-분포의 임계치 3.15보다 크므로 귀무가설을 기각한다.

(6) 남자의 봉급수준 추정식:

$$\hat{Y}_i = (3551.39 + 660.0) + 89.53\,ED_i + 1.29\,EXP_i + (22.21 + 3.92)\,TEN_i,$$

여자의 봉급수준 추정식:

$$\hat{Y}_i = 3551.39 + 89.53\,ED_i + 1.29\,EXP_i + 22.21\,TEN_i,$$

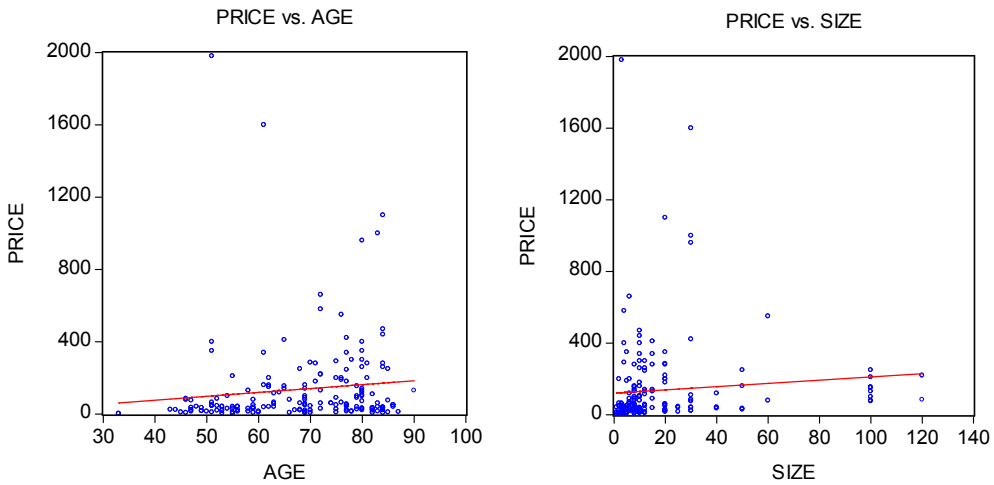
(7) $\hat{Y}_{\text{여성}} = 3551.39 + 89.53 \times 12 + 1.29 \times 52 + 22.21 \times 3 = 4759.46$

3.

(1)

	PRICE	AGE	SIZE
Mean	137.3827	68.01676	17.73743
Median	50.00000	69.00000	10.00000
Maximum	1980.000	90.00000	120.0000
Minimum	2.000000	33.00000	1.000000
Std. Dev.	245.7580	12.81304	23.94852
Skewness	4.496735	-0.409302	2.760329
Kurtosis	28.16710	2.165585	10.29639
Jarque-Bera	5327.229	10.19079	624.3746
Probability	0.000000	0.006125	0.000000
Sum	24591.50	12175.00	3175.000
Sum Sq. Dev.	10750666	29222.95	102088.7
Observations	179	179	179

(2) $S_{price,age} = 351.27$ $corr_{price,age} = 0.112$ $S_{price,size} = 515.97$ $corr_{price,size} = 0.088$



(3)

Descriptive Statistics for PRICE
Categorized by values of DIE
Sample: 1 179
Included observations: 179

DIE	Mean	Median	Max	Min.	Std. Dev.	Obs.
0	93.28151	41.00000	1000.000	2.000000	130.5761	119
1	224.8500	68.50000	1980.000	5.000000	369.3392	60
All	137.3827	50.00000	1980.000	2.000000	245.7580	179

$E(PRICE \mid DIE = 1) > E(PRICE \mid DIE = 0)$

* Actually, if you conduct the test of mean difference, the difference of means according to DIE is rejected at 5% significance level.

(We have learned how to conduct it from Principles of Statistics 1, right???)

(4)

Descriptive Statistics for PRICE
Categorized by values of MEDIUM
Sample: 1 179
Included observations: 179

MEDIUM	Mean	Median	Max	Min.	Std. Dev.	Obs.
0	121.4138	50.00000	1600.000	5.000000	292.3376	29
1	130.3000	30.00000	1000.000	2.000000	306.8395	10
2	139.8694	50.00000	1980.000	2.000000	235.0418	134
3	170.8333	125.0000	400.0000	10.00000	171.7095	6
All	137.3827	50.00000	1980.000	2.000000	245.7580	179

From the statistics, it seems that means classified MEDIUM are equal.

* Actually, if you conduct the test of mean difference, the difference of means according to MEDIUM cannot be rejected at 5% significance level.

(We have learned how to conduct it from Principles of Statistics 1, right???)

(5)

Descriptive Statistics for PRICE
Categorized by values of SUPPORT
Sample: 1 179
Included observations: 179

SUPPORT	Mean	Median	Max	Min.	Std. Dev.	Obs.
1	149.2949	50.00000	1980.000	2.000000	279.8272	117
2	110.3077	47.00000	1000.000	5.000000	171.6472	52

3	138.8000	107.5000	340.0000	11.00000	110.6273	10
All	137.3827	50.00000	1980.000	2.000000	245.7580	179

From the statistics, it seems that means classified SUPPORT are equal.

* Actually, if you conduct the test of mean difference, the difference of means according to SUPPORT cannot be rejected at 5% significance level.

(6)

Dependent Variable: LOG(PRICE)
Method: Least Squares
Sample: 1 179
Included observations: 179

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.226131	2.124696	-1.989052	0.0483
AGE	0.206465	0.066559	3.101994	0.0022
AGE^2	-0.001334	0.000506	-2.635201	0.0092
SIZE	0.021222	0.003603	5.890565	0.0000
DIE	0.774200	0.183203	4.225919	0.0000

R-squared	0.304985	Mean dependent var	4.064914
Adjusted R-squared	0.289007	S.D. dependent var	1.305106
S.E. of regression	1.100471	Akaike info criterion	3.056888
Sum squared resid	210.7202	Schwarz criterion	3.145922
Log likelihood	-268.5915	F-statistic	19.08854
Durbin-Watson stat	1.284359	Prob(F-statistic)	0.000000

This is a Log-linear regression model. All coefficients are significant at significant level 0.05.
Coefficient means % price change as additional one absolute unit of regressor changes.
And the coefficient of age square shows concavity about dependent variable.

(7)

Dependent Variable: LOG(PRICE)
Method: Least Squares
Sample: 1 179
Included observations: 179

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.393730	2.511608	-2.545672	0.0118
AGE	0.263030	0.074967	3.508624	0.0006
AGE^2	-0.001742	0.000563	-3.092059	0.0023
SIZE	0.021119	0.003649	5.787262	0.0000
DIE	0.868686	0.189171	4.592075	0.0000
CANVAS	-0.027187	0.365937	-0.074293	0.9409
PAPER	-0.328021	0.382984	-0.856486	0.3929

ACRYLIC	0.917399	0.482145	1.902745	0.0588
OIL	0.366491	0.233866	1.567098	0.1190
WATERCOLOR	0.959583	0.498841	1.923625	0.0561

R-squared	0.334363	Mean dependent var	4.064914
Adjusted R-squared	0.298915	S.D. dependent var	1.305106
S.E. of regression	1.092776	Akaike info criterion	3.069564
Sum squared resid	201.8129	Schwarz criterion	3.247630
Log likelihood	-264.7260	F-statistic	9.432476
Durbin-Watson stat	1.305649	Prob(F-statistic)	0.000000

: Test for Individual coefficient is based on P-value.

(8)

F(2,169;0.05)=3.00, So do not reject $H_0 : \beta_6 = \beta_7 = 0$.

(9)

F(3,169;0.05)=2.60, So do not reject $H_0 : \beta_8 = \beta_9 = \beta_{10} = 0$.