

Multivariate Lab Exercises

Getting Started

- Remember again to put on the filter
- Think about which independent variables you want to use
- For today we will only look at one dependent variable, so choose the one that you think does the best job in measuring the issue you are interested in.
- For example, if you are interested in gender equality, choose the one question that you think most clearly shows gender attitudes. If you are choosing market-liberalism, think whether less regulation really is the best question or should you choose a different question.

After adding the filter, go to linear regression

*issp2006steve.sav [DataSet1] - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

Reports
Descriptive Statistics
Tables
Compare Means
General Linear Model
Generalized Linear Models
Mixed Models
Correlate
Regression
Loglinear
Classify
Data Reduction
Scale
Nonparametric Tests
Time Series
Survival
Multiple Response
Missing Value Analysis...
Complex Samples
Quality Control
ROC Curve...

Linear...
Curve Estimation...
Binary Logistic...
Multinomial Logistic...
Ordinal...
Probit...
Nonlinear...
Weight Estimation...
2-Stage Least Squares...
Optimal Scaling...

| Name | Type | Label | Values | Missing | Columns | Align | Measure |
|--------------|---------|--------------------------------|------------------|----------------|---------|-------|---------|
| 209 ru_prt | Numeric | R: Party affiliation: Russia | {0, NAP, other | 97 - 2E+307, 0 | 9 | Right | Nominal |
| 210 se_prt | Numeric | R: Party affiliation: Sweden | {0, NAP, other | 0, 99 | 9 | Right | Nominal |
| 211 si_prt | Numeric | R: Party affiliation: Slovenia | {0, NAP, other | 98 - 2E+307, 0 | 9 | Right | Nominal |
| 212 tw_prt | Numeric | R: Party affiliation: Taiwan | {0, NAP, other | 97 - 2E+307, 0 | 9 | Right | Nominal |
| 213 us_prt | Numeric | | {0, NAP, other | 0, 99 | 9 | Right | Nominal |
| 214 uy_prt | Numeric | | {0, NAP, other | 0, 99 | 9 | Right | Nominal |
| 215 ve_prt | Numeric | | {0, NAP, other | 98 - 2E+307, 0 | 9 | Right | Nominal |
| 216 za_prt | Numeric | | {0, NAP, other | 97 - 2E+307, 0 | 9 | Right | Nominal |
| 217 vote_le | Numeric | | {0, NAP: no vote | 8 - 2E+307, 0 | 9 | Right | Nominal |
| 218 relig | Numeric | | {0, No religion, | 997 - 2E+307, | 7 | Right | Scale |
| 219 religgrp | Numeric | | {1, No religion} | 98, 99 | 10 | Right | Nominal |
| 220 attend | Numeric | | {0, Not applica | 97 - 2E+307, 0 | 8 | Right | Nominal |
| 221 topbot | Numeric | | {0, Not availabl | 97 - 2E+307, 0 | 8 | Right | Nominal |
| 222 au_reg | Numeric | | {0, NAP, other | 0, 99 | 8 | Right | Nominal |
| 223 ca_reg | Numeric | | {0, NAP, other | 0, 99 | 8 | Right | Nominal |
| 224 ch_reg | Numeric | Region: Switzerland | {0, NAP, other | 0 | 8 | Right | Nominal |
| 225 cl_reg | Numeric | Region: Republic of Chile | {0, NAP, other | 0 | 8 | Right | Nominal |
| 226 cz_reg | Numeric | Region: Czech Republic | {0, NAP, other | 0 | 8 | Right | Nominal |
| 227 de_reg | Numeric | Region: Germany | {0, NAP, other | 0 | 8 | Right | Nominal |
| 228 dk_reg | Numeric | Region: Denmark | {0, NAP, other | 0 | 8 | Right | Nominal |
| 229 do_reg | Numeric | Region: Dominican Republic | {0, NAP, other | 0 | 8 | Right | Scale |
| 230 es_reg | Numeric | Region: Spain | {0, NAP, other | 0 | 8 | Right | Nominal |
| 231 fi_reg | Numeric | Region: Finland | {0, NAP, other | 0, 98 | 8 | Right | Nominal |
| 232 fr_reg | Numeric | Region: France | {0, NAP, other | 0, 99 | 8 | Right | Scale |
| 233 gb_reg | Numeric | Region: Great Britain | {0, NAP, other | 0 | 8 | Right | Nominal |
| 234 hr_reg | Numeric | Region: Croatia | {0, NAP, other | 0 | 8 | Right | Nominal |
| 235 hu_reg | Numeric | Region: Hungary | {0, NAP, other | 0 | 8 | Right | Nominal |
| 236 ie_reg | Numeric | Region: Ireland | {0, NAP, other | 0 | 8 | Right | Nominal |
| 237 il_reg | Numeric | Region: Israel | {0, NAP, other | 0 | 8 | Right | Nominal |
| 238 jp_reg | Numeric | Region: Japan | {0, NAP, other | 0 | 8 | Right | Nominal |
| 239 kr_reg | Numeric | Region: South Korea | {0, NAP, other | 0 | 8 | Right | Nominal |
| 240 lv_reg | Numeric | Region: Latvia | {0, NAP, other | 0 | 8 | Right | Nominal |
| 241 nl_reg | Numeric | Region: Netherlands | {0, NAP, other | 0 | 8 | Right | Nominal |
| 242 no_reg | Numeric | Region: Norway | {0, NAP, other | 0 | 8 | Right | Nominal |
| 243 nz_reg | Numeric | Region: New Zealand | {0, NAP, other | 0, 99 | 8 | Right | Scale |
| 244 ph_reg | Numeric | Region: Philippines | {0, NAP, other | 0 | 8 | Right | Nominal |
| 245 pl_reg | Numeric | Region: Poland | {0, NAP, other | 0 | 8 | Right | Nominal |
| 246 pt_reg | Numeric | Region: Portugal | {0, NAP, other | 0 | 8 | Right | Nominal |
| 247 ru_reg | Numeric | Region: Russia | {0, NAP, other | 0 | 8 | Right | Nominal |
| 248 se_reg | Numeric | Region: Sweden | {0, NAP, other | 0 | 8 | Right | Nominal |
| 249 si_reg | Numeric | Region: Slovenia | {0, NAP, other | 0, 99 | 8 | Right | Nominal |
| 250 tw_reg | Numeric | Region: Taiwan | {0, NAP, other | 0, 99 | 8 | Right | Nominal |
| 251 us_reg | Numeric | Region: USA | {0, NAP, other | 0 | 8 | Right | Nominal |
| 252 uy_reg | Numeric | Region: Uruguay | {0, NAP, other | 0 | 8 | Right | Nominal |
| 253 ve_reg | Numeric | Region: Venezuela | {0, Not availabl | 0 | 8 | Right | Nominal |

Data View Variable View /

Linear Regression

SPSS Processor is ready

start | Inbo... | DN - Ny... | Google... | Skype... | Table co... | Calculator | D:\Word... | H:\H U... | Docume... | K.V. (On... | Multivari... | statassi... | D:\Vectu... | statassi... | SPSS_N... | *issp20... | Output1... | Present...

Choose your independent variables

#issp2006steve.sav [DataSet1] - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

Linear Regression

Dependent: LESSREG

Block 1 of 1

Independent(s): R: Sex [sex], R: Age [age], R: Education II-highest ed

Method: Enter

Selection Variable: Rule...

Case Labels: Rule...

WLS Weight: Rule...

Statistics... Plots... Save... Options...

| Name | Type | Yes | Missing | Columns | Align | Measure |
|--------------|---------|---------------------------|---------|---------|---------|---------|
| 209 ru_prt | Numeric | other 97 - 2E+307, 0 | 9 | Right | Nominal | |
| 210 se_prt | Numeric | other 0, 99 | 9 | Right | Nominal | |
| 211 si_prt | Numeric | other 98 - 2E+307, 0 | 9 | Right | Nominal | |
| 212 tw_prt | Numeric | other 97 - 2E+307, 0 | 9 | Right | Nominal | |
| 213 us_prt | Numeric | other 0, 99 | 9 | Right | Nominal | |
| 214 uy_prt | Numeric | other 0, 99 | 9 | Right | Nominal | |
| 215 ve_prt | Numeric | other 98 - 2E+307, 0 | 9 | Right | Nominal | |
| 216 za_prt | Numeric | other 97 - 2E+307, 0 | 9 | Right | Nominal | |
| 217 vote_le | Numeric | no voti 8 - 2E+307, 0 | 9 | Right | Nominal | |
| 218 relig | Numeric | religion, 997 - 2E+307, 7 | 10 | Right | Scale | |
| 219 religgrp | Numeric | religion} 98, 99 | 10 | Right | Nominal | |
| 220 attend | Numeric | applica 97 - 2E+307, 0 | 8 | Right | Nominal | |
| 221 topbot | Numeric | availabl 97 - 2E+307, 0 | 8 | Right | Nominal | |
| 222 au_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 223 ca_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 224 ch_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 225 cl_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 226 cz_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 227 de_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 228 dk_reg | Numeric | other 0, 99 | 8 | Right | Nominal | |
| 229 do_reg | Numeric | 0, NAP, other 0 | 8 | Right | Scale | |
| 230 es_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 231 fi_reg | Numeric | 0, NAP, other 0, 98 | 8 | Right | Nominal | |
| 232 fr_reg | Numeric | 0, NAP, other 0, 99 | 8 | Right | Scale | |
| 233 gb_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 234 hr_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 235 hu_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 236 ie_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 237 il_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 238 jp_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 239 kr_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 240 lv_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 241 nl_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 242 no_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 243 nz_reg | Numeric | 0, NAP, other 0, 99 | 8 | Right | Scale | |
| 244 ph_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 245 pl_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 246 pt_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 247 ru_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 248 se_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |
| 249 si_reg | Numeric | 0, NAP, other 0, 99 | 8 | Right | Nominal | |
| 250 tw_reg | Numeric | 0, NAP, other 0, 99 | 8 | Right | Nominal | |
| 251 us_reg | Numeric | 0, NAP, other 0 | 8 | Right | Nominal | |

Ask for collinearity diagnostics under "test" (you can also choose Durbin-Watson and casewise diagnostics if you want to test for heteroscedasticity, but consult the textbooks for advise)

The screenshot displays the SPSS Data Editor interface with a data grid in the background. The grid has columns for Name, Type, Width, and Measure. The data rows list various regions (e.g., Spain, Finland, France, Great Britain, Croatia, Hungary, Ireland, Israel, Japan, South Korea, Latvia, Netherlands, Norway, New Zealand, Philippines, Poland, Portugal, Russia, Sweden, Slovenia, Taiwan, USA, Uruguay) and their corresponding measures.

Overlaid on the data grid are two dialog boxes:

- Linear Regression**: The dependent variable is set to "LESSREG". The independent variables are listed in a scrollable list, including "ZA Study Number", "Edition of the data", "Respondent ID Nu", "Country/Sample (s)", "ISO code of count", "Q1: Obey laws with", "Q2a: Public protest", "Q2b: Protest demo", "Q2c: National anti", "Q3a: Revolutionar", "Q3b: Revolutionar", "Q4: Worse type of", "Q5a: Gov. and ecc", "Q5b: Gov. and ecc", "Q5c: Gov. and ecc", "Q5d: Gov. and ecc", "Q5e: Gov. and ecc", "Q5f: Gov. and ecc", and "Q6a: Government".
- Linear Regression: Statistics**: This sub-dialog box has several options checked:
 - Regression Coefficients**: Estimates, Confidence intervals, Covariance matrix, Model fit, R squared change, Descriptives, Part and partial correlations, Collinearity diagnostics.
 - Residuals**: Durbin-Watson, Casewise diagnostics.
 - Outliers**: Outliers outside: 3 standard deviations, All cases.

The F-statistic shows that the model as a whole is significant, but this is almost ALWAYS the case, so it tells you when the model is bad, but not when it is good

ANOVA^b

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|------------|----------------|------|-------------|-------|-------------------|
| 1 | Regression | 9.125 | 3 | 3.042 | 3.053 | .028 ^a |
| | Residual | 1112.752 | 1117 | .996 | | |
| | Total | 1121.877 | 1120 | | | |

a. Predictors: (Constant), R: Education II-highest education level, R: Sex, R: Age

b. Dependent Variable: LESSREG

Which variable(s) is/are significant?
 Which Variable explains the greatest amount of variance?

Coefficients^a

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|-------|---|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 3.639 | .151 | | 24.082 | .000 | | |
| | R: Sex | -.090 | .060 | -.045 | -1.491 | .136 | .997 | 1.003 |
| | R: Age | .000 | .002 | -.005 | -.164 | .869 | .990 | 1.010 |
| | R: Education II-highest education level | .071 | .027 | .077 | 2.576 | .010 | .993 | 1.007 |

a. Dependent Variable: LESSREG

Which variable(s) is/are significant?

Coefficients^a

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|-------|---|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 3.639 | .151 | | 24.082 | .000 | | |
| | R: Sex | -.090 | .060 | -.045 | -1.491 | .136 | .997 | 1.003 |
| | R: Age | .000 | .002 | -.005 | -.164 | .869 | .990 | 1.010 |
| | R: Education II-highest education level | .071 | .027 | .077 | 2.576 | .010 | .993 | 1.007 |

a. Dependent Variable: LESSREG

Is there a problem with Collinearity?

Coefficients^a

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|-------|---|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 3.639 | .151 | | 24.082 | .000 | | |
| | R: Sex | -.090 | .060 | -.045 | -1.491 | .136 | .997 | 1.003 |
| | R: Age | .000 | .002 | -.005 | -.164 | .869 | .990 | 1.010 |
| | R: Education II-highest education level | .071 | .027 | .077 | 2.576 | .010 | .993 | 1.007 |

a. Dependent Variable: LESSREG

Nevertheless, SEX and AGE are rather equally distributed on dimensions 3 and 4 which indicates there could be a problem between them

Collinearity Diagnostics^a

| Model | Dimension | Eigenvalue | Condition Index | Variance Proportions | | | |
|-------|-----------|------------|-----------------|----------------------|--------|--------|---|
| | | | | (Constant) | R: Sex | R: Age | R: Education II-highest education level |
| 1 | 1 | 3.735 | 1.000 | .00 | .01 | .01 | .01 |
| | 2 | .144 | 5.100 | .00 | .03 | .21 | .67 |
| | 3 | .093 | 6.352 | .00 | .55 | .46 | .06 |
| | 4 | .029 | 11.427 | .99 | .42 | .32 | .26 |

a. Dependent Variable: LESSREG

Next step

- Probably only educational level is a good predictor, so it would be best to use a bivariate regression or replace SEX and AGE with some other variables
- But since there might have been a problem of collinearity between AGE and SEX and since AGE had a much lower std. Coefficient, we will eliminate AGE now and see if SEX become significant

Sex is still insignificant

Coefficients

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|--------------------------------------|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 (Constant) | 3.618 | .124 | | 29.265 | .000 | | |
| R: Sex | -.089 | .060 | -.044 | -1.483 | .138 | 1.000 | 1.000 |
| R: Education II-high education level | .073 | .027 | .079 | 2.667 | .008 | 1.000 | 1.000 |

a. Dependent Variable: LESSREG

Adjusted R-square

- Increased now from .005 to .007
- (Not shown here)
- So eliminating a variable made the model better
- But still it cannot explain even 1% of the change in LESSREG

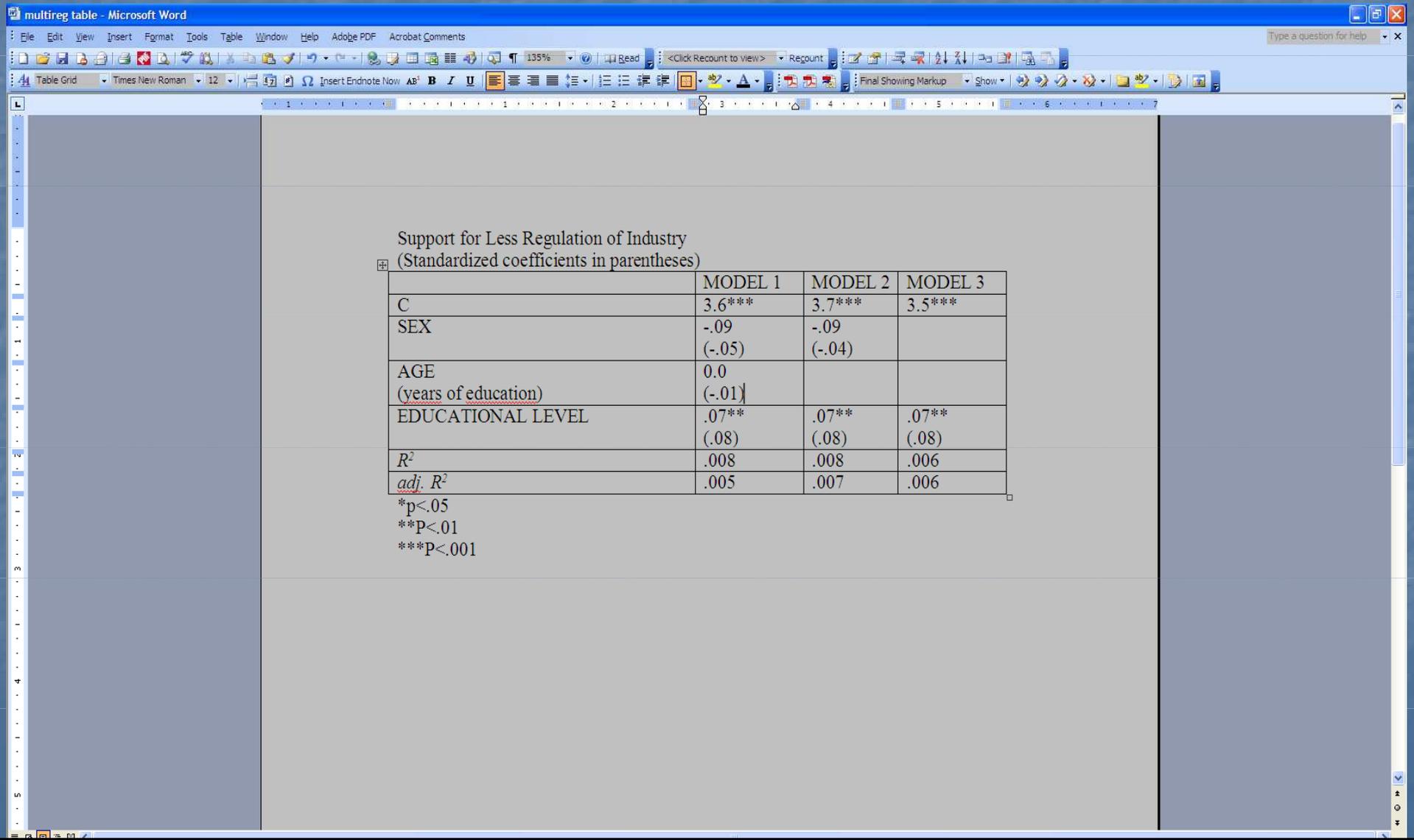
With only EDUCATIONAL LEVEL: it is significant, but the adjusted r-square is only .06, so again it shows we should look for different variables

Coefficients^a

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|-------|--|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 3.475 | .078 | | 44.504 | .000 | | |
| | R: Education II-higher education level | .073 | .027 | .080 | 2.689 | .007 | 1.000 | 1.000 |

a. Dependent Variable: LESSREG

Make table in Word



The screenshot shows a Microsoft Word document titled "multireg table - Microsoft Word". The document contains a table with the following data:

Support for Less Regulation of Industry
(Standardized coefficients in parentheses)

| | MODEL 1 | MODEL 2 | MODEL 3 |
|-----------------------------|----------------|----------------|----------------|
| C | 3.6*** | 3.7*** | 3.5*** |
| SEX | -.09 (-.05) | -.09 (-.04) | |
| AGE (years of education) | 0.0 (-.01) | | |
| EDUCATIONAL LEVEL | .07** (.08) | .07** (.08) | .07** (.08) |
| R^2 | .008 | .008 | .006 |
| $adj. R^2$ | .005 | .007 | .006 |

*P<.05
**P<.01
***P<.001

Your Task

- Run a multiple regression with the dependent variable you have chosen and at least 5 independent variables
- Eliminate all the variables that are not significant
- Make sure there is no-collinearity
- Try to make the best model
- Make a table in Word