QS101: Introduction to Quantitative Methods in Social Science

Week 19: Multivariate Regression and Regression with Categorical Variables

Dr. Florian Reiche
Teaching Fellow in Quantitative Methods
Course Director BA Politics and Sociology
Deputy Director of Student Experience and Progression

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Your Regression Models I

Regression with Categorical Variables

- Dichotomous Categorical Variables
- Regression with a 1/2/3 Variable

Your Regression Models II

Your Regression Models I

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  - What does each slope coefficient indicate?
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Regression with Categorical Variables

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Dichotomous Categorical Variables

The Setup

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- Run the regression: **`regress c_fimngrs_dv c_sex`**
- The interpretation of the output is straightforward

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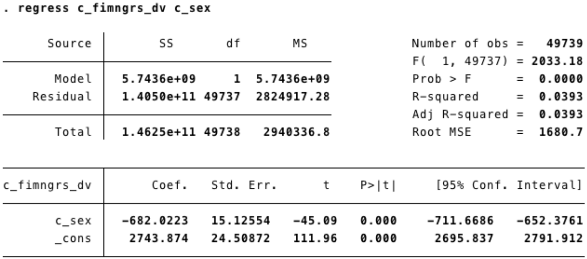
The Output



```
. regress c_fimngrs_dv c_sex

      Source |       SS       df       MS              Number of obs =   49739
-------------+------------------------------           F(  1, 49737) = 2033.18
       Model |  5.7436e+09     1  5.7436e+09           Prob > F      =  0.0000
    Residual |  1.4050e+11 49737  2824917.28           R-squared     =  0.0393
-------------+------------------------------           Adj R-squared =  0.0393
       Total |  1.4625e+11 49738   2940336.8           Root MSE      =  1680.7

------------------------------------------------------------------------------
c_fimngrs_dv |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       c_sex |  -682.0223   15.12554   -45.09   0.000    -711.6686   -652.3761
       _cons |   2743.874   24.50872   111.96   0.000     2695.837    2791.912
------------------------------------------------------------------------------
```

Figure: Regression on the Influence of Gender on Monthly Income

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- Now build the estimated regression equation
- Male: $2743.87 - 682.02 \times 0 = 2743.87$
- Female: $2743.87 - 682.02 \times 1 = 2061.85$
- The coefficient therefore tells you how much more or less the category coded as “1” would earn.

Regression with Categorical Variables

Regression with a 1/2/3 Variable

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- Captures 3 religious categories: Christian (1), Muslim (2), and Other (3) (source: variable **c_oprlg1**)

The Setup

- If we have a predictor with three (or more) categories, we need to transform these
- For example: new variable **`c_rel`**
- Captures 3 religious categories: Christian (1), Muslim (2), and Other (3) (source: variable **`c_oprlg1`**)
- We need to create dummy variables from **`c_rel`**:

Creating Dummy Variables

Old Variable	New Variables		
c_rel	c_rel1	c_rel2	c_rel3
1	1	0	0
1	1	0	0
1	1	0	0
2	0	1	0
2	0	1	0
2	0	1	0
3	0	0	1
3	0	0	1
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- The command is: **tabulate** *oldvar*, **gen(***oldvar***)**
- For example: **tabulate c_rel, gen(c_rel)**
- You can check the coding for the first ten cases by typing: **list c_rel c_rel1 c_rel2 c_rel3 in 1/10, nolabel**

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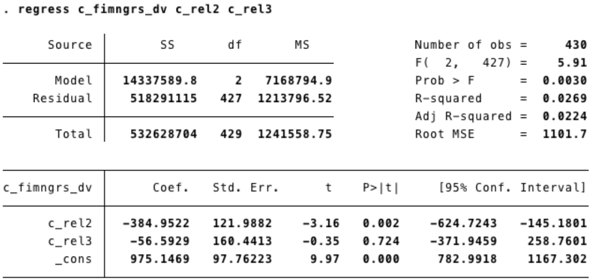
- For example: **`regress c_fimngrs_dv c_rel2 c_rel3`**

The Output



```
. regress c_fimngrs_dv c_rel2 c_rel3

      Source |       SS           df       MS      Number of obs   =       430
-------------+----------------------------------   F(  2,     427) =      5.91
       Model |  14337589.8         2   7168794.9   Prob > F        =    0.0030
    Residual |   518291115       427  1213796.52   R-squared       =    0.0269
-------------+----------------------------------   Adj R-squared   =    0.0224
       Total |   532628704       429  1241558.75   Root MSE        =    1101.7

------------------------------------------------------------------------------
c_fimngrs_dv |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      c_rel2 |  -384.9522   121.9882    -3.16   0.002    -624.7243   -145.1801
      c_rel3 |   -56.5929   160.4413    -0.35   0.724    -371.9459    258.7601
       _cons |   975.1469   97.76223     9.97   0.000     782.9918    1167.302
------------------------------------------------------------------------------
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Figure: Regression on the Influence of Religion on Monthly Income

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- Here, **`c_rel1`** is omitted, so **`_cons`** shows the mean for a Christian person

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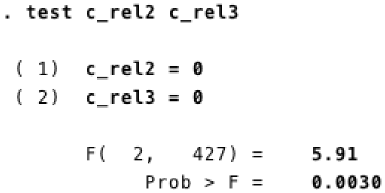
- The other coefficients tell you how much more, or less a Muslim or a person with the religion "other" earns, *relative* to a Christian person

Interpretation

- Here, **`c_rel1`** is omitted, so **`_cons`** shows the mean for a Christian person
- The other coefficients tell you how much more, or less a Muslim or a person with the religion "other" earns, *relative* to a Christian person
- Last step, test that the differences between the three groups are significant, by typing: **`test c_rel2 c_rel3`**

Regression with a 1/2/3 Variable



```
. test c_rel2 c_rel3

 ( 1)  c_rel2 = 0
 ( 2)  c_rel3 = 0

       F(  2,   427) =    5.91
            Prob > F =    0.0030
```

Figure: Test for Significant Differences of Income between Religious Groups

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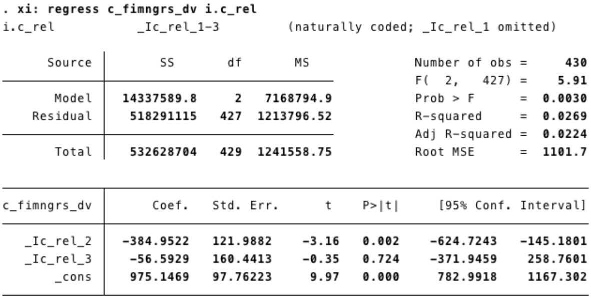
- We can save ourselves the faffing with generating the dummies by using the **`xi`** command
- For example: **`xi: regress c_fimngrs_dv i.c_rel`**
- STATA automatically leaves the first category (here: Christian) out
- If you want to omit a different category as your reference, you can tell STATA before running the regression: **`char c_rel[omit] 3`**

The Output



```
. xi: regress c_fimngrs_dv i.c_rel
i.c_rel           _Ic_rel_1-3         (naturally coded; _Ic_rel_1 omitted)

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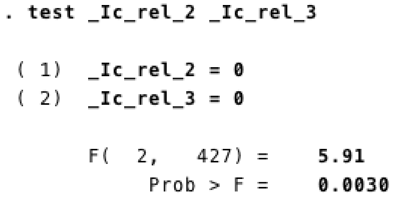
Regression with a 1/2/3 Variable

- The test command here is: **`test _Ic_rel2 _Ic_rel3`**



```
. test _Ic_rel_2 _Ic_rel_3

 ( 1)  _Ic_rel_2 = 0
 ( 2)  _Ic_rel_3 = 0

       F(  2,   427) =    5.91
            Prob > F =    0.0030
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