ADF

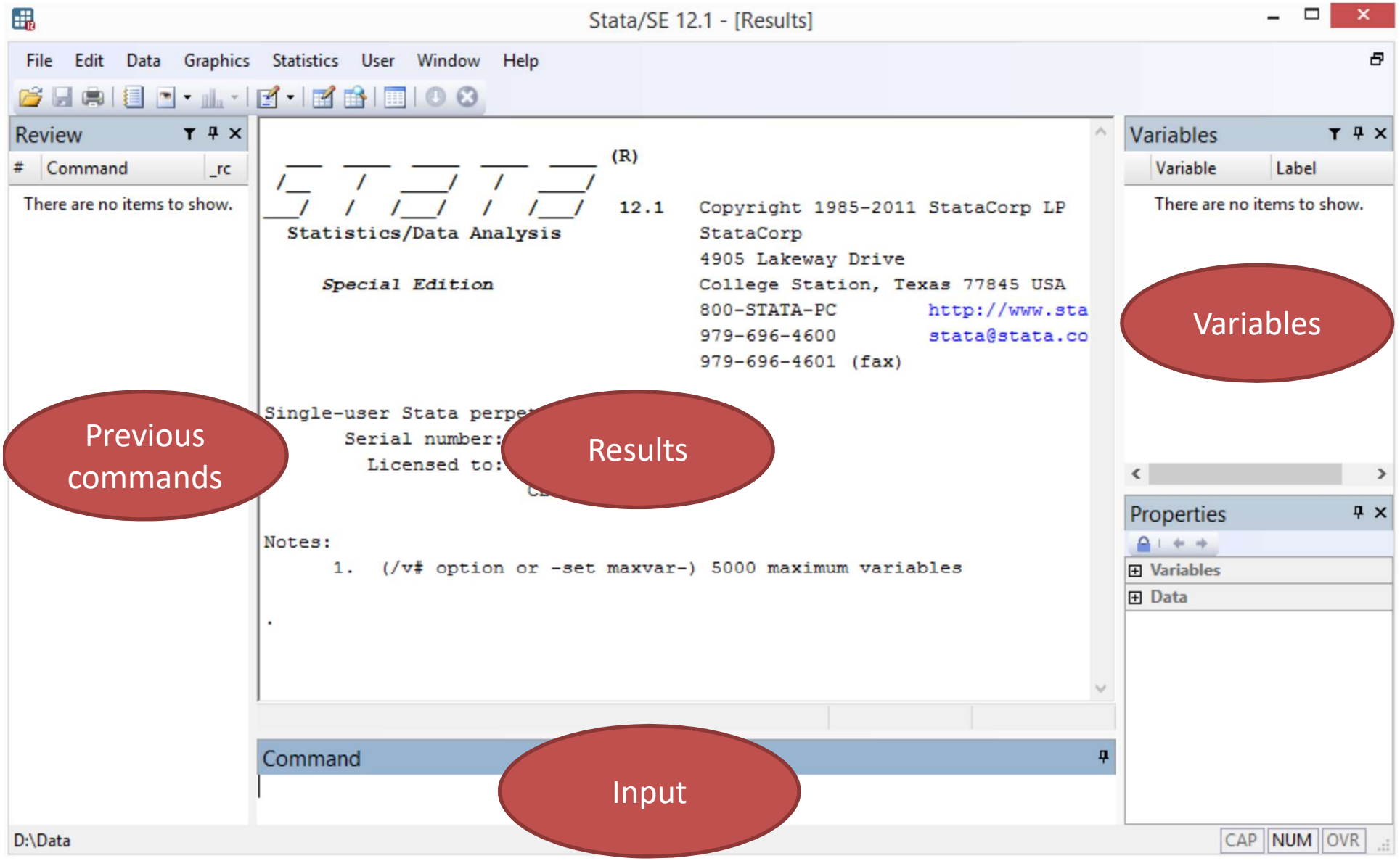
Illustrations

Using Stata

How to run commands:

- Write the command line
  - Standard approach
- Run a *do* file (contains several command lines)
  - Ideal for running a series of commands
  - Allows implementation of methods not available in Stata

Stata – Main Windows

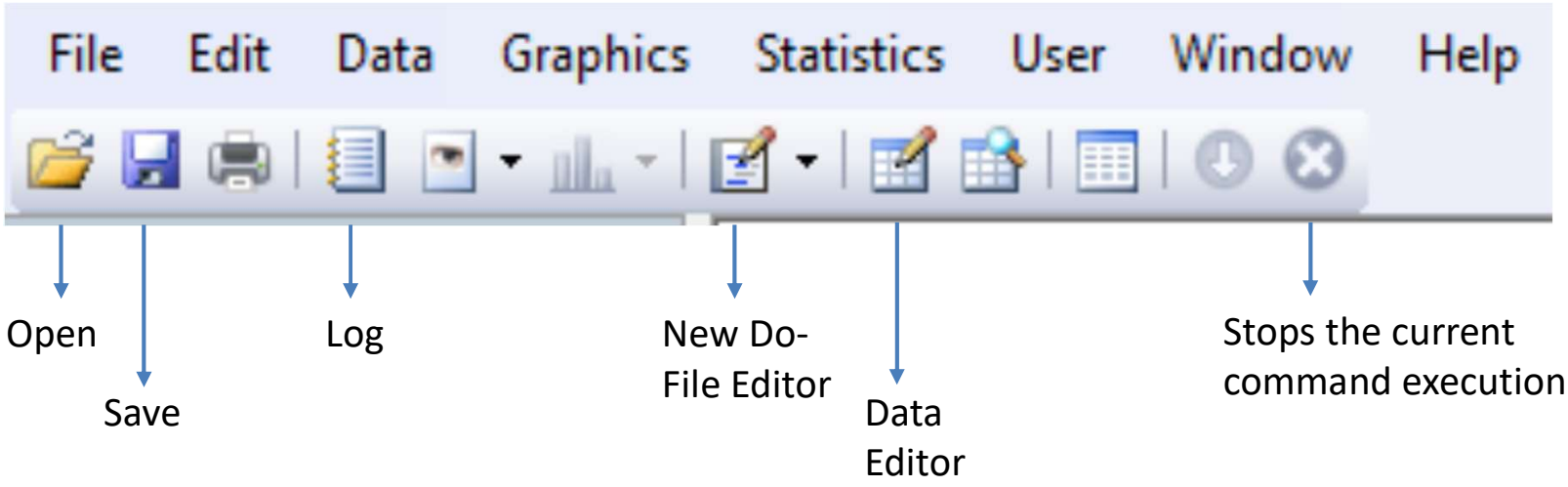


Stata – Main Menu

File

- Open – open dataset
- Save – save dataset
- Do – run a *do* file
- Log – register everything that you type and any output that appears in the Results window in a *smcl* file (only accessible in Stata) ou *log* (plain text that can be read by any text processor)
  - Begin – opens a log file
  - Close – closes the log file
  - Suspend – suspends logging
  - Resume – resumes logging

Stata – Main Shortcuts



Stata – Some Commands

describe [*varlist*]

- Produces a summary of the dataset

summarize [*varlist*] [, detail]

- Displays a variety of univariate summary statistics

generate *newvar* = *formula*

- Creates a new variable

replace *varname* = *formula* [if *expressao*] [in #/#]

- Replaces contents of an existing variable

drop [*varlist*] [if *expressao*] [in #/#]

- Drops variables or observations

Stata – Others

Missing data:

- .

Conditions:

- Equality: ==
- Different: !=
- Or: |
- And: &

Estimates:

- predict [, *options*] $\rightarrow \hat{Y}, \hat{u}, X\hat{\beta}, \ldots$

Illustration 1 – Question 1

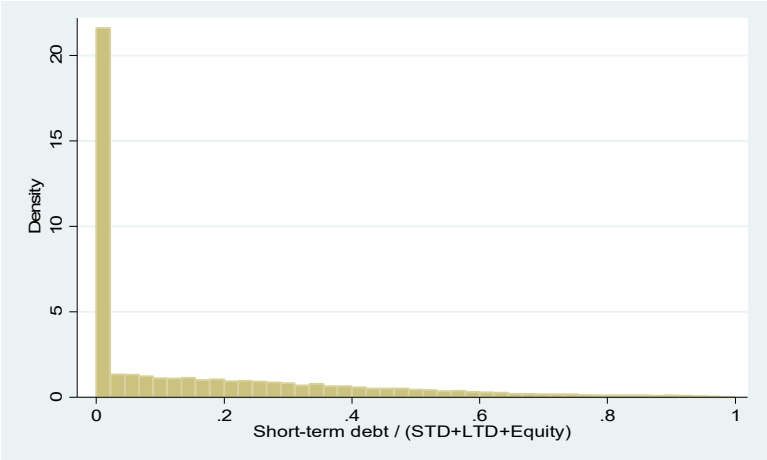
```
. describe
Contains data from H:\S1-19-20-ADF\CentralBalancos-BP.dta
  obs:        32,226
 vars:            16                          2 Sep 2019 18:02
 size:     1,482,396
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
id              int     %8.0g                 Firm id
YEAR            int     %8.0g                 Year
LEV_ST          float   %9.0g                 Short-term debt / (STD+LTD+Equity)
LEV_LT          float   %9.0g                 Long-term debt / (STD+LTD+Equity)
LEV             float   %9.0g                 Total debt / (STD+LTD+Equity)
COLLAT          float   %9.0g                 Tangible assets / Total assets
SIZE            float   %9.0g                 Log(Total assets)
PROF            float   %9.0g                 EBIT / Total assets
GROWTH          float   %9.0g                 Sales growth rate
AGE             int     %8.0g                 YEAR - Foundation year
LE              byte    %8.0g                 =1 if large firm
MicE            byte    %8.0g                 =1 if micro firm
SE              byte    %8.0g                 =1 if small firm
MedE            byte    %8.0g                 =1 if medium firm
-------------------------------------------------------------------------------
```

Illustration 1 – Question 2

```
. summarize
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
          id |     32,226     2714.09    1597.178         1       5514
        YEAR |     32,226     1998.01    1.989032      1995       2001
      LEV_ST |     32,226    .1583845    .2185988         0   .9997105
      LEV_LT |     32,226    .0768912    .1678684         0   .9982489
         LEV |     32,226    .2352757    .2589438         0   .9997105
-------------+---------------------------------------------------------
      COLLAT |     32,226    .3175925      .22441         0   .9982307
        SIZE |     32,226    13.66189    1.922785   4.976734   22.38044
        PROF |     32,226    .0671496    .1138881   -.822547   10.11724
      GROWTH |     32,226    27.98725    559.0894  -99.89224   73055.81
         AGE |     32,226    20.25119     15.6708         1        212
-------------+---------------------------------------------------------
          LE |     32,226    .0596413    .2368247         0          1
        MicE |     32,226    .3063986    .4610044         0          1
          SE |     32,226    .4156892    .4928481         0          1
        MedE |     32,226     .218271    .4130787         0          1
```

Illustration 1 – Question 3

```
. histogram LEV_ST
(bin=45, start=0, width=.02221579)
```




```
. histogram LEV_LT
(bin=45, start=0, width=.02221579)
```

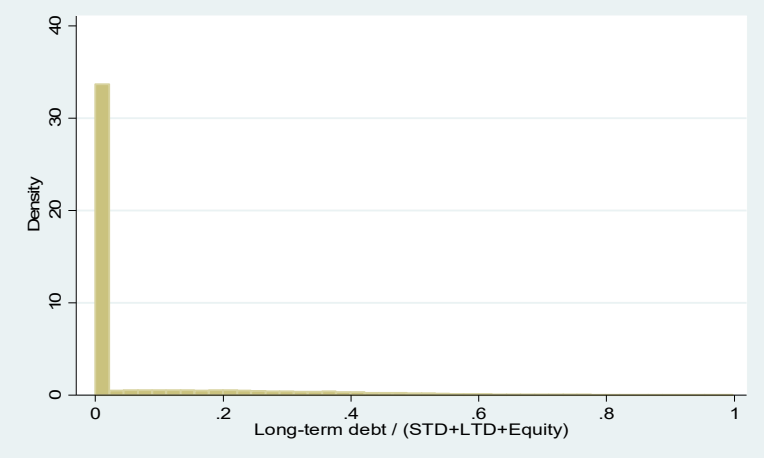


Illustration 1 – Question 4

```
. gen GROUPS="1-Micro" if MicE==1
. replace GROUPS="2-Small" if SE==1
. replace GROUPS="3-Medium" if MedE==1
. replace GROUPS="4-Large" if LE==1

. graph box LEV_ST, over(GROUPS)
```

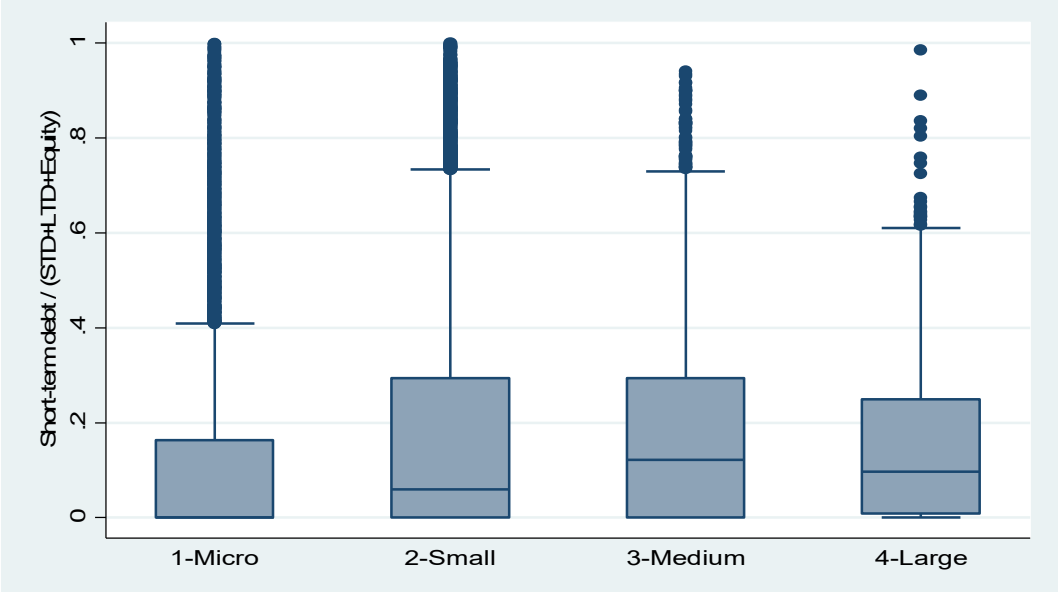


Illustration 1 – Question 4

```
. graph box LEV_LT, over(GROUPS)
```

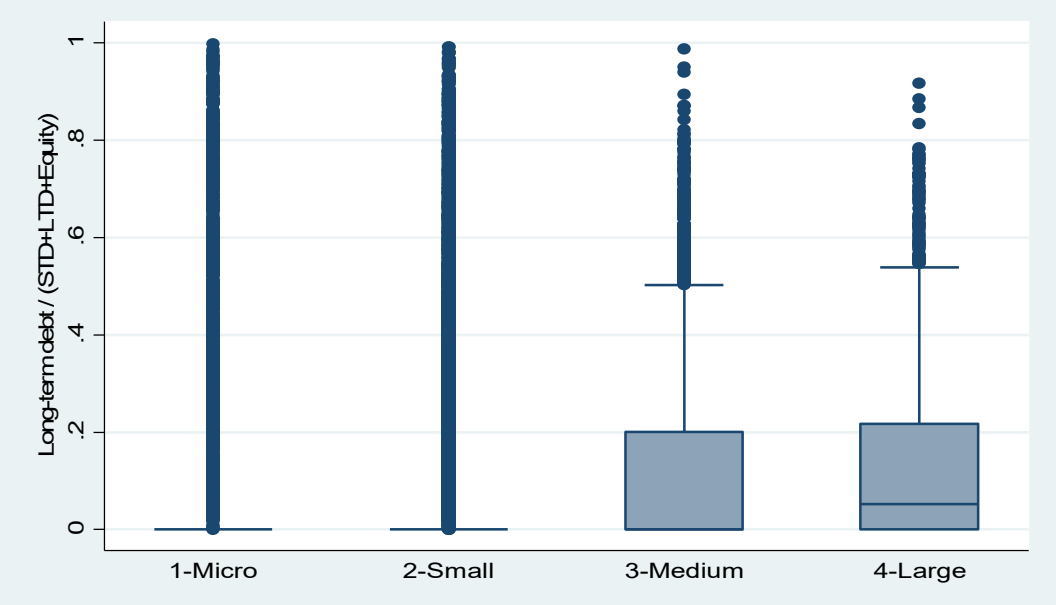


Illustration 1 – Question 5

```
. tabulate GROUPS

     GROUPS |      Freq.     Percent        Cum.
------------+-----------------------------------
    1-Micro |      9,874       30.64       30.64
    2-Small |     13,396       41.57       72.21
   3-Medium |      7,034       21.83       94.04
    4-Large |      1,922        5.96      100.00
------------+-----------------------------------
      Total |     32,226      100.00
```

Illustration 1 – Question 6

```
. tabulate GROUPS YEAR
```

GROUPS	Ano 1995	1996	1997	1998	Total
1-Micro	1,418	1,441	1,414	1,431	9,874
2-Small	1,845	1,893	1,907	1,946	13,396
3-Medium	967	968	1,006	1,030	7,034
4-Large	279	267	271	277	1,922
Total	4,509	4,569	4,598	4,684	32,226

GROUPS	Ano 1999	2000	2001	Total
1-Micro	1,446	1,392	1,332	9,874
2-Small	1,951	1,950	1,904	13,396
3-Medium	1,024	1,019	1,020	7,034
4-Large	271	283	274	1,922
Total	4,692	4,644	4,530	32,226

Illustration 1 – Question 7.1

```
. table GROUPS, contents(mean LEV_ST mean LEV_LT mean LEV)

----------------------------------------------------------
GROUPS      | mean(LEV_ST1)   mean(LEV_LT1)     mean(LEV1)
------------+---------------------------------------------
   1-Micro  |      .1288624       .0417675       .1706299
   2-Small  |      .1721035       .0750359       .2471394
  3-Medium  |      .1752302       .1147087        .289939
   4-Large  |      .1527809       .1318627       .2846436
----------------------------------------------------------
```

Illustration 1 – Question 7.2

```
. gen DEBT_ST=LEV_ST>0
. gen DEBT_LT=LEV_LT>0
. gen DEBT=LEV>0
. table GROUPS, contents(mean DEBT_ST mean DEBT_LT mean
DEBT)

----------------------------------------------------
GROUPS      |mean(DEBT_ST) mean(DEBT_LT)    mean(DEBT)
------------+---------------------------------------
   1-Micro  |     .3601377       .094288      .4196881
   2-Small  |     .5811436      .2300687      .6672887
  3-Medium  |     .7361388      .4640318      .8129087
   4-Large  |     .8116545      .5952133      .8563996
----------------------------------------------------
```

Illustration 1 – Question 7.3

```
. table GROUPS if DEBT_ST==1, contents(mean LEV_ST)
. table GROUPS if DEBT_LT==1, contents(mean LEV_LT)
. table GROUPS if DEBT==1, contents(mean LEV)
```

GROUPS	mean(LEV_ST1)
1-Micro	.3578141
2-Small	.2961462
3-Medium	.2380397
4-Large	.1882339

GROUPS	mean(LEV_LT1)
1-Micro	.4429778
2-Small	.3261457
3-Medium	.2472001
4-Large	.2215386

GROUPS	mean(LEV1)
1-Micro	.4065635
2-Small	.3703635
3-Medium	.3566685
4-Large	.3323724

Illustration 1 – Question 8

```
. cor LEV_LT COLLAT SIZE PROF GROWTH
(obs=32,226)

             |   LEV_LT   COLLAT     SIZE     PROF   GROWTH
-------------+---------------------------------------------
      LEV_LT |   1.0000
      COLLAT |   0.1071   1.0000
        SIZE |   0.2716   0.1349   1.0000
        PROF |  -0.0779  -0.1060  -0.1281   1.0000
      GROWTH |   0.0076  -0.0248  -0.0049   0.0325   1.0000
```

Illustration 1 – Question 9

```
. oneway LEV_LT GROUPS, bonferroni

                        Analysis of Variance
    Source              SS         df      MS             F     Prob > F
------------------------------------------------------------------------
Between groups      28.0952331      3    9.3650777    342.91     0.0000
 Within groups      879.998687  32222    .027310492
------------------------------------------------------------------------
    Total            908.09392  32225    .028179796

Bartlett's test for equal variances:  chi2(3) = 196.0970  Prob>chi2 = 0.000
```

Illustration 1 – Question 9

Comparison of Long-term debt / (STD+LTD+Equity) by GROUPS
(Bonferroni)

Row Mean- Col Mean	1-Micro	2-Small	3-Medium
2-Small	.033268 0.000		
3-Medium	.072941 0.000	.039673 0.000	
4-Large	.090095 0.000	.056827 0.000	.017154 0.000

Illustration 1 – Question 10

```
. kwallis LEV_LT, by(GROUP)

Kruskal-Wallis equality-of-populations rank test

  +-------------------------------+
  |   GROUPS |    Obs | Rank Sum |
  |----------+--------+----------|
  |  1-Micro |  9,874 | 1.34e+08 |
  |  2-Small | 13,396 | 2.10e+08 |
  | 3-Medium |  7,034 | 1.35e+08 |
  |  4-Large |  1,922 | 4.03e+07 |
  +-------------------------------+

chi-squared =  2050.033 with 3 d.f.
probability =     0.0001

chi-squared with ties =  3434.319 with 3 d.f.
probability =     0.0001
```

Illustration 2 – Question 1

```
. keep if YEAR==1999
. regress LEV_LT SIZE COLLAT PROF GROWTH AGE

      Source |       SS           df       MS      Number of obs   =     4,692
-------------+----------------------------------   F(5, 4686)      =     73.26
       Model |  10.6236513         5  2.12473026   Prob > F        =    0.0000
    Residual |  135.914959     4,686  .029004473   R-squared       =    0.0725
-------------+----------------------------------   Adj R-squared   =    0.0715
       Total |   146.53861     4,691  .031238246   Root MSE        =    .17031

------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0227699   .0013931    16.34   0.000     .0200387     .025501
      COLLAT |   .0356729   .0112018     3.18   0.001      .013712    .0576337
        PROF |  -.1313503   .0278565    -4.72   0.000    -.1859621   -.0767386
      GROWTH |   5.98e-07   2.20e-06     0.27   0.786    -3.71e-06    4.91e-06
         AGE |  -.0003878   .0001676    -2.31   0.021    -.0007165   -.0000591
       _cons |  -.2246217    .018836   -11.93   0.000    -.2615491   -.1876942
------------------------------------------------------------------------------
```

Illustration 2 – Question 2

Interpretation of partial effects. Ceteris paribus,

- if total of assets increases 1%, the proportion of long term debt increases, in average, 0.023/100=0.0002.
- each additional year of the firm, reduces the proportion of debt, in average, 0.0004
- if the proportion of collateral increases 0.1 (10pp), the proportion of debt increases, in average, 0.036*0.1=0.0036 (0.36pp in scale 100%)
- if profitability increases 0.1, the proportion of debt decreases, in average, 0.131*0.1=0.0131
- if growth increases 0.1, the proportion of debt decreases, in average, 0.000*0.1=0.0000
    - 3 last effects are response to 0.1 instead of 1, in order to give rise to a meaningfull interpretation

Illustration 2 – Question 2

Intuition for effects:

Positive effects on the long term proportion:

- SIZE: larger firms are typicaly more diversified and have lower probability of failure. Therefore they are issued debt more easily than small firms.
- COLLAT: firms with a higher proportion of collateral are safer in cases of failure. Therefore they are issued debt more easily.
- GROWTH: firms with higher growth are more promissing. Therefore they are issued debt more easily.

Negative effects on the long term proportion:

- PROF: more profitable firms are more likely to generate internal funding. Therefore they use less debt.
- AGE: firms that survived for a long time display less debt needs.

Illustration 2 – Question 3

At the 5% significance level all variables, except PROF, are statistically individually significant.

At the 5% significance level all variables are jointly significant

Illustration 2 – Question 4

To test the joint significace of PROF and GROWTH:

```
. Quietly regress LEV_LT SIZE COLLAT PROF GROWTH AGE

. test PROF GROWTH

 ( 1)  PROF = 0
 ( 2)  GROWTH = 0

       F(  2,  4686) =   11.12
            Prob > F =    0.0000
```

At the 5% significance level PROF and GROWTH are statistically significant

Illustration 2 – Question 4

Repetition of the test, for illustrative purposes, without the authomatic command

```
. regress LEV_LT SIZE COLLAT AGE
      Source |       SS           df       MS      Number of obs   =     4,692
-------------+----------------------------------   F(3, 4688)      =    114.19
       Model |  9.97877613         3  3.32625871   Prob > F        =    0.0000
    Residual |  136.559834     4,688  .029129657   R-squared       =    0.0681
-------------+----------------------------------   Adj R-squared   =    0.0675
       Total |   146.53861     4,691  .031238246   Root MSE        =    .17067
…
. display ((0.0725-0.0681)/2/((1-0.0725)/(4692-6)))
11.11504
```

Illustration 2 – Question 5

```
. gen SIZEp=SIZE-13.13199
. gen COLLATp=COLLAT-0.0791719
. gen PROFp=PROF-0.385232
. gen GROWTHp=GROWTH-6.437331
. gen AGEp=AGE-53

. regress LEV_LT SIZEp COLLATp PROFp GROWTHp AGEp
      Source |       SS           df       MS      Number of obs   =     4,692
-------------+----------------------------------   F(5, 4686)      =     73.26
       Model |  10.6236514         5  2.12473028   Prob > F        =    0.0000
    Residual |  135.914959     4,686  .029004473   R-squared       =    0.0725
-------------+----------------------------------   Adj R-squared   =    0.0715
       Total |   146.53861     4,691  .031238246   Root MSE        =    .17031
------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       SIZEp |   .0227699   .0013931    16.34   0.000     .0200387     .025501
     COLLATp |   .0356729   .0112018     3.18   0.001      .013712    .0576337
       PROFp |  -.1313503   .0278565    -4.72   0.000    -.1859621   -.0767386
     GROWTHp |   5.98e-07   2.20e-06     0.27   0.786    -3.71e-06    4.91e-06
       AGEp |  -.0003878   .0001676    -2.31   0.021    -.0007165   -.0000591
       _cons |   .0060656   .0106732     0.57   0.570    -.0148589    .0269902
------------------------------------------------------------------------------
```

Illustration 2 – Question 6

```
. regress LEV_LT SIZE COLLAT PROF GROWTH AGE SE MedE LE

      Source |       SS           df       MS      Number of obs   =     4,692
-------------+----------------------------------   F(8, 4683)      =     49.76
       Model |  11.4798615         8  1.43498268   Prob > F        =    0.0000
    Residual |  135.058749     4,683   .02884022   R-squared       =    0.0783
-------------+----------------------------------   Adj R-squared   =    0.0768
       Total |   146.53861     4,691  .031238246   Root MSE        =    .16982

------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0301683   .0021456    14.06   0.000     .0259618    .0343747
      COLLAT |   .0407159   .0113232     3.60   0.000     .0185171    .0629146
        PROF |  -.1208179   .0278736    -4.33   0.000    -.1754634   -.0661725
      GROWTH |   2.28e-07   2.19e-06     0.10   0.917    -4.08e-06    4.53e-06
         AGE |  -.0002906   .0001691    -1.72   0.086     -.000622    .0000409
          SE |  -.0208001   .0068367    -3.04   0.002    -.0342032   -.0073969
        MedE |   -.028482   .0100863    -2.82   0.005    -.0482558   -.0087082
          LE |  -.0873071   .0163264    -5.35   0.000    -.1193145   -.0552997
       _cons |  -.3107104   .0268095   -11.59   0.000    -.3632698   -.2581511
------------------------------------------------------------------------------
```

Illustration 2 – Question 6

```
. test SE MedE LE

( 1)  SE = 0
( 2)  MedE = 0
( 3)  LE = 0

      F(  3,  4683) =    9.90
           Prob > F =    0.0000
```

The new regressors are jointly significant.

Ceteris paribus:

- a small firm, relative to a micro firm, displays in average a long term proportion of debt smaller in 0.021
- a medium firm, relative to a micro firm, displays in average a long term proportion of debt smaller in 0.028
- a large firm, relative to a micro firm, displays in average a long term proportion of debt smaller in 0.087

Illustration 2 – Question 7.1

Model:

$$LEV\_LT = \beta_0 + \beta_1 SIZE + \beta_2 COLLAT + \beta_3 PROF + \beta_4 GROWTH + \beta_5 AGE + \beta_6 (SE * PROF) + \beta_7 (MedE * PROF) + \beta_8 (LE * PROF) + v$$

Effects of firm profitability:

- Micro firms: β_3
- Small firms: $\beta_3 + \beta_6$
- Medium firms: $\beta_3 + \beta_7$
- Large firms: $\beta_3 + \beta_8$

Null hypotheses:

	Small	Medium	Large
Micro	$\beta_6 = 0$	$\beta_7 = 0$	$\beta_8 = 0$
Small		$\beta_6 = \beta_7$	$\beta_6 = \beta_8$
Medium			$\beta_7 = \beta_9$

Illustration 2 – Question 7.1

```
. gen PROF_SE=PROF*SE
. gen PROF_MedE=PROF*MedE
. gen PROF_LE=PROF*LE

. regress LEV_LT SIZE COLLAT PROF GROWTH AGE PROF_SE PROF_MedE PROF_LE
      Source |       SS           df       MS      Number of obs   =     4,692
-------------+----------------------------------   F(8, 4683)      =     51.41
       Model |  11.8295674         8  1.47869593   Prob > F        =    0.0000
    Residual |  134.709043     4,683  .028765544   R-squared       =    0.0807
-------------+----------------------------------   Adj R-squared   =    0.0792
       Total |   146.53861     4,691  .031238246   Root MSE        =     .1696

------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0276292   .0015862    17.42   0.000     .0245194     .030739
      COLLAT |   .0363435   .0111628     3.26   0.001     .0144591    .0582279
        PROF |   .0095068   .0369042     0.26   0.797    -.0628428    .0818565
      GROWTH |  -2.68e-07   2.20e-06    -0.12   0.903    -4.57e-06    4.04e-06
         AGE |  -.0003792   .0001672    -2.27   0.023     -.000707   -.0000515
     PROF_SE |  -.2026651   .0517991    -3.91   0.000    -.3042157   -.1011145
   PROF_MedE |   -.343819   .0730633    -4.71   0.000    -.4870576   -.2005805
     PROF_LE |  -.7133022   .1360224    -5.24   0.000    -.9799701   -.4466343
       _cons |  -.2892868    .021412   -13.51   0.000    -.3312644   -.2473092
------------------------------------------------------------------------------
```

Illustration 2 – Question 7.1

Effects of firm profitability:

- When profitability increases 0.1 (10 pp for percentage), the proportion of long-term debt in the firm's capital structure decreases, on average:
  - 0.00095 (0.095 pp in percentage) - micro firms
  - -0.0193 - small firms → display _b[PROF]+_b[PROF_SE]
  - -0.0334 - medium firms → display _b[PROF]+_b[PROF_MedE]
  - -0.0704 - large firms → display _b[PROF]+_b[PROF_LE]

Illustration 2 – Question 7.1

Profitability effects differ significantly across groups?

```
 . test PROF_SE=PROF_MedE
 ( 1)  PROF_SE - PROF_MedE = 0
       F(  1,  4683) =    3.84
            Prob > F =    0.0502
```

```
. test PROF_SE=PROF_LE
 ( 1)  PROF_SE - PROF_LE = 0
       F(  1,  4683) =   14.66
            Prob > F =    0.0001
```

```
. test PROF_MedE=PROF_LE
 ( 1)  PROF_MedE - PROF_LE = 0
       F(  1,  4683) =    7.44
            Prob > F =    0.0064
```

(p-values)	Small	Medium	Large
Micro	0.000***	0.000***	0.000***
Small		0.0502*	0.000***
Medium			0.001***

Illustration 2 – Question 7.2

Model:

$$LEV_{LT1} = \beta_0 + \beta_1 SIZE2 + \beta_2 COLLAT2 + \beta_3 PROF1 + \beta_4 GROWTH2 + \beta_5 AGE + \beta_6 LE + \beta_7 (LE * SIZE2) + \beta_8 (LE * COLLAT2) + \beta_9 (LE * PROF1) + \beta_{10} (LE * GROWTH2) + \beta_{11} (LE * AGE) + w$$

Null hypotheses:

- $H_0: \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = 0$ (no structural break)

```
. gen SIZE_LE=SIZE*LE
. gen COLLAT_LE=COLLAT*LE
. gen GROWTH_LE=GROWTH*LE
. gen AGE_LE=AGE*LE
```

Illustration 2 – Question 7.2

```
. regress LEV_LT SIZE COLLAT PROF GROWTH AGE LE SIZE_LE COLLAT_LE PROF_LE GROWTH_LE AGE_LE

      Source |       SS           df       MS      Number of obs   =     4,692
-------------+----------------------------------   F(11, 4680)     =     36.14
       Model |  11.4734211        11  1.04303829   Prob > F        =    0.0000
    Residual |  135.065189     4,680  .028860083   R-squared       =    0.0783
-------------+----------------------------------   Adj R-squared   =    0.0761
       Total |   146.53861     4,691  .031238246   Root MSE        =    .16988

------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0262108   .0015979    16.40   0.000     .0230782    .0293433
      COLLAT |   .0298537   .0114426     2.61   0.009     .0074207    .0522867
        PROF |  -.1178161   .0283403    -4.16   0.000    -.1733765   -.0622557
      GROWTH |   4.15e-07   2.19e-06     0.19   0.850    -3.89e-06    4.72e-06
         AGE |  -.0003768   .0001822    -2.07   0.039    -.0007339   -.0000196
          LE |  -.0570063   .1411598    -0.40   0.686    -.3337461    .2197334
     SIZE_LE |   -.002168   .0082257    -0.26   0.792    -.0182943    .0139582
   COLLAT_LE |   .1055932    .053384     1.98   0.048     .0009355    .2102509
     PROF_LE |  -.2771129   .1595962    -1.74   0.083    -.5899966    .0357708
   GROWTH_LE |   .0010892   .0006263     1.74   0.082    -.0001386     .002317
      AGE_LE |   .0003647    .000469     0.78   0.437    -.0005547    .0012842
       _cons |  -.2680171   .0213989   -12.52   0.000    -.3099691   -.2260651
------------------------------------------------------------------------------
```

Illustration 2 – Question 7.2

```
. test LE SIZE_LE COLLAT_LE PROF_LE GROWTH_LE AGE_LE

 ( 1)  LE = 0
 ( 2)  SIZE_LE = 0
 ( 3)  COLLAT_LE = 0
 ( 4)  PROF_LE = 0
 ( 5)  GROWTH_LE = 0
 ( 6)  AGE_LE = 0

       F(  6,  4680) =    4.91
            Prob > F =    0.0001
```

The null hypothesis is rejected, which implies that it is better to estimate separate models for each size-based group of firms or, equivalently, the model of the previous page, since:

(see the next page and compare with the interactions model)

Illustration 2 – Question 7.2

```
. regress LEV_LT SIZE COLLAT PROF GROWTH AGE if LE==0
(…)
------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0262108   .0016006    16.38   0.000     .0230728    .0293487
      COLLAT |   .0298537    .011462     2.60   0.009     .0073825    .0523249
        PROF |  -.1178161   .0283882    -4.15   0.000    -.1734712    -.062161
      GROWTH |   4.15e-07   2.20e-06     0.19   0.850    -3.89e-06    4.72e-06
         AGE |  -.0003768   .0001825    -2.06   0.039    -.0007345    -.000019
       _cons |  -.2680171   .0214351   -12.50   0.000    -.3100405   -.2259936
------------------------------------------------------------------------------

. regress LEV_LT SIZE COLLAT PROF GROWTH AGE if LE==1
(…)
------------------------------------------------------------------------------
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0240427   .0078385     3.07   0.002      .008609    .0394765
      COLLAT |   .1354469   .0506539     2.67   0.008     .0357116    .2351822
        PROF |   -.394929   .1525738    -2.59   0.010    -.6953401   -.0945179
      GROWTH |   .0010896   .0006084     1.79   0.074    -.0001082    .0022875
         AGE |   -.000012   .0004198    -0.03   0.977    -.0008387    .0008146
       _cons |  -.3250234   .1355432    -2.40   0.017     -.591902   -.0581448
------------------------------------------------------------------------------
```

Illustration 2 – Question 8.1 & 8.2

```
. quietly regress LEV_LT1 SIZE2 COLLAT2 PROF1 GROWTH2 AGE SE MedE LE


. ovtest

Ramsey RESET test using powers of the fitted values of LEV_LT
       Ho:  model has no omitted variables
                 F(3, 4680) =     10.62
                   Prob > F =      0.0000
```

→ Unsuitable model functional form

```
. estat hettest, rhs fstat

 Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: SIZE COLLAT PROF GROWTH AGE SE MedE LE

         F(8 , 4683)  =    20.76
         Prob > F     =   0.0000
```

→ Heteroskedastic erros

Illustration 2 – Question 8.1 & 8.2

RESET test – manual implementation

```
. predict XB
. gen XB2=XB^2
. gen XB3=XB^3
. gen XB4=XB^4
. quietly regress LEV_LT SIZE COLLAT PROF GROWTH AGE SE MedE LE XB2 XB3 XB4

. test XB2 XB3 XB4

 ( 1)  XB2 = 0
 ( 2)  XB3 = 0
 ( 3)  XB4 = 0

       F(  3,  4680) =   10.62
            Prob > F =    0.0000
```

Illustration 2 – Question 8.1 & 8.2

BP test – manual implementation

```
. quietly regress LEV_LT SIZE COLLAT PROF GROWTH AGE SE MedE LE

. predict uhat, resid

. gen uhat2=uhat^2

. quietly regress uhat2 SIZE COLLAT PROF GROWTH AGE SE MedE LE

. test SIZE COLLAT PROF GROWTH AGE SE MedE LE
 ( 1)  SIZE = 0
 ( 2)  COLLAT = 0
 ( 3)  PROF = 0
 ( 4)  GROWTH = 0
 ( 5)  AGE = 0
 ( 6)  SE = 0
 ( 7)  MedE = 0
 ( 8)  LE = 0

       F(  8,  4683) =   20.76
            Prob > F =    0.0000
```

Illustration 2 – Question 9

```
regress LEV_LT SIZE COLLAT PROF GROWTH AGE LE SIZE_LE COLLAT_LE PROF_LE GROWTH_LE AGE_LE,
robust

Linear regression                               Number of obs     =      4,692
                                                F(11, 4680)       =      47.01
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0783
                                                Root MSE          =     .16988

------------------------------------------------------------------------------
             |               Robust
      LEV_LT |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   .0262108   .0014557    18.01   0.000     .0233569    .0290646
      COLLAT |   .0298537   .0125967     2.37   0.018     .0051583    .0545491
        PROF |  -.1178161   .0215441    -5.47   0.000    -.1600527   -.0755795
      GROWTH |   4.15e-07   1.06e-06     0.39   0.694    -1.65e-06    2.48e-06
         AGE |  -.0003768   .0001775    -2.12   0.034    -.0007247   -.0000289
          LE |  -.0570063   .1558992    -0.37   0.715    -.3626422    .2486295
     SIZE_LE |   -.002168   .0091113    -0.24   0.812    -.0200304    .0156944
   COLLAT_LE |   .1055932   .0590662     1.79   0.074    -.0102043    .2213907
     PROF_LE |  -.2771129   .1219132    -2.27   0.023    -.5161203   -.0381055
   GROWTH_LE |   .0010892   .0007304     1.49   0.136    -.0003428    .0025212
      AGE_LE |   .0003647   .0004279     0.85   0.394    -.0004742    .0012037
       _cons |  -.2680171   .0173169   -15.48   0.000    -.3019663   -.2340678
------------------------------------------------------------------------------
```