Universidad del País Vasco Euskal Herriko Unibertsitatea
CAMPUS OF INTERNATIONAL EXCELLENCE

Example 6.1

Interval estimation

Pilar González and Susan Orbe

Dpt. Applied Economics III (Econometrics and Statistics)

Example 6.1. Interval estimation.

Pizza consumption.

Consider the simple regression model of consumption of pizza on income.

a. Estimate the coefficients of the model by OLS using the data file `pizza.gdt` and write down the Sample Regression Function.
b. If the annual income increases by $1000, what is the estimated variation in the expected consumption of pizza?
c. If the annual income increases by $1000, estimate the lower bound of the variation in the expected consumption of pizza (95 % probability).
d. If the annual income increases by $1000, estimate the upper bound of the variation in the expected consumption of pizza (90 % probability).
e. Add the explanatory variable age to the model and estimate its coefficients by OLS. If the annual income increases by $1000 holding age constant, estimate the upper and lower bounds between which the variation of consumption will lie (95 % probability).
f. Comment on the results.

Example 6.1. Interval estimation.

First, estimate the model by OLS. The results are shown in the figure below.

gretl: model 1

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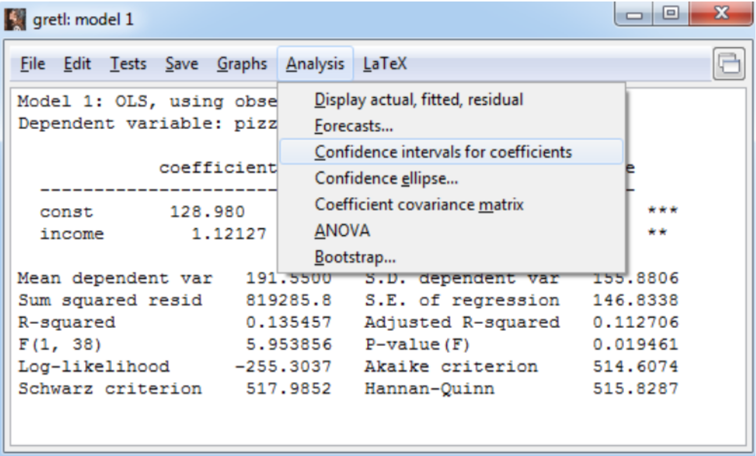
```
Model 1: OLS, using observations 1-40
Dependent variable: pizza

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       128.980      34.5913       3.729    0.0006   ***
  income        1.12127     0.459527     2.440    0.0195   **

Mean dependent var    191.5500   S.D. dependent var    155.8806
Sum squared resid     819285.8   S.E. of regression    146.8338
R-squared             0.135457   Adjusted R-squared    0.112706
F(1, 38)              5.953856   P-value(F)            0.019461
Log-likelihood       -255.3037   Akaike criterion      514.6074
Schwarz criterion     517.9852   Hannan-Quinn          515.8287
```

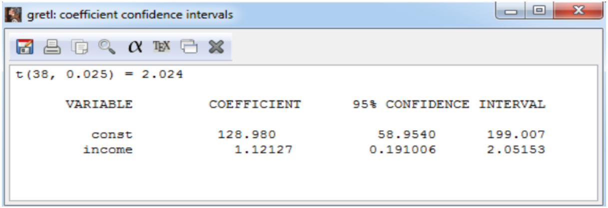
The **Analysis** pulldown menu of the model's estimation window is used to estimate confidence intervals for coefficients.

`Analysis -> Confidence intervals for coefficients`



Example 6.1. Interval estimation.

The output shows the confidence intervals for all the coefficients in the model.



gretl: coefficient confidence intervals

t(38, 0.025) = 2.024

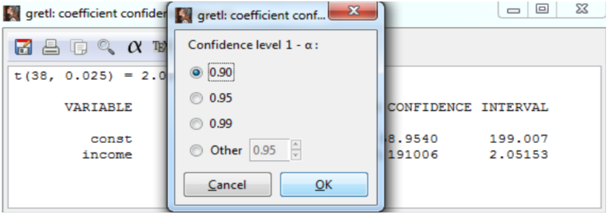
VARIABLE	COEFFICIENT	95% CONFIDENCE INTERVAL	
const	128.980	58.9540	199.007
income	1.12127	0.191006	2.05153

The figure above shows the value of the t-ordinate, the regressors, the point estimation of the coefficients and the lower and upper bounds of the confidence intervals.

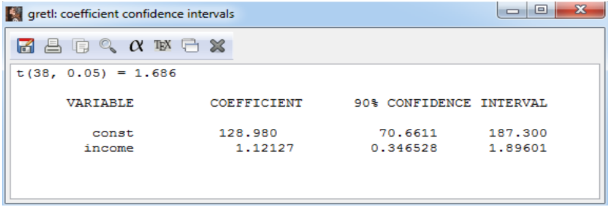
Gretl computes by default 95 % confidence intervals.

Example 6.1. Interval estimation.

The $\boxed{\alpha}$ icon at the top of the `gretl:coefficient confidence intervals` window can be used to change the size of the confidence.



The results show the lower and upper bounds of the 90 % confidence intervals.



Example 6.1. Interval estimation.

The results of estimating the model proposed in item e. are shown below.

gretl: model 2

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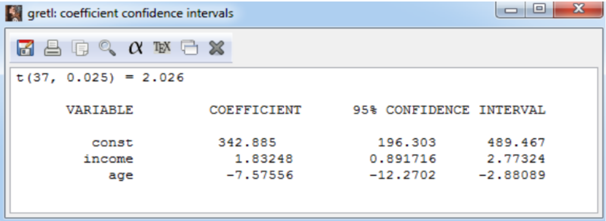
```
Model 2: OLS, using observations 1-40
Dependent variable: pizza

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       342.885      72.3434       4.740    3.14e-05 ***
  income        1.83248     0.464301     3.947    0.0003   ***
  age          -7.57556     2.31699     -3.270    0.0023   ***

Mean dependent var   191.5500   S.D. dependent var   155.8806
Sum squared resid    635636.7   S.E. of regression   131.0701
R-squared            0.329251   Adjusted R-squared   0.292994
F(2, 37)             9.081100   P-value(F)           0.000619
Log-likelihood      -250.2276   Akaike criterion     506.4552
Schwarz criterion    511.5218   Hannan-Quinn         508.2871
```

The 95 % confidence intervals estimated for this model appear in the figure below.


gretl: coefficient confidence intervals

t(37, 0.025) = 2.026

VARIABLE	COEFFICIENT	95% CONFIDENCE	INTERVAL
const	342.885	196.303	489.467
income	1.83248	0.891716	2.77324
age	-7.57556	-12.2702	-2.88089

Example 6.1. Interval estimation.

Results

SRF: $\widehat{pizza}_i = 128.980 + 1.12127\, income_i \qquad i = 1, \ldots, 40$

b. $\hat{\beta}_2$: The estimated change in the expected consumption of pizza when income increases by $1000 is $1.12127.

c. The 95 % confidence interval for β_2 is: $CI(\beta_2)_{0.95} = (0.191006\ ;\ 2.05153)$

At a $95\,\%$ confidence level, the estimated lower bound of the variation in the consumption of pizza when the annual income increases by $1000 is $0.191006.

d. The 90 % confidence interval for β_2 is: $CI(\beta_2)_{0.90} = (0.346528\ ;\ 1.89601)$

At a $90\,\%$ confidence level, the estimated upper bound of the variation in the consumption of pizza when the annual income increases by $1000 is $1.89601.

SRF: $\widehat{pizza}_i = 342.885 + 1.83248\, income_i - 7.57556\, age_i \qquad i = 1, \ldots, 40$

e. The 95 % confidence interval for β_2 is: $CI(\beta_2)_{0.95} = (0.891716\ ;\ 2.77324)$

At a $95\,\%$ confidence level, the estimated lower and upper bounds between which the variation in the consumption of pizza will lie when the annual income increases by $1000 are 0.891716 and 2.77324 dollars, respectively.