**Yi Ma**

**Homework 5**

**ECON 586**

1(a). Regression without heteroskedasticity-robust standard errors

t test of coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -2.6824347 24.2207299 -0.1107 0.91184

lcigpric -0.8509044 5.7823214 -0.1472 0.88305

lincome 0.8690144 0.7287636 1.1925 0.23344

restaurn -2.8656213 1.1174059 -2.5645 0.01051 \*

white -0.5592363 1.4594610 -0.3832 0.70169

educ -0.5017533 0.1671677 -3.0015 0.00277 \*\*

age 0.7745021 0.1605158 4.8251 1.676e-06 \*\*\*

agesq -0.0090686 0.0017481 -5.1878 2.699e-07 \*\*\*

Regression with heteroskedasticity-robust standard error

t test of coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -2.6824347 25.7732316 -0.1041 0.917133

lcigpric -0.8509044 6.0243117 -0.1412 0.887712

lincome 0.8690144 0.5950006 1.4605 0.144538

restaurn -2.8656213 1.0122202 -2.8310 0.004756 \*\*

white -0.5592363 1.3714344 -0.4078 0.683548

educ -0.5017533 0.1616027 -3.1049 0.001971 \*\*

age 0.7745021 0.1373458 5.6391 2.372e-08 \*\*\*

agesq -0.0090686 0.0014517 -6.2469 6.799e-10 \*\*\*

The Price and income variables are not significant either with or without heteroskedasticity-robust standard errors.

(b). Now estimate a Poisson regression model

Deviance Residuals:

Min 1Q Median 3Q Max

-6.329 -4.224 -3.275 2.245 13.976

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) 3.964e-01 6.139e-01 0.646 0.518

lcigpric -1.060e-01 1.434e-01 -0.739 0.460

lincome 1.037e-01 2.028e-02 5.115 3.14e-07 \*\*\*

restaurn -3.636e-01 3.122e-02 -11.646 < 2e-16 \*\*\*

white -5.520e-02 3.742e-02 -1.475 0.140

educ -5.942e-02 4.256e-03 -13.961 < 2e-16 \*\*\*

age 1.143e-01 4.969e-03 22.994 < 2e-16 \*\*\*

agesq -1.371e-03 5.695e-05 -24.070 < 2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for poisson family taken to be 1)

Null deviance: 15821 on 806 degrees of freedom

Residual deviance: 14752 on 799 degrees of freedom

AIC: 16239

Number of Fisher Scoring iterations: 6

The price variable is still insignificant but the income variable is very significant.

Interpretation: a one percent increase in price level will decrease the number of cigarettes consumed per day by .001060; a one percent increase in income level will increase the number of cigarettes consumed per day by .001037.

(c). Find the dispersion parameter.

Deviance Residuals:

Min 1Q Median 3Q Max

-6.329 -4.224 -3.275 2.245 13.976

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.3964494 2.7673851 0.143 0.88612

lcigpric -0.1059607 0.6463348 -0.164 0.86982

lincome 0.1037275 0.0914154 1.135 0.25685

restaurn -0.3636059 0.1407348 -2.584 0.00995 \*\*

white -0.0552011 0.1686704 -0.327 0.74355

educ -0.0594225 0.0191852 -3.097 0.00202 \*\*

age 0.1142571 0.0223981 5.101 4.22e-07 \*\*\*

agesq -0.0013708 0.0002567 -5.340 1.21e-07 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasipoisson family taken to be **20.31782**)

Null deviance: 15821 on 806 degrees of freedom

Residual deviance: 14752 on 799 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 6

The dispersion parameter (phi) is 20.31782 which is greater than 1. It is an indication of over dispersion. The t statistics on lcigprice and lincome still remains very small suggesting that they are still insignificant.

(d). At what point does the effect of *age* on expected cigarette consumption become negative?

To solve for this part we take the expectation of cigarette and take the FOC with respect to age and age squared

E{cigs}= α age+β age^2

Taking FOC

d E{cigs}/d age= α +2 β age=0

age= -α/2β

from the test in part b α= 0.1143 and β=-.001371

age=0.1143/2(-0.001371)=41.68

Therefore, the expected consumption of cigarette become negative at the age of 41.68.