

**Example 43g — Tobit regression**

[Description](#)[Remarks and examples](#)[Also see](#)

## Description

Tobit regression is demonstrated using `auto.dta`:

```
. use https://www.stata-press.com/data/r17/auto
(1978 automobile data)
. generate wgt = weight/1000
```

See *Structural models 1: Linear regression* in [SEM] **Intro 5** for background.

## Remarks and examples

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Remarks are presented under the following headings:

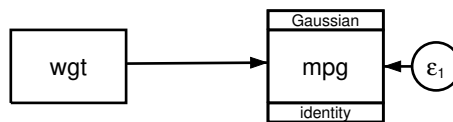
*Fitting tobit regression models*  
*Fitting the model with the Builder*

## Fitting tobit regression models

The first example in [R] **tobit** is

```
. tobit mpg wgt, ll(17)
```

This model corresponds to



Censoring information does not appear in the path diagram by default. It can be added to the path diagram by customizing the appearance of `mpg` in the Builder. The Builder reports the censoring information for `mpg` in the Details pane.

To fit this model with `gsem`, we type

```
. gsem mpg <- wgt, family(gaussian, lcensored(17))
Refining starting values:
Grid node 0:   log likelihood = -170.32555
Fitting full model:
Iteration 0:   log likelihood = -170.32555
Iteration 1:   log likelihood = -164.66209
Iteration 2:   log likelihood = -164.25471
Iteration 3:   log likelihood = -164.25438
Iteration 4:   log likelihood = -164.25438

Generalized structural equation model
Response:     mpg
Lower limit:  17
Family:       Gaussian
Link:         Identity
Log likelihood = -164.25438

Number of obs   = 74
Uncensored     = 56
Left-censored  = 18
Right-censored = 0
```

	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
mpg						
wgt	-6.87305	.700257	-9.82	0.000	-8.245529	-5.500572
_cons	41.49856	2.058384	20.16	0.000	37.4642	45.53291
var(e.mpg)	14.78942	2.817609			10.18085	21.48414

Notes:

1. The reported coefficients and standard errors (SEs) match those reported by `tobit`.
2. `gsem` reports the point estimate of `e.mpg` as 14.78942. This is an estimate of  $\sigma^2$ , the error variance. `tobit` reports an estimated  $\sigma$  as 3.845701. And  $\sqrt{14.78942} = 3.8457$ .

## Fitting the model with the Builder

Use the diagram in [Fitting tobit regression models](#) above for reference.

1. Open the dataset and create the rescaled weight variable.


In the Command window, type



```
. use https://www.stata-press.com/data/r17/auto
. generate wgt = weight/1000
```


2. Open a new Builder diagram.

Select menu item **Statistics > SEM (structural equation modeling) > Model building and estimation**.

3. Put the Builder in `gsem` mode by clicking on the  $\overset{G}{SEM}$  button.
4. Create the independent variable.

- a. Select the Add observed variable tool, .
- b. Click in the diagram about one-fourth of the way in from the left and half of the way up from the bottom.
- c. In the Contextual Toolbar, use the *Variable* control to select the variable `wgt`.

5. Create the tobit response.
  - a. Select the Add generalized response variable tool, .
  - b. Click about one-third of the way in from the right side of the diagram, to the right of the `wgt` rectangle.
  - c. In the Contextual Toolbar, select **Gaussian**, **Identity** in the *Family/Link* control (it may already be selected).
  - d. In the Contextual Toolbar, use the *Variable* control to select the variable `mpg`.
  - e. In the Contextual Toolbar, click on the **Properties...** button.
  - f. In the resulting *Variable properties* dialog box, click on the **Censoring...** button in the **Variable** tab.
  - g. In the resulting *Censoring* dialog box, select the *Left-censored* radio button. In the resulting *Left censoring* box below, select the *Constant* radio button (it may already be selected), and type 17 in the *Constant* control.
  - h. Click on **OK** in the *Censoring* dialog box, and then click on **OK** in the *Variable properties* dialog box. The Details pane will now show the censoring information for `mpg`.
6. Create a path from the independent variable to the dependent variable.
  - a. Select the Add path tool, .
  - b. Click in the right side of the `wgt` rectangle (it will highlight when you hover over it), and drag a path to the left side of the `mpg` rectangle (it will highlight when you can release to connect the path).
7. Estimate.
 

Click on the **Estimate** button, , in the Standard Toolbar, and then click on **OK** in the resulting *GSEM estimation options* dialog box.

You can open a completed diagram in the Builder by typing

```
. webgetsem gsem_tobit
```

## Also see

- [SEM] [Example 38g](#) — Random-intercept and random-slope models (multilevel)
- [SEM] [Example 44g](#) — Interval regression
- [SEM] [Example 45g](#) — Heckman selection model
- [SEM] [Example 46g](#) — Endogenous treatment-effects model
- [SEM] [Intro 5](#) — Tour of models
- [SEM] [gsem](#) — Generalized structural equation model estimation command