1 Function Approximation Warmup

1.1 Exploring and downloading the data

```
rm(list=ls())
                         # Clear the workspace
set.seed(20866)
library(ggplot2)
library(sandwich)
library(car)
library(xtable)
library(aod)
library(systemfit)
## Loading required package: Matrix
## Loading required package: Imtest
## Loading required package:
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##
      as.Date, as.Date.numeric
library(MASS)
library(stargazer)
## Please cite as:
##
## Hlavac, Marek (2014). stargazer: LaTeX code and ASCII text for
well-formatted regression and summary statistics tables.
## R package version 5.1. http://CRAN.R-project.org/package=stargazer
setwd("/Users/Tony/Downloads")
data <- read.csv("cps_00005.csv")</pre>
datamatrix <- as.matrix(read.csv("cps_00005.csv"))</pre>
datamatrix <- datamatrix[,-5:-8]</pre>
datamatrix <- datamatrix[,-2:-3]</pre>
datamatrix <- datamatrix[datamatrix[,9]!= 0,]</pre>
datamatrix <- datamatrix[datamatrix[,9]!= 9999999,]</pre>
```

```
incomeadjust <- function(data.m = datamatrix, sampq = TRUE){</pre>
  AdjInc <- c(rep(NA, nrow(data.m)))
 data.m <- cbind(data.m, AdjInc)</pre>
 for (i in 1:nrow(datamatrix)){
    year <- as.numeric(data.m[i,1])</pre>
    income <- as.numeric(data.m[i,9])</pre>
    if (year == 2004){
      AdjustedIncome <- income * 1.25
      data.m[i,10] = round(AdjustedIncome)
    if (year == 2014){
      AdjustedIncome <- income
      data.m[i,10] = round(AdjustedIncome)
 if (sampq == TRUE){
 top <- head(data.m, n=15)</pre>
 bottom<- tail(data.m, n=15)
  sample <- rbind(top,bottom)</pre>
 row.names(sample) <- NULL</pre>
 return(sample)
 if (sampq == FALSE){
   return(data.m)
incomeadjust(datamatrix, TRUE)
         YEAR REGION AGE SEX RACE EDUC99 EMPSTAT HRSWORK INCWAGE Adjinc
                            2 100
##
   [1,] 2004
                   11 59
                                        13
                                                 10
                                                          2
                                                              60000 75000
   [2,] 2004
                   11 49
                            1 100
                                        10
                                                 10
                                                         20
                                                              32000 40000
```

```
[3,] 2004
                         42
                               2
                                   100
                                                     10
                                                               40
                                                                     30000
                                                                             37500
##
                     11
                                            15
##
     [4,] 2004
                     11
                         68
                               2
                                   100
                                            15
                                                     10
                                                               20
                                                                     18000
                                                                             22500
##
    [5,] 2004
                         42
                               2
                                   100
                                            10
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                                                                     30000
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                     11
     [6,]
          2004
                     11
                         45
                               1
                                   100
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                                                               33
                                                                     50000
                                                                             62500
##
     [7,]
          2004
                         20
                                   100
                                            10
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                                                                             18750
                     11
                               1
##
     [8,]
          2004
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                                                               44
                                                                     18000
                                                                             22500
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     [9,] 2004
                     11
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                                   100
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                                                                     10000
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   [10,]
          2004
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                                   100
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                                                               25
                                                                     20285
                                                                             25356
##
                     11
                               2
   [11,]
                                   100
##
          2004
                     11
                         74
                               1
                                            15
                                                     10
                                                               26
                                                                     19000
                                                                             23750
##
   [12,]
          2004
                     11
                         73
                               2
                                   100
                                            14
                                                     10
                                                               32
                                                                     24250
                                                                             30312
   [13,]
          2004
                         71
                               2
                                   802
                                                     32
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                                                                      5270
                                                                              6588
                     11
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##
   [14,]
          2004
                         47
                               2
                                   802
                                            17
                                                     10
                                                               30
                                                                     20900
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                     11
   [15,]
          2004
                         36
                                   100
                                                                     26048
                                                                             32560
##
                     11
                               1
                                            10
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                                                               19
   [16,] 2014
##
                     42
                         58
                               1
                                   651
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                                                                     50000
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   [17,] 2014
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                         30
                               2
                                   652
                                            16
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   [18,] 2014
                     42
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                                   652
                                            13
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                                                                0
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##
                               1
   [19,] 2014
##
                     42
                         48
                               1
                                   651
                                            10
                                                     10
                                                               50
                                                                     43160
                                                                             43160
                                                               80
   [20,] 2014
                     42
                         42
                                                                     55120
##
                               2
                                   651
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   [21,] 2014
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                         35
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   [22,] 2014
##
                     42
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                               1
                                   804
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                                                               40
                                                                     14000
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##
   [23,]
          2014
                     42
                         39
                               1
                                   651
                                            15
                                                     10
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                                                                     27000
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   [24,] 2014
##
                     42
                         26
                                   651
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                                   651
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##
   [26,]
          2014
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   [27,]
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                         20
                                                     30
                                                                0
                                                                      3480
                                                                              3480
##
          2014
                               1
                                   652
                                            10
   [28,] 2014
                     42
                         36
                               2
                                   100
                                            13
                                                     21
                                                                0
                                                                     55300
                                                                             55300
## [29,] 2014
                                                                0
                     42
                         47
                               1
                                   807
                                            10
                                                     32
                                                                     35000
                                                                             35000
## [30,] 2014
                     42
                         21
                               2
                                   807
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```

To find the CPI, I used the Bureau of Labor Statistics CPI Inflation Calculator, which told me that a dollar in 2004 has the same buying power as 1.25in2014. Therefore, to adjust 2004 income to its 2014 equivalent, I wrote a function that multiplied all 2004 income.

1.2 Make a new variable that is log wage income in your data

```
sample <- incomeadjust(datamatrix, TRUE)
logInc <- c(rep(NA, nrow(sample)))
sample <- cbind(sample, logInc)

logVarf <- function(data.m = sample){</pre>
```

```
for (i in 1:nrow(sample)){
    rowIncomeLog <- log(sample[i,10])</pre>
    sample[i,11] <- rowIncomeLog</pre>
  }
  ## return(datamatrix) Commenting out so it doesn't actually return this
  return(sample)
logVarf(sample)
##
         YEAR REGION AGE SEX RACE EDUC99 EMPSTAT HRSWORK INCWAGE Adjinc
##
    [1,] 2004
                    11 59
                             2 100
                                                            2
                                                                60000
                                                                       75000
                                         13
                                                  10
##
    [2,] 2004
                   11
                        49
                             1
                                100
                                         10
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                                                           20
                                                                32000
                                                                        40000
    [3,] 2004
                        42
                             2
##
                    11
                                100
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                                                  10
                                                           40
                                                                30000
                                                                        37500
##
    [4,] 2004
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                        68
                             2 100
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##
    [5,] 2004
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##
    [6,] 2004
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                                                                50000
                                                                        62500
    [7,] 2004
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                                                                        18750
    [8,] 2004
                       19
##
                                100
                                         10
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                   11
                             1
                                                           44
                                                                        22500
    [9,] 2004
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                                                  10
                                                           20
                                                                10000
                                                                        12500
## [10,] 2004
                             2 100
                                                                20285
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                        59
                                          8
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                                                                        25356
##
   [11,] 2004
                   11
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                             1
                                100
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                                                           26
                                                                19000
                                                                        23750
## [12,] 2004
                   11
                        73
                             2 100
                                         14
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                                                           32
                                                                24250
                                                                        30312
## [13,] 2004
                   11
                        71
                                802
                                         11
                                                  32
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                                                                         6588
  [14,] 2004
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                                                                        26125
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                                                           19
                                                                26048
                                                                        32560
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  [16,] 2014
##
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  [17,] 2014
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                                652
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                                                           40
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## [18,] 2014
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##
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                                                                43160 43160
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                                                                55120 55120
                             2
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                                                           80
## [21,] 2014
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## [22,] 2014
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## [23,] 2014
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## [26,] 2014
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## [27,] 2014
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                             1
## [28,] 2014
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                                                                55300
                                                                        55300
## [29,] 2014
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                             1
## [30,] 2014
                   42
                       21
                                807
                                         11
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                                                                10300
                                                                       10300
```

```
##
            logInc
##
   [1,] 11.225243
##
   [2,] 10.596635
##
   [3,] 10.532096
   [4,] 10.021271
##
    [5,] 10.532096
##
##
   [6,] 11.042922
##
   [7,] 9.838949
##
   [8,] 10.021271
##
    [9,] 9.433484
## [10,] 10.140771
## [11,] 10.075338
## [12,] 10.319299
## [13,] 8.793005
## [14,] 10.170648
## [15,] 10.390840
## [16,] 10.819778
## [17,] 10.126631
## [18,] 8.517193
## [19,] 10.672669
## [20,] 10.917268
## [21,] 10.085809
## [22,] 9.546813
## [23,] 10.203592
## [24,] 9.798127
## [25,] 11.002100
## [26,] 10.571317
## [27,] 8.154788
## [28,] 10.920528
## [29,] 10.463103
## [30,] 9.239899
```

1.3 Construct "potential experience", which will be "Age - years of schooling - 5"

```
sample <- logVarf(sample)

potExp <- c(rep(NA, nrow(sample)))
YrsOfSch <- c(rep(NA, nrow(sample)))
sample <- cbind(sample, potExp, YrsOfSch)

potExpf <- function(data.m = sample){</pre>
```

```
for (i in 1:nrow(sample)){
  indAge = as.numeric(sample[i,3])
  indEduCode = as.numeric(sample[i,6])
  if (indEduCode < 6){</pre>
   indYrsOfSch = 9
    indPotExp = indAge - indYrsOfSch - 5
    sample[i,12] = indPotExp
    sample[i,13] = indYrsOfSch
  if (indEduCode == 6){
   indYrsOfSch = 10
    indPotExp = indAge - indYrsOfSch - 5
    sample[i,12] = indPotExp
    sample[i,13] = indYrsOfSch
  if (indEduCode == 7){
   indYrsOfSch = 11
    indPotExp = indAge - indYrsOfSch - 5
    sample[i,12] = indPotExp
    sample[i,13] = indYrsOfSch
  if (indEduCode == 8){
    indYrsOfSch = 12
    indPotExp = indAge - indYrsOfSch - 5
    sample[i,12] = indPotExp
    sample[i,13] = indYrsOfSch
  if (indEduCode == 9){
    indYrsOfSch = 13
    indPotExp = indAge - indYrsOfSch - 5
    sample[i,12] = indPotExp
    sample[i,13] = indYrsOfSch
```

```
if (indEduCode == 10){
  indYrsOfSch = 13
  indPotExp = indAge - indYrsOfSch - 5
  sample[i,12] = indPotExp
  sample[i,13] = indYrsOfSch
if (indEduCode == 11){
 indYrsOfSch = 14
  indPotExp = indAge - indYrsOfSch - 5
  sample[i,12] = indPotExp
  sample[i,13] = indYrsOfSch
}
if (indEduCode == 12){
 indYrsOfSch = 15
  indPotExp = indAge - indYrsOfSch - 5
  sample[i,12] = indPotExp
  sample[i,13] = indYrsOfSch
if (indEduCode == 13){
 indYrsOfSch = 15
 indPotExp = indAge - indYrsOfSch - 5
  sample[i,12] = indPotExp
  sample[i,13] = indYrsOfSch
if (indEduCode == 14){
  indYrsOfSch = 15
  indPotExp = indAge - indYrsOfSch - 5
  sample[i,12] = indPotExp
  sample[i,13] = indYrsOfSch
if (indEduCode == 15){
  indYrsOfSch = 17
  indPotExp = indAge - indYrsOfSch - 5
  sample[i,12] = indPotExp
  sample[i,13] = indYrsOfSch
```

```
if (indEduCode == 16){
     indYrsOfSch = 19
     indPotExp = indAge - indYrsOfSch - 5
     sample[i,12] = indPotExp
     sample[i,13] = indYrsOfSch
    }
   if (indEduCode == 17){
     indYrsOfSch = 19
     indPotExp = indAge - indYrsOfSch - 5
     sample[i,12] = indPotExp
     sample[i,13] = indYrsOfSch
   if (indEduCode == 18){
     indYrsOfSch = 22
     indPotExp = indAge - indYrsOfSch - 5
     sample[i,12] = indPotExp
     sample[i,13] = indYrsOfSch
  ## return(datamatrix) Commenting out so it doesn't actually return this
 return(sample)
potExpf(sample)
        YEAR REGION AGE SEX RACE EDUC99 EMPSTAT HRSWORK INCWAGE AdjInc
##
##
   [1,] 2004
                          2 100
                                                     2
                                                          60000 75000
                 11 59
                                     13
                                             10
                                                          32000 40000
##
   [2,] 2004
                 11 49
                         1 100
                                     10
                                             10
                                                     20
   [3,] 2004
                         2 100
                                                          30000 37500
                 11 42
                                     15
                                             10
                                                     40
##
   [4,] 2004
                 11 68
                         2 100
                                     15
                                             10
                                                     20
                                                         18000 22500
   [5,] 2004
                         2 100
                                                          30000 37500
##
                 11
                     42
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##
   [6,] 2004
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                                                          50000 62500
   [7,] 2004
                 11 20
                         1 100
                                     10
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##
   [8,] 2004
                 11 19
                        1 100
                                     10
                                             10
                                                     44
                                                          18000 22500
   [9,] 2004
                 11 18
                        2 100
                                             10
                                                     20
                                                         10000 12500
```

```
## [10,] 2004
                       59
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                                                                 20285
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                                                                        25356
## [11,] 2004
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## [12,] 2004
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## [13,] 2004
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## [14,] 2004
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##
   [15,] 2004
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##
  [16,] 2014
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                                                                        50000
## [17,] 2014
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                                          16
                                                           40
## [18,] 2014
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                             1
                                 652
                                          13
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                                                                  5000
                                                                          5000
## [19,] 2014
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                                          10
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## [20,] 2014
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                        42
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                                 651
                                                           80
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## [21,] 2014
                   42
                        35
                                 802
                                          10
                                                  10
                                                           40
                                                                 24000
                                                                        24000
                             1
## [22,] 2014
                                 804
                                                                 14000
                                                                        14000
                   42
                        50
                             1
                                          10
                                                  10
                                                           40
## [23,] 2014
                   42
                        39
                             1
                                651
                                          15
                                                  10
                                                           40
                                                                 27000
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##
  [24,] 2014
                   42
                        26
                             1
                                 651
                                          10
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                                                                 18000
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  [25,] 2014
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##
                   42
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                   42
  [27,] 2014
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##
                             1
                                652
                                          10
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                                                            0
                                                                          3480
## [28,] 2014
                   42
                        36
                                 100
                                          13
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                                                            0
                                                                 55300
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   [29,] 2014
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##
                   42
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                                                  32
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##
   [30,] 2014
                   42
                        21
                             2
                                807
                                          11
                                                  10
                                                           19
                                                                 10300
                                                                        10300
##
             logInc potExp YrsOfSch
##
    [1,] 11.225243
                         39
                                   15
##
    [2,] 10.596635
                         31
                                   13
    [3,] 10.532096
                         20
                                   17
##
##
    [4,] 10.021271
                         46
                                   17
##
    [5,] 10.532096
                         24
                                   13
                         25
    [6,] 11.042922
##
                                   15
##
    [7,] 9.838949
                          2
                                   13
##
    [8,] 10.021271
                          1
                                   13
##
    [9,] 9.433484
                          1
                                   12
   [10,] 10.140771
                                   12
##
                         42
##
  [11,] 10.075338
                         52
                                   17
  [12,] 10.319299
                         53
                                   15
## [13,] 8.793005
                         52
                                   14
## [14,] 10.170648
                         23
                                   19
  [15,] 10.390840
                         18
                                   13
  [16,] 10.819778
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                                   14
  [17,] 10.126631
                          6
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## [18,] 8.517193
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## [19,] 10.672669
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## [20,] 10.917268
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## [21,] 10.085809
                         17
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## [22,] 9.546813
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                                   13
## [23,] 10.203592
                         17
                                   17
```

```
## [24,] 9.798127
                                13
## [25,] 11.002100
                       0
                                19
## [26,] 10.571317
                       8
                               13
## [27,] 8.154788
                      2
                               13
## [28,] 10.920528
                      16
                               15
## [29,] 10.463103
                       29
                                13
## [30,] 9.239899
                                14
```

1.4 Make a table comparing the following regressions for 2014 and 2014

```
library(stargazer)

regData <- incomeadjust(datamatrix, FALSE)
regData <- logVarf(regData)
regData <- potExpf(regData)</pre>
```