```
      name:  Grant Aarons Assignment 3
       log:  C:\Users\gaarons\Git\Notes\Stata\2016F\Metrics\logs\stata_3.smcl
  log type:  smcl
 opened on:  12 Jan 2017, 12:42:50

 1 . * Use s or t to get smcl or text log file
 2 . /*
   > Grant Aarons
   > gaarons@london.edu
   > Econometrics 1, London Business School
   > */
 3 . global programdir C:\Users\gaarons\Git\Notes\Stata\2016F\Metrics\programs

 4 . global datadir C:\Users\gaarons\Git\Notes\Stata\2016F\Metrics\data

 5 . global outputdir C:\Users\gaarons\Git\Notes\Stata\2016F\Metrics\output

 6 . /*
   > Program: stata_31.do
   > Description: Introduction to econometrics in stata
   > */
 7 .
 8 . ******************************************************************
 9 . ************************* START QUESTION 4 *************************
10 . ******************************************************************
11 . do $programdir/stata_31.do

12 . /*
   > Grant Aarons
   > gaarons@london.edu
   > Econometrics 1, London Business School
   > Assignment 3
   > */
13 . * Load the data
14 . import excel "$datadir/schaller.xls", sheet("Sheet1") firstrow clear

15 . *pause Dataset has been loaded
16 .
17 .
18 . *** Part A
19 . * Tabulate the variables we were given as standard practice
20 . tabstat inv q, stat(min max mean sd)

   stats |       inv         q
---------+--------------------
     min |         0 -1.966133
     max |  .7142991  45.44712
    mean |  .1686158  1.601154
      sd |  .0899994  3.803969
----------------------------

21 . tabstat inv q, by(year) stat(min max mean sd)

Summary statistics: min, max, mean, sd
  by categories of: year (year)

    year |       inv         q
---------+--------------------
       1 |  .0205936 -1.748583
         |  .6704475  6.588722
         |  .1927996  .5728584
         |   .112118  1.648371
---------+--------------------
       2 |  .0107318 -1.405087
         |  .5325488  6.588691
         |  .1718815   .597845
         |  .0927825  1.577901
---------+--------------------
       3 |  .0113419 -1.508873
         |  .4278665  6.862064
         |  .1607248  .6349403
         |  .0906696  1.647415
---------+--------------------
       4 |   .020651 -1.917622
         |  .5146071   9.03307
         |  .1472462  .4967591
         |  .0863553   1.78078
---------+--------------------
       5 |  .0169944 -1.636174
```

| | |
|---|---|
| | .4385091  16.39879 |
| | .1687614  1.575704 |
| | .0985533  2.936246 |
| 6 | .0140286 -1.316996 |
| | .5664171  19.55134 |
| | .2085197  2.143651 |
| | .1088841  3.536015 |
| 7 | .0214348 -1.514729 |
| | .5919886    15.757 |
| | .1891974  1.982852 |
| | .097126  3.214572 |
| 8 | .0210933 -1.966133 |
| | .5523365  14.29717 |
| | .1445815  1.188414 |
| | .0933408  2.806896 |
| 9 | .0088241 -1.738319 |
| | .6472303  25.06137 |
| | .1469142  2.615832 |
| | .0936516  4.240391 |
| 10 | .011097 -1.219954 |
| | .6800648  41.90479 |
| | .1684816  3.291839 |
| | .104496  5.477325 |
| 11 | 0 -1.477367 |
| | .7142991  30.18523 |
| | .1494652  2.990903 |
| | .0990541  5.405804 |
| 12 | .0182395 -1.211948 |
| | .5982081  45.44712 |
| | .1608216  3.946245 |
| | .0958416  6.795034 |
| 13 | .0338612 -1.499547 |
| | .5844074   36.9486 |
| | .170258  2.496707 |
| | .092345  4.696228 |
| 14 | .0159083 -1.326542 |
| | .6414233   33.9775 |
| | .1872097  2.878355 |
| | .0944825  5.152764 |
| 15 | .0456929 -1.344155 |
| | .5690441   30.4778 |
| | .2180801  2.873494 |
| | .0922757   4.62583 |
| 16 | .0360537 -.8103173 |
| | .655834  34.83765 |
| | .2338404  3.488654 |
| | .1016048   5.38048 |
| 17 | .0221875 -1.069489 |
| | .6108891  26.40782 |
| | .2184982  2.396935 |
| | .1053458  4.369127 |
| 18 | .0287359  -1.00933 |
| | .4589968  32.06573 |
| | .1938358  3.517091 |
| | .0837783  5.388207 |
| 19 | .0264943 -.7960994 |
| | .6606368  27.86442 |
| | .1970291    3.4057 |
| | .0883814  4.786166 |
| 20 | .0167316 -1.255464 |
| | .4899229  28.40281 |
| | .1765477   2.31209 |
| | .073611  4.739304 |
| 21 | .005226 -1.066554 |

| | |
|---|---|
| | .4338658  19.17337 |
| | .1469716  1.841841 |
| | .0706017  3.489996 |
| 22 | .0145928 -1.131676 |
| | .4037121  23.90062 |
| | .1444561  2.179387 |
| | .0679987  4.141808 |
| 23 | .0329763 -1.542628 |
| | .4842557  27.49858 |
| | .179273  2.346174 |
| | .0853335  4.718412 |
| 24 | .027034 -1.610933 |
| | .4426112  20.43754 |
| | .1931256  1.318847 |
| | .0856918  3.528182 |
| 25 | .0077582 -1.955251 |
| | .4441033  13.70439 |
| | .151674  .2314248 |
| | .0673722  1.925192 |
| 26 | .0190473 -1.428982 |
| | .3261356  11.73812 |
| | .1382109  .4759651 |
| | .0570254  1.95111 |
| 27 | .0209634 -1.275176 |
| | .3595692  10.10888 |
| | .1506596  .618547 |
| | .0608719  1.754108 |
| 28 | .0438521 -1.347831 |
| | .4033135  7.400327 |
| | .1579665  .2473247 |
| | .0649604  1.413838 |
| 29 | .0144415 -1.547875 |
| | .6127569  9.157542 |
| | .1717787  .1102235 |
| | .0799605  1.391528 |
| 30 | .0184241 -1.279086 |
| | .361407  9.488826 |
| | .1628513  .1234602 |
| | .0678179  1.305088 |
| 31 | .0212685 -1.405766 |
| | .361128  10.21523 |
| | .1569981  .2477085 |
| | .0689526  1.521988 |
| 32 | .0150045 -1.365615 |
| | .4270046  6.407879 |
| | .1365325  .0176893 |
| | .065645  1.335595 |
| 33 | .0092279 -1.760928 |
| | .6422654  8.459704 |
| | .1219511  .1681494 |
| | .0767863  1.469953 |
| 34 | .0138137 -1.722591 |
| | .5336629  7.986071 |
| | .1385301  .4142811 |
| | .0793025  1.433183 |
| 35 | .012056 -1.870826 |
| | .4314426  6.277641 |
| | .1458804  .292498 |
| | .0779655  1.263107 |
| Total | 0 -1.966133 |
| | .7142991  45.44712 |
| | .1686158  1.601154 |
| | .0899994  3.803969 |

```
22 . * Too long a printout by firm, but could be used
23 . *tabstat inv q, by(firm) stat(min max mean sd)
24 .
25 . * Run the required regression of inv = alpha + beta_1*q
26 . reg inv q
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | **5.63683287** | **1** | **5.63683287** | Number of obs | = **5,740** |
| Residual | **40.8484783** | **5,738** | **.00711894** | F(1, 5738) | = **791.81** |
| | | | | Prob > F | = **0.0000** |
| | | | | R-squared | = **0.1213** |
| | | | | Adj R-squared | = **0.1211** |
| Total | **46.4853111** | **5,739** | **.008099897** | Root MSE | = **.08437** |

| inv | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| q | **.0082388** | **.0002928** | **28.14** | **0.000** | **.0076648** | **.0088127** |
| _cons | **.1554243** | **.0012083** | **128.63** | **0.000** | **.1530555** | **.157793** |

```
27 .
28 . *pause Part A completed
29 .
30 .
31 . *** Part B
32 . * Create dummy variables corresponding to each firm using ``xi'' command
33 . xi firm

34 . reg inv q i.firm
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | **18.0371613** | **164** | **.109982691** | Number of obs | = **5,740** |
| Residual | **28.4481498** | **5,575** | **.005102807** | F(164, 5575) | = **21.55** |
| | | | | Prob > F | = **0.0000** |
| | | | | R-squared | = **0.3880** |
| | | | | Adj R-squared | = **0.3700** |
| Total | **46.4853111** | **5,739** | **.008099897** | Root MSE | = **.07143** |

| inv | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| q | **.007249** | **.0003543** | **20.46** | **0.000** | **.0065544** | **.0079437** |
| firm | | | | | | |
| 2 | **-.0110881** | **.0171628** | **-0.65** | **0.518** | **-.0447339** | **.0225577** |
| 3 | **.1144593** | **.0171091** | **6.69** | **0.000** | **.0809188** | **.1479999** |
| 4 | **-.0299033** | **.0171512** | **-1.74** | **0.081** | **-.0635263** | **.0037196** |
| 5 | **-.0131718** | **.017159** | **-0.77** | **0.443** | **-.0468102** | **.0204666** |
| 6 | **.0295458** | **.0171438** | **1.72** | **0.085** | **-.0040628** | **.0631544** |
| 7 | **-.0179783** | **.0171701** | **-1.05** | **0.295** | **-.0516385** | **.0156819** |
| 8 | **-.0288828** | **.017146** | **-1.68** | **0.092** | **-.0624955** | **.0047299** |
| 9 | **-.0102863** | **.0171597** | **-0.60** | **0.549** | **-.043926** | **.0233535** |
| 10 | **.0012063** | **.0171321** | **0.07** | **0.944** | **-.0323793** | **.0347918** |
| 11 | **-.0333366** | **.017152** | **-1.94** | **0.052** | **-.0669612** | **.0002879** |
| 12 | **.0018204** | **.0171088** | **0.11** | **0.915** | **-.0317196** | **.0353604** |
| 13 | **-.0626703** | **.0172465** | **-3.63** | **0.000** | **-.0964802** | **-.0288605** |
| 14 | **.0299757** | **.017154** | **1.75** | **0.081** | **-.0036528** | **.0636042** |
| 15 | **.0299541** | **.0171049** | **1.75** | **0.080** | **-.0035781** | **.0634864** |
| 16 | **-.0105629** | **.017164** | **-0.62** | **0.538** | **-.0442109** | **.0230852** |
| 17 | **.0073799** | **.0171342** | **0.43** | **0.667** | **-.0262099** | **.0409697** |
| 18 | **-.0479316** | **.0171712** | **-2.79** | **0.005** | **-.0815939** | **-.0142694** |
| 19 | **.0637984** | **.0171457** | **3.72** | **0.000** | **.0301863** | **.0974106** |
| 20 | **.037534** | **.0171446** | **2.19** | **0.029** | **.003924** | **.071144** |
| 21 | **.0033487** | **.0171188** | **0.20** | **0.845** | **-.0302108** | **.0369082** |
| 22 | **.0302641** | **.017113** | **1.77** | **0.077** | **-.0032841** | **.0638123** |
| 23 | **-.0303263** | **.0171771** | **-1.77** | **0.078** | **-.064** | **.0033474** |
| 24 | **.0416049** | **.0170807** | **2.44** | **0.015** | **.00812** | **.0750897** |
| 25 | **.0983835** | **.0171279** | **5.74** | **0.000** | **.0648062** | **.1319608** |
| 26 | **-.0093883** | **.0171363** | **-0.55** | **0.584** | **-.0429821** | **.0242056** |
| 27 | **.0475203** | **.0171412** | **2.77** | **0.006** | **.0139168** | **.0811237** |
| 28 | **-.0567045** | **.0170798** | **-3.32** | **0.001** | **-.0901876** | **-.0232214** |
| 29 | **-.0106659** | **.0171139** | **-0.62** | **0.533** | **-.0442157** | **.022884** |
| 30 | **.0435252** | **.0171216** | **2.54** | **0.011** | **.0099602** | **.0770903** |
| 31 | **.0755715** | **.0171089** | **4.42** | **0.000** | **.0420314** | **.1091115** |
| 32 | **.0205752** | **.0171604** | **1.20** | **0.231** | **-.0130659** | **.0542164** |
| 33 | **.0620965** | **.017091** | **3.63** | **0.000** | **.0285915** | **.0956015** |
| 34 | **.0030676** | **.0171605** | **0.18** | **0.858** | **-.0305736** | **.0367088** |
| 35 | **.0632206** | **.0171094** | **3.70** | **0.000** | **.0296795** | **.0967617** |
| 36 | **.0552266** | **.0171313** | **3.22** | **0.001** | **.0216426** | **.0888107** |
| 37 | **-.0210293** | **.0171333** | **-1.23** | **0.220** | **-.0546173** | **.0125587** |
| 38 | **.0675202** | **.0171455** | **3.94** | **0.000** | **.0339083** | **.1011321** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 39 | .0023553 | .0171479 | 0.14 | 0.891 | -.0312612 | .0359719 |
| 40 | .0053389 | .0171174 | 0.31 | 0.755 | -.028218 | .0388957 |
| 41 | -.0111797 | .0170966 | -0.65 | 0.513 | -.0446957 | .0223363 |
| 42 | .003941 | .0171214 | 0.23 | 0.818 | -.0296235 | .0375056 |
| 43 | .009515 | .0171506 | 0.55 | 0.579 | -.0241068 | .0431369 |
| 44 | .0487956 | .0171345 | 2.85 | 0.004 | .0152054 | .0823859 |
| 45 | .0431771 | .0171268 | 2.52 | 0.012 | .009602 | .0767523 |
| 46 | .0745948 | .0171477 | 4.35 | 0.000 | .0409785 | .1082111 |
| 47 | -.0113431 | .0171585 | -0.66 | 0.509 | -.0449804 | .0222943 |
| 48 | .0060311 | .017105 | 0.35 | 0.724 | -.0275013 | .0395635 |
| 49 | -.0075513 | .0171799 | -0.44 | 0.660 | -.0412306 | .026128 |
| 50 | -.0351712 | .0171655 | -2.05 | 0.041 | -.0688223 | -.00152 |
| 51 | -.014578 | .0171518 | -0.85 | 0.395 | -.0482021 | .0190461 |
| 52 | -.0170216 | .0171304 | -0.99 | 0.320 | -.0506038 | .0165606 |
| 53 | -.0350846 | .0171745 | -2.04 | 0.041 | -.0687533 | -.0014159 |
| 54 | .021855 | .0171225 | 1.28 | 0.202 | -.0117117 | .0554218 |
| 55 | .0219519 | .0171542 | 1.28 | 0.201 | -.011677 | .0555808 |
| 56 | .0318367 | .0171471 | 1.86 | 0.063 | -.0017783 | .0654517 |
| 57 | .0461108 | .0171369 | 2.69 | 0.007 | .0125157 | .0797059 |
| 58 | -.0164856 | .0170781 | -0.97 | 0.334 | -.0499654 | .0169941 |
| 59 | .0258278 | .0171496 | 1.51 | 0.132 | -.007792 | .0594476 |
| 60 | .0461384 | .0170906 | 2.70 | 0.007 | .0126342 | .0796425 |
| 61 | .0948239 | .0171271 | 5.54 | 0.000 | .061248 | .1283997 |
| 62 | .0181437 | .0170817 | 1.06 | 0.288 | -.0153432 | .0516306 |
| 63 | -.0138999 | .0171558 | -0.81 | 0.418 | -.047532 | .0197321 |
| 64 | -.0218311 | .0171141 | -1.28 | 0.202 | -.0553815 | .0117193 |
| 65 | .0429222 | .0171283 | 2.51 | 0.012 | .009344 | .0765003 |
| 66 | .0747595 | .017076 | 4.38 | 0.000 | .0412839 | .1082351 |
| 67 | .0701564 | .0171259 | 4.10 | 0.000 | .0365831 | .1037298 |
| 68 | .0002675 | .0171323 | 0.02 | 0.988 | -.0333185 | .0338534 |
| 69 | .0460002 | .0171216 | 2.69 | 0.007 | .0124352 | .0795652 |
| 70 | .0683109 | .0171055 | 3.99 | 0.000 | .0347775 | .1018444 |
| 71 | .0279947 | .0171355 | 1.63 | 0.102 | -.0055975 | .061587 |
| 72 | .0685164 | .017128 | 4.00 | 0.000 | .0349388 | .102094 |
| 73 | .0334759 | .017076 | 1.96 | 0.050 | 2.71e-07 | .0669515 |
| 74 | .1187479 | .0171123 | 6.94 | 0.000 | .0852011 | .1522947 |
| 75 | .000034 | .0171192 | 0.00 | 0.998 | -.0335264 | .0335943 |
| 76 | -.0218521 | .017176 | -1.27 | 0.203 | -.0555238 | .0118196 |
| 77 | .0353268 | .0171035 | 2.07 | 0.039 | .0017974 | .0688563 |
| 78 | .0150356 | .0170872 | 0.88 | 0.379 | -.0184619 | .048533 |
| 79 | .0102299 | .0171945 | 0.59 | 0.552 | -.023478 | .0439379 |
| 80 | .0039382 | .0171484 | 0.23 | 0.818 | -.0296793 | .0375558 |
| 81 | .0184951 | .0171391 | 1.08 | 0.281 | -.0151041 | .0520943 |
| 82 | -.0116276 | .01716 | -0.68 | 0.498 | -.0452678 | .0220127 |
| 83 | .0826889 | .0171298 | 4.83 | 0.000 | .0491079 | .1162699 |
| 84 | .0102795 | .017157 | 0.60 | 0.549 | -.0233549 | .043914 |
| 85 | -.0076072 | .0171474 | -0.44 | 0.657 | -.0412227 | .0260084 |
| 86 | .0313087 | .0170968 | 1.83 | 0.067 | -.0022077 | .0648251 |
| 87 | -.0275372 | .017099 | -1.61 | 0.107 | -.0610578 | .0059834 |
| 88 | -.0599936 | .0171762 | -3.49 | 0.000 | -.0936656 | -.0263217 |
| 89 | .1633283 | .017079 | 9.56 | 0.000 | .1298468 | .1968097 |
| 90 | .0081582 | .0171509 | 0.48 | 0.634 | -.0254643 | .0417807 |
| 91 | -.030904 | .0171306 | -1.80 | 0.071 | -.0644867 | .0026787 |
| 92 | -.0180802 | .0171059 | -1.06 | 0.291 | -.0516145 | .0154541 |
| 93 | .061324 | .0170765 | 3.59 | 0.000 | .0278473 | .0948006 |
| 94 | -.000042 | .0171425 | -0.00 | 0.998 | -.0336479 | .0335639 |
| 95 | -.0093794 | .0171398 | -0.55 | 0.584 | -.0429802 | .0242213 |
| 96 | -.0172457 | .0171775 | -1.00 | 0.315 | -.0509202 | .0164288 |
| 97 | .133017 | .0171655 | 7.75 | 0.000 | .0993659 | .166668 |
| 98 | -.0031429 | .0171327 | -0.18 | 0.854 | -.0367296 | .0304438 |
| 99 | .0409969 | .0171073 | 2.40 | 0.017 | .0074599 | .0745338 |
| 100 | .0317446 | .0171282 | 1.85 | 0.064 | -.0018333 | .0653225 |
| 101 | -.0117057 | .0171386 | -0.68 | 0.495 | -.0453041 | .0218927 |
| 102 | -.0047098 | .0170769 | -0.28 | 0.783 | -.0381872 | .0287675 |
| 103 | .0809494 | .0171046 | 4.73 | 0.000 | .0474178 | .1144811 |
| 104 | -.04242 | .0171655 | -2.47 | 0.013 | -.0760711 | -.0087689 |
| 105 | -.0092774 | .0171248 | -0.54 | 0.588 | -.0428487 | .0242939 |
| 106 | .0096833 | .0171703 | 0.56 | 0.573 | -.0239773 | .0433439 |
| 107 | .0668296 | .0171257 | 3.90 | 0.000 | .0332566 | .1004026 |
| 108 | -.0319637 | .0171538 | -1.86 | 0.062 | -.0655919 | .0016645 |
| 109 | -.0208587 | .0171625 | -1.22 | 0.224 | -.054504 | .0127865 |
| 110 | .0406201 | .0171572 | 2.37 | 0.018 | .0069853 | .0742549 |
| 111 | .0033588 | .0171546 | 0.20 | 0.845 | -.0302708 | .0369884 |
| 112 | -.0346632 | .0172433 | -2.01 | 0.044 | -.0684668 | -.0008596 |
| 113 | .0231535 | .0171585 | 1.35 | 0.177 | -.0104839 | .056791 |
| 114 | .0125792 | .0172291 | 0.73 | 0.465 | -.0211966 | .0463549 |
| 115 | -.0169208 | .0171619 | -0.99 | 0.324 | -.0505649 | .0167232 |
| 116 | .0422971 | .0171135 | 2.47 | 0.013 | .0087479 | .0758463 |
| 117 | .118987 | .0170846 | 6.96 | 0.000 | .0854945 | .1524796 |
| 118 | -.0081228 | .017153 | -0.47 | 0.636 | -.0417494 | .0255038 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 119 | -.0221458 | .0170959 | -1.30 | 0.195 | -.0556604 | .0113688 |
| 120 | .0237715 | .0171219 | 1.39 | 0.165 | -.0097942 | .0573371 |
| 121 | -.0102183 | .0171641 | -0.60 | 0.552 | -.0438667 | .0234301 |
| 122 | -.0261932 | .017147 | -1.53 | 0.127 | -.0598079 | .0074216 |
| 123 | .114001 | .0171271 | 6.66 | 0.000 | .0804252 | .1475767 |
| 124 | .0278888 | .0171065 | 1.63 | 0.103 | -.0056467 | .0614242 |
| 125 | -.0029403 | .0171321 | -0.17 | 0.864 | -.0365259 | .0306453 |
| 126 | -.0069179 | .0171391 | -0.40 | 0.686 | -.0405172 | .0266814 |
| 127 | .0136327 | .0171308 | 0.80 | 0.426 | -.0199503 | .0472158 |
| 128 | .0681524 | .017084 | 3.99 | 0.000 | .0346612 | .1016436 |
| 129 | .0146445 | .017076 | 0.86 | 0.391 | -.0188312 | .0481202 |
| 130 | -.0654175 | .0171515 | -3.81 | 0.000 | -.0990411 | -.0317938 |
| 131 | .0228469 | .0171368 | 1.33 | 0.183 | -.0107479 | .0564417 |
| 132 | -.0359411 | .0171453 | -2.10 | 0.036 | -.0695527 | -.0023296 |
| 133 | .0962414 | .0171039 | 5.63 | 0.000 | .0627111 | .1297718 |
| 134 | .154328 | .0171078 | 9.02 | 0.000 | .1207901 | .1878659 |
| 135 | -.0470046 | .0171615 | -2.74 | 0.006 | -.0806477 | -.0133614 |
| 136 | .0097354 | .01714 | 0.57 | 0.570 | -.0238656 | .0433364 |
| 137 | -.021706 | .0171425 | -1.27 | 0.205 | -.055312 | .0118999 |
| 138 | .0481099 | .0171488 | 2.81 | 0.005 | .0144915 | .0817282 |
| 139 | .1480501 | .0171195 | 8.65 | 0.000 | .1144893 | .181611 |
| 140 | .034904 | .0170849 | 2.04 | 0.041 | .001411 | .068397 |
| 141 | .0460388 | .0171494 | 2.68 | 0.007 | .0124193 | .0796582 |
| 142 | .0125785 | .0170974 | 0.74 | 0.462 | -.020939 | .046096 |
| 143 | -.0526768 | .0174231 | -3.02 | 0.003 | -.0868328 | -.0185207 |
| 144 | .0085849 | .0170765 | 0.50 | 0.615 | -.0248917 | .0420615 |
| 145 | .026235 | .017142 | 1.53 | 0.126 | -.0073701 | .0598401 |
| 146 | .0101592 | .0171455 | 0.59 | 0.554 | -.0234527 | .0437711 |
| 147 | -.0571875 | .0170837 | -3.35 | 0.001 | -.0906781 | -.0236968 |
| 148 | -.0134221 | .0171724 | -0.78 | 0.434 | -.0470867 | .0202426 |
| 149 | -.031901 | .0171313 | -1.86 | 0.063 | -.0654849 | .0016829 |
| 150 | .0948328 | .0171226 | 5.54 | 0.000 | .0612658 | .1283997 |
| 151 | .0718996 | .0171187 | 4.20 | 0.000 | .0383402 | .105459 |
| 152 | .0511302 | .0170784 | 2.99 | 0.003 | .0176498 | .0846106 |
| 153 | .0137322 | .0171189 | 0.80 | 0.422 | -.0198274 | .0472919 |
| 154 | .0102959 | .0171328 | 0.60 | 0.548 | -.023291 | .0438828 |
| 155 | .0079635 | .0171219 | 0.47 | 0.642 | -.0256021 | .0415292 |
| 156 | -.0071696 | .0171092 | -0.42 | 0.675 | -.0407102 | .026371 |
| 157 | -.0306744 | .0171116 | -1.79 | 0.073 | -.0642197 | .0028709 |
| 158 | -.0000973 | .0171537 | -0.01 | 0.995 | -.0337252 | .0335306 |
| 159 | .0100507 | .0171292 | 0.59 | 0.557 | -.0235291 | .0436306 |
| 160 | -.003881 | .0171547 | -0.23 | 0.821 | -.0375109 | .0297488 |
| 161 | -.0054513 | .0170979 | -0.32 | 0.750 | -.0389697 | .0280672 |
| 162 | -.0424006 | .0171917 | -2.47 | 0.014 | -.076103 | -.0086983 |
| 163 | -.0316199 | .0170922 | -1.85 | 0.064 | -.0651272 | .0018874 |
| 164 | .2038804 | .0172066 | 11.85 | 0.000 | .1701489 | .237612 |
| _cons | .1394105 | .0121809 | 11.45 | 0.000 | .1155313 | .1632898 |

```
35 .
36 . *pause Part B completed
37 .
38 . *** Part C
39 . * regress inv on firm dummies alone and obtain the residual
40 . reg inv i.firm
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | 15.9015861 | 163 | .097555743 | Number of obs | = 5,740 |
| Residual | 30.583725 | 5,576 | .005484886 | F(163, 5576) | = 17.79 |
| | | | | Prob > F | = 0.0000 |
| | | | | R-squared | = 0.3421 |
| | | | | Adj R-squared | = 0.3228 |
| Total | 46.4853111 | 5,739 | .008099897 | Root MSE | = .07406 |

| inv | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| firm | | | | | | |
| 2 | -.0463644 | .0177037 | -2.62 | 0.009 | -.0810706 | -.0116582 |
| 3 | .0926863 | .0177037 | 5.24 | 0.000 | .0579801 | .1273925 |
| 4 | -.0627225 | .0177037 | -3.54 | 0.000 | -.0974287 | -.0280163 |
| 5 | -.0476682 | .0177037 | -2.69 | 0.007 | -.0823744 | -.012962 |
| 6 | -.0016269 | .0177037 | -0.09 | 0.927 | -.0363331 | .0330794 |
| 7 | -.0547145 | .0177037 | -3.09 | 0.002 | -.0894207 | -.0200083 |
| 8 | -.0605399 | .0177037 | -3.42 | 0.001 | -.0952461 | -.0258337 |
| 9 | -.0449276 | .0177037 | -2.54 | 0.011 | -.0796338 | -.0102214 |
| 10 | -.0271394 | .0177037 | -1.53 | 0.125 | -.0618456 | .0075668 |
| 11 | -.0663346 | .0177037 | -3.75 | 0.000 | -.1010409 | -.0316284 |
| 12 | -.0198649 | .0177037 | -1.12 | 0.262 | -.0545711 | .0148413 |
| 13 | -.0131799 | .0177037 | -0.74 | 0.457 | -.0478861 | .0215264 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | -.0034511 | .0177037 | -0.19 | 0.845 | -.0381573 | .0312551 |
| 15 | .0096168 | .0177037 | 0.54 | 0.587 | -.0250894 | .044323 |
| 16 | -.0460741 | .0177037 | -2.60 | 0.009 | -.0807804 | -.0113679 |
| 17 | -.0215037 | .0177037 | -1.21 | 0.225 | -.0562099 | .0132025 |
| 18 | -.0848731 | .0177037 | -4.79 | 0.000 | -.1195793 | -.0501669 |
| 19 | .0322069 | .0177037 | 1.82 | 0.069 | -.0024993 | .0669131 |
| 20 | .0061922 | .0177037 | 0.35 | 0.727 | -.028514 | .0408984 |
| 21 | -.0214032 | .0177037 | -1.21 | 0.227 | -.0561095 | .013303 |
| 22 | .0072421 | .0177037 | 0.41 | 0.683 | -.0274641 | .0419484 |
| 23 | -.0683914 | .0177037 | -3.86 | 0.000 | -.1030976 | -.0336852 |
| 24 | .0333578 | .0177037 | 1.88 | 0.060 | -.0013484 | .068064 |
| 25 | .0711326 | .0177037 | 4.02 | 0.000 | .0364264 | .1058388 |
| 26 | -.0387809 | .0177037 | -2.19 | 0.029 | -.0734871 | -.0040746 |
| 27 | .0169559 | .0177037 | 0.96 | 0.338 | -.0177503 | .0516621 |
| 28 | -.0492857 | .0177037 | -2.78 | 0.005 | -.0839919 | -.0145795 |
| 29 | -.0339525 | .0177037 | -1.92 | 0.055 | -.0686587 | .0007537 |
| 30 | .0179631 | .0177037 | 1.01 | 0.310 | -.0167431 | .0526693 |
| 31 | .0538777 | .0177037 | 3.04 | 0.002 | .0191715 | .0885839 |
| 32 | -.0142134 | .0177037 | -0.80 | 0.422 | -.0489196 | .0204928 |
| 33 | .0474473 | .0177037 | 2.68 | 0.007 | .012741 | .0821535 |
| 34 | -.0317294 | .0177037 | -1.79 | 0.073 | -.0664357 | .0029768 |
| 35 | .0413572 | .0177037 | 2.34 | 0.020 | .006651 | .0760634 |
| 36 | .0270809 | .0177037 | 1.53 | 0.126 | -.0076253 | .0617871 |
| 37 | -.049687 | .0177037 | -2.81 | 0.005 | -.0843932 | -.0149808 |
| 38 | .0359605 | .0177037 | 2.03 | 0.042 | .0012543 | .0706667 |
| 39 | -.0297369 | .0177037 | -1.68 | 0.093 | -.0644431 | .0049694 |
| 40 | -.0190212 | .0177037 | -1.07 | 0.283 | -.0537274 | .015685 |
| 41 | .0059927 | .0177037 | 0.34 | 0.735 | -.0287135 | .0406989 |
| 42 | -.0215471 | .0177037 | -1.22 | 0.224 | -.0562533 | .0131591 |
| 43 | -.0231805 | .0177037 | -1.31 | 0.190 | -.0578867 | .0115257 |
| 44 | .0198575 | .0177037 | 1.12 | 0.262 | -.0148487 | .0545637 |
| 45 | .0162103 | .0177037 | 0.92 | 0.360 | -.0184959 | .0509165 |
| 46 | .0425333 | .0177037 | 2.40 | 0.016 | .0078271 | .0772395 |
| 47 | -.0457316 | .0177037 | -2.58 | 0.010 | -.0804378 | -.0110254 |
| 48 | .0263947 | .0177037 | 1.49 | 0.136 | -.0083115 | .0611009 |
| 49 | -.0461492 | .0177037 | -2.61 | 0.009 | -.0808554 | -.011443 |
| 50 | -.0709933 | .0177037 | -4.01 | 0.000 | -.1056995 | -.0362871 |
| 51 | -.047524 | .0177037 | -2.68 | 0.007 | -.0822302 | -.0128178 |
| 52 | -.0449302 | .0177037 | -2.54 | 0.011 | -.0796364 | -.0102239 |
| 53 | -.0726629 | .0177037 | -4.10 | 0.000 | -.1073691 | -.0379566 |
| 54 | -.0039451 | .0177037 | -0.22 | 0.824 | -.0386513 | .0307611 |
| 55 | -.0115221 | .0177037 | -0.65 | 0.515 | -.0462283 | .0231841 |
| 56 | -.0000788 | .0177037 | -0.00 | 0.996 | -.034785 | .0346274 |
| 57 | .0165654 | .0177037 | 0.94 | 0.349 | -.0181408 | .0512716 |
| 58 | -.0220309 | .0177037 | -1.24 | 0.213 | -.0567371 | .0126753 |
| 59 | -.0066356 | .0177037 | -0.37 | 0.708 | -.0413418 | .0280706 |
| 60 | .0316898 | .0177037 | 1.79 | 0.074 | -.0030165 | .066396 |
| 61 | .0677658 | .0177037 | 3.83 | 0.000 | .0330596 | .102472 |
| 62 | .0272186 | .0177037 | 1.54 | 0.124 | -.0074876 | .0619248 |
| 63 | -.0477142 | .0177037 | -2.70 | 0.007 | -.0824204 | -.013008 |
| 64 | .0015401 | .0177037 | 0.09 | 0.931 | -.0331661 | .0362463 |
| 65 | .0155501 | .0177037 | 0.88 | 0.380 | -.0191561 | .0502563 |
| 66 | .0752376 | .0177037 | 4.25 | 0.000 | .0405314 | .1099438 |
| 67 | .0434331 | .0177037 | 2.45 | 0.014 | .0087269 | .0781393 |
| 68 | -.0281283 | .0177037 | -1.59 | 0.112 | -.0628345 | .006578 |
| 69 | .0204488 | .0177037 | 1.16 | 0.248 | -.0142574 | .055155 |
| 70 | .0477585 | .0177037 | 2.70 | 0.007 | .0130522 | .0824647 |
| 71 | -.0011984 | .0177037 | -0.07 | 0.946 | -.0359046 | .0335078 |
| 72 | .0412188 | .0177037 | 2.33 | 0.020 | .0065126 | .075925 |
| 73 | .0328962 | .0177037 | 1.86 | 0.063 | -.00181 | .0676024 |
| 74 | .0959444 | .0177037 | 5.42 | 0.000 | .0612382 | .1306506 |
| 75 | -.0248425 | .0177037 | -1.40 | 0.161 | -.0595487 | .0098637 |
| 76 | -.0597242 | .0177037 | -3.37 | 0.001 | -.0944304 | -.025018 |
| 77 | .0155004 | .0177037 | 0.88 | 0.381 | -.0192058 | .0502066 |
| 78 | .0023913 | .0177037 | 0.14 | 0.893 | -.0323149 | .0370975 |
| 79 | .051463 | .0177037 | 2.91 | 0.004 | .0167568 | .0861692 |
| 80 | -.0282713 | .0177037 | -1.60 | 0.110 | -.0629775 | .0064349 |
| 81 | -.0115589 | .0177037 | -0.65 | 0.514 | -.0462651 | .0231473 |
| 82 | -.0463194 | .0177037 | -2.62 | 0.009 | -.0810256 | -.0116132 |
| 83 | .0549381 | .0177037 | 3.10 | 0.002 | .0202319 | .0896443 |
| 84 | -.0237981 | .0177037 | -1.34 | 0.179 | -.0585043 | .0109081 |
| 85 | -.0395869 | .0177037 | -2.24 | 0.025 | -.0742931 | -.0048807 |
| 86 | .0140537 | .0177037 | 0.79 | 0.427 | -.0206525 | .0487599 |
| 87 | -.0456679 | .0177037 | -2.58 | 0.010 | -.0803741 | -.0109617 |
| 88 | -.0978886 | .0177037 | -5.53 | 0.000 | -.1325948 | -.0631824 |
| 89 | .1567992 | .0177037 | 8.86 | 0.000 | .122093 | .1915054 |
| 90 | -.0246092 | .0177037 | -1.39 | 0.165 | -.0593154 | .010097 |
| 91 | -.0588708 | .0177037 | -3.33 | 0.001 | -.093577 | -.0241646 |
| 92 | -.0387872 | .0177037 | -2.19 | 0.028 | -.0734934 | -.004081 |
| 93 | .0641024 | .0177037 | 3.62 | 0.000 | .0293962 | .0988086 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 94 | -.0308961 | .0177037 | -1.75 | 0.081 | -.0656023 | .0038101 |
| 95 | -.0396196 | .0177037 | -2.24 | 0.025 | -.0743258 | -.0049134 |
| 96 | -.055389 | .0177037 | -3.13 | 0.002 | -.0900952 | -.0206828 |
| 97 | .168835 | .0177037 | 9.54 | 0.000 | .1341288 | .2035412 |
| 98 | -.031635 | .0177037 | -1.79 | 0.074 | -.0663412 | .0030712 |
| 99 | .0621631 | .0177037 | 3.51 | 0.000 | .0274569 | .0968693 |
| 100 | .0044086 | .0177037 | 0.25 | 0.803 | -.0302976 | .0391148 |
| 101 | -.0416618 | .0177037 | -2.35 | 0.019 | -.076368 | -.0069556 |
| 102 | -.001127 | .0177037 | -0.06 | 0.949 | -.0358332 | .0335792 |
| 103 | .060717 | .0177037 | 3.43 | 0.001 | .0260108 | .0954232 |
| 104 | -.0782415 | .0177037 | -4.42 | 0.000 | -.1129477 | -.0435352 |
| 105 | -.0357128 | .0177037 | -2.02 | 0.044 | -.070419 | -.0010066 |
| 106 | -.0270939 | .0177037 | -1.53 | 0.126 | -.0618001 | .0076123 |
| 107 | .0401573 | .0177037 | 2.27 | 0.023 | .0054511 | .0748635 |
| 108 | -.0653616 | .0177037 | -3.69 | 0.000 | -.1000678 | -.0306554 |
| 109 | -.0560756 | .0177037 | -3.17 | 0.002 | -.0907818 | -.0213694 |
| 110 | .0065055 | .0177037 | 0.37 | 0.713 | -.0282007 | .0412117 |
| 111 | -.0301916 | .0177037 | -1.71 | 0.088 | -.0648978 | .0045146 |
| 112 | .0143614 | .0177037 | 0.81 | 0.417 | -.0203448 | .0490677 |
| 113 | -.0112408 | .0177037 | -0.63 | 0.525 | -.045947 | .0234654 |
| 114 | .0594683 | .0177037 | 3.36 | 0.001 | .0247621 | .0941745 |
| 115 | -.0520106 | .0177037 | -2.94 | 0.003 | -.0867168 | -.0173044 |
| 116 | .0191136 | .0177037 | 1.08 | 0.280 | -.0155926 | .0538198 |
| 117 | .1078621 | .0177037 | 6.09 | 0.000 | .0731559 | .1425683 |
| 118 | -.0413463 | .0177037 | -2.34 | 0.020 | -.0760525 | -.0066401 |
| 119 | -.0390276 | .0177037 | -2.20 | 0.028 | -.0737338 | -.0043214 |
| 120 | .0494182 | .0177037 | 2.79 | 0.005 | .014712 | .0841244 |
| 121 | -.0457608 | .0177037 | -2.58 | 0.010 | -.080467 | -.0110546 |
| 122 | -.0580835 | .0177037 | -3.28 | 0.001 | -.0927897 | -.0233773 |
| 123 | .0869552 | .0177037 | 4.91 | 0.000 | .052249 | .1216614 |
| 124 | .006985 | .0177037 | 0.39 | 0.693 | -.0277212 | .0416912 |
| 125 | -.0312861 | .0177037 | -1.77 | 0.077 | -.0659923 | .0034201 |
| 126 | -.0369805 | .0177037 | -2.09 | 0.037 | -.0716867 | -.0022743 |
| 127 | -.0143831 | .0177037 | -0.81 | 0.417 | -.0490894 | .0203231 |
| 128 | .0574712 | .0177037 | 3.25 | 0.001 | .022765 | .0921774 |
| 129 | .013773 | .0177037 | 0.78 | 0.437 | -.0209332 | .0484792 |
| 130 | -.0983107 | .0177037 | -5.55 | 0.000 | -.1330169 | -.0636044 |
| 131 | -.0066625 | .0177037 | -0.38 | 0.707 | -.0413687 | .0280437 |
| 132 | -.0674566 | .0177037 | -3.81 | 0.000 | -.1021628 | -.0327504 |
| 133 | .0762481 | .0177037 | 4.31 | 0.000 | .0415419 | .1109543 |
| 134 | .1330009 | .0177037 | 7.51 | 0.000 | .0982946 | .1677071 |
| 135 | -.082001 | .0177037 | -4.63 | 0.000 | -.1167072 | -.0472948 |
| 136 | -.0205373 | .0177037 | -1.16 | 0.246 | -.0552435 | .0141689 |
| 137 | -.0525667 | .0177037 | -2.97 | 0.003 | -.0872729 | -.0178605 |
| 138 | .0158057 | .0177037 | 0.89 | 0.372 | -.0189005 | .0505119 |
| 139 | .1230968 | .0177037 | 6.95 | 0.000 | .0883906 | .157803 |
| 140 | .023623 | .0177037 | 1.33 | 0.182 | -.0110832 | .0583292 |
| 141 | .0136152 | .0177037 | 0.77 | 0.442 | -.021091 | .0483214 |
| 142 | -.0049101 | .0177037 | -0.28 | 0.782 | -.0396163 | .0297961 |
| 143 | .0181167 | .0177037 | 1.02 | 0.306 | -.0165895 | .0528229 |
| 144 | .0112982 | .0177037 | 0.64 | 0.523 | -.023408 | .0460044 |
| 145 | -.0045251 | .0177037 | -0.26 | 0.798 | -.0392313 | .0301811 |
| 146 | -.0214016 | .0177037 | -1.21 | 0.227 | -.0561078 | .0133046 |
| 147 | -.0467027 | .0177037 | -2.64 | 0.008 | -.0814089 | -.0119965 |
| 148 | -.0506048 | .0177037 | -2.86 | 0.004 | -.085311 | -.0158986 |
| 149 | -.0600311 | .0177037 | -3.39 | 0.001 | -.0947373 | -.0253249 |
| 150 | .069006 | .0177037 | 3.90 | 0.000 | .0342998 | .1037122 |
| 151 | .0471642 | .0177037 | 2.66 | 0.008 | .012458 | .0818705 |
| 152 | .0452041 | .0177037 | 2.55 | 0.011 | .0104979 | .0799103 |
| 153 | -.0110455 | .0177037 | -0.62 | 0.533 | -.0457517 | .0236608 |
| 154 | -.0182215 | .0177037 | -1.03 | 0.303 | -.0529277 | .0164847 |
| 155 | -.0176781 | .0177037 | -1.00 | 0.318 | -.0523843 | .0170281 |
| 156 | -.0289575 | .0177037 | -1.64 | 0.102 | -.0636637 | .0057487 |
| 157 | -.0532392 | .0177037 | -3.01 | 0.003 | -.0879454 | -.018533 |
| 158 | -.0334624 | .0177037 | -1.89 | 0.059 | -.0681686 | .0012438 |
| 159 | -.017543 | .0177037 | -0.99 | 0.322 | -.0522492 | .0171632 |
| 160 | -.037459 | .0177037 | -2.12 | 0.034 | -.0721652 | -.0027528 |
| 161 | -.0231408 | .0177037 | -1.31 | 0.191 | -.0578471 | .0115654 |
| 162 | -.0831324 | .0177037 | -4.70 | 0.000 | -.1178386 | -.0484262 |
| 163 | -.0468346 | .0177037 | -2.65 | 0.008 | -.0815408 | -.0121284 |
| 164 | .2471651 | .0177037 | 13.96 | 0.000 | .2124589 | .2818713 |
| _cons | .1722653 | .0125184 | 13.76 | 0.000 | .1477243 | .1968063 |

```
41 . predict einv, residuals

42 .
43 . * regress q on firm dummies alone and obtain the residual
44 . reg q i.firm
```

| Source | SS | df | MS | Number of obs | = | 5,740 |
|---|---|---|---|---|---|---|
| | | | | F(163, 5576) | = | 35.69 |
| Model | 42404.191 | 163 | 260.148411 | Prob > F | = | 0.0000 |
| Residual | 40640.1674 | 5,576 | 7.28840879 | R-squared | = | 0.5106 |
| | | | | Adj R-squared | = | 0.4963 |
| Total | 83044.3584 | 5,739 | 14.4701792 | Root MSE | = | 2.6997 |

| q | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| firm | | | | | | |
| 2 | -4.866352 | .645353 | -7.54 | 0.000 | -6.131495 | -3.601208 |
| 3 | -3.003586 | .645353 | -4.65 | 0.000 | -4.268729 | -1.738443 |
| 4 | -4.527385 | .645353 | -7.02 | 0.000 | -5.792528 | -3.262242 |
| 5 | -4.758758 | .645353 | -7.37 | 0.000 | -6.023901 | -3.493615 |
| 6 | -4.300253 | .645353 | -6.66 | 0.000 | -5.565397 | -3.03511 |
| 7 | -5.067738 | .645353 | -7.85 | 0.000 | -6.332881 | -3.802595 |
| 8 | -4.367086 | .645353 | -6.77 | 0.000 | -5.632229 | -3.101943 |
| 9 | -4.778749 | .645353 | -7.40 | 0.000 | -6.043893 | -3.513606 |
| 10 | -3.910269 | .645353 | -6.06 | 0.000 | -5.175412 | -2.645126 |
| 11 | -4.552061 | .645353 | -7.05 | 0.000 | -5.817204 | -3.286918 |
| 12 | -2.99148 | .645353 | -4.64 | 0.000 | -4.256624 | -1.726337 |
| 13 | 6.827187 | .645353 | 10.58 | 0.000 | 5.562044 | 8.092331 |
| 14 | -4.61121 | .645353 | -7.15 | 0.000 | -5.876354 | -3.346067 |
| 15 | -2.805525 | .645353 | -4.35 | 0.000 | -4.070668 | -1.540381 |
| 16 | -4.898768 | .645353 | -7.59 | 0.000 | -6.163911 | -3.633625 |
| 17 | -3.984481 | .645353 | -6.17 | 0.000 | -5.249625 | -2.719338 |
| 18 | -5.096064 | .645353 | -7.90 | 0.000 | -6.361207 | -3.83092 |
| 19 | -4.358045 | .645353 | -6.75 | 0.000 | -5.623189 | -3.092902 |
| 20 | -4.323588 | .645353 | -6.70 | 0.000 | -5.588732 | -3.058445 |
| 21 | -3.414516 | .645353 | -5.29 | 0.000 | -4.67966 | -2.149373 |
| 22 | -3.175872 | .645353 | -4.92 | 0.000 | -4.441016 | -1.910729 |
| 23 | -5.251062 | .645353 | -8.14 | 0.000 | -6.516205 | -3.985919 |
| 24 | -1.137682 | .645353 | -1.76 | 0.078 | -2.402825 | .1274617 |
| 25 | -3.759242 | .645353 | -5.83 | 0.000 | -5.024385 | -2.494099 |
| 26 | -4.054692 | .645353 | -6.28 | 0.000 | -5.319835 | -2.789549 |
| 27 | -4.216341 | .645353 | -6.53 | 0.000 | -5.481485 | -2.951198 |
| 28 | 1.023417 | .645353 | 1.59 | 0.113 | -.2417258 | 2.288561 |
| 29 | -3.212386 | .645353 | -4.98 | 0.000 | -4.47753 | -1.947243 |
| 30 | -3.526282 | .645353 | -5.46 | 0.000 | -4.791425 | -2.261138 |
| 31 | -2.992644 | .645353 | -4.64 | 0.000 | -4.257788 | -1.727501 |
| 32 | -4.799077 | .645353 | -7.44 | 0.000 | -6.06422 | -3.533934 |
| 33 | -2.02086 | .645353 | -3.13 | 0.002 | -3.286003 | -.7557163 |
| 34 | -4.800237 | .645353 | -7.44 | 0.000 | -6.065381 | -3.535094 |
| 35 | -3.016051 | .645353 | -4.67 | 0.000 | -4.281194 | -1.750908 |
| 36 | -3.882698 | .645353 | -6.02 | 0.000 | -5.147841 | -2.617554 |
| 37 | -3.95331 | .645353 | -6.13 | 0.000 | -5.218453 | -2.688167 |
| 38 | -4.353644 | .645353 | -6.75 | 0.000 | -5.618787 | -3.088501 |
| 39 | -4.427102 | .645353 | -6.86 | 0.000 | -5.692245 | -3.161959 |
| 40 | -3.360462 | .645353 | -5.21 | 0.000 | -4.625605 | -2.095318 |
| 41 | 2.368921 | .645353 | 3.67 | 0.000 | 1.103778 | 3.634065 |
| 42 | -3.516076 | .645353 | -5.45 | 0.000 | -4.781219 | -2.250933 |
| 43 | -4.510337 | .645353 | -6.99 | 0.000 | -5.77548 | -3.245193 |
| 44 | -3.992002 | .645353 | -6.19 | 0.000 | -5.257146 | -2.726859 |
| 45 | -3.720063 | .645353 | -5.76 | 0.000 | -4.985206 | -2.45492 |
| 46 | -4.422873 | .645353 | -6.85 | 0.000 | -5.688017 | -3.15773 |
| 47 | -4.743883 | .645353 | -7.35 | 0.000 | -6.009026 | -3.47874 |
| 48 | 2.809145 | .645353 | 4.35 | 0.000 | 1.544001 | 4.074288 |
| 49 | -5.324561 | .645353 | -8.25 | 0.000 | -6.589704 | -4.059418 |
| 50 | -4.941651 | .645353 | -7.66 | 0.000 | -6.206794 | -3.676507 |
| 51 | -4.544886 | .645353 | -7.04 | 0.000 | -5.81003 | -3.279743 |
| 52 | -3.849973 | .645353 | -5.97 | 0.000 | -5.115116 | -2.58483 |
| 53 | -5.183904 | .645353 | -8.03 | 0.000 | -6.449047 | -3.918761 |
| 54 | -3.559118 | .645353 | -5.51 | 0.000 | -4.824262 | -2.293975 |
| 55 | -4.617728 | .645353 | -7.16 | 0.000 | -5.882871 | -3.352585 |
| 56 | -4.402726 | .645353 | -6.82 | 0.000 | -5.667869 | -3.137582 |
| 57 | -4.075778 | .645353 | -6.32 | 0.000 | -5.340921 | -2.810635 |
| 58 | -.7649613 | .645353 | -1.19 | 0.236 | -2.030105 | .500182 |
| 59 | -4.478312 | .645353 | -6.94 | 0.000 | -5.743455 | -3.213169 |
| 60 | -1.993179 | .645353 | -3.09 | 0.002 | -3.258322 | -.7280354 |
| 61 | -3.732652 | .645353 | -5.78 | 0.000 | -4.997795 | -2.467508 |
| 62 | 1.251882 | .645353 | 1.94 | 0.052 | -.0132611 | 2.517025 |
| 63 | -4.664669 | .645353 | -7.23 | 0.000 | -5.929812 | -3.399526 |
| 64 | 3.224053 | .645353 | 5.00 | 0.000 | 1.958909 | 4.489196 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 65 | -3.775961 | .645353 | -5.85 | 0.000 | -5.041104 | -2.510818 |
| 66 | .0659443 | .645353 | 0.10 | 0.919 | -1.199199 | 1.331088 |
| 67 | -3.686471 | .645353 | -5.71 | 0.000 | -4.951614 | -2.421327 |
| 68 | -3.917178 | .645353 | -6.07 | 0.000 | -5.182321 | -2.652034 |
| 69 | -3.524795 | .645353 | -5.46 | 0.000 | -4.789938 | -2.259652 |
| 70 | -2.835203 | .645353 | -4.39 | 0.000 | -4.100346 | -1.57006 |
| 71 | -4.027183 | .645353 | -6.24 | 0.000 | -5.292326 | -2.762039 |
| 72 | -3.765691 | .645353 | -5.84 | 0.000 | -5.030834 | -2.500547 |
| 73 | -.0799685 | .645353 | -0.12 | 0.901 | -1.345112 | 1.185175 |
| 74 | -3.145733 | .645353 | -4.87 | 0.000 | -4.410876 | -1.88059 |
| 75 | -3.431694 | .645353 | -5.32 | 0.000 | -4.696837 | -2.16655 |
| 76 | -5.224431 | .645353 | -8.10 | 0.000 | -6.489575 | -3.959288 |
| 77 | -2.735045 | .645353 | -4.24 | 0.000 | -4.000188 | -1.469901 |
| 78 | -1.744269 | .645353 | -2.70 | 0.007 | -3.009412 | -.4791253 |
| 79 | 5.688083 | .645353 | 8.81 | 0.000 | 4.422939 | 6.953226 |
| 80 | -4.443287 | .645353 | -6.89 | 0.000 | -5.708431 | -3.178144 |
| 81 | -4.14593 | .645353 | -6.42 | 0.000 | -5.411073 | -2.880786 |
| 82 | -4.785723 | .645353 | -7.42 | 0.000 | -6.050866 | -3.520579 |
| 83 | -3.828204 | .645353 | -5.93 | 0.000 | -5.093348 | -2.563061 |
| 84 | -4.700998 | .645353 | -7.28 | 0.000 | -5.966141 | -3.435854 |
| 85 | -4.411584 | .645353 | -6.84 | 0.000 | -5.676728 | -3.146441 |
| 86 | -2.380325 | .645353 | -3.69 | 0.000 | -3.645468 | -1.115181 |
| 87 | -2.501125 | .645353 | -3.88 | 0.000 | -3.766268 | -1.235982 |
| 88 | -5.227596 | .645353 | -8.10 | 0.000 | -6.49274 | -3.962453 |
| 89 | -.900681 | .645353 | -1.40 | 0.163 | -2.165824 | .3644622 |
| 90 | -4.520257 | .645353 | -7.00 | 0.000 | -5.785401 | -3.255114 |
| 91 | -3.858013 | .645353 | -5.98 | 0.000 | -5.123156 | -2.592869 |
| 92 | -2.856521 | .645353 | -4.43 | 0.000 | -4.121664 | -1.591377 |
| 93 | .3832855 | .645353 | 0.59 | 0.553 | -.8818578 | 1.648429 |
| 94 | -4.256308 | .645353 | -6.60 | 0.000 | -5.521452 | -2.991165 |
| 95 | -4.171619 | .645353 | -6.46 | 0.000 | -5.436762 | -2.906476 |
| 96 | -5.261856 | .645353 | -8.15 | 0.000 | -6.526999 | -3.996713 |
| 97 | 4.941089 | .645353 | 7.66 | 0.000 | 3.675946 | 6.206233 |
| 98 | -3.930475 | .645353 | -6.09 | 0.000 | -5.195618 | -2.665331 |
| 99 | 2.91987 | .645353 | 4.52 | 0.000 | 1.654727 | 4.185013 |
| 100 | -3.770992 | .645353 | -5.84 | 0.000 | -5.036135 | -2.505848 |
| 101 | -4.13243 | .645353 | -6.40 | 0.000 | -5.397574 | -2.867287 |
| 102 | .4942529 | .645353 | 0.77 | 0.444 | -.7708903 | 1.759396 |
| 103 | -2.791056 | .645353 | -4.32 | 0.000 | -4.056199 | -1.525912 |
| 104 | -4.941557 | .645353 | -7.66 | 0.000 | -6.2067 | -3.676414 |
| 105 | -3.646751 | .645353 | -5.65 | 0.000 | -4.911895 | -2.381608 |
| 106 | -5.073405 | .645353 | -7.86 | 0.000 | -6.338548 | -3.808262 |
| 107 | -3.679438 | .645353 | -5.70 | 0.000 | -4.944582 | -2.414295 |
| 108 | -4.607226 | .645353 | -7.14 | 0.000 | -5.872369 | -3.342082 |
| 109 | -4.858157 | .645353 | -7.53 | 0.000 | -6.1233 | -3.593014 |
| 110 | -4.706094 | .645353 | -7.29 | 0.000 | -5.971237 | -3.440951 |
| 111 | -4.628273 | .645353 | -7.17 | 0.000 | -5.893416 | -3.36313 |
| 112 | 6.76293 | .645353 | 10.48 | 0.000 | 5.497787 | 8.028073 |
| 113 | -4.744689 | .645353 | -7.35 | 0.000 | -6.009832 | -3.479546 |
| 114 | 6.468334 | .645353 | 10.02 | 0.000 | 5.203191 | 7.733478 |
| 115 | -4.840617 | .645353 | -7.50 | 0.000 | -6.10576 | -3.575474 |
| 116 | -3.198145 | .645353 | -4.96 | 0.000 | -4.463288 | -1.933002 |
| 117 | -1.53468 | .645353 | -2.38 | 0.017 | -2.799824 | -.269537 |
| 118 | -4.583168 | .645353 | -7.10 | 0.000 | -5.848311 | -3.318024 |
| 119 | -2.328837 | .645353 | -3.61 | 0.000 | -3.59398 | -1.063694 |
| 120 | 3.537956 | .645353 | 5.48 | 0.000 | 2.272813 | 4.803099 |
| 121 | -4.903066 | .645353 | -7.60 | 0.000 | -6.168209 | -3.637923 |
| 122 | -4.399257 | .645353 | -6.82 | 0.000 | -5.664401 | -3.134114 |
| 123 | -3.730955 | .645353 | -5.78 | 0.000 | -4.996098 | -2.465812 |
| 124 | -2.883669 | .645353 | -4.47 | 0.000 | -4.148812 | -1.618525 |
| 125 | -3.91029 | .645353 | -6.06 | 0.000 | -5.175434 | -2.645147 |
| 126 | -4.147117 | .645353 | -6.43 | 0.000 | -5.41226 | -2.881973 |
| 127 | -3.864778 | .645353 | -5.99 | 0.000 | -5.129921 | -2.599635 |
| 128 | -1.473463 | .645353 | -2.28 | 0.022 | -2.738606 | -.2083193 |
| 129 | -.1202265 | .645353 | -0.19 | 0.852 | -1.38537 | 1.144917 |
| 130 | -4.537601 | .645353 | -7.03 | 0.000 | -5.802744 | -3.272458 |
| 131 | -4.070799 | .645353 | -6.31 | 0.000 | -5.335942 | -2.805656 |
| 132 | -4.347549 | .645353 | -6.74 | 0.000 | -5.612693 | -3.082406 |
| 133 | -2.758069 | .645353 | -4.27 | 0.000 | -4.023212 | -1.492926 |
| 134 | -2.942074 | .645353 | -4.56 | 0.000 | -4.207217 | -1.67693 |
| 135 | -4.827747 | .645353 | -7.48 | 0.000 | -6.09289 | -3.562603 |
| 136 | -4.176109 | .645353 | -6.47 | 0.000 | -5.441253 | -2.910966 |
| 137 | -4.257219 | .645353 | -6.60 | 0.000 | -5.522362 | -2.992075 |
| 138 | -4.456349 | .645353 | -6.91 | 0.000 | -5.721493 | -3.191206 |
| 139 | -3.442303 | .645353 | -5.33 | 0.000 | -4.707446 | -2.17716 |
| 140 | -1.556216 | .645353 | -2.41 | 0.016 | -2.821359 | -.2910723 |
| 141 | -4.472818 | .645353 | -6.93 | 0.000 | -5.737962 | -3.207675 |
| 142 | -2.412541 | .645353 | -3.74 | 0.000 | -3.677684 | -1.147398 |
| 143 | 9.765928 | .645353 | 15.13 | 0.000 | 8.500785 | 11.03107 |
| 144 | .3742963 | .645353 | 0.58 | 0.562 | -.890847 | 1.63944 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 145 | -4.243346 | .645353 | -6.58 | 0.000 | -5.508489 | -2.978203 |
| 146 | -4.353792 | .645353 | -6.75 | 0.000 | -5.618935 | -3.088649 |
| 147 | 1.446372 | .645353 | 2.24 | 0.025 | .1812283 | 2.711515 |
| 148 | -5.129339 | .645353 | -7.95 | 0.000 | -6.394483 | -3.864196 |
| 149 | -3.880535 | .645353 | -6.01 | 0.000 | -5.145679 | -2.615392 |
| 150 | -3.562787 | .645353 | -5.52 | 0.000 | -4.827931 | -2.297644 |
| 151 | -3.412235 | .645353 | -5.29 | 0.000 | -4.677378 | -2.147092 |
| 152 | -.8175055 | .645353 | -1.27 | 0.205 | -2.082649 | .4476378 |
| 153 | -3.418071 | .645353 | -5.30 | 0.000 | -4.683214 | -2.152928 |
| 154 | -3.933964 | .645353 | -6.10 | 0.000 | -5.199108 | -2.668821 |
| 155 | -3.53725 | .645353 | -5.48 | 0.000 | -4.802393 | -2.272106 |
| 156 | -3.005625 | .645353 | -4.66 | 0.000 | -4.270768 | -1.740481 |
| 157 | -3.112807 | .645353 | -4.82 | 0.000 | -4.37795 | -1.847663 |
| 158 | -4.602697 | .645353 | -7.13 | 0.000 | -5.867841 | -3.337554 |
| 159 | -3.806547 | .645353 | -5.90 | 0.000 | -5.071691 | -2.541404 |
| 160 | -4.632064 | .645353 | -7.18 | 0.000 | -5.897208 | -3.366921 |
| 161 | -2.440271 | .645353 | -3.78 | 0.000 | -3.705414 | -1.175128 |
| 162 | -5.618929 | .645353 | -8.71 | 0.000 | -6.884072 | -4.353786 |
| 163 | -2.098864 | .645353 | -3.25 | 0.001 | -3.364007 | -.8337206 |
| 164 | 5.9711 | .645353 | 9.25 | 0.000 | 4.705957 | 7.236243 |
| _cons | 4.532296 | .4563335 | 9.93 | 0.000 | 3.637705 | 5.426888 |

```
45 . predict eq, residuals

46 .
47 . * regress einv on eq, the partitioned regression, partialing out result
48 . reg einv eq
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | 2.13557517 | 1 | 2.13557517 | Prob > F | 0.0000 |
| Residual | 28.4481498 | 5,738 | .004957851 | R-squared | 0.0698 |
| Total | 30.583725 | 5,739 | .005329104 | Adj R-squared | 0.0697 |
| | | | | Root MSE | .07041 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of obs | = | 5,740 | | | | |
| F(1, 5738) | = | 430.75 | | | | |
| Prob > F | = | 0.0000 | | | | |
| R-squared | = | 0.0698 | | | | |
| Adj R-squared | = | 0.0697 | | | | |
| Root MSE | = | .07041 | | | | |

| einv | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| eq | .007249 | .0003493 | 20.75 | 0.000 | .0065643 | .0079337 |
| _cons | 1.59e-12 | .0009294 | 0.00 | 1.000 | -.0018219 | .0018219 |

```
49 .
50 . * Follow up questions addressed in the LaTex write-up
51 .
52 . *pause Part C completed
53 .
54 .
55 . *** Part D
56 . * Purely analytical and addressed in the LaTex write-up
57 . * Not asked to compute anything in Stata
58 .
59 .
60 . *** Part E
61 . * Regress inv on eq
62 . reg inv eq
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | 2.13557518 | 1 | 2.13557518 | Prob > F | 0.0000 |
| Residual | 44.349736 | 5,738 | .007729128 | R-squared | 0.0459 |
| Total | 46.4853111 | 5,739 | .008099897 | Adj R-squared | 0.0458 |
| | | | | Root MSE | .08792 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of obs | = | 5,740 | | | | |
| F(1, 5738) | = | 276.30 | | | | |
| Prob > F | = | 0.0000 | | | | |
| R-squared | = | 0.0459 | | | | |
| Adj R-squared | = | 0.0458 | | | | |
| Root MSE | = | .08792 | | | | |

| inv | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| eq | .007249 | .0004361 | 16.62 | 0.000 | .0063941 | .0081039 |
| _cons | .1686158 | .0011604 | 145.31 | 0.000 | .166341 | .1708906 |

```
63 .
64 . * Follow up questions addressed in the LaTex write-up
65 .
66 . *pause Part E completed
67 .
   end of do-file

68 .
69 .
70 . ******************************************************************
71 . ************************* START QUESTION 5 ************************
72 . ******************************************************************
73 . do $programdir/stata_32.do

74 . /*
   > Grant Aarons
   > gaarons@london.edu
   > Econometrics 1, London Business School
   > Assignment 3
   > */
75 . * Load the data
76 . import excel "$datadir/ps3.xls", sheet("Sheet1") firstrow clear

77 . *pause Dataset has been loaded
78 .
79 . * Need to identify panelists/firms
80 . gen individual = _n

81 .
82 . * Reshape the data from wide to long
83 . reshape long w ed a, i(individual) j(year)
   (note: j = 0 1 2)

   Data                               wide   ->   long
   -----------------------------------------------------------------------------
   Number of obs.                     1500   ->    4500
   Number of variables                  10   ->       5
   j variable (3 values)                     ->   year
   xij variables:
                                 w0 w1 w2   ->   w
                              ed0 ed1 ed2   ->   ed
                                 a0 a1 a2   ->   a
   -----------------------------------------------------------------------------

84 . replace w = log(w)
   variable w was long now double
   (4,500 real changes made)

85 . gen xp = a-ed-6

86 . gen xp_p2 = xp^2

87 .
88 . * Create necessary variables
89 . by individual: egen luwe=mean(w)

90 . by individual: egen educ=mean(ed)

91 . by individual: egen exp=mean(xp)

92 . by individual: egen exp_p2=mean(xp_p2)

93 .
94 . *pause Check the means calculated above by individual
95 .
96 . *** Part A
97 . * For the 1990 portion of the data, regress log(wage) on constant, educ, exp, exp2
98 . * NOT SURE THAT THE PSET is written correctly, want the means of the individual over each variable..
   > .?
```

```
 99 .
100 . * should we regress the average over all individuals or just 1990
101 . * (average by individual used later) NOT THIS: reg luwe educ exp exp_p2
102 . reg w ed xp xp_p2 if year==0
```

| Source | SS | df | MS | Number of obs | = | 1,500 |
|---|---|---|---|---|---|---|
| | | | | F(3, 1496) | = | 46.28 |
| Model | 91.6141861 | 3 | 30.538062 | Prob > F | = | 0.0000 |
| Residual | 987.209592 | 1,496 | .65989946 | R-squared | = | 0.0849 |
| | | | | Adj R-squared | = | 0.0831 |
| Total | 1078.82378 | 1,499 | .719695649 | Root MSE | = | .81234 |

| w | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | .1440517 | .0131358 | 10.97 | 0.000 | .1182852 | .1698182 |
| xp | .026499 | .0284373 | 0.93 | 0.352 | -.0292823 | .0822802 |
| xp_p2 | .0009687 | .0013386 | 0.72 | 0.469 | -.0016571 | .0035945 |
| _cons | 7.384689 | .2795876 | 26.41 | 0.000 | 6.836263 | 7.933114 |

```
103 .
104 . * Pooled Regression (1990-1992)
105 . reg w ed xp xp_p2
```

| Source | SS | df | MS | Number of obs | = | 4,500 |
|---|---|---|---|---|---|---|
| | | | | F(3, 4496) | = | 164.80 |
| Model | 318.441207 | 3 | 106.147069 | Prob > F | = | 0.0000 |
| Residual | 2895.83354 | 4,496 | .64409109 | R-squared | = | 0.0991 |
| | | | | Adj R-squared | = | 0.0985 |
| Total | 3214.27475 | 4,499 | .714442043 | Root MSE | = | .80255 |

| w | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | .1479199 | .0072281 | 20.46 | 0.000 | .1337493 | .1620905 |
| xp | .0273553 | .0165968 | 1.65 | 0.099 | -.0051826 | .0598931 |
| xp_p2 | .0005749 | .0007205 | 0.80 | 0.425 | -.0008377 | .0019874 |
| _cons | 7.385116 | .1622288 | 45.52 | 0.000 | 7.067067 | 7.703164 |

```
106 .
107 . *pause Part A completed
108 .
109 .
110 . *** Part B
111 . * Discussed in the LaTex write-up
112 . * Not asked to compute anything in Stata, but helpful to do so
113 .
114 . *Combined for all IV
115 . rvfplot

116 . graph export "..\output\fittedResid_hettest.pdf", replace
    (file ..\output\fittedResid_hettest.pdf written in PDF format)

117 . estat hettest

    Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
             Ho: Constant variance
             Variables: fitted values of w

             chi2(1)      =   114.87
             Prob > chi2  =   0.0000

118 .
119 . *For individual IV
120 . rvpplot ed
```

```
121 . graph export "..\output\edResid_hettest.pdf", replace
    (file ..\output\edResid_hettest.pdf written in PDF format)

122 . rvpplot xp

123 . graph export "..\output\xpResid_hettest.pdf", replace
    (file ..\output\xpResid_hettest.pdf written in PDF format)

124 . rvpplot xp_p2

125 . graph export "..\output\xp_p2Resid_hettest.pdf", replace
    (file ..\output\xp_p2Resid_hettest.pdf written in PDF format)

126 .
127 . estat hettest ed

    Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
             Ho: Constant variance
             Variables: ed

             chi2(1)      =    76.42
             Prob > chi2  =   0.0000

128 . estat hettest xp

    Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
             Ho: Constant variance
             Variables: xp

             chi2(1)      =     1.19
             Prob > chi2  =   0.2760

129 . estat hettest xp_p2

    Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
             Ho: Constant variance
             Variables: xp_p2

             chi2(1)      =     0.00
             Prob > chi2  =   0.9587

130 .
131 . *** Part C
132 . * Purely analytical and addressed in the LaTex write-up
133 . * Not asked to compute anything in Stata
134 . * The problem set should have asked us to compute the FE estimated coefficients
135 . xi year

136 . reg w ed xp xp_p2 i.year
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | 319.315949 | 5 | 63.8631898 | Number of obs | = 4,500 |
| Residual | 2894.9588 | 4,494 | .644183089 | F(5, 4494) | = 99.14 |
| | | | | Prob > F | = 0.0000 |
| Total | 3214.27475 | 4,499 | .714442043 | R-squared | = 0.0993 |
| | | | | Adj R-squared | = 0.0983 |
| | | | | Root MSE | = .80261 |

| w | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | .1464139 | .0074734 | 19.59 | 0.000 | .1317624 | .1610655 |
| xp | .0253395 | .0167407 | 1.51 | 0.130 | -.0074805 | .0581595 |
| xp_p2 | .0006004 | .0007209 | 0.83 | 0.405 | -.0008129 | .0020136 |
| year | | | | | | |
| 1 | .0340731 | .0298066 | 1.14 | 0.253 | -.0243624 | .0925086 |
| 2 | .0247063 | .0312118 | 0.79 | 0.429 | -.0364843 | .0858968 |
| _cons | 7.403881 | .1652676 | 44.80 | 0.000 | 7.079875 | 7.727887 |

```
137 .
138 . * To show the effect of different years on the coefficient estimates
139 . reg w ed xp xp_p2 if year==0
```

| Source | SS | df | MS | Number of obs | = | 1,500 |
|---|---|---|---|---|---|---|
| | | | | F(3, 1496) | = | 46.28 |
| Model | 91.6141861 | 3 | 30.538062 | Prob > F | = | 0.0000 |
| Residual | 987.209592 | 1,496 | .65989946 | R-squared | = | 0.0849 |
| | | | | Adj R-squared | = | 0.0831 |
| Total | 1078.82378 | 1,499 | .719695649 | Root MSE | = | .81234 |

| w | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | .1440517 | .0131358 | 10.97 | 0.000 | .1182852 | .1698182 |
| xp | .026499 | .0284373 | 0.93 | 0.352 | -.0292823 | .0822802 |
| xp_p2 | .0009687 | .0013386 | 0.72 | 0.469 | -.0016571 | .0035945 |
| _cons | 7.384689 | .2795876 | 26.41 | 0.000 | 6.836263 | 7.933114 |

```
140 . reg w ed xp xp_p2 if year==1
```

| Source | SS | df | MS | Number of obs | = | 1,500 |
|---|---|---|---|---|---|---|
| | | | | F(3, 1496) | = | 54.27 |
| Model | 104.638302 | 3 | 34.8794341 | Prob > F | = | 0.0000 |
| Residual | 961.470297 | 1,496 | .642694049 | R-squared | = | 0.0981 |
| | | | | Adj R-squared | = | 0.0963 |
| Total | 1066.1086 | 1,499 | .711213208 | Root MSE | = | .80168 |

| w | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | .1440497 | .0129141 | 11.15 | 0.000 | .1187179 | .1693814 |
| xp | .0152927 | .0300446 | 0.51 | 0.611 | -.0436413 | .0742267 |
| xp_p2 | .0008968 | .0012998 | 0.69 | 0.490 | -.0016529 | .0034464 |
| _cons | 7.539949 | .2956219 | 25.51 | 0.000 | 6.960071 | 8.119826 |

```
141 . reg w ed xp xp_p2 if year==2
```

| Source | SS | df | MS | Number of obs | = | 1,500 |
|---|---|---|---|---|---|---|
| | | | | F(3, 1496) | = | 61.41 |
| Model | 116.20869 | 3 | 38.7362301 | Prob > F | = | 0.0000 |
| Residual | 943.702983 | 1,496 | .630817502 | R-squared | = | 0.1096 |
| | | | | Adj R-squared | = | 0.1079 |
| Total | 1059.91167 | 1,499 | .707079168 | Root MSE | = | .79424 |

| w | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | .1501405 | .012801 | 11.73 | 0.000 | .1250307 | .1752503 |
| xp | .0057006 | .0322058 | 0.18 | 0.860 | -.0574728 | .0688741 |
| xp_p2 | .0012123 | .0012884 | 0.94 | 0.347 | -.0013151 | .0037397 |
| _cons | 7.519055 | .3162754 | 23.77 | 0.000 | 6.898665 | 8.139446 |

```
142 .
143 . *** Part D
144 . * Only MATLAB
145 .
146 . *** Part E
147 . * Estimate the within estimator \tilde{\beta}_W for the wage equation
148 .
149 . preserve

150 . * Need demeaned variables
151 . replace w = w - luwe
    (4,500 real changes made)
```

```
152 . replace ed = ed - educ
    variable ed was byte now float
    (4,500 real changes made)

153 . replace xp = xp - exp
    (4,500 real changes made)

154 . replace xp_p2 = xp_p2 - exp_p2
    (4,500 real changes made)

155 . * Need to do this to get the same coefficient names for Hausman test
156 .
157 . * Pooled Regression (1990-1992) but after demeaned/Within/FixedEffects
158 . *reg w_dm ed_dm xp_dm xp_p2_dm
159 . reg w ed xp xp_p2

      Source |       SS           df       MS      Number of obs   =     4,500
-------------+----------------------------------   F(3, 4496)      =     23.26
       Model |  10.5005623         3  3.50018743   Prob > F        =     0.0000
    Residual |    676.6235     4,496  .150494551   R-squared       =     0.0153
-------------+----------------------------------   Adj R-squared   =     0.0146
       Total |  687.124063     4,499  .152728176   Root MSE        =     .38794

------------------------------------------------------------------------------
           w |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ed |   .0637628   .0264373     2.41   0.016     .0119326    .1155929
          xp |   .1301495   .0250195     5.20   0.000      .081099    .1791999
       xp_p2 |  -.0035098   .0011127    -3.15   0.002    -.0056913   -.0013284
       _cons |  -1.05e-08    .005783    -0.00   1.000    -.0113376    .0113375
------------------------------------------------------------------------------

160 . estimates store fixedEffects

161 . restore

162 . * Firm fixed effect
163 . * FOR within each individual demean the average over time, firm fixed effect
164 .
165 . * Follow up questions addressed in the LaTex write-up
166 .
167 . *pause Part E completed
168 .
169 . *** Part F
170 . * Only MATLAB
171 .
172 . *** Part G
173 . * Only Stata - WE CANNOT DO THIS PROBLEM WITH THE STATA IC license that we are
174 . * given.  Max matsize=800 on IC and we need 1500.
175 .
176 . * Check if the results match with Stata by using the command xtgls on the
177 . * variable from the original wage equation.
178 .
179 . /* xtset individual year
    > set matsize 2000
    > xtgls w ed xp xp_p2
    > estimates store gls
    > */
180 .
181 . xtset individual year
           panel variable:  individual (strongly balanced)
            time variable:  year, 0 to 2
                    delta:  1 unit

182 . xtreg w ed xp xp_p2, re

Random-effects GLS regression                   Number of obs     =     4,500
Group variable: individual                      Number of groups  =     1,500

R-sq:                                           Obs per group:
     within  = 0.0111                                         min =         3
     between = 0.1216                                         avg =       3.0
     overall = 0.0979                                         max =         3

                                                Wald chi2(3)      =    240.24
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

| w | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ed | **.1480811** | **.0096409** | **15.36** | **0.000** | **.1291853** | **.166977** |
| xp | **.0646342** | **.0200796** | **3.22** | **0.001** | **.0252789** | **.1039895** |
| xp_p2 | **-.0009324** | **.0008798** | **-1.06** | **0.289** | **-.0026567** | **.000792** |
| _cons | **7.172555** | **.2005449** | **35.77** | **0.000** | **6.779494** | **7.565616** |
| sigma_u | **.64661827** | | | | | |
| sigma_e | **.47514938** | | | | | |
| rho | **.64936605** | (fraction of variance due to u_i) | | | | |

```
183 . estimates store gls

184 .
185 . * Follow up questions addressed in the LaTex write-up
186 .
187 . *pause Part G completed
188 .
189 .
190 . *** Part H
191 . * Are the FGLS results different than the FE ones? Perform a Hausman test.
192 .
193 . hausman fixedEffects gls
```

| | Coefficients (b) fixedEffects | (B) gls | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| ed | **.0637628** | **.1480811** | **-.0843184** | **.0246168** |
| xp | **.1301495** | **.0646342** | **.0655153** | **.0149259** |
| xp_p2 | **-.0035098** | **-.0009324** | **-.0025775** | **.0006813** |

b = consistent under Ho and Ha; obtained from regress
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

chi2(**3**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **33.41**
Prob>chi2 = **0.0000**

```
194 .
195 . * Follow up questions addressed in the LaTex write-up
196 .
197 . *pause Part H completed
198 .
199 .
end of do-file

200 .
201 . log close _all
      name:  Grant Aarons Assignment 3
       log:  C:\Users\gaarons\Git\Notes\Stata\2016F\Metrics\logs\stata_3.smcl
  log type:  smcl
 closed on:  12 Jan 2017, 12:42:52
```