

EconometRics

```
# ECONOMETRICS WITH R - EconometRics
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# During the last semester of my BSc, I attended the Econometrics course
# taught by Professor Carlo Fezzi
# at the University of Trento. In class and on my own, I wrote this script to
# apply the theoretical
# concepts learned during the course. For any questions, please contact me at
# thomas.demassari@gmail.com

# Main topics:
# - OLS regression
# - Omitted variables bias and 2SLS
# - Panel data analysis
# - Time series analysis

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# (Markowitz, 1952)

# NB: The datasets used are uploaded on my GitHub page
rm(list=ls())
setwd("/Users/thomasdemassari/Library/CloudStorage/OneDrive-
Personal/Università/BSc/Econometria/Datasets/")

# Libraries ----
library(moments)      # Kurtosis and Skewness
library(lmtest)       # HC estimators

## Loading required package: zoo
```

```
##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric

library(whitestrapp) # White Test

##
## Please cite as:

## Lopez, J. (2020), White's test and Bootstrapped White's test under the
## methodology of Jeong, J., Lee, K. (1999) package version 0.0.1

library(wooldridge) # Data of Wooldridge, Introductory Econometrics
library(lmtest)      # White Estimator for s.e.
library(sandwich)    # White Estimator for s.e.
library(car)         # Linear Hypothesis Test

## Loading required package: carData

library(AER)         # 2SLS

## Loading required package: survival

library(timeSeries) # Returns

## Loading required package: timeDate

##
## Attaching package: 'timeDate'

## The following objects are masked from 'package:moments':
##
##      kurtosis, skewness

##
## Attaching package: 'timeSeries'

## The following object is masked from 'package:zoo':
##
##      time<-

## The following objects are masked from 'package:graphics':
##
##      lines, points

library(quantmod)    # Data from Yahoo Finance

## Loading required package: xts

## Loading required package: TTR
```

```

## Registered S3 method overwritten by 'quantmod':
##   method      from
##   as.zoo.data.frame zoo

library(lubridate) # To take dates from quantmod data

##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:base':
##
##   date, intersect, setdiff, union

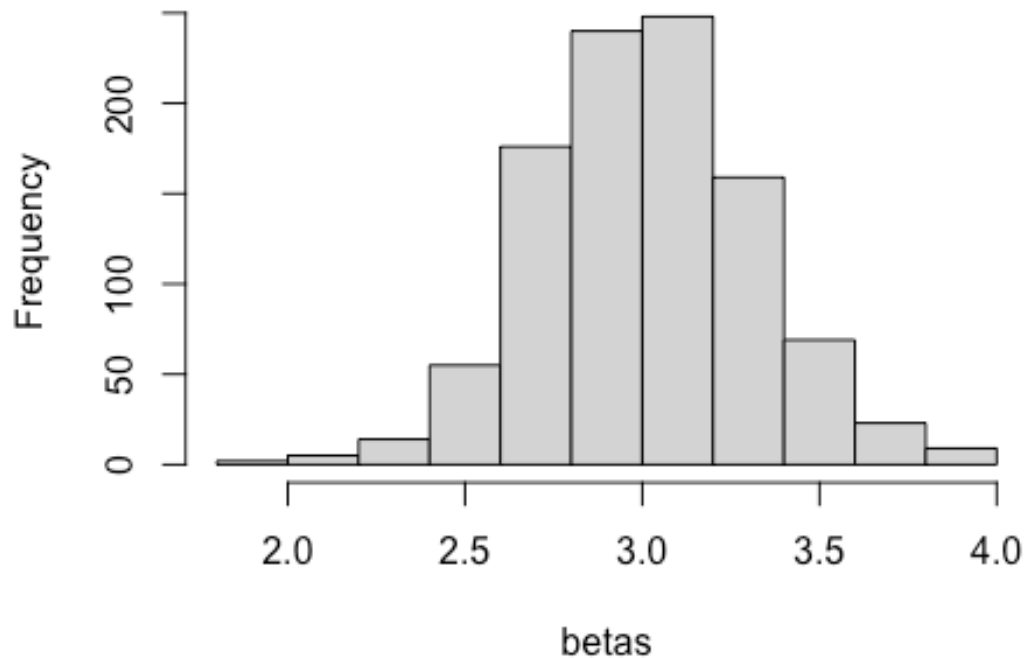
# Monte Carlo Simulation for estimating distribution of OLS betas in a sample
of 300 observations ----
x = runif(10^6)
real_beta = 3
reps = 10^3 # It will be better to use a larger number of repetitions, but it
would take too long on my PC...
obs = 300
betas = NULL

for (i in 1:reps){
  x_sample = sample(x, obs)
  y = 2 + (real_beta*x_sample) + 1.5*rnorm(obs)
  ols = lm(y ~ x_sample)
  betas[i] = summary(ols)$coeff[2]
}

hist(betas, main = "Distribution of estimate of beta")

```

Distribution of estimate of beta



```
result = cbind(mean(betas), kurtosis(betas)+3, skewness(betas))
colnames(result) = c("Mean", "Kurtosis", "Skewness")
print(result)
```

```
##           Mean Kurtosis  Skewness
## [1,] 3.009237 3.316524 0.05289213
```

Omitted Variable Bias -----

The goal is to evaluate the impact of the mother's cigarette smoking on the baby's birth weight.

We have cross-sectional data from one year.

Theoretical model

List of variables that might have an impact on the baby's birth weight (y):

1. Mother's habits (alcohol, exercise, diet, etc.)

2. Genetics

3. Availability of healthcare

4. Income

5. Pollution

6. Baby's sex

7. Gestational duration

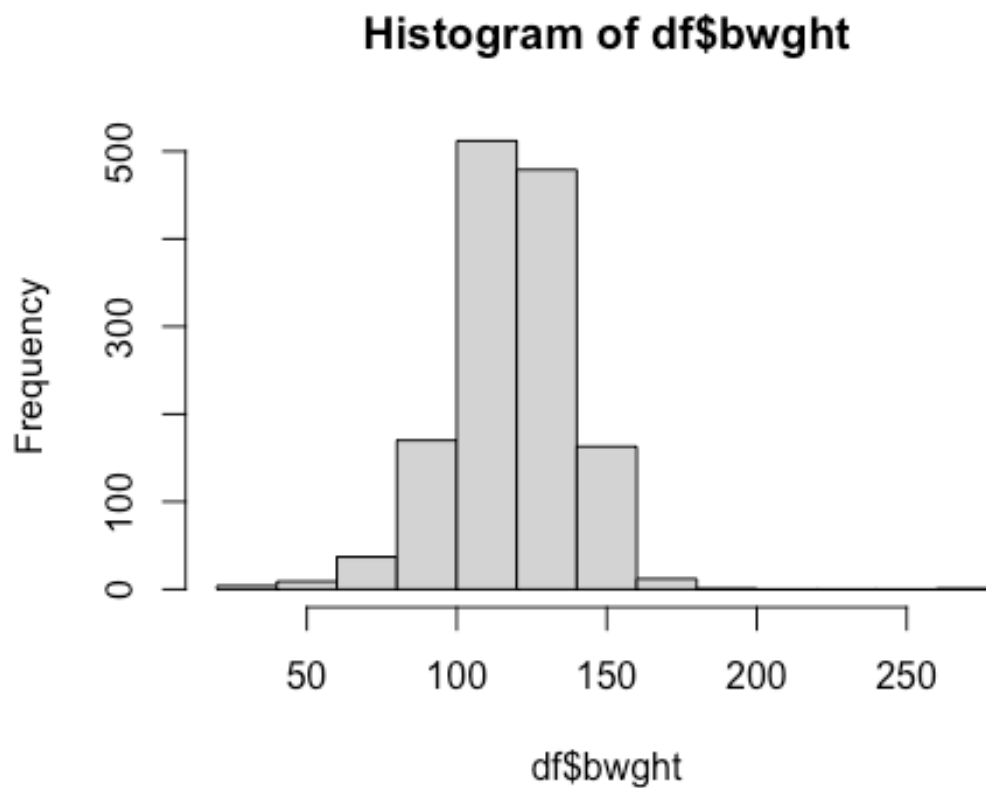
Variables that might be correlated with x: 1, 3, 4, 5, 7

Our goal is to maintain the exogeneity assumption.

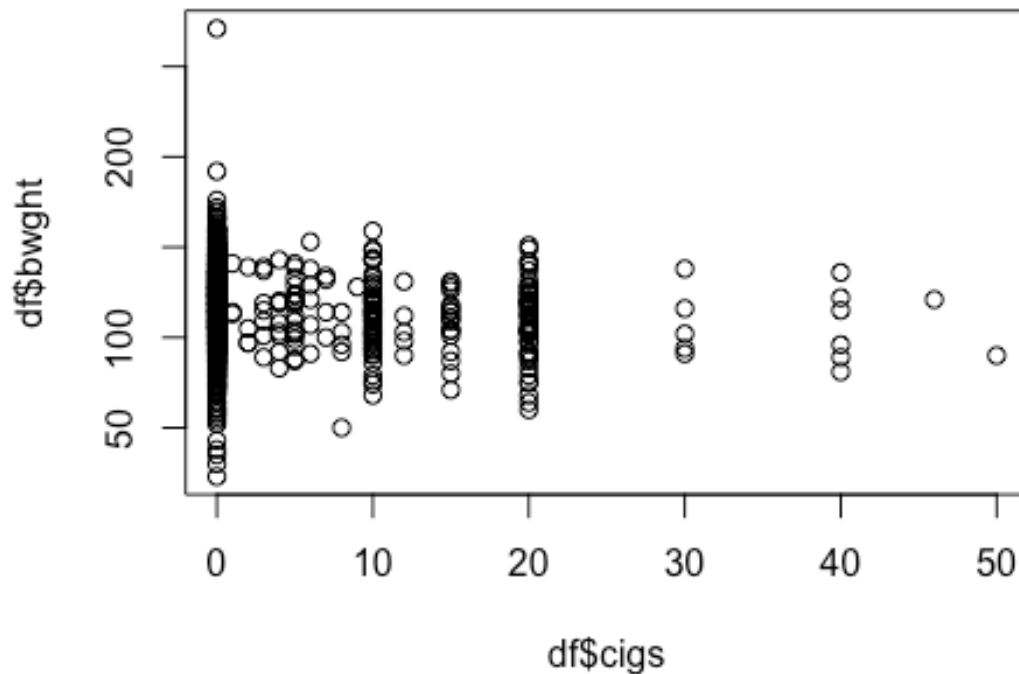
```
df = read.csv("bweight.csv", sep = ";", header = TRUE)
head(df)
```

```
##      inc bwght  cigs  smoker
## 1 27.5    90    50      1
## 2  0.5   121    46      1
## 3  5.5    89    40      1
## 4  6.5   122    40      1
## 5 18.5   115    40      1
## 6 22.5   136    40      1
```

```
hist(df$bwght)
```



```
plot(df$cigs, df$bwght)
```



```

betas_of_cigs = matrix(0, ncol = 1, nrow = 4) # Where I will
save betas of df$cigs
colnames(betas_of_cigs) = "betas_of_cigs"
row_names = NULL

# Weight and cigs
lm1 = lm(df$bwght ~ I(df$cigs/100))
betas_of_cigs[1] = summary(lm1)$coef[2]
row_names[1] = "w~(100)cig"
# NB: In this case, as we have divide x by 100, beta indicates the average
effect of 100 more cigs

# Log-linear model
lm2 = lm(log(df$bwght) ~ df$cigs)
betas_of_cigs[2] = summary(lm2)$coef[2]
row_names[2] = "w~cig(%)"
# NB: In this case, beta indicates the percentage average effect of 1 more
cigarette

# According to the theoretical model, exogeneity assumption is violated, thus
the parameters are biased
# Considering the income
cor(df$inc, df$cigs)

```

```
## [1] -0.1730449

lm3 = lm(df$bwght ~ df$cigs + df$inc)
betas_of_cigs[3] = summary(lm3)$coef[2]
row_names[3] = "w~cig + inc"

# Instead of number of cigs smoked, we can use a dummy (smoker or not
smoker)
lm4 = lm(df$bwght ~ df$smoker + df$inc)
summary(lm4)

##
## Call:
## lm(formula = df$bwght ~ df$smoker + df$inc)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -96.343 -11.692   0.927  12.836 149.859
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 117.32051    1.06555 110.103 < 2e-16 ***
## df$smoker   -8.05462    1.52162  -5.293 1.39e-07 ***
## df$inc       0.08989    0.02922   3.076 0.00214 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 20.05 on 1385 degrees of freedom
## Multiple R-squared:  0.03146,    Adjusted R-squared:  0.03006
## F-statistic: 22.5 on 2 and 1385 DF,  p-value: 2.431e-10

betas_of_cigs[4] = summary(lm4)$coef[2]
row_names[4] = "w~cig_dummy + inc"

# It's strange that R2 increases if we consider the dummy smoker instead of
number of cigs, because
# dummy contains less information than number of cigs. It could be due to an
measurement error (data
# are self-reported) or due to a non-linear effect.

rownames(betas_of_cigs) = row_names
print(betas_of_cigs)

##              betas_of_cigs
## w~(100)cig      -51.377209282
## w~cig(%)        -0.004490654
## w~cig + inc     -0.463407540
## w~cig_dummy + inc -8.054621841

# Demonstration of measurement error on X and Y ----
result = matrix(NA, 5, 4)
```

```

colnames(result) = c("b0", "s.e. b0", "b1", "s.e. b1")
rownames(result) = c("ok", "CEV X", "Fake X", "CEV Y", "Fake Y")

N = 10^4
u = rnorm(N)
x = runif(N, 100, 200)
y = 2 + 3*x + u

# X is correctly reported
lm_ok = lm(y ~ x)
result[1, 1] = coefficients(summary(lm_ok))[1, 1]
result[1, 2] = coefficients(summary(lm_ok))[1, 2]
result[1, 3] = coefficients(summary(lm_ok))[2, 1]
result[1, 4] = coefficients(summary(lm_ok))[2, 2]

# CEV on X
x_cev = x + 200*rnorm(N)
lm_xcev = lm(y ~ x_cev)
result[2, 1] = coefficients(summary(lm_xcev))[1, 1]
result[2, 2] = coefficients(summary(lm_xcev))[1, 2]
result[2, 3] = coefficients(summary(lm_xcev))[2, 1]
result[2, 4] = coefficients(summary(lm_xcev))[2, 2]

# Fake data on X
possible_error = sample(runif(N, min = 50, max = 250), N/2)
indices_of_fake_x = sample(c(1:N), N/2)
x_fake = x

for (i in 1:length(x)){
  if (i %in% indices_of_fake_x){
    x_fake[i] = x[i] + possible_error[i]
  }
}

lm_xfake = lm(y ~ x_fake)
summary(lm_xfake)

##
## Call:
## lm(formula = y ~ x_fake)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -200.185  -65.978    1.582   65.365  149.599
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 379.64577    2.45166  154.85  <2e-16 ***

```



```
## x_fake      0.37377    0.01136    32.91    <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 81.01 on 7442 degrees of freedom
## (2556 observations deleted due to missingness)
## Multiple R-squared:  0.127, Adjusted R-squared:  0.1269
## F-statistic: 1083 on 1 and 7442 DF, p-value: < 2.2e-16

result[3, 1] = coefficients(summary(lm_xfake))[1, 1]
result[3, 2] = coefficients(summary(lm_xfake))[1, 2]
result[3, 3] = coefficients(summary(lm_xfake))[2, 1]
result[3, 4] = coefficients(summary(lm_xfake))[2, 2]

# CEV on Y
y_cev = y + 100*rnorm(N)
lm_ycev = lm(y_cev ~ x)
result[4, 1] = coefficients(summary(lm_ycev))[1, 1]
result[4, 2] = coefficients(summary(lm_ycev))[1, 2]
result[4, 3] = coefficients(summary(lm_ycev))[2, 1]
result[4, 4] = coefficients(summary(lm_ycev))[2, 2]

# Fake data on Y
y_fake = y + 88
lm_yfake = lm(y_fake ~ x)
summary(lm_yfake)

##
## Call:
## lm(formula = y_fake ~ x)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.5036 -0.6726  0.0019  0.6723  4.3447
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  89.931151   0.053053   1695    <2e-16 ***
## x             3.000468   0.000346   8672    <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9963 on 9998 degrees of freedom
## Multiple R-squared:  0.9999, Adjusted R-squared:  0.9999
## F-statistic: 7.521e+07 on 1 and 9998 DF, p-value: < 2.2e-16

result[5, 1] = coefficients(summary(lm_yfake))[1, 1]
result[5, 2] = coefficients(summary(lm_yfake))[1, 2]
result[5, 3] = coefficients(summary(lm_yfake))[2, 1]
result[5, 4] = coefficients(summary(lm_yfake))[2, 2]
```

```

print(result)

##              b0      s.e. b0              b1      s.e. b1
## ok          1.931151 0.05305246 3.00046800 0.0003459788
## CEV X      444.019031 1.07206564 0.06388725 0.0042134089
## Fake X     379.645772 2.45166161 0.37377034 0.0113579513
## CEV Y        4.045261 5.33932342 2.98420239 0.0348201162
## Fake Y      89.931151 0.05305246 3.00046800 0.0003459788

# Nonlinear model with piecewise and continuous curve ----
# 01. Piecewise curve
set.seed(226091)
n = 2000
x = runif(n)

# Dummy variable
d = numeric(n)
d[x>0.5] = 1

y = 1 - 2*x + 3*x*d + 0.1*rnorm(n) - 1.5*d

plot(x,y)

lm1 = lm(y ~ x*d)
summary(lm1)

##
## Call:
## lm(formula = y ~ x * d)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.31341 -0.06692  0.00025  0.07231  0.35615
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.003304   0.006502  154.30  <2e-16 ***
## x             -2.011940   0.022213  -90.58  <2e-16 ***
## d             -1.502843   0.017658  -85.11  <2e-16 ***
## x:d            3.007025   0.030974   97.08  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09966 on 1996 degrees of freedom
## Multiple R-squared:  0.8697, Adjusted R-squared:  0.8695
## F-statistic: 4439 on 3 and 1996 DF, p-value: < 2.2e-16

```

```

# Estimation of the model in the first part of the curve (dummy == 0)
lm1.1 = lm(y[x<=0.5] ~ x[x<=0.5])
summary(lm1.1)

##
## Call:
## lm(formula = y[x <= 0.5] ~ x[x <= 0.5])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.282769 -0.070159  0.003245  0.072306  0.269642
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.003304   0.006458  155.35  <2e-16 ***
## x[x <= 0.5] -2.011940   0.022062  -91.19  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09899 on 1018 degrees of freedom
## Multiple R-squared:  0.8909, Adjusted R-squared:  0.8908
## F-statistic: 8316 on 1 and 1018 DF, p-value: < 2.2e-16

abline(coef(lm1.1), col = "red")
# Estimation of the model in the second part of the curve (dummy == 1)
lm1.2 = lm(y[x>0.5] ~ x[x>0.5])
summary(lm1.2)

##
## Call:
## lm(formula = y[x > 0.5] ~ x[x > 0.5])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.31341 -0.06413 -0.00265  0.07145  0.35615
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.49954   0.01653  -30.22  <2e-16 ***
## x[x > 0.5]   0.99508   0.02174   45.78  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1004 on 978 degrees of freedom
## Multiple R-squared:  0.6818, Adjusted R-squared:  0.6815
## F-statistic: 2096 on 1 and 978 DF, p-value: < 2.2e-16

abline(coef(lm1.2), col = "blue")

```

02. Continuous curve

```
lm2 = lm(y ~ x + I(d*(x-0.5)))
```

```
summary(lm2)
```

```
##
```

```
## Call:
```

```
## lm(formula = y ~ x + I(d * (x - 0.5)))
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
```

##	-0.31351	-0.06696	0.00007	0.07235	0.35638
----	----------	----------	---------	---------	---------

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
```

## (Intercept)	1.003122	0.006043	166.01	<2e-16 ***
## x	-2.010902	0.017520	-114.78	<2e-16 ***
## I(d * (x - 0.5))	3.006979	0.030960	97.12	<2e-16 ***

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

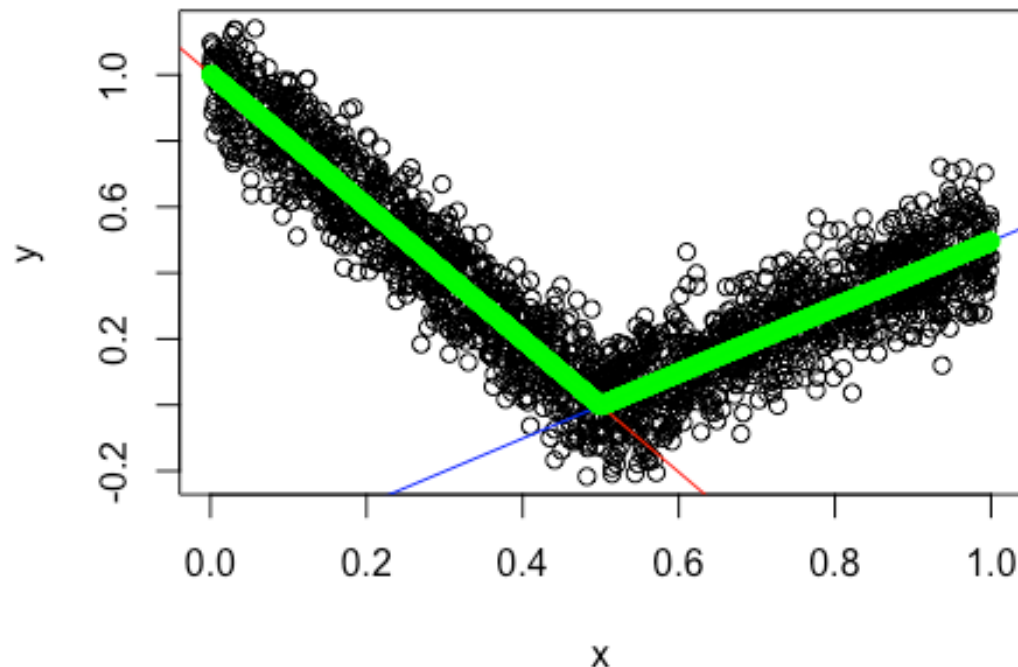
```
##
```

```
## Residual standard error: 0.09964 on 1997 degrees of freedom
```

```
## Multiple R-squared:  0.8697, Adjusted R-squared:  0.8695
```

```
## F-statistic: 6662 on 2 and 1997 DF, p-value: < 2.2e-16
```

```
points(x, predict(lm2), col = "green")
```



```
# Comparison between models
```

```
anova(lm2, lm1)
```

```
## Analysis of Variance Table
```

```
##
```

```
## Model 1: y ~ x + I(d * (x - 0.5))
```

```
## Model 2: y ~ x * d
```

```
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
```

```
## 1   1997 19.826
```

```
## 2   1996 19.826  1 5.7535e-05 0.0058 0.9393
```

```
# An empirical application of a nonlinear relationship analysis ----
```

```
df = read.csv("cars.csv")
```

```
head(df)
```

```
##   MPG cylind disp  HP weight seconds year origin
```

```
name
```

```
## 1  18      8 3.07 1.30  3.504   12.0   70      1 chevrolet chevelle  
malibu
```

```
## 2  15      8 3.50 1.65  3.693   11.5   70      1          buick skylark  
320
```

```
## 3  18      8 3.18 1.50  3.436   11.0   70      1          plymouth  
satellite
```

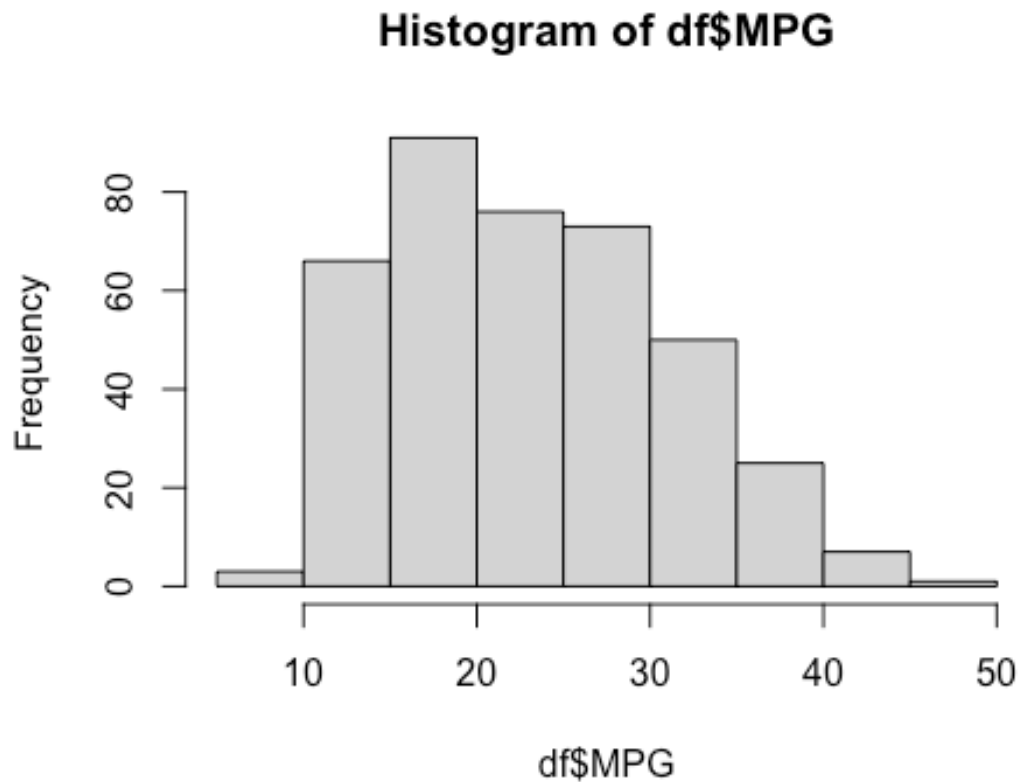
```
## 4  16      8 3.04 1.50  3.433   12.0   70      1          amc rebel
```

```
sst
## 5 17      8 3.02 1.40  3.449    10.5  70    1          ford
torino
## 6 15      8 4.29 1.98  4.341    10.0  70    1    ford galaxie
500
```

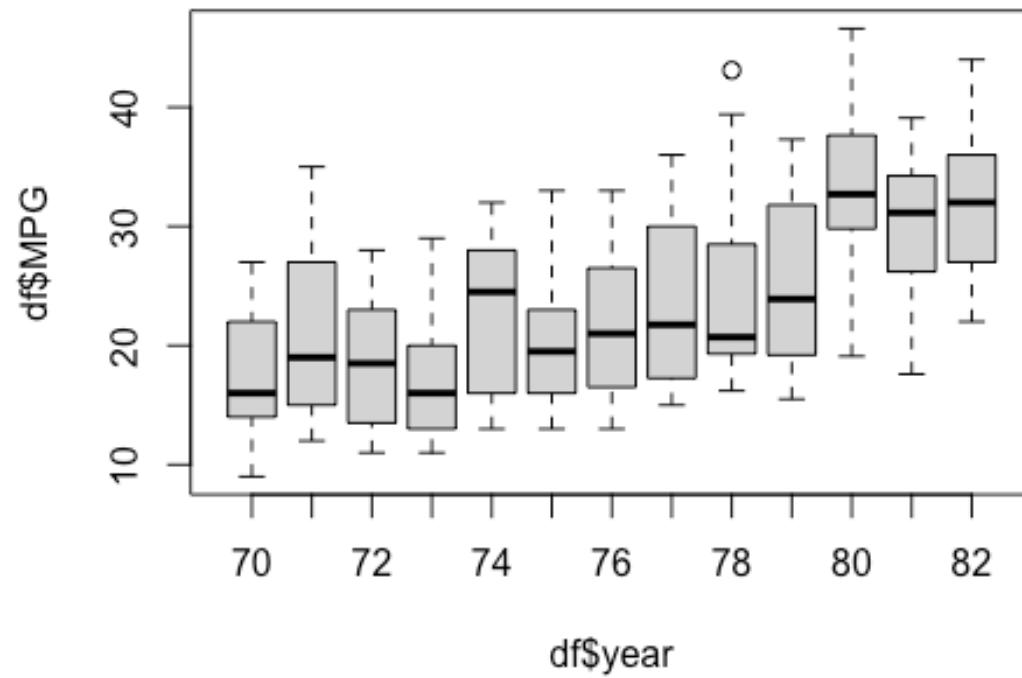
Explanation of variables:
1. MPG = miles per gallon
2. cylind = number of cylinders
3. disp = engine displacement (100 cubic inches)
4. HP = horsepower
5. weight = car weight in 1000lb
6. seconds = seconds from 0 to 60
7. year
8. origin = 1 is USA, 2 = Europe, 3 = Japan

Graphical analysis

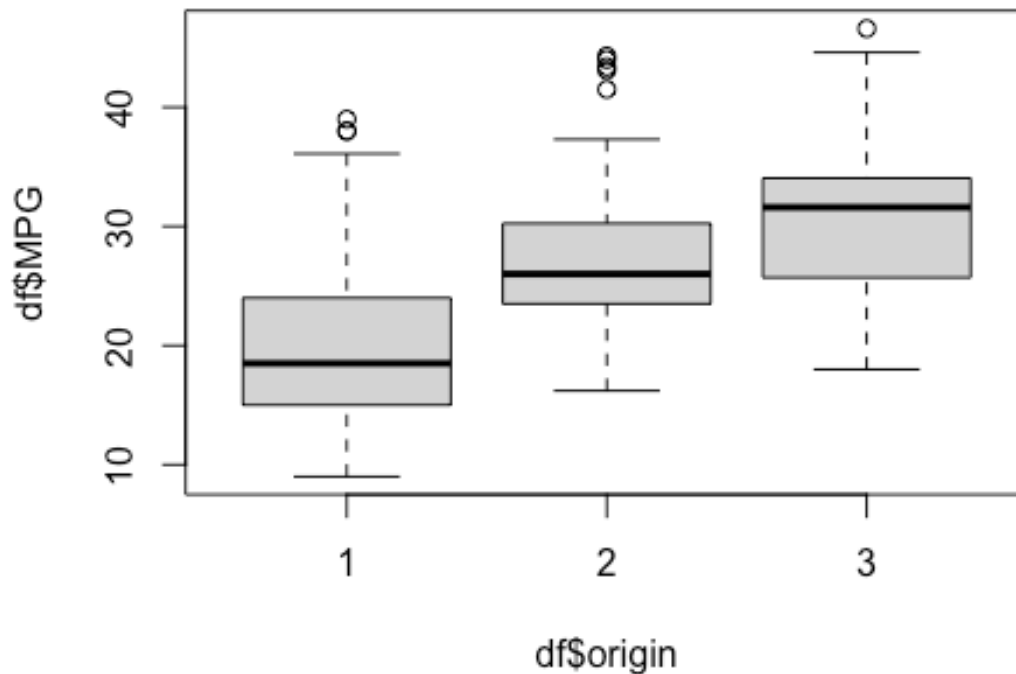
```
hist(df$MPG)
```



```
boxplot(df$MPG ~ df$year)
```



```
boxplot(df$MPG ~ df$origin)
```



```
# Estimation of the linear model
```

```
# MPG ~ weight
```

```
plot(df$weight, df$MPG)
```

```
lm.0 = lm(df$MPG ~ df$weight)
```

```
summary(lm.0)
```

```
##
```

```
## Call:
```

```
## lm(formula = df$MPG ~ df$weight)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
```

```
## -11.9736  -2.7556  -0.3358   2.1379  16.5194
```

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)  46.2165     0.7987   57.87  <2e-16 ***
```

```
## df$weight    -7.6473     0.2580  -29.64  <2e-16 ***
```

```
## ---
```

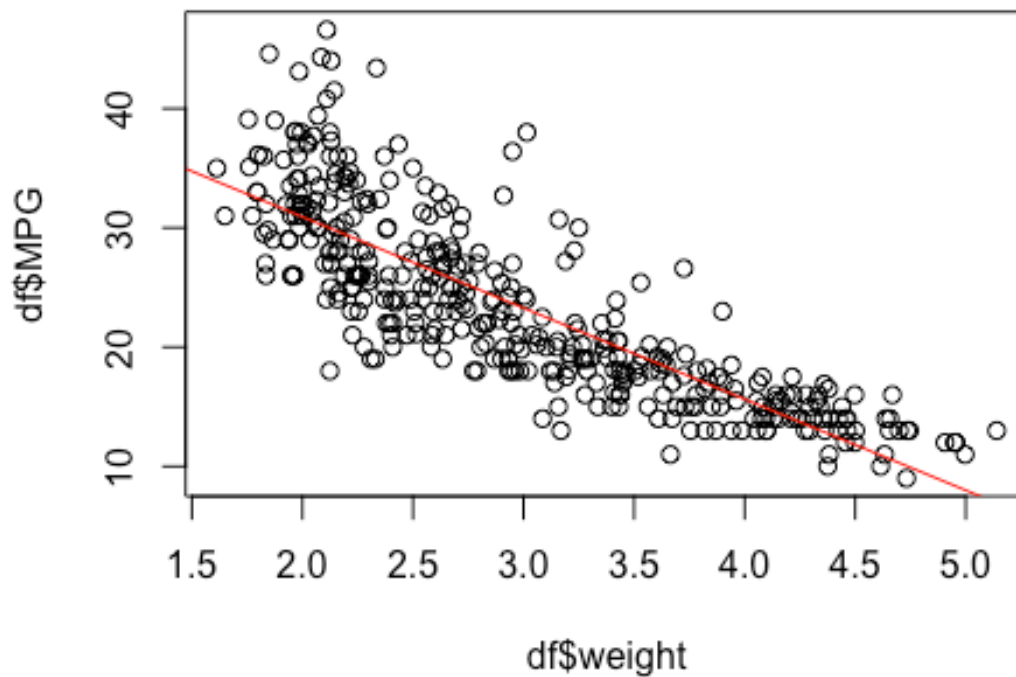
```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
```

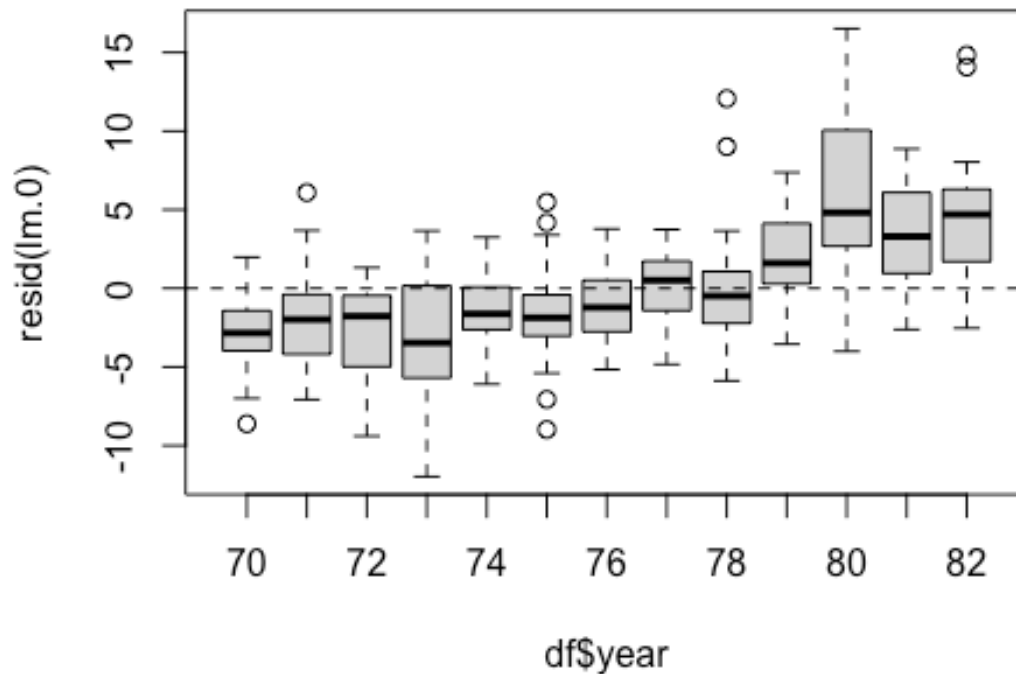
```
## Residual standard error: 4.333 on 390 degrees of freedom
```



```
## Multiple R-squared:  0.6926, Adjusted R-squared:  0.6918  
## F-statistic: 878.8 on 1 and 390 DF,  p-value: < 2.2e-16  
  
abline(lm.0, col = "red")
```



```
# This model assume that efficiency is constant, but if we analyzise the  
residuals we can see  
# that it isn't  
boxplot(resid(lm.0) ~ df$year)  
abline(h = 0, col = "black", lty = "dashed")
```



The model underestimate the efficiency in the first part, and overestimate its in the second part

Including the time, in a linear way

```
lm.1 = lm(df$MPG ~ df$weight + df$year)
summary(lm.1)
```

```
##
## Call:
## lm(formula = df$MPG ~ df$weight + df$year)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.8505 -2.3014 -0.1167  2.0367 14.3555
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -14.34725    4.00652  -3.581 0.000386 ***
## df$weight    -6.63208    0.21456 -30.911 < 2e-16 ***
## df$year        0.75732    0.04947  15.308 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 3.427 on 389 degrees of freedom
## Multiple R-squared:  0.8082, Adjusted R-squared:  0.8072
## F-statistic: 819.5 on 2 and 389 DF,  p-value: < 2.2e-16

# Including the time, in a nonlinear way (using a n-1 dummy)
lm.2 = lm(df$MPG ~ df$weight + factor(df$year))
summary(lm.2)

##
## Call:
## lm(formula = df$MPG ~ df$weight + factor(df$year))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.2409  -2.0409   0.0044   1.9897  13.4664
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    39.1252     0.8995  43.499 < 2e-16 ***
## df$weight     -6.3554     0.2023 -31.409 < 2e-16 ***
## factor(df$year)71  1.2466     0.8466   1.473 0.141714
## factor(df$year)72  0.1661     0.8364   0.199 0.842640
## factor(df$year)73 -0.2958     0.7695  -0.384 0.700880
## factor(df$year)74  1.9352     0.8580   2.256 0.024672 *
## factor(df$year)75  1.3314     0.8226   1.619 0.106377
## factor(df$year)76  2.0150     0.7997   2.520 0.012160 *
## factor(df$year)77  3.2993     0.8394   3.931 0.000101 ***
## factor(df$year)78  3.1239     0.7940   3.934 9.93e-05 ***
## factor(df$year)79  5.3859     0.8310   6.481 2.85e-10 ***
## factor(df$year)80 10.1959     0.8645  11.793 < 2e-16 ***
## factor(df$year)81  7.1409     0.8531   8.370 1.13e-15 ***
## factor(df$year)82  8.3450     0.8433   9.896 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.155 on 378 degrees of freedom
## Multiple R-squared:  0.842, Adjusted R-squared:  0.8366
## F-statistic: 155 on 13 and 378 DF,  p-value: < 2.2e-16

# Comparison between models
anova(lm.1, lm.2)

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year
## Model 2: df$MPG ~ df$weight + factor(df$year)
##      Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1       389 4569.0
## 2       378 3762.8 11      806.2 7.3627 1.896e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Refuting the null hypothesis, so the efficiency is not constant over time.

Including other variables

```
lm.3 = lm(df$MPG ~ df$weight + df$year + df$cylind + df$disp + df$HP +  
df$seconds)
```

```
summary(lm.3)
```

```
##
```

```
## Call:
```

```
## lm(formula = df$MPG ~ df$weight + df$year + df$cylind + df$disp +  
##     df$HP + df$seconds)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max  
## -8.6927 -2.3864 -0.0801  2.0291 14.3607
```

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)  
## (Intercept) -14.53525    4.76388  -3.051  0.00244 **  
## df$weight    -6.79462    0.67002 -10.141 < 2e-16 ***  
## df$year       0.75337    0.05262  14.318 < 2e-16 ***  
## df$cylind    -0.32986    0.33210  -0.993  0.32122  
## df$disp       0.76784    0.73577   1.044  0.29733  
## df$HP        -0.03914    1.38365  -0.028  0.97745  
## df$seconds    0.08527    0.10204   0.836  0.40383
```

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
```

```
## Residual standard error: 3.435 on 385 degrees of freedom
```

```
## Multiple R-squared:  0.8093, Adjusted R-squared:  0.8063
```

```
## F-statistic: 272.2 on 6 and 385 DF,  p-value: < 2.2e-16
```

```
lm.4 = lm(df$MPG ~ df$weight + df$year + df$cylind + df$disp + df$HP)
```

```
summary(lm.4)
```

```
##
```

```
## Call:
```

```
## lm(formula = df$MPG ~ df$weight + df$year + df$cylind + df$disp +  
##     df$HP)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max  
## -8.8714 -2.3852 -0.0895  2.0971 14.4267
```

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)  
## (Intercept) -12.77949    4.27394  -2.990  0.00297 **  
## df$weight    -6.52445    0.58665 -11.122 < 2e-16 ***  
## df$year       0.74992    0.05244  14.302 < 2e-16 ***  
## df$cylind    -0.34369    0.33156  -1.037  0.30058
```

```

## df$disp      0.69964      0.73095      0.957      0.33908
## df$HP        -0.77149      1.07036     -0.721      0.47149
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.434 on 386 degrees of freedom
## Multiple R-squared:  0.8089, Adjusted R-squared:  0.8064
## F-statistic: 326.8 on 5 and 386 DF,  p-value: < 2.2e-16

lm.5 = lm(df$MPG ~ df$weight + df$year + df$cylind + df$disp)
summary(lm.5)

##
## Call:
## lm(formula = df$MPG ~ df$weight + df$year + df$cylind + df$disp)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.0169 -2.2958 -0.0967  2.0400 14.4239
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -13.69248    4.07939  -3.357 0.000868 ***
## df$weight    -6.61240    0.57346 -11.531 < 2e-16 ***
## df$year        0.75859    0.05101  14.872 < 2e-16 ***
## df$cylind     -0.32169    0.32995  -0.975 0.330182
## df$disp        0.48882    0.66946   0.730 0.465727
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.432 on 387 degrees of freedom
## Multiple R-squared:  0.8087, Adjusted R-squared:  0.8067
## F-statistic: 408.9 on 4 and 387 DF,  p-value: < 2.2e-16

lm.6 = lm(df$MPG ~ df$weight + df$year + df$cylind)
summary(lm.6)

##
## Call:
## lm(formula = df$MPG ~ df$weight + df$year + df$cylind)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.0139 -2.2887 -0.0577  1.9908 14.3845
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -13.90761    4.06628  -3.420 0.000692 ***
## df$weight    -6.36570    0.46308 -13.746 < 2e-16 ***
## df$year        0.75202    0.05018  14.987 < 2e-16 ***
## df$cylind     -0.15173    0.23370  -0.649 0.516571

```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.43 on 388 degrees of freedom
## Multiple R-squared:  0.8084, Adjusted R-squared:  0.8069
## F-statistic: 545.6 on 3 and 388 DF,  p-value: < 2.2e-16

lm.7 = lm(df$MPG ~ df$weight + df$year)
summary(lm.7)

##
## Call:
## lm(formula = df$MPG ~ df$weight + df$year)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.8505 -2.3014 -0.1167  2.0367 14.3555
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -14.34725    4.00652  -3.581 0.000386 ***
## df$weight    -6.63208    0.21456 -30.911 < 2e-16 ***
## df$year        0.75732    0.04947  15.308 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.427 on 389 degrees of freedom
## Multiple R-squared:  0.8082, Adjusted R-squared:  0.8072
## F-statistic: 819.5 on 2 and 389 DF,  p-value: < 2.2e-16

# Comparison between models
anova(lm.4, lm.3)

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year + df$cyland + df$disp + df$HP
## Model 2: df$MPG ~ df$weight + df$year + df$cyland + df$disp + df$HP +
##          df$seconds
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      386 4551.6
## 2      385 4543.3  1     8.2421 0.6984 0.4038

anova(lm.5, lm.4)

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year + df$cyland + df$disp
## Model 2: df$MPG ~ df$weight + df$year + df$cyland + df$disp + df$HP
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      387 4557.7
## 2      386 4551.6  1     6.1259 0.5195 0.4715
```

```

anova(lm.6, lm.5)

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year + df$cyland
## Model 2: df$MPG ~ df$weight + df$year + df$cyland + df$disp
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1      388 4564.0
## 2      387 4557.7  1      6.2789 0.5331 0.4657

anova(lm.7, lm.6)

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year
## Model 2: df$MPG ~ df$weight + df$year + df$cyland
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1      389 4569
## 2      388 4564  1      4.9581 0.4215 0.5166

anova(lm.7, lm.3)

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year
## Model 2: df$MPG ~ df$weight + df$year + df$cyland + df$disp + df$HP +
##           df$seconds
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1      389 4569.0
## 2      385 4543.3  4      25.605 0.5424 0.7047

# The best model is lm.7

# Including the time, in a nonlinear way (using a n dummy)
lm.8 = lm(df$MPG ~ df$weight + factor(df$year) - 1)
summary(lm.8)

##
## Call:
## lm(formula = df$MPG ~ df$weight + factor(df$year) - 1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.2409  -2.0409   0.0044   1.9897  13.4664
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## df$weight      -6.3554     0.2023  -31.41  <2e-16 ***
## factor(df$year)70 39.1252     0.8995   43.50  <2e-16 ***
## factor(df$year)71 40.3718     0.8630   46.78  <2e-16 ***
## factor(df$year)72 39.2913     0.8858   44.35  <2e-16 ***

```

```

## factor(df$year)73 38.8293 0.8529 45.52 <2e-16 ***
## factor(df$year)74 41.0604 0.8497 48.32 <2e-16 ***
## factor(df$year)75 40.4566 0.8631 46.87 <2e-16 ***
## factor(df$year)76 41.1402 0.8251 49.86 <2e-16 ***
## factor(df$year)77 42.4245 0.8505 49.88 <2e-16 ***
## factor(df$year)78 42.2491 0.7822 54.01 <2e-16 ***
## factor(df$year)79 44.5111 0.8517 52.26 <2e-16 ***
## factor(df$year)80 49.3210 0.7828 63.01 <2e-16 ***
## factor(df$year)81 46.2661 0.7859 58.87 <2e-16 ***
## factor(df$year)82 47.4701 0.7579 62.63 <2e-16 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.155 on 378 degrees of freedom
## Multiple R-squared: 0.9843, Adjusted R-squared: 0.9837
## F-statistic: 1690 on 14 and 378 DF, p-value: < 2.2e-16

# Including the origin of cars
# With the intercept
lm.9 = lm(df$MPG ~ df$weight + df$year + factor(df$origin))
summary(lm.9)

##
## Call:
## lm(formula = df$MPG ~ df$weight + df$year + factor(df$origin))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.6025 -2.1132 -0.0206  1.7617 13.5261
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -18.30694    4.01724  -4.557 6.96e-06 ***
## df$weight      -5.88700    0.25994 -22.647 < 2e-16 ***
## df$year         0.76985    0.04867  15.818 < 2e-16 ***
## factor(df$origin)2  1.97631    0.51797   3.815 0.000158 ***
## factor(df$origin)3  2.21453    0.51882   4.268 2.48e-05 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.337 on 387 degrees of freedom
## Multiple R-squared: 0.819, Adjusted R-squared: 0.8172
## F-statistic: 437.9 on 4 and 387 DF, p-value: < 2.2e-16

# Without the intercept
lm.10 = lm(df$MPG ~ df$weight + df$year + factor(df$origin) - 1)
summary(lm.10)

##
## Call:
## lm(formula = df$MPG ~ df$weight + df$year + factor(df$origin) -

```



```
##      1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.6025 -2.1132 -0.0206  1.7617 13.5261
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## df$weight      -5.88700    0.25994  -22.647  < 2e-16 ***
## df$year         0.76985    0.04867   15.818  < 2e-16 ***
## factor(df$origin)1 -18.30694    4.01724   -4.557 6.96e-06 ***
## factor(df$origin)2 -16.33064    3.92708   -4.158 3.95e-05 ***
## factor(df$origin)3 -16.09241    3.98598   -4.037 6.52e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.337 on 387 degrees of freedom
## Multiple R-squared:  0.982, Adjusted R-squared:  0.9818
## F-statistic: 4220 on 5 and 387 DF,  p-value: < 2.2e-16

# In different regions, has the passage of time had varying effects?
lm.11 = lm(df$MPG ~ df$weight + factor(df$origin)*df$year)
summary(lm.11)

##
## Call:
## lm(formula = df$MPG ~ df$weight + factor(df$origin) * df$year)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.8311 -2.0312 -0.0869  1.6681 12.9686
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -3.74793    5.05929  -0.741 0.459265
## df$weight        -6.21949    0.26366 -23.589  < 2e-16 ***
## factor(df$origin)2 -38.92547   10.12189  -3.846 0.000141 ***
## factor(df$origin)3 -27.37209    9.19217  -2.978 0.003087 **
## df$year           0.59208    0.06153   9.623  < 2e-16 ***
## factor(df$origin)2:df$year  0.53656    0.13288   4.038 6.51e-05 ***
## factor(df$origin)3:df$year  0.38135    0.11848   3.219 0.001397 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.256 on 385 degrees of freedom
## Multiple R-squared:  0.8286, Adjusted R-squared:  0.8259
## F-statistic: 310.2 on 6 and 385 DF,  p-value: < 2.2e-16

anova(lm.10, lm.11)
```

```

## Analysis of Variance Table
##
## Model 1: df$MPG ~ df$weight + df$year + factor(df$origin) - 1
## Model 2: df$MPG ~ df$weight + factor(df$origin) * df$year
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1     387 4310.4
## 2     385 4082.7  2     227.69 10.736 2.904e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

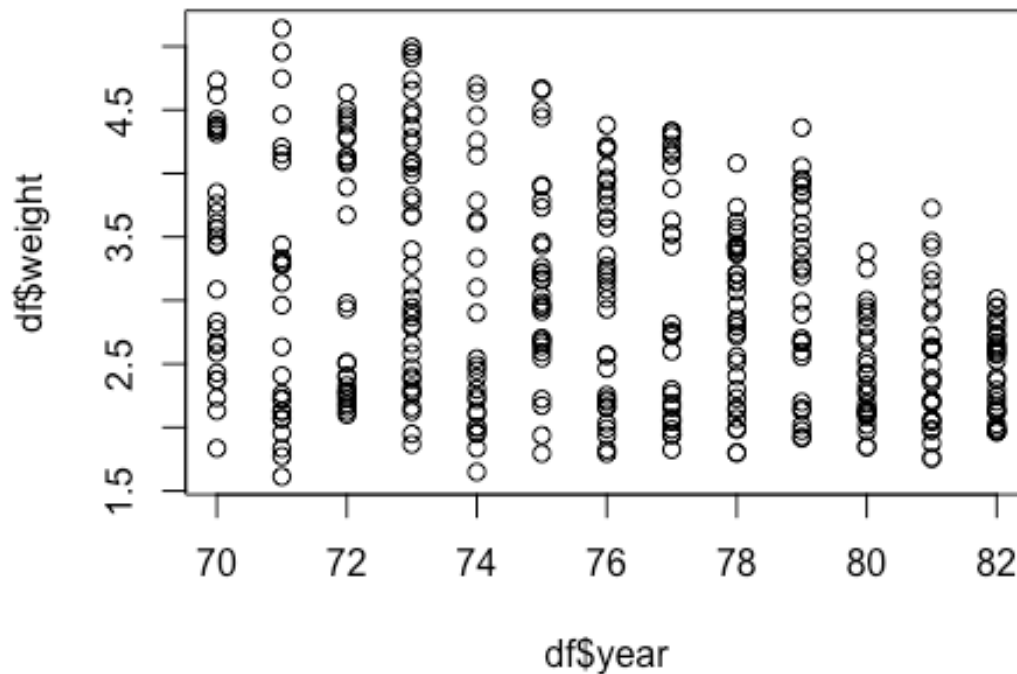
# Yes, the time had varying effects in different regions

# Considering a nonlinear effect of weight
# Polynomial model
lm.12 = lm(df$MPG ~ df$weight + I(df$weight^2) + df$year)
summary(lm.12)

##
## Call:
## lm(formula = df$MPG ~ df$weight + I(df$weight^2) + df$year)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.4561 -1.7083 -0.1726  1.5192 13.1789
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.1208     3.8794   0.547   0.585
## df$weight    -21.5480     1.4409 -14.955 <2e-16 ***
## I(df$weight^2)  2.3477     0.2248  10.443 <2e-16 ***
## df$year        0.8289     0.0443  18.712 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.032 on 388 degrees of freedom
## Multiple R-squared:  0.8503, Adjusted R-squared:  0.8491
## F-statistic: 734.4 on 3 and 388 DF,  p-value: < 2.2e-16

plot(df$year, df$weight)

```



```
cor(df$weight, df$weight^2)
## [1] 0.992019
# Multicollinearity problem
# Piecewise curve
d25 = rep(0, length(df$year))
d25[df$weight >= 2.5] = 1
lm.13 = lm(df$MPG ~ d25*df$weight + I(df$year-70))
summary(lm.13)
##
## Call:
## lm(formula = df$MPG ~ d25 * df$weight + I(df$year - 70))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.6137 -1.9227 -0.0469  1.6316 13.0549
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   49.73520    2.94802   16.871  < 2e-16 ***
## d25          -19.21626    3.08955   -6.220 1.29e-09 ***
```

```
## df$weight      -11.57911      1.36555   -8.479 4.83e-16 ***
## I(df$year - 70)  0.82418      0.04586   17.972 < 2e-16 ***
## d25:df$weight    7.02261      1.39408    5.037 7.25e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.121 on 387 degrees of freedom
## Multiple R-squared:  0.8417, Adjusted R-squared:  0.8401
## F-statistic: 514.5 on 4 and 387 DF,  p-value: < 2.2e-16

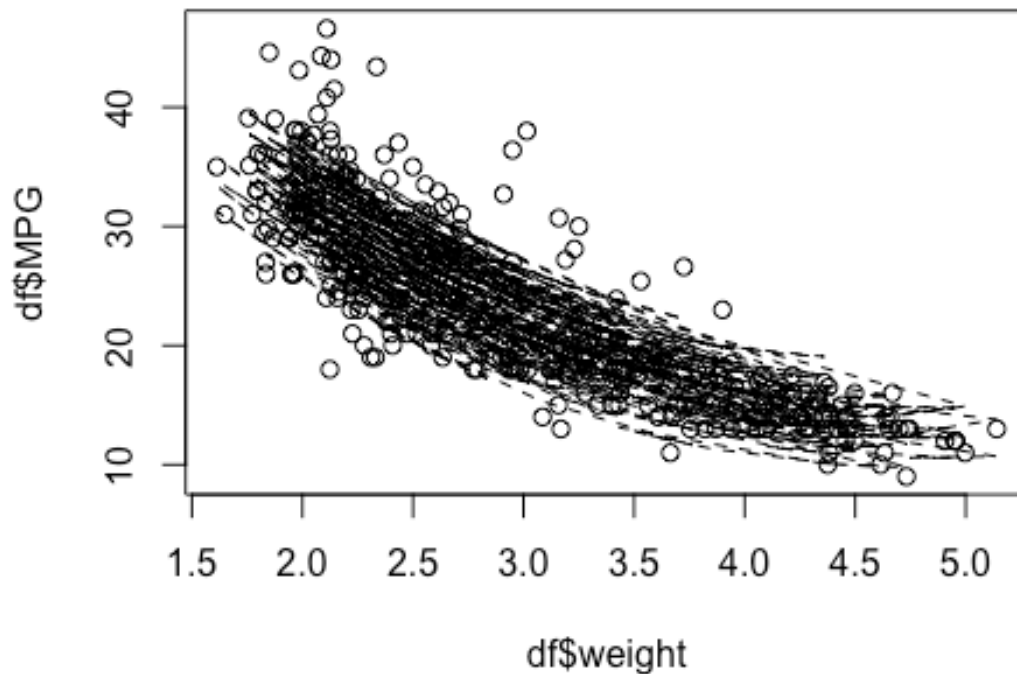
# Graphical representation of nonlinear relationship
origin = 1
weight = seq(min(df$weight), max(df$weight), 0.01)
year = 75

pred = data.frame(weight, origin, year)
pred$d25 = 0
pred$d25[pred$weight > 2.5] = 1

y_hat = predict(lm.12, newdata = pred, interval = "confidence")

## Warning: 'newdata' had 353 rows but variables found have 392 rows

plot(df$weight, df$MPG)
lines(df$weight, y_hat[,2], type = "l", lty = 2)
lines(df$weight, y_hat[,3], type = "l", lty = 2)
```



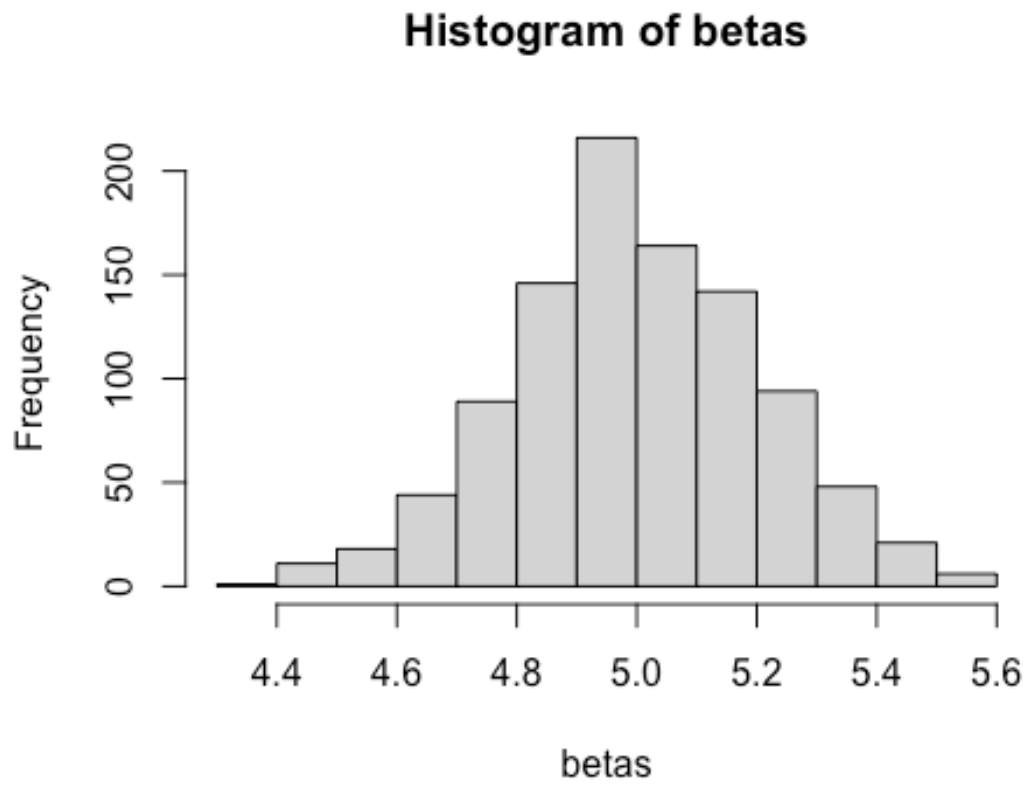
```
# Demonstration of consistency of HC0 (White Estimator for standard error) --
--
set.seed(226091)
n = 500
reps = 10^3 # It will be better to use a larger number of repetitions, but it
would take too long on my PC...

betas = numeric(n)
se_ols = numeric(n)
se_white = numeric(n)

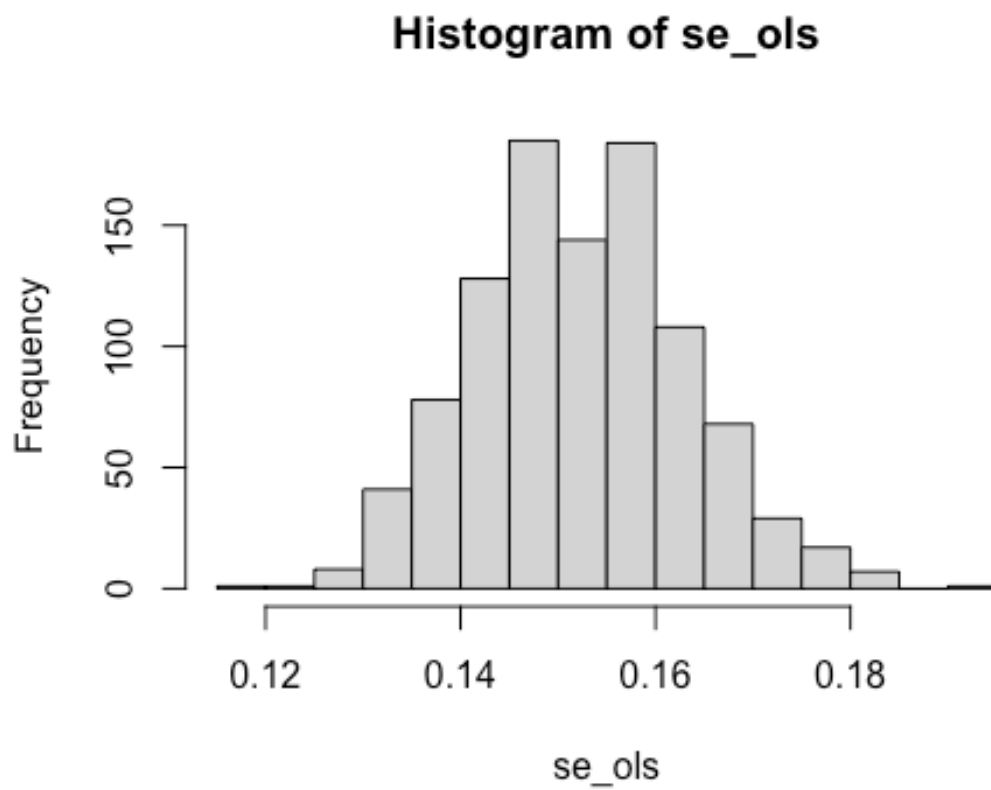
for (i in 1:reps){
  x = runif(n, -1, 2)
  u = rnorm(500)
  u = 2*u*(x^2)
  y = 1 + 5*x + u

  model = lm(y ~ x)
  betas[i] = coef(model)[2]
  se_ols[i] = summary(model)$coef[2,2]
  se_white[i] = coeftest(model, vcov = vcovHC(model, "HC0"))[2,2]
}
```

```
hist(betas)
```

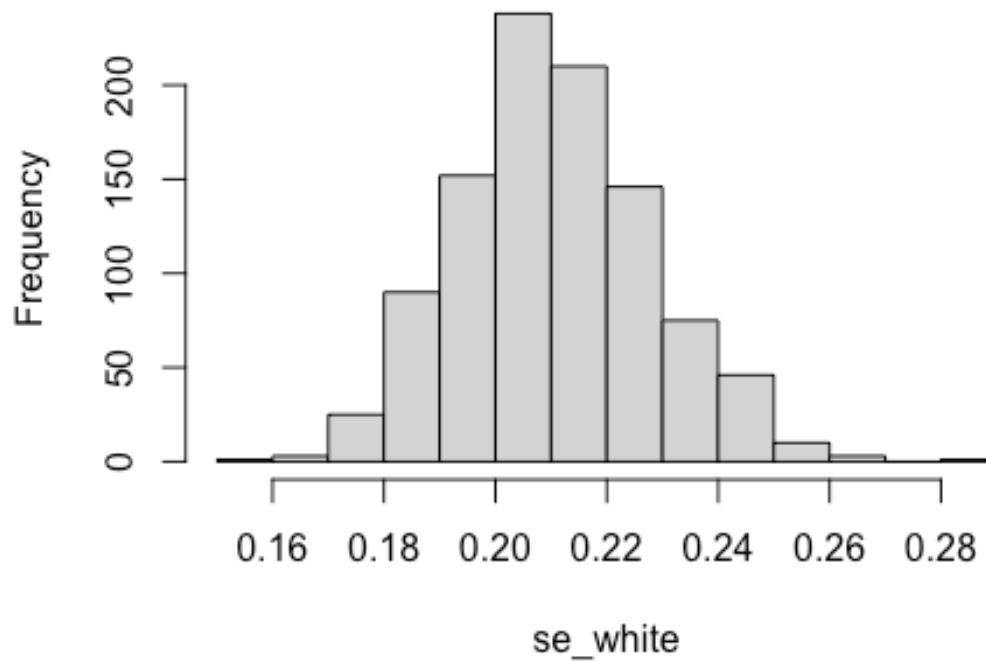


```
hist(se_ols)
```



```
hist(se_white)
```

Histogram of se_white



```
mean(se_ols)
## [1] 0.1522703

mean(se_white)
## [1] 0.2106517

sd(betas) / mean(se_ols)                                # OLS underestimate
s.e.
## [1] 1.358837

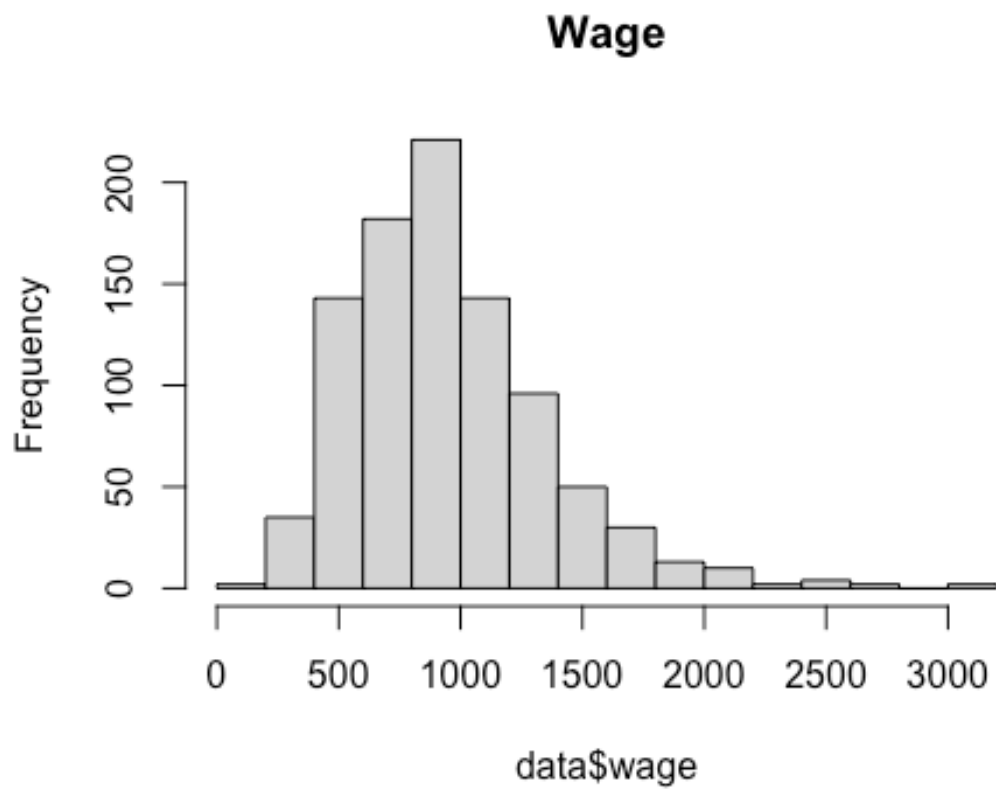
sd(betas) / mean(se_white)                              # White Estimator
estimate correctly s.e.
## [1] 0.9822399

# Two Stage Least Squares ----
data(wage2)                                              #
Data from Wooldridge
data = wage2

# Descriptive statistics
```



```
# Wage  
hist(data$wage, main = "Wage")
```



```
hist(log(data$wage), main = "Log wage")
```



```
# Hourly wage  
data$hwage = data$wage / (data$hours * 4.33)  
hist(log(data$hwage), main = "Hourly wage")
```

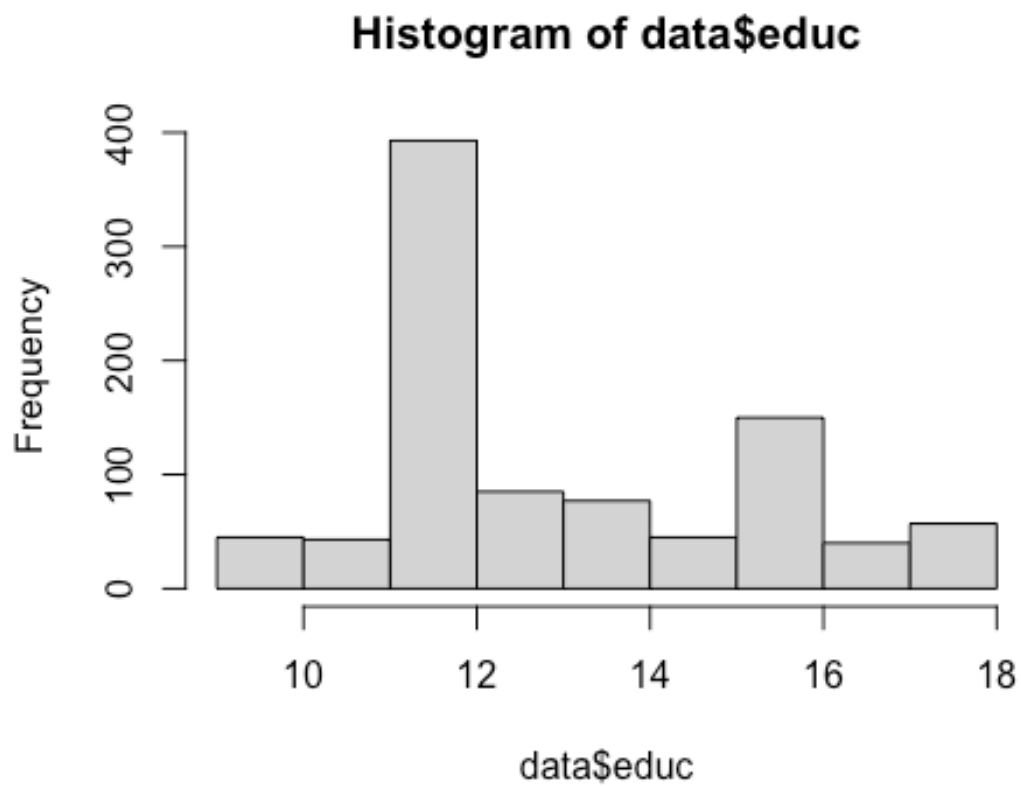


```
# Education
```

```
summary(data$educ)
```

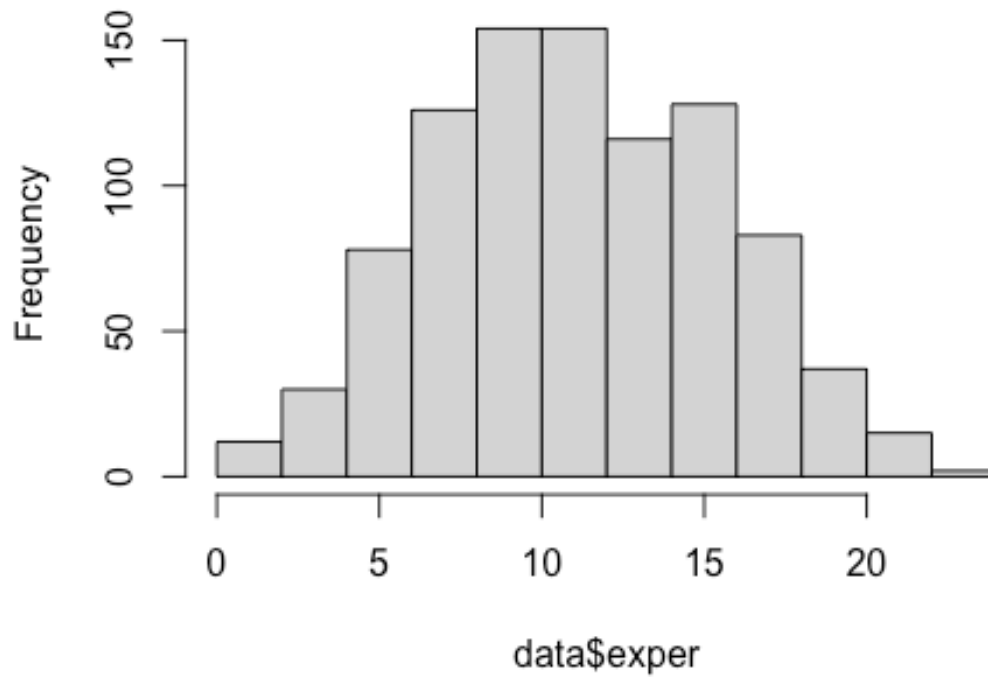
```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      9.00  12.00   12.00   13.47  16.00   18.00
```

```
hist(data$educ)
```



```
# Experience  
hist(data$exper)
```

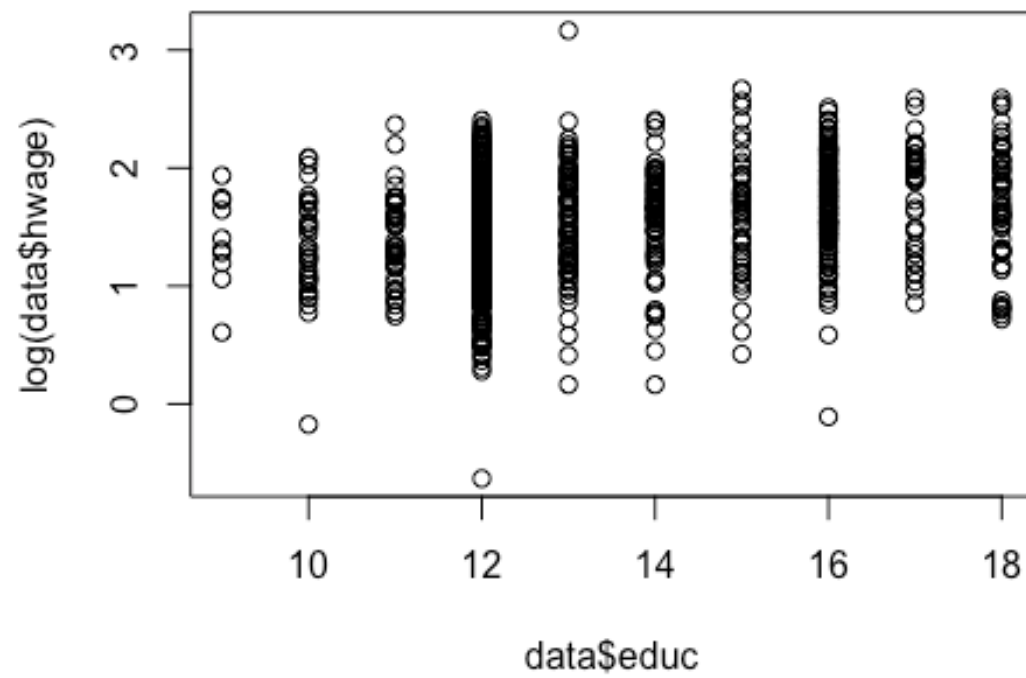
Histogram of data\$exper



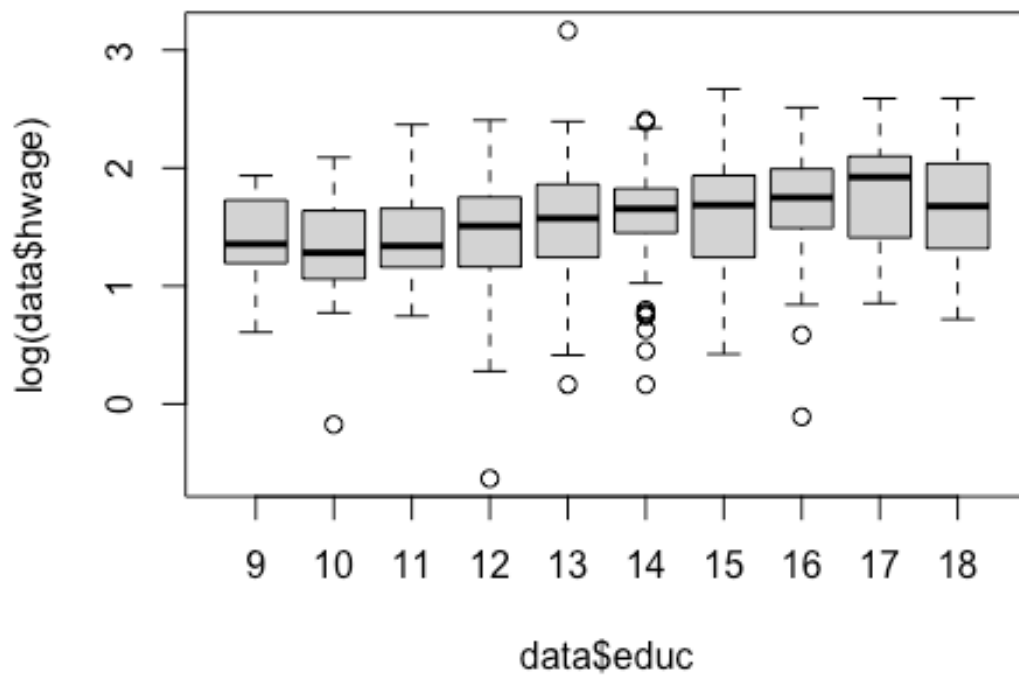
Scatter plot

```
plot(data$educ, log(data$hwage))  
is not a relationship
```

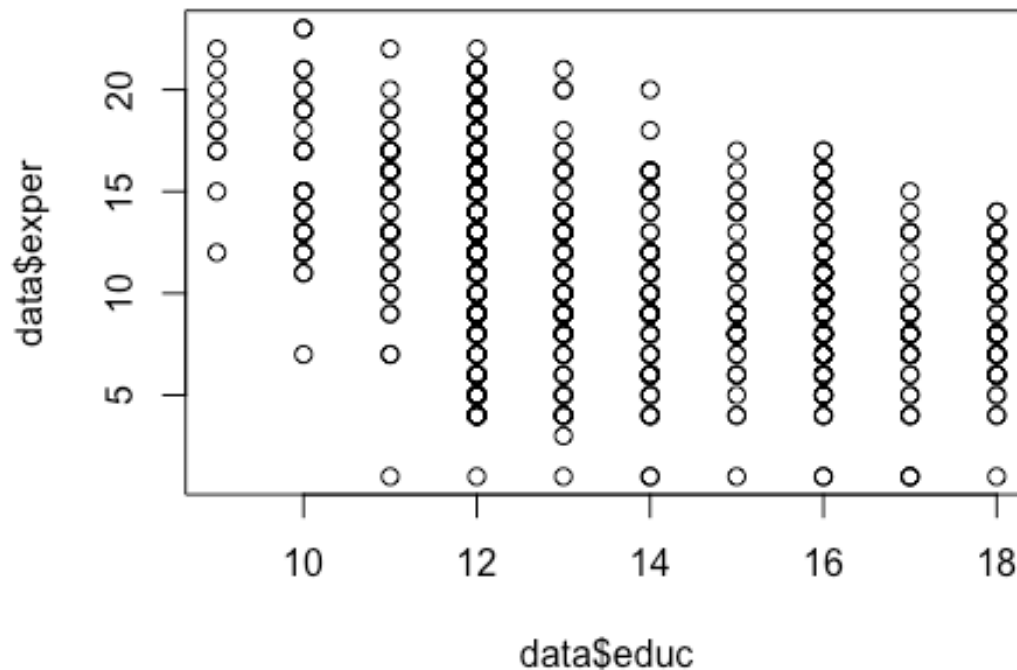
It seems there



```
boxplot(log(data$hwage) ~ data$educ)
```



```
plot(data$educ, data$exper) # There is a relationship between education and  
experience (r = -0.45)
```



```
cor(data$educ, data$exper)
```

```
## [1] -0.4555731
```

*# Ability of workers could be an omitted variable (positively correlated with education and hourly wage,
so models without ability will overestimate the beta)*

ESTIMATION

```
output = matrix(NA, 7, 2)      # Matrix where I will save the betas of  
education in different models
```

```
colnames(output) = c("coef (*100)", "sd.err (*100)")
```

```
rownames(output) = c("log(hwage) ~ edu", "log(hwage) ~ edu + exp",  
"log(hwage) ~ ...", "with proxy (IQ)",  
"White", "No NA", "2SLS")
```

Log-linear model without experience

```
m00 = lm(log(hwage) ~ educ, data = data)
```

```
summary(m00)
```

```
##
```

```
## Call:
```

```
## lm(formula = log(hwage) ~ educ, data = data)
```



```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.09788 -0.26760  0.04829  0.30024  1.64710
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.829856   0.089128   9.311  < 2e-16 ***
## educ         0.052947   0.006531   8.107 1.63e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4385 on 933 degrees of freedom
## Multiple R-squared:  0.0658, Adjusted R-squared:  0.0648
## F-statistic: 65.72 on 1 and 933 DF,  p-value: 1.626e-15

output[1,] = coef(summary(m00))[2,1:2] * 100
# This model does not consider the work experience. The impact of education
# on hourly wage is
# underestimate, as the work experience is positively correlated with hourly
# wage, but negatively correlated
# with education.

# Log-linear model with experience
m01 = lm(log(hwage) ~ educ + exper, data = data)
summary(m01)

##
## Call:
## lm(formula = log(hwage) ~ educ + exper, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.01814 -0.26266  0.04045  0.28711  1.66734
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.343045   0.122965   2.790  0.00538 **
## educ         0.071518   0.007218   9.908  < 2e-16 ***
## exper        0.020469   0.003625   5.647 2.17e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4314 on 932 degrees of freedom
## Multiple R-squared:  0.09671, Adjusted R-squared:  0.09477
## F-statistic: 49.89 on 2 and 932 DF,  p-value: < 2.2e-16

output[2,] = coef(summary(m01))[2,1:2] * 100
# As expected, b_educ is higher than previous estimate
```

```

# Adding more regressors
m02 = lm(log(hwage) ~ educ + exper + black + tenure + south + urban, data =
data)
summary(m02)

##
## Call:
## lm(formula = log(hwage) ~ educ + exper + black + tenure + south +
##      urban, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.08807 -0.24769  0.02313  0.27398  1.60521
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.379526   0.122182   3.106 0.001952 **
## educ         0.059764   0.007062   8.463 < 2e-16 ***
## exper        0.015631   0.003590   4.354 1.48e-05 ***
## black       -0.150974   0.042484  -3.554 0.000399 ***
## tenure       0.013625   0.002769   4.920 1.02e-06 ***
## south       -0.083727   0.029647  -2.824 0.004843 **
## urban        0.177164   0.030457   5.817 8.25e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.413 on 928 degrees of freedom
## Multiple R-squared:  0.1755, Adjusted R-squared:  0.1702
## F-statistic: 32.93 on 6 and 928 DF,  p-value: < 2.2e-16

output[3,] = coef(summary(m02))[2,1:2]*100

# Testing the hypothesis that one additional educational year has the same
# impact of one additional
# experience year in the same company.
# H0: b_educ = b_tenure + b_experience
# NB: tenure is the number of years spend to work in the same company
linearHypothesis(m02, c("educ = exper + tenure"),test="F")

## Linear hypothesis test
##
## Hypothesis:
## educ - exper - tenure = 0
##
## Model 1: restricted model
## Model 2: log(hwage) ~ educ + exper + black + tenure + south + urban
##
##      Res.Df    RSS Df Sum of Sq      F    Pr(>F)
## 1      929 161.82
## 2      928 158.30  1      3.5163 20.613 6.36e-06 ***

```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# or, without using linearHypothesis function:
m02r = lm(log(hwage) ~ I(educ + exper) + I(educ + tenure) + black + south +
urban, data=data)
anova(m02,m02r)

## Analysis of Variance Table
##
## Model 1: log(hwage) ~ educ + exper + black + tenure + south + urban
## Model 2: log(hwage) ~ I(educ + exper) + I(educ + tenure) + black + south +
##      urban
##      Res.Df    RSS Df Sum of Sq      F    Pr(>F)
## 1      928 158.30
## 2      929 161.82 -1    -3.5163 20.613 6.36e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# We refuse the null hypothesis, so one additional educational year has not
the same impact of one
# additional experience year in the same company

# Using a proxy variable of ability: IQ
# Theoretically, b_educ will be lower because the proxy variable reduce, but
not delete, the bias
# (unless, cor(IQ, ability) == 1, but it is not the case)
m03 = lm(log(hwage) ~ educ + exper + black + tenure + south + urban + IQ,
data=data)
summary(m03)

##
## Call:
## lm(formula = log(hwage) ~ educ + exper + black + tenure + south +
##      urban + IQ, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.11870 -0.24755  0.02043  0.27162  1.58899
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.165366   0.139834   1.183  0.23728
## educ         0.048975   0.007842   6.245 6.45e-10 ***
## exper        0.015734   0.003573   4.403 1.19e-05 ***
## black        -0.106721   0.044627  -2.391  0.01698 *
## tenure        0.013281   0.002759   4.814 1.72e-06 ***
## south        -0.073211   0.029704  -2.465  0.01389 *
## urban         0.175234   0.030323   5.779 1.03e-08 ***
## IQ            0.003484   0.001123   3.103  0.00197 **
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4111 on 927 degrees of freedom
## Multiple R-squared:  0.184, Adjusted R-squared:  0.1778
## F-statistic: 29.86 on 7 and 927 DF,  p-value: < 2.2e-16

output[4,] <-coef(summary(m03))[2,1:2] * 100

# Testing and correcting for heteroskedasticity
white = white_test(m03)
# The p-value is very close to 0.05, it would be better to correct for
heteroskedasticity
coeftest(m03, vcov = vcovHC(m03, "HC1"))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.1653658  0.1330625  1.2428  0.214267
## educ         0.0489746  0.0083333  5.8769 5.825e-09 ***
## exper        0.0157335  0.0034964  4.4999 7.662e-06 ***
## black        -0.1067212  0.0435272 -2.4518  0.014397 *
## tenure        0.0132815  0.0028351  4.6846 3.224e-06 ***
## south        -0.0732107  0.0310951 -2.3544  0.018760 *
## urban         0.1752339  0.0299547  5.8500 6.813e-09 ***
## IQ            0.0034843  0.0011194  3.1127  0.001911 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

output[5,] <-coeftest(m03, vcov = vcovHC(m03, "HC1"))[2,1:2] * 100

# 2SLS
# Using feduc (education of father) and meduc (education of mother) as
instrument variables
datas = data[is.na(data$feduc)==0,]
datas = datas[is.na(datas$meduc)==0,]

# Try to estimate again m03 without NA
m03 = lm(log(hwage) ~ educ + exper + black + tenure + south + urban + IQ,
data=datas)
summary(m03)

##
## Call:
## lm(formula = log(hwage) ~ educ + exper + black + tenure + south +
##      urban + IQ, data = datas)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.11870 -0.24755  0.02043  0.27162  1.58899
```

```
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.165366   0.139834   1.183  0.23728
## educ         0.048975   0.007842   6.245 6.45e-10 ***
## exper        0.015734   0.003573   4.403 1.19e-05 ***
## black       -0.106721   0.044627  -2.391  0.01698 *
## tenure       0.013281   0.002759   4.814 1.72e-06 ***
## south       -0.073211   0.029704  -2.465  0.01389 *
## urban        0.175234   0.030323   5.779 1.03e-08 ***
## IQ           0.003484   0.001123   3.103  0.00197 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4111 on 927 degrees of freedom
## Multiple R-squared:  0.184, Adjusted R-squared:  0.1778
## F-statistic: 29.86 on 7 and 927 DF,  p-value: < 2.2e-16

output[6,] <-coef(summary(m03))[2,1:2] * 100
# Does not change

# First stage of 2SLS
stage1 = lm(educ ~ exper + black + tenure + south + urban + feduc + meduc,
data = datas)
# Are feduc and meduc weak IV?
stage1r = lm(educ ~ exper + black + tenure + south + urban, data = datas)
anova(stage1, stage1r)

## Analysis of Variance Table
##
## Model 1: educ ~ exper + black + tenure + south + urban + feduc + meduc
## Model 2: educ ~ exper + black + tenure + south + urban
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1      714 2409.9
## 2      716 2785.4 -2    -375.46 55.62 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# No, they are not weak IV
# Second stage of 2SLS
datas$educ_hat = predict(stage1)
stage2 = lm(log(hwage) ~ educ_hat + exper + black + tenure + south + urban,
data=datas)
summary(stage2)

##
## Call:
## lm(formula = log(hwage) ~ educ_hat + exper + black + tenure +
##     south + urban, data = datas)
##
## Residuals:
```

```
##      Min      1Q   Median      3Q      Max
## -2.20685 -0.24315  0.02175  0.29595  1.51635
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.393005   0.360555  -1.090  0.27608
## educ_hat     0.106126   0.022194   4.782 2.11e-06 ***
## exper        0.030293   0.006705   4.518 7.31e-06 ***
## black       -0.097644   0.061261  -1.594  0.11140
## tenure       0.008984   0.003466   2.592  0.00975 **
## south       -0.061316   0.035665  -1.719  0.08601 .
## urban        0.173549   0.037089   4.679 3.44e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4301 on 715 degrees of freedom
## Multiple R-squared:  0.1271, Adjusted R-squared:  0.1198
## F-statistic: 17.36 on 6 and 715 DF,  p-value: < 2.2e-16

# In this case (as we have compute "manually" 2SLS) we have to correct the
# s.e. as R compute these
# referring to datas$educ_hat = predict(stage1), but we know that s.e. are
# referred to data$educ
# In addition, we note that b_educ is bigger than previous estimates, but we
# have said the beta is
# overestimate. The IV are strong, but this discordance could be due to
# correlation between residuals
# and IV (income of parents could be correlated with the education of
# parents)
# So, unless the IVs are strong, they are not good instrument as correlation
# between them and the
# residuals is not zero. Right now, we cannot find another instrument.

# Estimating again 2SLS regression using IVREG function
# In this case s.e. compute by R are correct.
twosls = ivreg(log(hwage) ~ educ + exper + black + tenure + south + urban |
               feduc + meduc + exper + black + tenure + south + urban,
               data = datas)
summary(twosls)

##
## Call:
## ivreg(formula = log(hwage) ~ educ + exper + black + tenure +
##       south + urban | feduc + meduc + exper + black + tenure +
##       south + urban, data = datas)
##
## Residuals:
##      Min      1Q   Median      3Q      Max
## -1.9863 -0.2577  0.0235  0.2851  1.6359
##
```

```
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.393005   0.358988  -1.095  0.27399
## educ         0.106126   0.022098   4.803 1.91e-06 ***
## exper        0.030293   0.006676   4.537 6.68e-06 ***
## black        -0.097644   0.060995  -1.601  0.10985
## tenure       0.008984   0.003451   2.603  0.00943 **
## south        -0.061316   0.035510  -1.727  0.08465 .
## urban        0.173549   0.036927   4.700 3.12e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4282 on 715 degrees of freedom
## Multiple R-Squared: 0.1347, Adjusted R-squared: 0.1274
## Wald test: 17.51 on 6 and 715 DF, p-value: < 2.2e-16

output[7,] <-coef(summary(twosls))[2,1:2] * 100
# The consideration made above are valid also here

# Demonstration of the unbiasedness of OLS with time-invariant omitted
# variables in panel data ----
# Theoretical model:  $y = b_0 + (b_1)x + (b_2)z + e$ 
# where Z is the omitted variable, negatively correlated with X.
set.seed(226091)
N = 6 # Number of units
in the panel
t = 4 # Number of
observation for each units
id = rep(1:N, each = t) # ID of units

z = rep(runif(N, min = 10, max = 30)*5, each = t)
x = 4*(runif(t*N, min = 10, max = 30)) - z
e = rnorm(N*t)
y = 10 + 3*x + 15*z + 2*e
cor(x, z)

## [1] -0.6085338

cbind(id, y, x, z) # Panel

##           id           y           x           z
## [1,]  1  975.3192 -9.2834940  66.16083
## [2,]  1 1003.5211  0.4275309  66.16083
## [3,]  1 1075.3464 25.4077471  66.16083
## [4,]  1  977.8795 -9.1982451  66.16083
## [5,]  2 1151.5878 -17.7964973  79.68584
## [6,]  2 1298.2273 30.6489368  79.68584
## [7,]  2 1115.5111 -30.7374447  79.68584
## [8,]  2 1118.3982 -28.3624757  79.68584
## [9,]  3 1265.6402 -30.0152902  89.62913
```

```

## [10,] 3 1217.2052 -44.8839464 89.62913
## [11,] 3 1425.5893 23.9770967 89.62913
## [12,] 3 1332.6362 -7.9292574 89.62913
## [13,] 4 1620.0243 -48.9902904 117.14438
## [14,] 4 1739.4497 -9.8908180 117.14438
## [15,] 4 1685.4714 -27.3197885 117.14438
## [16,] 4 1601.7702 -55.2621495 117.14438
## [17,] 5 1044.3725 57.0960563 57.63448
## [18,] 5 1014.9949 47.0677443 57.63448
## [19,] 5 894.3906 6.1019278 57.63448
## [20,] 5 922.3044 15.5429432 57.63448
## [21,] 6 928.3306 -18.2151225 64.90592
## [22,] 6 912.1116 -23.3152456 64.90592
## [23,] 6 1042.2080 19.3883354 64.90592
## [24,] 6 961.6213 -7.7441780 64.90592

estimate = matrix(NA, 3, 2)
colnames(estimate) = c("beta_x", "s.e.")
rownames(estimate) = c("y ~ x + z", "y ~ x", "LSDV")

# OLS with z
ols_yesZ = lm(y ~ x + z)
summary(ols_yesZ)

##
## Call:
## lm(formula = y ~ x + z)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.2726 -0.7922 -0.1749  1.1635  2.9428
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  9.74823    1.66781   5.845 8.41e-06 ***
## x            2.99608    0.01475 203.090 < 2e-16 ***
## z            15.00506    0.02128 705.008 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.651 on 21 degrees of freedom
## Multiple R-squared:  1, Adjusted R-squared:  1
## F-statistic: 2.891e+05 on 2 and 21 DF, p-value: < 2.2e-16

estimate[1,] = coef(summary(ols_yesZ))[2,1:2]
# OLS is BLUE

# OLS without z
ols_noZ = lm(y ~ x)
summary(ols_noZ)

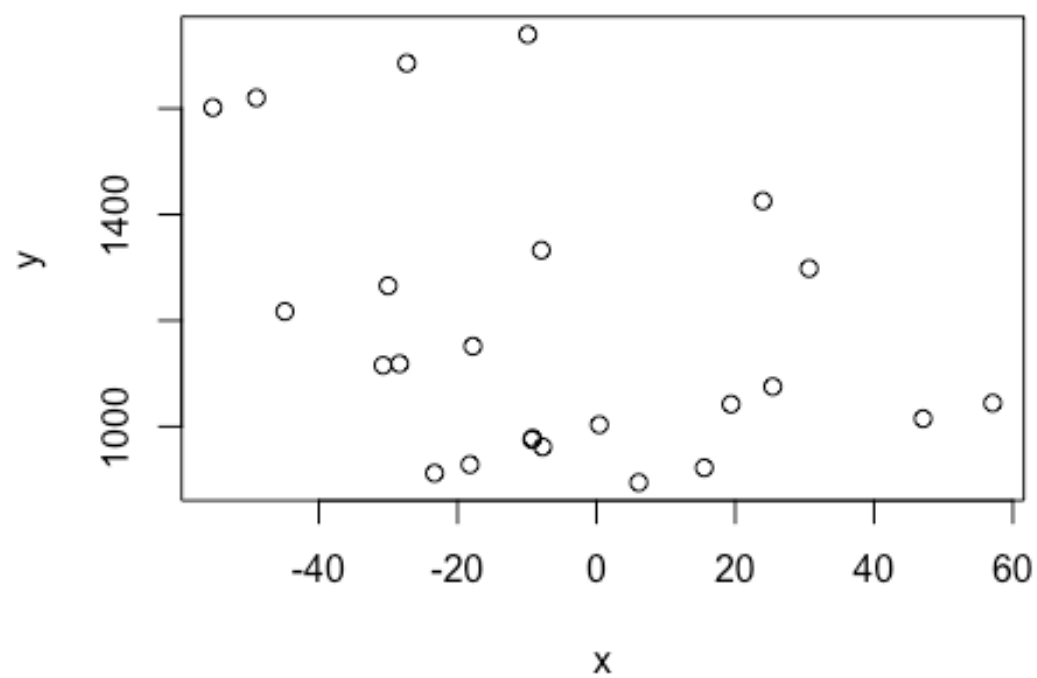
```



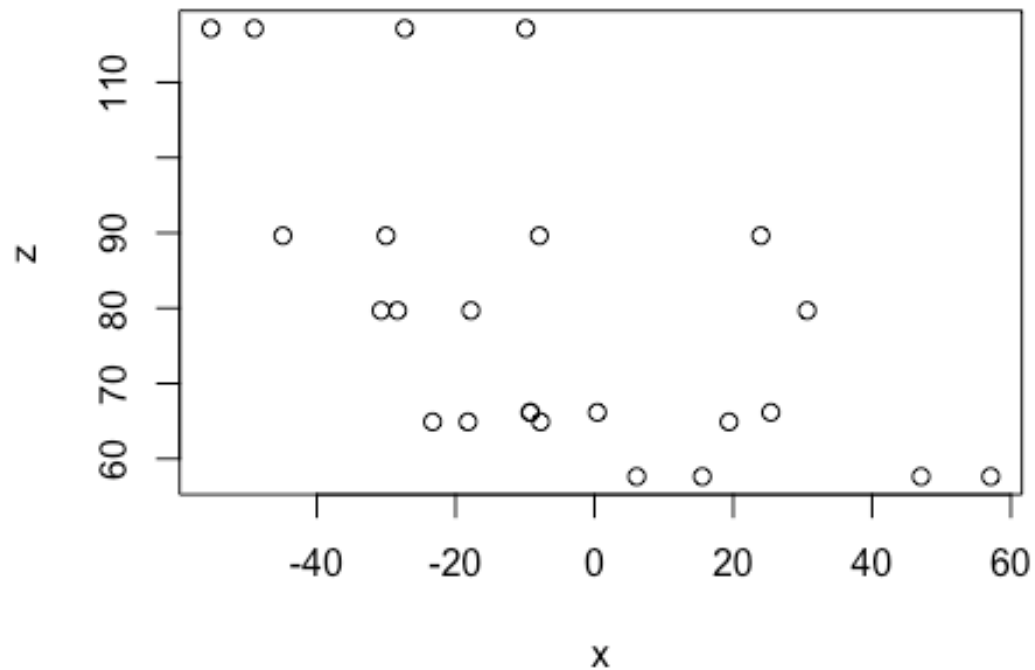
```
##
## Call:
## lm(formula = y ~ x)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -325.86 -192.88  -60.71  169.49  546.22
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 1160.264     51.725   22.431  <2e-16 ***
## x           -3.333       1.760   -1.894   0.0714 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 248.1 on 22 degrees of freedom
## Multiple R-squared:  0.1402, Adjusted R-squared:  0.1011
## F-statistic: 3.588 on 1 and 22 DF,  p-value: 0.07142

estimate[2,] = coef(summary(ols_noZ))[2,1:2]
# OLS is biased

# Plot
plot(x, y)
```



```
plot(x, z)
```



We can see (and we know) that for each unity the value of z is fixed and, for each unity the relationship between x and y is positive. We can use this feature to solve the problem of omitted variable

```
lsdv = lm(y ~ x + factor(id))
summary(lsdv)
```

```
##
## Call:
## lm(formula = y ~ x + factor(id))
##
## Residuals:
```

	Min	1Q	Median	3Q	Max
	-3.2225	-0.7909	-0.2822	1.1985	2.8999

```
##
## Coefficients:
```

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1002.51358	0.91043	1101.1	< 2e-16 ***
x	2.99339	0.01807	165.7	< 2e-16 ***
factor(id)2	203.02671	1.30927	155.1	< 2e-16 ***
factor(id)3	351.79545	1.32099	266.3	< 2e-16 ***
factor(id)4	765.02882	1.45172	527.0	< 2e-16 ***

```

## factor(id)5 -127.64659    1.39352   -91.6 < 2e-16 ***
## factor(id)6 -19.08043    1.29764   -14.7 4.25e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.82 on 17 degrees of freedom
## Multiple R-squared:      1, Adjusted R-squared:      1
## F-statistic: 7.929e+04 on 6 and 17 DF, p-value: < 2.2e-16

estimate[3,] = coef(summary(lsdv))[2,1:2]
# The estimate of beta_x is correct.

# An empirical application of panel data analysis ----
df_l16 = read.csv("farms.csv")
table(df_l16$year)

##
## 2006 2007 2008 2009 2010 2011
##  452  487  450  371  416  413

# Variables:
# 1. year = sampling year
# 2. fid = farm ID
# 3. county, region
# 4. wheat_share = share of farm allocated to wheat
# 5. wheat_price = price index of wheat
# 6. temp / precip = average temperature and precipitation on the farm
# 7. slope = average slope on the farm
# 8. ph = soil ph
# 8. coarse / med / fin = share of soil type

# Research question: the impact of prices and climate on agricultural wheat
production in the UK
# Fundamental hypothesis: agricultural firms operate in perfect competition

# We are trying to estimate a production function. This can be estimated
using the method:
# - Primal: all inputs are expressed in terms of quantity
# - Dual: all inputs are expressed in terms of price
# We are estimating a dual production function

# Variables that influence prices (and their volatility) x_{jt}:
# 1. Wheat quality {j}
# 2. Global demand and supply. We consider this price variability as
exogenous since it is not
#   determined by the individual farmer in the UK. {jt}
# 3. Distance affecting transportation costs {j}
# 4. Global demand and supply {jt}. We consider this price variability as
exogenous since it is not
#   determined by the individual farmer in the UK.

```

```

# Variables affecting  $y_{jt}$ :
# 1. Technology  $\{t\}$ 
# 2. Policy  $\{jt\}$  (varying in  $j$  and in  $t$ , because local policies affect only
certain farmers)

# Ordering the data
o = order(df_l16$fid)
df_l16_order = df_l16[o,]

# Here, we use wheat_price as an approximation of the production function. We
are thus saying that
# the production function is of the type  $f(x) = \text{global market wheat price}$ .
# In other words, we use wheat_share as the dependent variable, meaning we
estimate the amount of
# wheat produced based on the percentage of wheat allocated to wheat
cultivation.

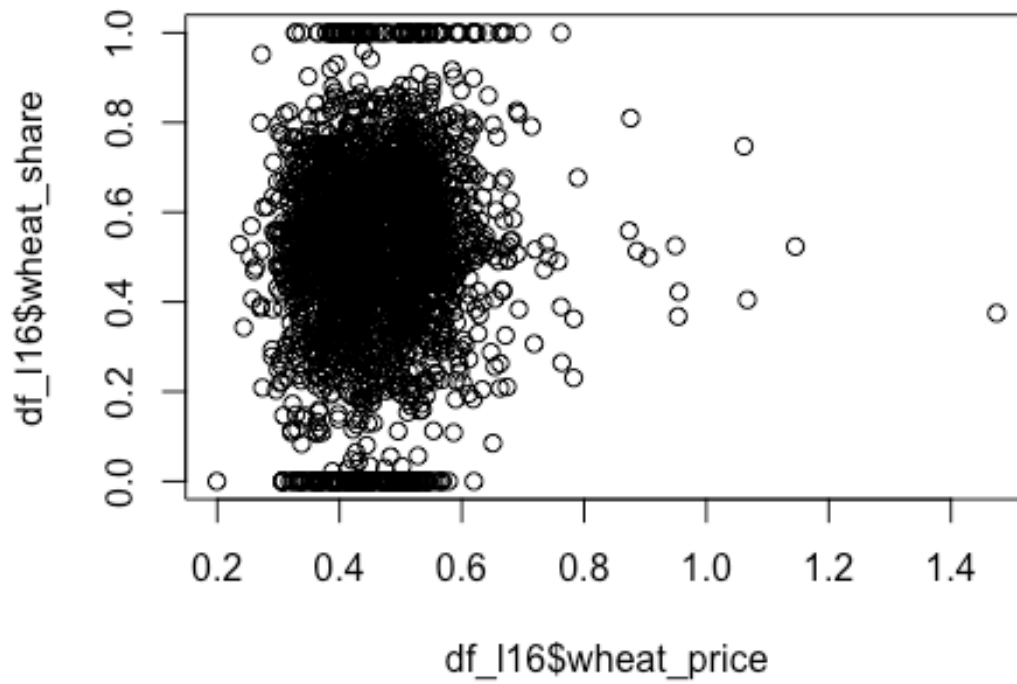
# Graphical analysis
hist(df_l16$wheat_share)

```

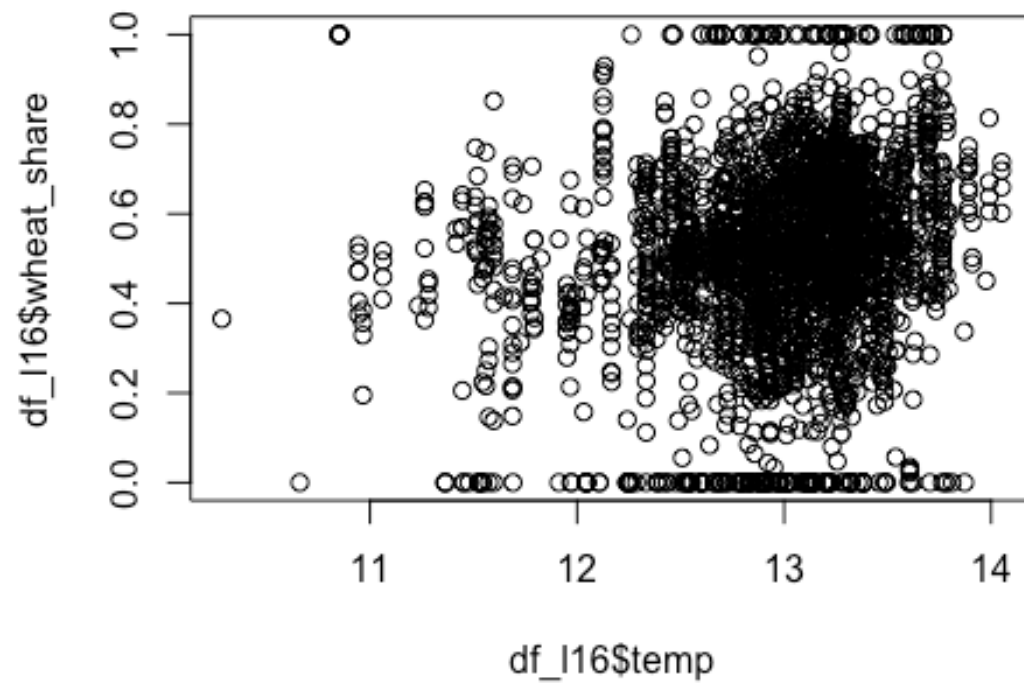


From the histogram, we can see that there is a problem of censoring (the share is between 0% and 100%).

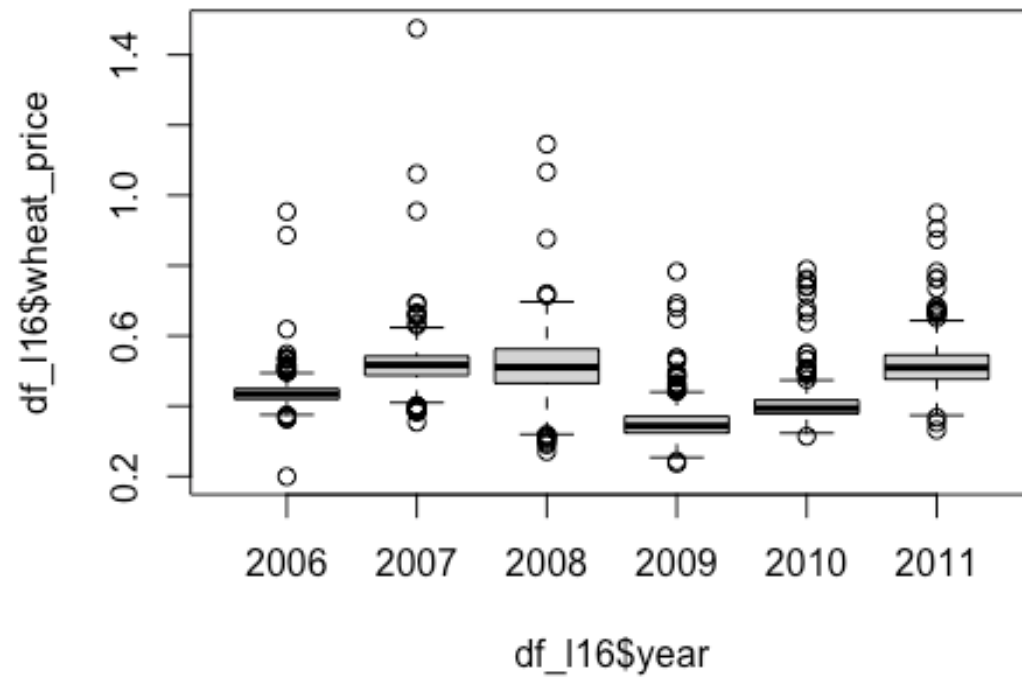
```
plot(df_l16$wheat_price, df_l16$wheat_share)
```



```
plot(df_l16$temp, df_l16$wheat_share)
```

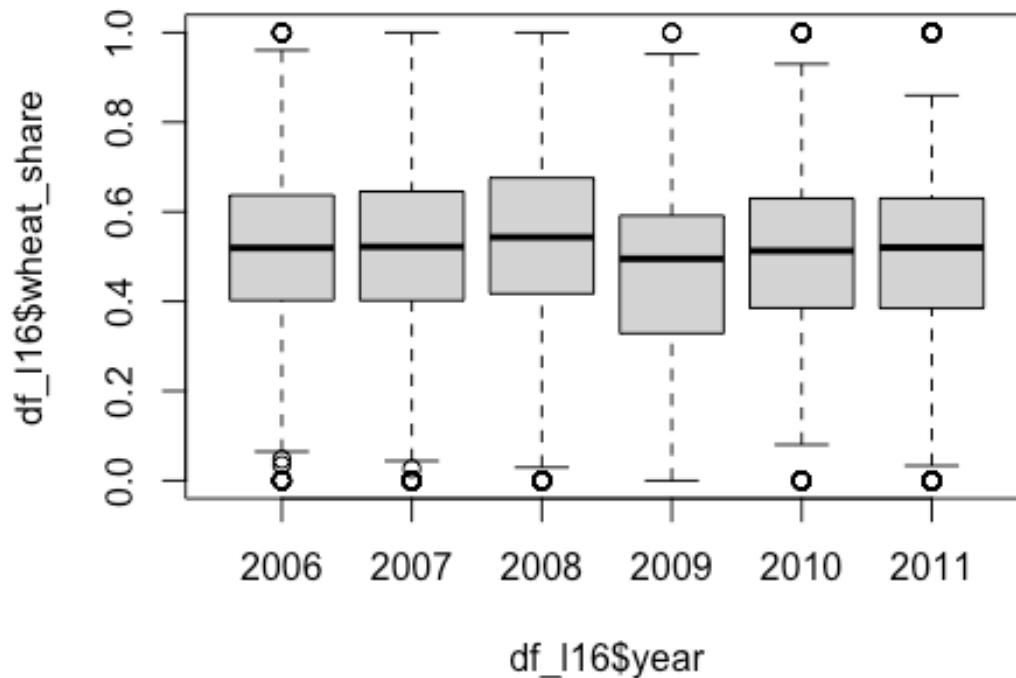


```
boxplot(df_l16$wheat_price ~ df_l16$year)
```



We observe that we have both variability between firms and temporal variability

```
boxplot(df_l16$wheat_share ~ df_l16$year)
```

Small variation over time. The main variation is between units

Modelling (using from specific to general approach)

```
output = matrix(NA, 10, 2)
colnames(output) = c("Beta of wheat_price", "Std. err.")
rownames(output) = c("Basic model", "Basic model with temp and precip (^1,
^2, I)",
                    "Basic model with temp (^1) and precip (^1, ^2)", "All
environment features",
                    "Farm FE (with NA)", "Farm FE (correct)", "Country FE",
                    "Temperature FE", "Farm FE with trend", "Time FE")
```

Basic model

```
m0 = lm(wheat_share ~ wheat_price, data = df_l16)
summary(m0)
```

```
##
```

```
## Call:
```

```
## lm(formula = wheat_share ~ wheat_price, data = df_l16)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
```

```
## -0.53094 -0.11091 0.01831 0.13929 0.52496
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.41230    0.02278  18.097 < 2e-16 ***
## wheat_price 0.19142    0.04845   3.951 7.99e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2255 on 2587 degrees of freedom
## Multiple R-squared: 0.005998, Adjusted R-squared: 0.005614
## F-statistic: 15.61 on 1 and 2587 DF, p-value: 7.988e-05

output[1,] = coef(summary(m0))[2, 1:2]

# Adding temp and precip, both in linear and in quadratic form
m1 = lm(wheat_share ~ wheat_price + temp + precip + I(precip^2) + I(temp^2) +
I(temp*precip), data = df_l16)
summary(m1)

##
## Call:
## lm(formula = wheat_share ~ wheat_price + temp + precip + I(precip^2) +
##      I(temp^2) + I(temp * precip), data = df_l16)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.65557 -0.10095  0.01358  0.12500  0.68246
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.328e-01  2.651e+00  -0.126  0.9001
## wheat_price  1.794e-01  4.602e-02   3.899  9.9e-05 ***
## temp         9.812e-02  3.324e-01   0.295  0.7679
## precip       1.568e-03  4.603e-03   0.341  0.7334
## I(precip^2)   4.362e-06  2.035e-06   2.144  0.0322 *
## I(temp^2)     3.393e-03  1.119e-02   0.303  0.7617
## I(temp * precip) -4.930e-04  2.612e-04  -1.888  0.0592 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2124 on 2582 degrees of freedom
## Multiple R-squared: 0.1201, Adjusted R-squared: 0.1181
## F-statistic: 58.74 on 6 and 2582 DF, p-value: < 2.2e-16

output[2,] = coef(summary(m1))[2, 1:2]
cor(df_l16$temp, I(df_l16$temp^2))

## [1] 0.9994224

cor(df_l16$prec, I(df_l16$prec^2))
```

```
## [1] 0.9929985

cor(df_l16$temp, df_l16$prec)

## [1] -0.4211656

# Multicollinenarity problem

# Removing temp^2 and interaction between temp and precip
m2 = lm(wheat_share ~ wheat_price + temp + I(precip^2) + precip, data =
df_l16)
summary(m2)

##
## Call:
## lm(formula = wheat_share ~ wheat_price + temp + I(precip^2) +
##      precip, data = df_l16)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.64887 -0.10047  0.01298  0.12377  0.67378
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.758e+00  2.214e-01   7.940 2.99e-15 ***
## wheat_price  1.863e-01  4.580e-02   4.068 4.88e-05 ***
## temp        1.488e-02  8.974e-03   1.658  0.0974 .
## I(precip^2)  7.944e-06  1.174e-06   6.765 1.64e-11 ***
## precip      -7.356e-03  8.686e-04  -8.469 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2125 on 2584 degrees of freedom
## Multiple R-squared:  0.1183, Adjusted R-squared:  0.1169
## F-statistic: 86.68 on 4 and 2584 DF, p-value: < 2.2e-16

output[3,] = coef(summary(m2))[2, 1:2]
# Multicollinenarity problem persist. but we have lots of observations, so it
is necessary a little
# part of variability of X to explain Y

# Including all environment features
m3= lm(wheat_share ~ wheat_price + temp + I(precip^2) + precip + ph + slope +
coarse + med + fine,
      data = df_l16)
summary(m3)

##
## Call:
## lm(formula = wheat_share ~ wheat_price + temp + I(precip^2) +
##      precip + ph + slope + coarse + med + fine, data = df_l16)
```

```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.63891 -0.10146  0.00655  0.12282  0.76589
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.874e+00  2.357e-01   7.951 2.74e-15 ***
## wheat_price  1.695e-01  4.452e-02   3.807 0.000144 ***
## temp         2.435e-03  8.988e-03   0.271 0.786489
## I(precip^2)  6.991e-06  1.172e-06   5.966 2.76e-09 ***
## precip      -6.323e-03  8.824e-04  -7.166 1.00e-12 ***
## ph           2.098e-02  7.418e-03   2.828 0.004715 **
## slope        2.122e-03  3.546e-03   0.598 0.549629
## coarse      -4.191e-03  7.019e-04  -5.971 2.68e-09 ***
## med         -3.334e-03  7.033e-04  -4.741 2.24e-06 ***
## fine        -2.319e-03  7.195e-04  -3.223 0.001286 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2062 on 2579 degrees of freedom
## Multiple R-squared:  0.1716, Adjusted R-squared:  0.1687
## F-statistic: 59.35 on 9 and 2579 DF, p-value: < 2.2e-16
```

```
output[4,] = coef(summary(m3))[2, 1:2]
```

```
# So far we have assumed that quality is constant over time and between
farms. Now we assume that
# quality varies only between farms and not over time, using Fixed Effects
model (with LSDV regression)
m4 = lm(wheat_share ~ wheat_price + factor(fid) + temp + precip + I(precip^2)
+ slope + ph + coarse +
      med + fine, data = df_l16)
options(max.print = 10000)
summary(m4)
```

```
##
## Call:
## lm(formula = wheat_share ~ wheat_price + factor(fid) + temp +
##      precip + I(precip^2) + slope + ph + coarse + med + fine,
##      data = df_l16)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.66850 -0.03526  0.00000  0.03738  0.64678
##
## Coefficients: (8 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.9588530  0.0555374  17.265 < 2e-16 ***
## wheat_price    0.0867584  0.0312039   2.780 0.005486 **
```

```
## factor(fid)1717 -0.5943812 0.1311257 -4.533 6.20e-06 ***
## factor(fid)1723 -0.6949826 0.0724905 -9.587 < 2e-16 ***
## factor(fid)1724 -0.8167392 0.1311896 -6.226 5.96e-10 ***
## factor(fid)1747 -0.5695312 0.0733146 -7.768 1.33e-14 ***
## factor(fid)1753 -0.9986137 0.0874145 -11.424 < 2e-16 ***
## factor(fid)1759 -0.6745176 0.0724791 -9.306 < 2e-16 ***
## factor(fid)1764 -0.6255377 0.1311245 -4.771 1.99e-06 ***
## factor(fid)1769 -0.5916647 0.0724802 -8.163 6.08e-16 ***
## factor(fid)1784 -0.8105775 0.0874171 -9.273 < 2e-16 ***
## factor(fid)1788 -0.5551483 0.0724791 -7.659 3.03e-14 ***
## factor(fid)1797 -0.6202565 0.0874131 -7.096 1.85e-12 ***
## factor(fid)1799 -0.5860926 0.0724833 -8.086 1.12e-15 ***
## factor(fid)1833 -0.9971746 0.0724862 -13.757 < 2e-16 ***
## factor(fid)1837 -0.4872499 0.0724801 -6.723 2.39e-11 ***
## factor(fid)1863 -0.7714415 0.1001549 -7.702 2.19e-14 ***
## factor(fid)1876 -0.4007416 0.0803018 -4.990 6.61e-07 ***
## factor(fid)1883 -0.6098228 0.1311314 -4.650 3.55e-06 ***
## factor(fid)1891 -0.9998160 0.0802940 -12.452 < 2e-16 ***
## factor(fid)1903 -0.3360623 0.1001727 -3.355 0.000811 ***
## factor(fid)1906 -0.4970212 0.0724915 -6.856 9.69e-12 ***
## factor(fid)1911 -0.4307228 0.0724812 -5.943 3.36e-09 ***
## factor(fid)1912 -0.5730753 0.0802940 -7.137 1.38e-12 ***
## factor(fid)1916 -0.5962815 0.1311896 -4.545 5.85e-06 ***
## factor(fid)1923 -0.6610658 0.1001541 -6.600 5.38e-11 ***
## factor(fid)1926 -0.6894998 0.1311215 -5.258 1.63e-07 ***
## factor(fid)1927 -0.6401664 0.0757046 -8.456 < 2e-16 ***
## factor(fid)1929 -0.9744839 0.0724831 -13.444 < 2e-16 ***
## factor(fid)1932 -0.4911629 0.0724905 -6.776 1.67e-11 ***
## factor(fid)1933 -0.3632230 0.1001553 -3.627 0.000295 ***
## factor(fid)1935 -0.4467631 0.0802977 -5.564 3.04e-08 ***
## factor(fid)1947 -0.4989075 0.0802958 -6.213 6.43e-10 ***
## factor(fid)1965 -0.6674159 0.1001467 -6.664 3.53e-11 ***
## factor(fid)1968 -0.9907498 0.1001995 -9.888 < 2e-16 ***
## factor(fid)1970 -0.6387331 0.1311283 -4.871 1.21e-06 ***
## factor(fid)1987 -0.9962313 0.1001534 -9.947 < 2e-16 ***
## factor(fid)1993 -0.5072128 0.0874172 -5.802 7.72e-09 ***
## factor(fid)1995 -0.3832577 0.1311314 -2.923 0.003514 **
## factor(fid)1997 -0.9994886 0.1311197 -7.623 4.00e-14 ***
## factor(fid)1999 -0.6284262 0.1311439 -4.792 1.79e-06 ***
## factor(fid)2888 -0.6291426 0.1311240 -4.798 1.73e-06 ***
## factor(fid)2891 -0.5079211 0.1311386 -3.873 0.000111 ***
## factor(fid)2917 -0.3629948 0.1311305 -2.768 0.005695 **
## factor(fid)2923 -0.4292446 0.1001554 -4.286 1.92e-05 ***
## factor(fid)2940 -0.3597704 0.0874131 -4.116 4.03e-05 ***
## factor(fid)2943 -0.5605668 0.0874256 -6.412 1.83e-10 ***
## factor(fid)2953 -0.5218811 0.1311441 -3.979 7.18e-05 ***
## factor(fid)2984 -0.3658095 0.0874280 -4.184 3.00e-05 ***
## factor(fid)4792 -0.3969487 0.1311451 -3.027 0.002507 **
## factor(fid)4803 -0.3182202 0.1311233 -2.427 0.015327 *
## factor(fid)4827 -0.2353191 0.1001442 -2.350 0.018891 *
```

```
## factor(fid)4835 -0.7278801 0.1001517 -7.268 5.43e-13 ***
## factor(fid)4837 -0.9206788 0.1001558 -9.192 < 2e-16 ***
## factor(fid)4841 -0.4914343 0.1311234 -3.748 0.000184 ***
## factor(fid)4847 -0.7149283 0.1311252 -5.452 5.66e-08 ***
## factor(fid)4848 -0.4813111 0.1001447 -4.806 1.67e-06 ***
## factor(fid)4865 -0.5804080 0.1001450 -5.796 8.02e-09 ***
## factor(fid)4870 -0.6032666 0.0874144 -6.901 7.12e-12 ***
## factor(fid)4880 -0.5399488 0.0874133 -6.177 8.06e-10 ***
## factor(fid)4885 -0.4505000 0.0874174 -5.153 2.84e-07 ***
## factor(fid)4893 -0.4479027 0.1001443 -4.473 8.21e-06 ***
## factor(fid)4899 -0.4265508 0.0874131 -4.880 1.16e-06 ***
## factor(fid)4930 -0.3421243 0.0802942 -4.261 2.14e-05 ***
## factor(fid)4964 -0.4045163 0.0757117 -5.343 1.03e-07 ***
## factor(fid)4965 -0.2839532 0.0724814 -3.918 9.28e-05 ***
## factor(fid)4968 -0.7950711 0.1311225 -6.064 1.62e-09 ***
## factor(fid)4971 -0.5841673 0.0724829 -8.059 1.39e-15 ***
## factor(fid)4982 -0.3819650 0.0724793 -5.270 1.53e-07 ***
## factor(fid)6610 -0.5965505 0.1311321 -4.549 5.74e-06 ***
## factor(fid)6616 -0.5450897 0.1311234 -4.157 3.38e-05 ***
## factor(fid)6677 -0.4754354 0.0874135 -5.439 6.10e-08 ***
## factor(fid)6680 -0.5059960 0.0874223 -5.788 8.39e-09 ***
## factor(fid)6683 -0.4913799 0.0874147 -5.621 2.19e-08 ***
## factor(fid)6686 -0.4037908 0.1311267 -3.079 0.002106 **
## factor(fid)6693 -0.1342208 0.0874199 -1.535 0.124872
## factor(fid)6694 -0.4388630 0.1001442 -4.382 1.24e-05 ***
## factor(fid)6701 -0.4872439 0.1001476 -4.865 1.24e-06 ***
## factor(fid)6714 -0.3592316 0.1311286 -2.740 0.006213 **
## factor(fid)6727 -0.4343579 0.0757028 -5.738 1.12e-08 ***
## factor(fid)6730 -0.0039505 0.0874246 -0.045 0.963963
## factor(fid)6736 -0.4680391 0.0724796 -6.458 1.37e-10 ***
## factor(fid)6745 -0.3652190 0.0874186 -4.178 3.08e-05 ***
## factor(fid)6753 -0.2112029 0.0724791 -2.914 0.003613 **
## factor(fid)6756 -0.4849756 0.0724792 -6.691 2.95e-11 ***
## factor(fid)6767 -0.6534442 0.1001447 -6.525 8.82e-11 ***
## factor(fid)6804 -0.5051853 0.0725034 -6.968 4.51e-12 ***
## factor(fid)6811 -0.6490825 0.0725083 -8.952 < 2e-16 ***
## factor(fid)6821 -0.4056021 0.0874161 -4.640 3.74e-06 ***
## factor(fid)6824 -0.4535930 0.0724856 -6.258 4.87e-10 ***
## factor(fid)6825 -0.3298778 0.0802974 -4.108 4.17e-05 ***
## factor(fid)6835 -0.5789550 0.0724981 -7.986 2.47e-15 ***
## factor(fid)6848 -0.4528536 0.0724869 -6.247 5.20e-10 ***
## factor(fid)6849 -0.6504982 0.1311235 -4.961 7.68e-07 ***
## factor(fid)6850 -0.2865162 0.1311343 -2.185 0.029025 *
## factor(fid)6865 -0.4000891 0.0724798 -5.520 3.88e-08 ***
## factor(fid)6867 -0.5230675 0.0724856 -7.216 7.86e-13 ***
## factor(fid)6870 0.0019475 0.1311215 0.015 0.988151
## factor(fid)6876 -0.3620808 0.1311316 -2.761 0.005818 **
## factor(fid)6878 -0.3531815 0.0724805 -4.873 1.20e-06 ***
## factor(fid)6885 -0.5974967 0.0724809 -8.244 3.19e-16 ***
## factor(fid)6894 -0.4852587 0.0724791 -6.695 2.87e-11 ***
```

```
## factor(fid)6905 -0.4192874 0.0724893 -5.784 8.58e-09 ***
## factor(fid)6908 -0.2804726 0.0724818 -3.870 0.000113 ***
## factor(fid)6909 -0.4648560 0.0874567 -5.315 1.20e-07 ***
## factor(fid)6915 -0.2776007 0.1001519 -2.772 0.005632 **
## factor(fid)6916 -0.5282206 0.1311536 -4.027 5.87e-05 ***
## factor(fid)6937 -0.5696108 0.1311316 -4.344 1.48e-05 ***
## factor(fid)6941 -0.5342957 0.1311279 -4.075 4.81e-05 ***
## factor(fid)11499 -1.0035351 0.1311257 -7.653 3.18e-14 ***
## factor(fid)11751 -0.4963647 0.1311261 -3.785 0.000159 ***
## factor(fid)11788 -0.9963647 0.1311261 -7.599 4.79e-14 ***
## factor(fid)11984 -0.9954671 0.1001575 -9.939 < 2e-16 ***
## factor(fid)12090 -0.9962602 0.1311265 -7.598 4.82e-14 ***
## factor(fid)12417 -0.9709425 0.1001456 -9.695 < 2e-16 ***
## factor(fid)12424 -0.9959241 0.1001550 -9.944 < 2e-16 ***
## factor(fid)12442 -0.9987640 0.0724804 -13.780 < 2e-16 ***
## factor(fid)12511 -0.9955880 0.1311292 -7.592 5.02e-14 ***
## factor(fid)12540 -0.4176614 0.0757046 -5.517 3.95e-08 ***
## factor(fid)12547 -0.3876722 0.0724996 -5.347 1.01e-07 ***
## factor(fid)12553 -0.3994304 0.0874354 -4.568 5.25e-06 ***
## factor(fid)12558 -0.6881135 0.0724791 -9.494 < 2e-16 ***
## factor(fid)12560 -0.9972224 0.0724860 -13.757 < 2e-16 ***
## factor(fid)12562 -0.5399751 0.1311407 -4.118 4.00e-05 ***
## factor(fid)12608 -0.6878045 0.1001838 -6.865 9.10e-12 ***
## factor(fid)12624 -0.9955880 0.1311292 -7.592 5.02e-14 ***
## factor(fid)12628 -0.0049417 0.1311316 -0.038 0.969943
## factor(fid)12641 -0.9524018 0.1311265 -7.263 5.61e-13 ***
## factor(fid)12661 -0.7318811 0.1001550 -7.307 4.08e-13 ***
## factor(fid)12662 -0.9981947 0.1001463 -9.967 < 2e-16 ***
## factor(fid)12672 -0.6568433 0.1001511 -6.559 7.09e-11 ***
## factor(fid)12686 -0.9950936 0.1311315 -7.589 5.17e-14 ***
## factor(fid)12755 -0.9962602 0.1311265 -7.598 4.82e-14 ***
## factor(fid)12782 -0.9975511 0.0802988 -12.423 < 2e-16 ***
## factor(fid)12798 -0.6340557 0.0802960 -7.896 4.95e-15 ***
## factor(fid)12802 -0.2158048 0.1001484 -2.155 0.031306 *
## factor(fid)12803 -0.0008014 0.1311199 -0.006 0.995124
## factor(fid)12821 -0.4129860 0.1001469 -4.124 3.90e-05 ***
## factor(fid)12856 -1.0044741 0.1311295 -7.660 3.02e-14 ***
## factor(fid)12862 -0.7247527 0.0874225 -8.290 < 2e-16 ***
## factor(fid)12867 -0.3058492 0.1311381 -2.332 0.019797 *
## factor(fid)12885 -0.7876688 0.1311585 -6.005 2.30e-09 ***
## factor(fid)12898 -0.9911171 0.1311585 -7.557 6.55e-14 ***
## factor(fid)12911 -0.3403604 0.1311316 -2.596 0.009521 **
## factor(fid)12934 -0.0001517 0.1001442 -0.002 0.998791
## factor(fid)31006 -0.4455482 0.1001586 -4.448 9.18e-06 ***
## factor(fid)31024 -0.3157118 0.1311415 -2.407 0.016166 *
## factor(fid)31025 -0.5830101 0.1311282 -4.446 9.28e-06 ***
## factor(fid)31026 -0.4946898 0.1311314 -3.772 0.000167 ***
## factor(fid)31032 -0.6201771 0.1311307 -4.729 2.43e-06 ***
## factor(fid)31036 -0.7993464 0.1311307 -6.096 1.33e-09 ***
## factor(fid)32005 -0.6097496 0.0757096 -8.054 1.45e-15 ***
```

```
## factor(fid)32016 -0.4724074 0.0874151 -5.404 7.38e-08 ***
## factor(fid)32019 -0.1532543 0.0874155 -1.753 0.079743 .
## factor(fid)32024 -0.8043125 0.1001551 -8.031 1.74e-15 ***
## factor(fid)32030 -0.9931479 0.1311427 -7.573 5.80e-14 ***
## factor(fid)32032 -0.6868892 0.0757035 -9.073 < 2e-16 ***
## factor(fid)32037 -0.4792524 0.0757188 -6.329 3.10e-10 ***
## factor(fid)32041 -0.4550488 0.0802957 -5.667 1.69e-08 ***
## factor(fid)32043 -0.2776633 0.1311206 -2.118 0.034345 *
## factor(fid)32049 -0.6657611 0.0724846 -9.185 < 2e-16 ***
## factor(fid)32056 -0.4166032 0.1001462 -4.160 3.33e-05 ***
## factor(fid)32060 -0.3494946 0.0874155 -3.998 6.64e-05 ***
## factor(fid)32062 -0.5074402 0.0724810 -7.001 3.58e-12 ***
## factor(fid)32067 -0.2775293 0.1001618 -2.771 0.005649 **
## factor(fid)32069 -0.2164761 0.0725082 -2.986 0.002869 **
## factor(fid)32072 -0.3956807 0.0724800 -5.459 5.45e-08 ***
## factor(fid)32107 -0.2815794 0.0724835 -3.885 0.000106 ***
## factor(fid)32122 -0.7440966 0.0724808 -10.266 < 2e-16 ***
## factor(fid)32176 -0.3588269 0.1001452 -3.583 0.000349 ***
## factor(fid)32184 -0.8071508 0.0874147 -9.234 < 2e-16 ***
## factor(fid)32186 -0.6955436 0.0724834 -9.596 < 2e-16 ***
## factor(fid)32187 -0.3616603 0.0757044 -4.777 1.92e-06 ***
## factor(fid)32188 -0.4130246 0.0757088 -5.455 5.56e-08 ***
## factor(fid)32189 -0.1498959 0.0874209 -1.715 0.086583 .
## factor(fid)32204 -0.2500075 0.0724798 -3.449 0.000575 ***
## factor(fid)32218 -0.2424446 0.0724858 -3.345 0.000841 ***
## factor(fid)32224 -0.3903190 0.0724835 -5.385 8.20e-08 ***
## factor(fid)32225 -0.5117737 0.0757030 -6.760 1.86e-11 ***
## factor(fid)32236 -0.4650636 0.0724856 -6.416 1.79e-10 ***
## factor(fid)32237 -0.5724688 0.0757020 -7.562 6.29e-14 ***
## factor(fid)32239 -0.4225865 0.1311362 -3.223 0.001294 **
## factor(fid)32240 -0.7492660 0.0724840 -10.337 < 2e-16 ***
## factor(fid)32247 -0.9273582 0.0874157 -10.609 < 2e-16 ***
## factor(fid)32253 -0.4878580 0.0725272 -6.727 2.33e-11 ***
## factor(fid)32272 -0.4024428 0.1311213 -3.069 0.002178 **
## factor(fid)32287 -0.4258056 0.0757044 -5.625 2.15e-08 ***
## factor(fid)32298 -0.6855671 0.1311362 -5.228 1.91e-07 ***
## factor(fid)32301 -0.6345837 0.0724861 -8.755 < 2e-16 ***
## factor(fid)32302 -0.2893196 0.1311198 -2.207 0.027473 *
## factor(fid)32304 -0.4619947 0.0874230 -5.285 1.41e-07 ***
## factor(fid)32312 -0.4126672 0.0724888 -5.693 1.46e-08 ***
## factor(fid)32323 -0.5998566 0.0724806 -8.276 2.45e-16 ***
## factor(fid)32340 -0.4110918 0.0724826 -5.672 1.65e-08 ***
## factor(fid)32342 0.0025941 0.0874180 0.030 0.976330
## factor(fid)32344 -0.7140011 0.0874401 -8.166 5.96e-16 ***
## factor(fid)32345 -0.7639792 0.1001603 -7.628 3.86e-14 ***
## factor(fid)32351 -1.0015014 0.0874147 -11.457 < 2e-16 ***
## factor(fid)32352 -0.6357029 0.0757256 -8.395 < 2e-16 ***
## factor(fid)32359 -0.1221278 0.1001453 -1.220 0.222812
## factor(fid)32360 -0.4961595 0.0803028 -6.179 7.98e-10 ***
## factor(fid)32367 -0.9998533 0.0757019 -13.208 < 2e-16 ***
```



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## factor(fid)32372 -0.5402481 0.0724816 -7.454 1.41e-13 ***
## factor(fid)32387 -0.8866494 0.0802955 -11.042 < 2e-16 ***
## factor(fid)32391 -0.7567626 0.0757272 -9.993 < 2e-16 ***
## factor(fid)32395 -0.6882997 0.1311885 -5.247 1.73e-07 ***
## factor(fid)32397 -0.5666947 0.0802994 -7.057 2.42e-12 ***
## factor(fid)32399 -1.0026692 0.1311231 -7.647 3.34e-14 ***
## factor(fid)32415 -0.3751763 0.1311223 -2.861 0.004268 **
## factor(fid)32432 -0.0632004 0.1311427 -0.482 0.629921
## factor(fid)32433 -0.5748532 0.1311898 -4.382 1.24e-05 ***
## factor(fid)32434 -0.4584746 0.1311210 -3.497 0.000483 ***
## factor(fid)32437 -0.9907178 0.1311621 -7.553 6.71e-14 ***
## factor(fid)32439 -0.4433269 0.1002242 -4.423 1.03e-05 ***
## factor(fid)32443 -0.5520769 0.1311210 -4.210 2.67e-05 ***
## factor(fid)32444 -1.0051788 0.1311328 -7.665 2.90e-14 ***
## factor(fid)32451 -0.7288752 0.1001444 -7.278 5.03e-13 ***
## factor(fid)32453 -0.5367727 0.1311427 -4.093 4.45e-05 ***
## factor(fid)32461 -0.7485271 0.1001464 -7.474 1.21e-13 ***
## factor(fid)32462 -0.5635056 0.1003347 -5.616 2.26e-08 ***
## factor(fid)32466 -0.4652054 0.1001542 -4.645 3.65e-06 ***
## factor(fid)32469 -0.7270341 0.1001660 -7.258 5.81e-13 ***
## factor(fid)32471 -0.5331058 0.1001485 -5.323 1.15e-07 ***
## factor(fid)32479 -0.3005734 0.1311415 -2.292 0.022022 *
## factor(fid)32480 -0.3313353 0.1311415 -2.527 0.011604 *
## factor(fid)32500 -0.9999125 0.1311196 -7.626 3.90e-14 ***
## factor(fid)32503 -0.5175063 0.0803013 -6.445 1.49e-10 ***
## factor(fid)32508 -0.8669613 0.0803019 -10.796 < 2e-16 ***
## factor(fid)32513 -0.7517657 0.0802943 -9.363 < 2e-16 ***
## factor(fid)32530 -0.5619303 0.1001511 -5.611 2.33e-08 ***
## factor(fid)32541 -0.9979390 0.1001470 -9.965 < 2e-16 ***
## factor(fid)32546 -0.5222558 0.1311215 -3.983 7.08e-05 ***
## factor(fid)32557 -0.4080684 0.1311200 -3.112 0.001886 **
## factor(fid)33031 -0.5275956 0.1311301 -4.023 5.97e-05 ***
## factor(fid)33065 -0.3414411 0.0874617 -3.904 9.82e-05 ***
## factor(fid)33134 -0.5913650 0.0724859 -8.158 6.32e-16 ***
## factor(fid)33143 -0.3683489 0.0803072 -4.587 4.81e-06 ***
## factor(fid)33166 -0.6003293 0.0757284 -7.927 3.90e-15 ***
## factor(fid)33186 -0.3701556 0.0724936 -5.106 3.64e-07 ***
## factor(fid)33189 -0.5368121 0.1001443 -5.360 9.38e-08 ***
## factor(fid)33248 -0.7687713 0.0803041 -9.573 < 2e-16 ***
## factor(fid)33274 -0.4228959 0.1311881 -3.224 0.001289 **
## factor(fid)33294 -0.4958412 0.0724802 -6.841 1.07e-11 ***
## factor(fid)33301 -0.7452696 0.0724851 -10.282 < 2e-16 ***
## factor(fid)33308 -0.9971847 0.1311235 -7.605 4.57e-14 ***
## factor(fid)33348 -0.4456213 0.1311597 -3.398 0.000695 ***
## factor(fid)34012 -0.4058358 0.0757028 -5.361 9.35e-08 ***
## factor(fid)34014 -0.3479172 0.1311470 -2.653 0.008051 **
## factor(fid)34015 -0.2761171 0.1311252 -2.106 0.035365 *
## factor(fid)34016 -0.4676973 0.1311306 -3.567 0.000371 ***
## factor(fid)34017 -0.5321972 0.1311208 -4.059 5.14e-05 ***
## factor(fid)34018 -0.5324004 0.0724835 -7.345 3.10e-13 ***
```

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## factor(fid)34020 -0.3807498 0.0724861 -5.253 1.68e-07 ***
## factor(fid)34032 -0.6278801 0.0724807 -8.663 < 2e-16 ***
## factor(fid)34070 -0.5066767 0.0724840 -6.990 3.86e-12 ***
## factor(fid)34073 -0.5317043 0.1311577 -4.054 5.25e-05 ***
## factor(fid)34082 -0.4802665 0.0724810 -6.626 4.54e-11 ***
## factor(fid)34083 -0.5635571 0.0802941 -7.019 3.16e-12 ***
## factor(fid)34086 -0.4618330 0.0757094 -6.100 1.30e-09 ***
## factor(fid)34087 -0.4888300 0.0724856 -6.744 2.07e-11 ***
## factor(fid)34088 -0.2081696 0.0724857 -2.872 0.004128 **
## factor(fid)34107 -0.1732373 0.0803241 -2.157 0.031159 *
## factor(fid)34125 -0.5666673 0.0724794 -7.818 9.05e-15 ***
## factor(fid)34133 -0.9952749 0.1311306 -7.590 5.11e-14 ***
## factor(fid)34136 -0.5709818 0.0757184 -7.541 7.37e-14 ***
## factor(fid)34137 -0.3409957 0.0725554 -4.700 2.80e-06 ***
## factor(fid)34141 -0.4629915 0.0725159 -6.385 2.18e-10 ***
## factor(fid)34143 -0.4962439 0.0874208 -5.676 1.60e-08 ***
## factor(fid)34148 -0.3999237 0.0802941 -4.981 6.94e-07 ***
## factor(fid)34149 -0.1918602 0.0874176 -2.195 0.028309 *
## factor(fid)34150 -0.6229609 0.0874174 -7.126 1.49e-12 ***
## factor(fid)34152 0.0062906 0.1001698 0.063 0.949933
## factor(fid)34155 -0.7628470 0.1001589 -7.616 4.19e-14 ***
## factor(fid)34157 -0.3218132 0.0757331 -4.249 2.25e-05 ***
## factor(fid)34160 -0.4958145 0.1001507 -4.951 8.09e-07 ***
## factor(fid)34169 -0.4828849 0.0874133 -5.524 3.80e-08 ***
## factor(fid)34179 -0.4860038 0.1001446 -4.853 1.32e-06 ***
## factor(fid)34181 -0.5638106 0.0725084 -7.776 1.25e-14 ***
## factor(fid)34184 -0.4919863 0.1001459 -4.913 9.80e-07 ***
## factor(fid)34188 -0.5289302 0.0757096 -6.986 3.96e-12 ***
## factor(fid)34189 -0.4063778 0.0724920 -5.606 2.39e-08 ***
## factor(fid)34196 -0.3865723 0.1311335 -2.948 0.003240 **
## factor(fid)34205 -0.6318088 0.0803152 -7.867 6.24e-15 ***
## factor(fid)34206 -0.5256569 0.0724793 -7.253 6.06e-13 ***
## factor(fid)34213 -0.5389029 0.0724791 -7.435 1.61e-13 ***
## factor(fid)34214 -0.6734510 0.0724987 -9.289 < 2e-16 ***
## factor(fid)34219 -0.4645559 0.0724801 -6.409 1.86e-10 ***
## factor(fid)34227 -0.5722681 0.0803135 -7.125 1.50e-12 ***
## factor(fid)34228 -0.6830334 0.0724892 -9.423 < 2e-16 ***
## factor(fid)34230 -0.5994020 0.0724795 -8.270 2.58e-16 ***
## factor(fid)34232 -0.3427378 0.0724798 -4.729 2.44e-06 ***
## factor(fid)34238 -0.5577023 0.0874369 -6.378 2.27e-10 ***
## factor(fid)34239 -0.5409758 0.1001749 -5.400 7.54e-08 ***
## factor(fid)34242 -0.2851199 0.0757094 -3.766 0.000171 ***
## factor(fid)34244 -0.5605750 0.0724791 -7.734 1.72e-14 ***
## factor(fid)34246 -0.3951607 0.0724890 -5.451 5.69e-08 ***
## factor(fid)34251 -0.3362343 0.1001453 -3.357 0.000803 ***
## factor(fid)34253 -0.4352580 0.0724892 -6.004 2.32e-09 ***
## factor(fid)34254 -0.3404034 0.0757022 -4.497 7.35e-06 ***
## factor(fid)34256 -0.5143286 0.0724838 -7.096 1.84e-12 ***
## factor(fid)34261 -0.4315919 0.0725024 -5.953 3.16e-09 ***
## factor(fid)34262 -0.5219950 0.0874275 -5.971 2.84e-09 ***
```

```
## factor(fid)34263 -0.7080208 0.0802988 -8.817 < 2e-16 ***
## factor(fid)34265 -0.4154139 0.0724791 -5.732 1.17e-08 ***
## factor(fid)34267 -0.4141648 0.0874131 -4.738 2.33e-06 ***
## factor(fid)34277 -0.4982259 0.0724811 -6.874 8.59e-12 ***
## factor(fid)34282 -1.0033898 0.1311252 -7.652 3.20e-14 ***
## factor(fid)34283 -0.4724717 0.0724919 -6.518 9.26e-11 ***
## factor(fid)34287 -0.7630315 0.1311470 -5.818 7.03e-09 ***
## factor(fid)34289 -0.5023477 0.1311349 -3.831 0.000132 ***
## factor(fid)34300 -0.4178227 0.0757064 -5.519 3.91e-08 ***
## factor(fid)34303 -0.5716730 0.0757019 -7.552 6.80e-14 ***
## factor(fid)34305 -0.4517926 0.0874142 -5.168 2.62e-07 ***
## factor(fid)34307 -0.4987593 0.0757103 -6.588 5.85e-11 ***
## factor(fid)34311 -0.4732454 0.0757019 -6.251 5.07e-10 ***
## factor(fid)34312 -0.4832592 0.1311252 -3.685 0.000235 ***
## factor(fid)34315 -0.4087976 0.1001535 -4.082 4.67e-05 ***
## factor(fid)34318 -0.4683741 0.0757028 -6.187 7.58e-10 ***
## factor(fid)34320 -0.4743987 0.0874132 -5.427 6.51e-08 ***
## factor(fid)34322 -0.6218862 0.0802970 -7.745 1.59e-14 ***
## factor(fid)34327 -0.2891407 0.0757120 -3.819 0.000139 ***
## factor(fid)34329 -0.4805879 0.1001519 -4.799 1.73e-06 ***
## factor(fid)34331 -0.3833581 0.0757049 -5.064 4.53e-07 ***
## factor(fid)34333 -0.4785564 0.0803061 -5.959 3.04e-09 ***
## factor(fid)34335 -0.3947281 0.0803096 -4.915 9.68e-07 ***
## factor(fid)34336 -0.4573523 0.0803006 -5.696 1.43e-08 ***
## factor(fid)34339 -0.5945777 0.0802942 -7.405 2.01e-13 ***
## factor(fid)34346 -0.3135593 0.0803032 -3.905 9.78e-05 ***
## factor(fid)34347 -0.4825167 0.0803106 -6.008 2.27e-09 ***
## factor(fid)34353 -0.5160617 0.0874542 -5.901 4.31e-09 ***
## factor(fid)34360 -0.7263214 0.1001511 -7.252 6.07e-13 ***
## factor(fid)34361 -0.6482871 0.1311894 -4.942 8.47e-07 ***
## factor(fid)34368 -0.3980457 0.0874334 -4.553 5.66e-06 ***
## factor(fid)34370 -0.6765267 0.1001451 -6.755 1.92e-11 ***
## factor(fid)34371 -0.4693648 0.1311894 -3.578 0.000356 ***
## factor(fid)34374 -0.7035477 0.1001549 -7.025 3.04e-12 ***
## factor(fid)34376 -0.4625886 0.1311499 -3.527 0.000431 ***
## factor(fid)34380 -0.3507706 0.1311196 -2.675 0.007536 **
## factor(fid)34382 -0.7990107 0.1311196 -6.094 1.35e-09 ***
## factor(fid)34507 -0.5789054 0.0724921 -7.986 2.47e-15 ***
## factor(fid)34508 -0.3500127 0.1001496 -3.495 0.000486 ***
## factor(fid)34513 -0.4681710 0.0803234 -5.829 6.61e-09 ***
## factor(fid)34518 -0.5462939 0.0724831 -7.537 7.59e-14 ***
## factor(fid)34521 -0.7344822 0.0724798 -10.134 < 2e-16 ***
## factor(fid)34525 -0.4948038 0.0724841 -6.826 1.19e-11 ***
## factor(fid)34529 -1.0028760 0.1311237 -7.648 3.30e-14 ***
## factor(fid)34531 -0.5931579 0.0757019 -7.835 7.94e-15 ***
## factor(fid)34540 -0.5350960 0.1001672 -5.342 1.04e-07 ***
## factor(fid)35179 0.0021483 0.1311219 0.016 0.986930
## factor(fid)35187 -0.5401971 0.1311306 -4.120 3.97e-05 ***
## factor(fid)35211 -0.2607138 0.1311225 -1.988 0.046928 *
## factor(fid)35214 0.0011326 0.1001451 0.011 0.990978
```

```
## factor(fid)35215 -0.3540373 0.1001443 -3.535 0.000418 ***
## factor(fid)35218 -0.3979821 0.1001447 -3.974 7.35e-05 ***
## factor(fid)35224 -0.2382725 0.1311261 -1.817 0.069365 .
## factor(fid)35225 -0.3833039 0.1001868 -3.826 0.000135 ***
## factor(fid)35228 -0.4352543 0.1001452 -4.346 1.46e-05 ***
## factor(fid)35239 -0.0649756 0.1002786 -0.648 0.517100
## factor(fid)35241 -0.4104070 0.1001459 -4.098 4.35e-05 ***
## factor(fid)35242 -0.2372614 0.1001502 -2.369 0.017939 *
## factor(fid)35246 -0.7443043 0.1001492 -7.432 1.65e-13 ***
## factor(fid)35248 -0.8749824 0.0874169 -10.009 < 2e-16 ***
## factor(fid)35250 -0.1924807 0.0874241 -2.202 0.027814 *
## factor(fid)35256 -0.3465439 0.0874231 -3.964 7.66e-05 ***
## factor(fid)35257 -0.4160219 0.0874135 -4.759 2.10e-06 ***
## factor(fid)35258 -0.4323387 0.1311288 -3.297 0.000996 ***
## factor(fid)35259 -0.9952749 0.1311306 -7.590 5.11e-14 ***
## factor(fid)35265 -0.4125878 0.0874134 -4.720 2.54e-06 ***
## factor(fid)35269 -0.6517196 0.0874414 -7.453 1.41e-13 ***
## factor(fid)35274 -0.3222316 0.1001471 -3.218 0.001316 **
## factor(fid)35275 -0.4974545 0.0874159 -5.691 1.47e-08 ***
## factor(fid)35288 -0.4740109 0.0803098 -5.902 4.28e-09 ***
## factor(fid)35290 -0.6236848 0.0874136 -7.135 1.40e-12 ***
## factor(fid)35292 -0.7458892 0.0874984 -8.525 < 2e-16 ***
## factor(fid)35294 -0.3514079 0.0802965 -4.376 1.28e-05 ***
## factor(fid)35295 -0.4335608 0.0802945 -5.400 7.57e-08 ***
## factor(fid)35296 -0.4403160 0.1001443 -4.397 1.16e-05 ***
## factor(fid)35298 -0.8277919 0.0757420 -10.929 < 2e-16 ***
## factor(fid)35302 -0.5370552 0.0802962 -6.688 3.00e-11 ***
## factor(fid)35304 -0.9979773 0.0757054 -13.182 < 2e-16 ***
## factor(fid)35314 -0.0159487 0.1001529 -0.159 0.873495
## factor(fid)35322 -0.5002927 0.0757051 -6.608 5.10e-11 ***
## factor(fid)35325 -0.3168621 0.0757230 -4.184 3.00e-05 ***
## factor(fid)35329 -0.4942026 0.0757381 -6.525 8.81e-11 ***
## factor(fid)35332 -0.9478894 0.1311303 -7.229 7.19e-13 ***
## factor(fid)35337 -0.4127497 0.0724966 -5.693 1.45e-08 ***
## factor(fid)35345 -0.3331255 0.0724877 -4.596 4.62e-06 ***
## factor(fid)35357 -0.3529335 0.1001500 -3.524 0.000436 ***
## factor(fid)35373 -0.5182383 0.1001449 -5.175 2.54e-07 ***
## factor(fid)35374 -0.3239706 0.0724791 -4.470 8.32e-06 ***
## factor(fid)35375 -0.3273121 0.0757137 -4.323 1.62e-05 ***
## factor(fid)35378 -0.3327398 0.1001642 -3.322 0.000912 ***
## factor(fid)35386 -0.3401572 0.0724829 -4.693 2.90e-06 ***
## factor(fid)35388 -0.1509928 0.0802982 -1.880 0.060215 .
## factor(fid)35392 -0.2346960 0.0874944 -2.682 0.007376 **
## factor(fid)35393 -0.3710270 0.0724793 -5.119 3.40e-07 ***
## factor(fid)35395 -0.3359373 0.0757021 -4.438 9.65e-06 ***
## factor(fid)35402 -0.6751192 0.0724793 -9.315 < 2e-16 ***
## factor(fid)35403 -0.5560650 0.0757101 -7.345 3.11e-13 ***
## factor(fid)35404 -0.1128236 0.1311470 -0.860 0.389748
## factor(fid)35407 -0.4683017 0.0725135 -6.458 1.36e-10 ***
## factor(fid)35413 -0.3649843 0.0725019 -5.034 5.28e-07 ***
```

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## factor(fid)35422 -0.2223924 0.0724853 -3.068 0.002186 **
## factor(fid)35425 -0.5478337 0.0803024 -6.822 1.22e-11 ***
## factor(fid)35426 -0.3758040 0.0724978 -5.184 2.42e-07 ***
## factor(fid)35427 -0.7882326 0.0874131 -9.017 < 2e-16 ***
## factor(fid)35428 -0.3161479 0.0724854 -4.362 1.36e-05 ***
## factor(fid)35430 -0.3635795 0.0874193 -4.159 3.35e-05 ***
## factor(fid)35431 -0.3275980 0.0874157 -3.748 0.000184 ***
## factor(fid)35435 -0.5406053 0.0874391 -6.183 7.78e-10 ***
## factor(fid)35436 -0.8113592 0.0725302 -11.187 < 2e-16 ***
## factor(fid)35439 -0.3872062 0.0757251 -5.113 3.50e-07 ***
## factor(fid)35447 -0.4625329 0.0803610 -5.756 1.01e-08 ***
## factor(fid)35449 -0.4400322 0.1001494 -4.394 1.18e-05 ***
## factor(fid)35450 -0.3929009 0.0724809 -5.421 6.74e-08 ***
## factor(fid)35453 -0.2653119 0.0724843 -3.660 0.000259 ***
## factor(fid)35454 -0.7011431 0.0725131 -9.669 < 2e-16 ***
## factor(fid)35455 -0.0012721 0.0724805 -0.018 0.985999
## factor(fid)35456 -0.9756951 0.0757045 -12.888 < 2e-16 ***
## factor(fid)35457 -0.6814814 0.1311440 -5.196 2.26e-07 ***
## factor(fid)35461 -0.3624885 0.0874170 -4.147 3.53e-05 ***
## factor(fid)35462 -0.5041950 0.0725082 -6.954 4.97e-12 ***
## factor(fid)35463 -0.4742161 0.0724791 -6.543 7.85e-11 ***
## factor(fid)35464 -0.4882524 0.1001443 -4.875 1.18e-06 ***
## factor(fid)35465 -0.5917991 0.0724807 -8.165 5.99e-16 ***
## factor(fid)35466 -0.9975330 0.0724845 -13.762 < 2e-16 ***
## factor(fid)35479 -0.5897352 0.1311204 -4.498 7.31e-06 ***
## factor(fid)35482 -0.2293447 0.0757107 -3.029 0.002487 **
## factor(fid)35484 -0.3898686 0.0725029 -5.377 8.55e-08 ***
## factor(fid)35488 -0.3625829 0.0874141 -4.148 3.51e-05 ***
## factor(fid)35491 0.0069723 0.0803332 0.087 0.930846
## factor(fid)35492 -0.3196168 0.0874388 -3.655 0.000264 ***
## factor(fid)35493 -0.7658540 0.0803016 -9.537 < 2e-16 ***
## factor(fid)35513 -0.5930900 0.1001471 -5.922 3.80e-09 ***
## factor(fid)35518 -0.3460294 0.0757049 -4.571 5.19e-06 ***
## factor(fid)35519 -0.0022543 0.1311221 -0.017 0.986285
## factor(fid)35524 -0.4948856 0.0725001 -6.826 1.19e-11 ***
## factor(fid)35527 -0.5282670 0.0874427 -6.041 1.85e-09 ***
## factor(fid)35533 -0.3925428 0.0757037 -5.185 2.40e-07 ***
## factor(fid)35535 -0.3433724 0.0874148 -3.928 8.89e-05 ***
## factor(fid)35537 -0.4562561 0.1311228 -3.480 0.000514 ***
## factor(fid)35559 -0.4737452 0.0724865 -6.536 8.23e-11 ***
## factor(fid)35567 -0.2621292 0.0874221 -2.998 0.002751 **
## factor(fid)35568 -0.5256940 0.0724813 -7.253 6.04e-13 ***
## factor(fid)35569 -0.2465498 0.1001453 -2.462 0.013913 *
## factor(fid)35570 -0.0025329 0.0874178 -0.029 0.976888
## factor(fid)35573 -0.0541885 0.0874194 -0.620 0.535424
## factor(fid)35576 -0.3951783 0.0724848 -5.452 5.67e-08 ***
## factor(fid)35579 -0.2681078 0.0724820 -3.699 0.000223 ***
## factor(fid)35580 -0.4196237 0.0724869 -5.789 8.34e-09 ***
## factor(fid)35587 -0.3317361 0.0724854 -4.577 5.05e-06 ***
## factor(fid)35588 -1.0016340 0.0874150 -11.458 < 2e-16 ***
```

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## factor(fid)35591 -0.8106098 0.0724921 -11.182 < 2e-16 ***
## factor(fid)35593 -0.3380310 0.0724808 -4.664 3.33e-06 ***
## factor(fid)35594 -0.5353681 0.0874360 -6.123 1.13e-09 ***
## factor(fid)35595 -0.0057074 0.0725081 -0.079 0.937269
## factor(fid)35596 -0.4326351 0.0803019 -5.388 8.08e-08 ***
## factor(fid)35607 -0.0009863 0.0874138 -0.011 0.990998
## factor(fid)35613 -0.3738933 0.0724844 -5.158 2.77e-07 ***
## factor(fid)35614 -0.6354352 0.0724795 -8.767 < 2e-16 ***
## factor(fid)35620 -0.3098478 0.0757125 -4.092 4.46e-05 ***
## factor(fid)35622 -0.9988246 0.0724803 -13.781 < 2e-16 ***
## factor(fid)35623 -0.3402127 0.0724804 -4.694 2.88e-06 ***
## factor(fid)35624 -0.6189054 0.0757025 -8.175 5.51e-16 ***
## factor(fid)35625 -0.0061443 0.1311382 -0.047 0.962635
## factor(fid)35627 -0.9874771 0.1311969 -7.527 8.19e-14 ***
## factor(fid)35630 -0.4930549 0.0874381 -5.639 1.98e-08 ***
## factor(fid)35631 -0.6036034 0.0803069 -7.516 8.85e-14 ***
## factor(fid)35634 -0.7119762 0.0874191 -8.144 7.06e-16 ***
## factor(fid)35635 -0.3746714 0.0757038 -4.949 8.15e-07 ***
## factor(fid)35636 -0.3765869 0.1311382 -2.872 0.004131 **
## factor(fid)35637 -0.4137530 0.0724813 -5.708 1.33e-08 ***
## factor(fid)35638 -0.4342391 0.0803025 -5.408 7.25e-08 ***
## factor(fid)35640 -0.5622233 0.0874137 -6.432 1.61e-10 ***
## factor(fid)35654 -0.3797064 0.0757952 -5.010 5.99e-07 ***
## factor(fid)35655 -0.4576286 0.0874133 -5.235 1.84e-07 ***
## factor(fid)35657 -0.2150179 0.0724855 -2.966 0.003053 **
## factor(fid)35666 -0.4748162 0.0725250 -6.547 7.64e-11 ***
## factor(fid)35668 -0.5490671 0.0803051 -6.837 1.10e-11 ***
## factor(fid)35672 -0.3613710 0.0725458 -4.981 6.92e-07 ***
## factor(fid)35673 -0.2500132 0.0725163 -3.448 0.000578 ***
## factor(fid)35674 -0.6536663 0.0725061 -9.015 < 2e-16 ***
## factor(fid)35675 -0.3211713 0.0874246 -3.674 0.000246 ***
## factor(fid)35679 -0.5569298 0.0724793 -7.684 2.52e-14 ***
## factor(fid)35680 -0.4634649 0.1311214 -3.535 0.000419 ***
## factor(fid)35681 -0.7528786 0.0724797 -10.387 < 2e-16 ***
## factor(fid)35683 -0.5349601 0.0725297 -7.376 2.48e-13 ***
## factor(fid)35684 -0.3330664 0.0757099 -4.399 1.15e-05 ***
## factor(fid)35685 -0.4036093 0.0724794 -5.569 2.96e-08 ***
## factor(fid)35686 -0.2147371 0.0874639 -2.455 0.014177 *
## factor(fid)35687 -0.2202958 0.1311204 -1.680 0.093111 .
## factor(fid)35688 -0.4328891 0.0757068 -5.718 1.26e-08 ***
## factor(fid)35690 -0.3115405 0.0725071 -4.297 1.83e-05 ***
## factor(fid)35692 -0.4708303 0.0724936 -6.495 1.07e-10 ***
## factor(fid)35696 -0.6016129 0.0802952 -7.493 1.05e-13 ***
## factor(fid)35697 -0.0041560 0.0874258 -0.048 0.962090
## factor(fid)35698 -0.5035015 0.0874209 -5.760 9.90e-09 ***
## factor(fid)35699 -0.1786567 0.1001449 -1.784 0.074595 .
## factor(fid)35702 -0.2746346 0.0874470 -3.141 0.001714 **
## factor(fid)35706 -0.1883366 0.1001463 -1.881 0.060186 .
## factor(fid)35707 -0.2450976 0.0757036 -3.238 0.001227 **
## factor(fid)35708 -0.3096599 0.0724802 -4.272 2.04e-05 ***
```

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## factor(fid)35709 -0.4215890 0.1311237 -3.215 0.001327 **
## factor(fid)35710 -0.2049018 0.0724871 -2.827 0.004755 **
## factor(fid)35712 -0.3631111 0.0874142 -4.154 3.42e-05 ***
## factor(fid)35714 -0.3953059 0.0874293 -4.521 6.54e-06 ***
## factor(fid)35715 -0.4461596 0.0757180 -5.892 4.54e-09 ***
## factor(fid)35718 -0.4880057 0.0724802 -6.733 2.23e-11 ***
## factor(fid)35720 -0.2774375 0.0724851 -3.828 0.000134 ***
## factor(fid)35721 -1.0013478 0.1311205 -7.637 3.60e-14 ***
## factor(fid)35731 -0.3411865 0.0874355 -3.902 9.89e-05 ***
## factor(fid)35732 -0.3953829 0.0724791 -5.455 5.57e-08 ***
## factor(fid)35733 -0.3498888 0.0724804 -4.827 1.50e-06 ***
## factor(fid)35735 -0.6474626 0.0725043 -8.930 < 2e-16 ***
## factor(fid)35738 -0.4539255 0.0724824 -6.263 4.73e-10 ***
## factor(fid)35739 -0.4048294 0.0725014 -5.584 2.71e-08 ***
## factor(fid)35746 -0.2991661 0.0724876 -4.127 3.84e-05 ***
## factor(fid)35748 -0.3423704 0.0728671 -4.699 2.82e-06 ***
## factor(fid)35754 -0.2320043 0.0874131 -2.654 0.008022 **
## factor(fid)35755 -0.4232816 0.1311218 -3.228 0.001268 **
## factor(fid)35756 -0.3379109 0.0724821 -4.662 3.36e-06 ***
## factor(fid)35757 -0.3144697 0.1311264 -2.398 0.016577 *
## factor(fid)35758 -0.5412995 0.0803478 -6.737 2.17e-11 ***
## factor(fid)35760 -0.6298346 0.0724802 -8.690 < 2e-16 ***
## factor(fid)35761 -0.5197011 0.0724951 -7.169 1.10e-12 ***
## factor(fid)35767 -0.6946951 0.0874131 -7.947 3.34e-15 ***
## factor(fid)35770 -0.2998383 0.1001726 -2.993 0.002798 **
## factor(fid)35772 -0.3451030 0.1001453 -3.446 0.000582 ***
## factor(fid)35773 -0.2571372 0.1001591 -2.567 0.010330 *
## factor(fid)35774 -0.4879344 0.0757388 -6.442 1.51e-10 ***
## factor(fid)35775 -0.5427972 0.1311205 -4.140 3.64e-05 ***
## factor(fid)35777 -0.3814038 0.0757026 -5.038 5.17e-07 ***
## factor(fid)35779 -0.4853218 0.0757125 -6.410 1.85e-10 ***
## factor(fid)35780 -0.2529605 0.1001462 -2.526 0.011625 *
## factor(fid)35782 -0.4227670 0.0874572 -4.834 1.45e-06 ***
## factor(fid)35789 -0.2182206 0.1001517 -2.179 0.029469 *
## factor(fid)35797 -0.3699743 0.0803068 -4.607 4.37e-06 ***
## factor(fid)35798 -0.2692288 0.0804238 -3.348 0.000832 ***
## factor(fid)35799 -0.4245059 0.0805401 -5.271 1.52e-07 ***
## factor(fid)35800 -0.3464662 0.1001694 -3.459 0.000555 ***
## factor(fid)35801 -0.3329924 0.0802997 -4.147 3.53e-05 ***
## factor(fid)35802 -0.3990493 0.1311242 -3.043 0.002374 **
## factor(fid)35804 -0.3540582 0.1311204 -2.700 0.006994 **
## factor(fid)35805 -0.4222908 0.0803037 -5.259 1.62e-07 ***
## factor(fid)35806 -0.5111061 0.0874895 -5.842 6.11e-09 ***
## factor(fid)35807 -0.2932896 0.0802989 -3.652 0.000267 ***
## factor(fid)35808 -0.5135235 0.0874146 -5.875 5.04e-09 ***
## factor(fid)35810 -0.4033124 0.1001465 -4.027 5.88e-05 ***
## factor(fid)35813 -0.4337865 0.0874460 -4.961 7.69e-07 ***
## factor(fid)35822 -0.6742754 0.0803222 -8.395 < 2e-16 ***
## factor(fid)35823 -0.3221514 0.0803057 -4.012 6.28e-05 ***
## factor(fid)35825 -0.5480853 0.1001445 -5.473 5.05e-08 ***
```

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## factor(fid)35826 -0.8073193 0.1311211 -6.157 9.12e-10 ***
## factor(fid)35827 -0.4633681 0.0803644 -5.766 9.55e-09 ***
## factor(fid)35828 -0.5019656 0.0803196 -6.250 5.13e-10 ***
## factor(fid)35829 -0.3248855 0.1001581 -3.244 0.001201 **
## factor(fid)35831 -0.2700389 0.0802998 -3.363 0.000788 ***
## factor(fid)35832 -0.5190464 0.0874488 -5.935 3.51e-09 ***
## factor(fid)35833 -0.3442717 0.1001490 -3.438 0.000600 ***
## factor(fid)35834 -0.7471304 0.0802953 -9.305 < 2e-16 ***
## factor(fid)35838 -0.6492551 0.1001446 -6.483 1.16e-10 ***
## factor(fid)35839 -0.9967489 0.0874209 -11.402 < 2e-16 ***
## factor(fid)35841 -0.8469175 0.1002028 -8.452 < 2e-16 ***
## factor(fid)35842 -0.3638673 0.1001548 -3.633 0.000288 ***
## factor(fid)35844 -0.2419963 0.0874680 -2.767 0.005721 **
## factor(fid)35845 -0.5539042 0.0874627 -6.333 3.03e-10 ***
## factor(fid)35847 -0.5642428 0.1311242 -4.303 1.77e-05 ***
## factor(fid)35853 -0.4679786 0.1311894 -3.567 0.000370 ***
## factor(fid)35855 -0.8843048 0.1311655 -6.742 2.10e-11 ***
## factor(fid)35857 -0.5610618 0.1311655 -4.278 1.99e-05 ***
## factor(fid)35858 -0.3755919 0.0874131 -4.297 1.83e-05 ***
## factor(fid)35865 -0.5706411 0.0874191 -6.528 8.67e-11 ***
## factor(fid)35869 -0.3693454 0.0874194 -4.225 2.51e-05 ***
## factor(fid)35871 -0.5967177 0.0874434 -6.824 1.21e-11 ***
## factor(fid)35882 -0.4039678 0.1001513 -4.034 5.72e-05 ***
## factor(fid)35884 -0.7573782 0.1001743 -7.561 6.36e-14 ***
## factor(fid)35890 -0.2765866 0.1001444 -2.762 0.005806 **
## factor(fid)35891 -0.6420766 0.1001659 -6.410 1.85e-10 ***
## factor(fid)35894 -0.4119125 0.1001507 -4.113 4.08e-05 ***
## factor(fid)35896 -0.4086054 0.1001446 -4.080 4.70e-05 ***
## factor(fid)35905 -0.4688629 0.1001553 -4.681 3.06e-06 ***
## factor(fid)35915 -0.5008363 0.1001447 -5.001 6.26e-07 ***
## factor(fid)35921 -0.4502545 0.1001457 -4.496 7.37e-06 ***
## factor(fid)35923 -0.3342961 0.1001444 -3.338 0.000861 ***
## factor(fid)35929 -0.3857405 0.1311224 -2.942 0.003305 **
## factor(fid)35930 -0.2144557 0.1311242 -1.636 0.102116
## factor(fid)35937 -0.7083262 0.1311224 -5.402 7.47e-08 ***
## factor(fid)35938 -0.6921674 0.1311524 -5.278 1.47e-07 ***
## factor(fid)35939 -0.7140552 0.1311242 -5.446 5.87e-08 ***
## factor(fid)35941 -0.4690141 0.1311224 -3.577 0.000357 ***
## factor(fid)35942 -0.0061443 0.1311382 -0.047 0.962635
## factor(fid)35943 -0.2128164 0.1311382 -1.623 0.104799
## factor(fid)35945 -0.9691685 0.1311224 -7.391 2.22e-13 ***
## factor(fid)35946 -0.6666191 0.1311242 -5.084 4.08e-07 ***
## factor(fid)35948 -0.3950153 0.1311242 -3.013 0.002627 **
## factor(fid)35950 -0.5847512 0.1311224 -4.460 8.72e-06 ***
## factor(fid)35953 -0.7704567 0.1311224 -5.876 5.00e-09 ***
## factor(fid)37051 -0.4677646 0.1311505 -3.567 0.000371 ***
## factor(fid)37068 -0.3261449 0.1311241 -2.487 0.012962 *
## factor(fid)37102 -0.5817180 0.0874134 -6.655 3.76e-11 ***
## factor(fid)37107 -0.4449802 0.0874755 -5.087 4.02e-07 ***
## factor(fid)37127 -0.3437946 0.0802991 -4.281 1.96e-05 ***
```



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## factor(fid)37151 -0.5521543 0.0724959 -7.616 4.19e-14 ***
## factor(fid)37156 -0.2630890 0.0874137 -3.010 0.002651 **
## factor(fid)37159 -0.5128992 0.1311380 -3.911 9.53e-05 ***
## factor(fid)37169 -0.5009364 0.0803042 -6.238 5.51e-10 ***
## factor(fid)37179 -0.4718996 0.0757046 -6.233 5.67e-10 ***
## factor(fid)37182 -0.3655769 0.0757118 -4.829 1.49e-06 ***
## factor(fid)37183 -0.2897011 0.1311264 -2.209 0.027278 *
## factor(fid)37201 -0.5616601 0.1001454 -5.608 2.36e-08 ***
## factor(fid)37239 -0.4213417 0.0724972 -5.812 7.30e-09 ***
## factor(fid)37242 -0.4742076 0.0757199 -6.263 4.72e-10 ***
## factor(fid)37270 -0.3809824 0.0757405 -5.030 5.39e-07 ***
## factor(fid)37284 -0.6756036 0.0725117 -9.317 < 2e-16 ***
## factor(fid)37293 -0.3591582 0.0724981 -4.954 7.95e-07 ***
## factor(fid)37297 -0.9985275 0.0802958 -12.436 < 2e-16 ***
## factor(fid)37303 -0.4820133 0.1002300 -4.809 1.64e-06 ***
## factor(fid)37304 -0.6281104 0.0757162 -8.296 < 2e-16 ***
## factor(fid)37322 -0.6024467 0.0724823 -8.312 < 2e-16 ***
## factor(fid)37326 -0.5411334 0.0874731 -6.186 7.61e-10 ***
## factor(fid)37327 -0.9980238 0.1001468 -9.966 < 2e-16 ***
## factor(fid)37335 -0.6459924 0.1311435 -4.926 9.17e-07 ***
## factor(fid)37354 -0.4501249 0.0724856 -6.210 6.57e-10 ***
## factor(fid)37359 -0.4706010 0.0725155 -6.490 1.11e-10 ***
## factor(fid)37369 -1.0050245 0.1001605 -10.034 < 2e-16 ***
## factor(fid)37373 -0.5220144 0.0874161 -5.972 2.83e-09 ***
## factor(fid)37380 -0.3975875 0.0874568 -4.546 5.83e-06 ***
## factor(fid)37384 -0.4593597 0.0724880 -6.337 2.95e-10 ***
## factor(fid)37387 -0.0051139 0.1001611 -0.051 0.959286
## factor(fid)37390 -0.6564500 0.1001452 -6.555 7.25e-11 ***
## factor(fid)37391 -0.5457922 0.1311380 -4.162 3.30e-05 ***
## factor(fid)37392 -0.3324557 0.1311522 -2.535 0.011333 *
## factor(fid)37394 -0.1678039 0.0724792 -2.315 0.020714 *
## factor(fid)37399 -0.4589749 0.0724798 -6.332 3.04e-10 ***
## factor(fid)37402 -0.5771598 0.0724813 -7.963 2.96e-15 ***
## factor(fid)37405 -0.6978019 0.0757024 -9.218 < 2e-16 ***
## factor(fid)37423 -0.3853360 0.0874255 -4.408 1.11e-05 ***
## factor(fid)37424 -0.6301855 0.0874141 -7.209 8.26e-13 ***
## factor(fid)37425 -0.5268318 0.0803108 -6.560 7.02e-11 ***
## factor(fid)37428 -0.2964267 0.0757464 -3.913 9.44e-05 ***
## factor(fid)37429 -0.6721571 0.0802975 -8.371 < 2e-16 ***
## factor(fid)37431 -0.3099236 0.0874131 -3.546 0.000402 ***
## factor(fid)37432 -0.3723326 0.1001450 -3.718 0.000207 ***
## factor(fid)37433 -0.5694218 0.0724940 -7.855 6.84e-15 ***
## factor(fid)37442 -0.4327776 0.0874133 -4.951 8.08e-07 ***
## factor(fid)37445 -0.4397643 0.0757024 -5.809 7.41e-09 ***
## factor(fid)37446 -0.5118138 0.0874145 -5.855 5.66e-09 ***
## factor(fid)37448 -0.4854720 0.0874365 -5.552 3.24e-08 ***
## factor(fid)37454 -0.2686384 0.0874131 -3.073 0.002150 **
## factor(fid)37456 -0.3662321 0.0874232 -4.189 2.94e-05 ***
## factor(fid)37457 -0.2218658 0.0803131 -2.763 0.005794 **
## factor(fid)37460 -0.2706364 0.0724797 -3.734 0.000194 ***
```

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## factor(fid)37472 -0.4082070 0.0724800 -5.632 2.06e-08 ***
## factor(fid)37478 -0.8590618 0.0874147 -9.827 < 2e-16 ***
## factor(fid)37479 -0.3859685 0.0724822 -5.325 1.14e-07 ***
## factor(fid)37480 -0.5464443 0.0724950 -7.538 7.55e-14 ***
## factor(fid)37492 -0.9963337 0.1311262 -7.598 4.80e-14 ***
## factor(fid)37493 -0.6177420 0.0724795 -8.523 < 2e-16 ***
## factor(fid)37501 -0.4661768 0.0874193 -5.333 1.09e-07 ***
## factor(fid)37516 -0.6554883 0.0724796 -9.044 < 2e-16 ***
## factor(fid)37539 -0.9962056 0.1311267 -7.597 4.84e-14 ***
## factor(fid)37540 -0.0130332 0.1312033 -0.099 0.920883
## factor(fid)37552 -0.4327594 0.0757118 -5.716 1.28e-08 ***
## factor(fid)37554 -0.5374282 0.0724812 -7.415 1.87e-13 ***
## factor(fid)37560 -0.3288929 0.0724810 -4.538 6.07e-06 ***
## factor(fid)37561 -0.1972783 0.0802940 -2.457 0.014106 *
## factor(fid)37564 -1.0012232 0.1001452 -9.998 < 2e-16 ***
## factor(fid)37568 -0.4090651 0.0874243 -4.679 3.10e-06 ***
## factor(fid)37572 -0.9879018 0.1311918 -7.530 7.98e-14 ***
## factor(fid)37574 -0.5252618 0.0757064 -6.938 5.53e-12 ***
## factor(fid)37581 -0.6204567 0.0724817 -8.560 < 2e-16 ***
## factor(fid)37583 -0.4594042 0.0724796 -6.338 2.93e-10 ***
## factor(fid)37584 -0.7067531 0.1001448 -7.057 2.42e-12 ***
## factor(fid)37586 -0.2184539 0.0874236 -2.499 0.012550 *
## factor(fid)37597 -0.2699849 0.0802941 -3.362 0.000789 ***
## factor(fid)37605 -0.5702595 0.0724817 -7.868 6.19e-15 ***
## factor(fid)37606 -0.5214464 0.0874199 -5.965 2.94e-09 ***
## factor(fid)37609 -0.5770031 0.0803026 -7.185 9.79e-13 ***
## factor(fid)37619 -0.1364303 0.0874132 -1.561 0.118759
## factor(fid)37637 -0.3180421 0.1311380 -2.425 0.015396 *
## factor(fid)37652 -0.6541397 0.0803100 -8.145 7.01e-16 ***
## factor(fid)37662 0.0001209 0.1311196 0.001 0.999264
## factor(fid)37666 -0.6134352 0.0757048 -8.103 9.81e-16 ***
## factor(fid)37667 -0.5601177 0.0764792 -7.324 3.62e-13 ***
## factor(fid)37675 -0.5623597 0.0874583 -6.430 1.63e-10 ***
## factor(fid)37676 -0.5827399 0.0803201 -7.255 5.94e-13 ***
## factor(fid)37677 -0.9926930 0.1311459 -7.569 5.96e-14 ***
## factor(fid)37695 -1.0016210 0.1311209 -7.639 3.54e-14 ***
## factor(fid)37696 -0.7993195 0.0803071 -9.953 < 2e-16 ***
## factor(fid)37707 -0.4366997 0.0802941 -5.439 6.10e-08 ***
## factor(fid)37711 -0.4055164 0.0874558 -4.637 3.79e-06 ***
## factor(fid)37719 -0.5581356 0.1311434 -4.256 2.19e-05 ***
## factor(fid)37721 -0.4952852 0.0874206 -5.666 1.70e-08 ***
## factor(fid)37728 -0.6352290 0.1311434 -4.844 1.38e-06 ***
## factor(fid)37732 -0.3835838 0.0874147 -4.388 1.21e-05 ***
## factor(fid)37737 -0.3579711 0.0874343 -4.094 4.42e-05 ***
## factor(fid)37747 -0.4942425 0.0874194 -5.654 1.82e-08 ***
## factor(fid)37749 -0.4909641 0.0874172 -5.616 2.26e-08 ***
## factor(fid)37752 -0.6226325 0.0874655 -7.119 1.57e-12 ***
## factor(fid)37755 -0.9547171 0.0874172 -10.921 < 2e-16 ***
## factor(fid)37770 -0.6692191 0.1001487 -6.682 3.13e-11 ***
## factor(fid)37771 -0.3391232 0.1001740 -3.385 0.000726 ***
```

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## factor(fid)37773 -0.4099241 0.1001448 -4.093 4.44e-05 ***
## factor(fid)37776 -0.4755413 0.1001443 -4.749 2.21e-06 ***
## factor(fid)37780 -0.5570122 0.1001443 -5.562 3.07e-08 ***
## factor(fid)37784 -0.3637034 0.1001458 -3.632 0.000289 ***
## factor(fid)37786 -0.6419773 0.1001444 -6.411 1.85e-10 ***
## factor(fid)37787 -0.4910977 0.1001488 -4.904 1.03e-06 ***
## factor(fid)37788 -0.5381136 0.1001442 -5.373 8.74e-08 ***
## factor(fid)37790 -0.6647132 0.1311215 -5.069 4.40e-07 ***
## factor(fid)37796 -0.7027160 0.1001443 -7.017 3.20e-12 ***
## factor(fid)37797 -0.3769645 0.1001475 -3.764 0.000173 ***
## factor(fid)37802 -0.5593628 0.1311404 -4.265 2.10e-05 ***
## factor(fid)37804 -0.6190146 0.1001476 -6.181 7.86e-10 ***
## factor(fid)37805 -0.4636215 0.1001455 -4.629 3.93e-06 ***
## factor(fid)37806 -0.6609602 0.1311404 -5.040 5.12e-07 ***
## factor(fid)37809 -0.5626695 0.1311459 -4.290 1.88e-05 ***
## factor(fid)37812 -0.4986813 0.1001454 -4.980 6.98e-07 ***
## factor(fid)37815 -0.5147794 0.1311434 -3.925 8.99e-05 ***
## factor(fid)37817 -0.4925865 0.1311434 -3.756 0.000178 ***
## factor(fid)37820 -0.9962706 0.1001532 -9.947 < 2e-16 ***
## factor(fid)37823 -0.6124369 0.1001538 -6.115 1.18e-09 ***
## factor(fid)37824 -0.0046611 0.1311303 -0.036 0.971649 **
## factor(fid)37827 -0.4279181 0.1311224 -3.264 0.001121 *
## factor(fid)37829 -0.2888964 0.1311328 -2.203 0.027716 *
## factor(fid)37837 -0.5930746 0.1311196 -4.523 6.49e-06 ***
## factor(fid)37838 -0.2349682 0.1311244 -1.792 0.073310 .
## factor(fid)37842 -0.5601902 0.1311344 -4.272 2.04e-05 ***
## factor(fid)37843 -0.4590075 0.1311385 -3.500 0.000476 ***
## factor(fid)37849 -0.4958006 0.1311385 -3.781 0.000161 ***
## factor(fid)37856 -1.0033164 0.1311250 -7.652 3.22e-14 ***
## factor(fid)37858 -0.6483678 0.1311250 -4.945 8.34e-07 ***
## factor(fid)37859 -0.5875895 0.1311250 -4.481 7.89e-06 ***
## factor(fid)37861 -0.5536028 0.1311278 -4.222 2.54e-05 ***
## factor(fid)37866 -0.7767077 0.1311196 -5.924 3.77e-09 ***
## factor(fid)37868 -0.3129006 0.1311385 -2.386 0.017134 *
## factor(fid)39146 -0.7290237 0.1311211 -5.560 3.10e-08 ***
## factor(fid)39157 -0.6611752 0.1004962 -6.579 6.19e-11 ***
## factor(fid)39189 -0.8451818 0.1311336 -6.445 1.48e-10 ***
## factor(fid)39244 -0.9972321 0.1311234 -7.605 4.56e-14 ***
## factor(fid)39280 -0.1914617 0.1311336 -1.460 0.144451
## factor(fid)39389 -0.4799063 0.0874156 -5.490 4.59e-08 ***
## factor(fid)39410 -0.6001517 0.0725130 -8.276 2.45e-16 ***
## factor(fid)39433 -0.7423181 0.0724791 -10.242 < 2e-16 ***
## factor(fid)39461 -0.7322746 0.1311423 -5.584 2.71e-08 ***
## factor(fid)39468 -0.2196991 0.1311315 -1.675 0.094028 .
## factor(fid)39505 -0.3245196 0.1001544 -3.240 0.001216 **
## factor(fid)39525 -0.4633033 0.1001581 -4.626 4.00e-06 ***
## factor(fid)39550 -0.6879936 0.0757078 -9.087 < 2e-16 ***
## factor(fid)39574 -1.0003089 0.0802941 -12.458 < 2e-16 ***
## factor(fid)39578 -0.6179443 0.0874176 -7.069 2.23e-12 ***
## factor(fid)39579 -1.0016980 0.1001461 -10.002 < 2e-16 ***
```

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## factor(fid)39580 -0.5650995 0.0874362 -6.463 1.32e-10 ***
## factor(fid)39582 -0.7056193 0.1001445 -7.046 2.61e-12 ***
## factor(fid)39583 -0.6205279 0.0874687 -7.094 1.86e-12 ***
## factor(fid)39609 -0.3134237 0.0757021 -4.140 3.63e-05 ***
## factor(fid)39620 -0.2896828 0.0724793 -3.997 6.68e-05 ***
## factor(fid)39622 -0.6921430 0.0724908 -9.548 < 2e-16 ***
## factor(fid)39623 -0.5443215 0.0874477 -6.225 6.00e-10 ***
## factor(fid)39658 -0.5425928 0.1311336 -4.138 3.67e-05 ***
## factor(fid)39703 -0.7216583 0.1311234 -5.504 4.26e-08 ***
## factor(fid)39709 -0.6902378 0.0757019 -9.118 < 2e-16 ***
## factor(fid)39735 -0.3919068 0.0757068 -5.177 2.51e-07 ***
## factor(fid)39737 -0.6592856 0.0757062 -8.708 < 2e-16 ***
## factor(fid)39754 -0.1843217 0.1001471 -1.841 0.065858 .
## factor(fid)39767 -1.0001465 0.1311196 -7.628 3.85e-14 ***
## factor(fid)39769 -0.9890182 0.1002221 -9.868 < 2e-16 ***
## factor(fid)39780 -0.4767354 0.0757021 -6.298 3.79e-10 ***
## factor(fid)39796 -0.9854714 0.1312237 -7.510 9.28e-14 ***
## factor(fid)39800 -0.9967307 0.1001511 -9.952 < 2e-16 ***
## factor(fid)39802 -1.0001443 0.1311196 -7.628 3.85e-14 ***
## factor(fid)39816 -0.9949911 0.0803142 -12.389 < 2e-16 ***
## factor(fid)39832 -0.6567366 0.0874631 -7.509 9.35e-14 ***
## factor(fid)39836 -0.5883457 0.1311483 -4.486 7.71e-06 ***
## factor(fid)39838 -0.4331698 0.1312119 -3.301 0.000981 ***
## factor(fid)39839 -0.7266628 0.1002074 -7.252 6.10e-13 ***
## factor(fid)39855 -0.5372955 0.0874627 -6.143 9.94e-10 ***
## factor(fid)39861 -0.5247025 0.0874492 -6.000 2.38e-09 ***
## factor(fid)39867 -0.5231878 0.1001567 -5.224 1.96e-07 ***
## factor(fid)39872 -0.9890182 0.1002221 -9.868 < 2e-16 ***
## factor(fid)39875 -0.9854714 0.1312237 -7.510 9.28e-14 ***
## factor(fid)39889 -0.9935503 0.1311401 -7.576 5.66e-14 ***
## factor(fid)39893 -0.4333776 0.1311502 -3.304 0.000970 ***
## factor(fid)39900 -0.6762862 0.1001873 -6.750 1.99e-11 ***
## factor(fid)39904 0.0076362 0.1311483 0.058 0.953576
## factor(fid)39906 -0.2972070 0.1311502 -2.266 0.023560 *
## factor(fid)39915 -0.5736765 0.1001523 -5.728 1.19e-08 ***
## factor(fid)39920 -0.7998479 0.1311211 -6.100 1.30e-09 ***
## factor(fid)39928 -0.4448202 0.1311483 -3.392 0.000710 ***
## factor(fid)39929 -0.7949472 0.1311472 -6.061 1.64e-09 ***
## factor(fid)39932 -0.5840767 0.1311196 -4.455 8.93e-06 ***
## factor(fid)39933 -0.4575326 0.1311196 -3.489 0.000496 ***
## factor(fid)39953 -0.5958603 0.1311211 -4.544 5.88e-06 ***
## factor(fid)39957 -0.8326953 0.1311326 -6.350 2.72e-10 ***
## temp NA NA NA NA
## precip NA NA NA NA
## I(precip^2) NA NA NA NA
## slope NA NA NA NA
## ph NA NA NA NA
## coarse NA NA NA NA
## med NA NA NA NA
## fine NA NA NA NA

```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1197 on 1795 degrees of freedom
## Multiple R-squared:  0.8057, Adjusted R-squared:  0.7199
## F-statistic: 9.389 on 793 and 1795 DF,  p-value: < 2.2e-16

output[5,] = coef(summary(m4))[2,1:2]
# The R2 is now very high (the fixed effects capture all the variability
# between farms). However,
# the coefficients of the variables become NA because all time-invariant
# variables are removed
# and thus cannot be estimated (temperature, precipitation, and all other
# factors assumed to be constant
# over time). The price parameter is estimated correctly, though (as well as
# its standard errors).

# FE estimator correct
m5 = lm(wheat_share ~ factor(fid) + wheat_price, data = df_l16)
summary(m5)

##
## Call:
## lm(formula = wheat_share ~ factor(fid) + wheat_price, data = df_l16)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.66850 -0.03526  0.00000  0.03738  0.64678
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.9588530   0.0555374   17.265 < 2e-16 ***
## factor(fid)1717 -0.5943812   0.1311257   -4.533 6.20e-06 ***
## factor(fid)1723 -0.6949826   0.0724905   -9.587 < 2e-16 ***
## factor(fid)1724 -0.8167392   0.1311896   -6.226 5.96e-10 ***
## factor(fid)1747 -0.5695312   0.0733146   -7.768 1.33e-14 ***
## factor(fid)1753 -0.9986137   0.0874145  -11.424 < 2e-16 ***
## factor(fid)1759 -0.6745176   0.0724791   -9.306 < 2e-16 ***
## factor(fid)1764 -0.6255377   0.1311245   -4.771 1.99e-06 ***
## factor(fid)1769 -0.5916647   0.0724802   -8.163 6.08e-16 ***
## factor(fid)1784 -0.8105775   0.0874171   -9.273 < 2e-16 ***
## factor(fid)1788 -0.5551483   0.0724791   -7.659 3.03e-14 ***
## factor(fid)1797 -0.6202565   0.0874131   -7.096 1.85e-12 ***
## factor(fid)1799 -0.5860926   0.0724833   -8.086 1.12e-15 ***
## factor(fid)1833 -0.9971746   0.0724862  -13.757 < 2e-16 ***
## factor(fid)1837 -0.4872499   0.0724801   -6.723 2.39e-11 ***
## factor(fid)1863 -0.7714415   0.1001549   -7.702 2.19e-14 ***
## factor(fid)1876 -0.4007416   0.0803018   -4.990 6.61e-07 ***
## factor(fid)1883 -0.6098228   0.1311314   -4.650 3.55e-06 ***
## factor(fid)1891 -0.9998160   0.0802940  -12.452 < 2e-16 ***
```

```
## factor(fid)1903 -0.3360623 0.1001727 -3.355 0.000811 ***
## factor(fid)1906 -0.4970212 0.0724915 -6.856 9.69e-12 ***
## factor(fid)1911 -0.4307228 0.0724812 -5.943 3.36e-09 ***
## factor(fid)1912 -0.5730753 0.0802940 -7.137 1.38e-12 ***
## factor(fid)1916 -0.5962815 0.1311896 -4.545 5.85e-06 ***
## factor(fid)1923 -0.6610658 0.1001541 -6.600 5.38e-11 ***
## factor(fid)1926 -0.6894998 0.1311215 -5.258 1.63e-07 ***
## factor(fid)1927 -0.6401664 0.0757046 -8.456 < 2e-16 ***
## factor(fid)1929 -0.9744839 0.0724831 -13.444 < 2e-16 ***
## factor(fid)1932 -0.4911629 0.0724905 -6.776 1.67e-11 ***
## factor(fid)1933 -0.3632230 0.1001553 -3.627 0.000295 ***
## factor(fid)1935 -0.4467631 0.0802977 -5.564 3.04e-08 ***
## factor(fid)1947 -0.4989075 0.0802958 -6.213 6.43e-10 ***
## factor(fid)1965 -0.6674159 0.1001467 -6.664 3.53e-11 ***
## factor(fid)1968 -0.9907498 0.1001995 -9.888 < 2e-16 ***
## factor(fid)1970 -0.6387331 0.1311283 -4.871 1.21e-06 ***
## factor(fid)1987 -0.9962313 0.1001534 -9.947 < 2e-16 ***
## factor(fid)1993 -0.5072128 0.0874172 -5.802 7.72e-09 ***
## factor(fid)1995 -0.3832577 0.1311314 -2.923 0.003514 **
## factor(fid)1997 -0.9994886 0.1311197 -7.623 4.00e-14 ***
## factor(fid)1999 -0.6284262 0.1311439 -4.792 1.79e-06 ***
## factor(fid)2888 -0.6291426 0.1311240 -4.798 1.73e-06 ***
## factor(fid)2891 -0.5079211 0.1311386 -3.873 0.000111 ***
## factor(fid)2917 -0.3629948 0.1311305 -2.768 0.005695 **
## factor(fid)2923 -0.4292446 0.1001554 -4.286 1.92e-05 ***
## factor(fid)2940 -0.3597704 0.0874131 -4.116 4.03e-05 ***
## factor(fid)2943 -0.5605668 0.0874256 -6.412 1.83e-10 ***
## factor(fid)2953 -0.5218811 0.1311441 -3.979 7.18e-05 ***
## factor(fid)2984 -0.3658095 0.0874280 -4.184 3.00e-05 ***
## factor(fid)4792 -0.3969487 0.1311451 -3.027 0.002507 **
## factor(fid)4803 -0.3182202 0.1311233 -2.427 0.015327 *
## factor(fid)4827 -0.2353191 0.1001442 -2.350 0.018891 *
## factor(fid)4835 -0.7278801 0.1001517 -7.268 5.43e-13 ***
## factor(fid)4837 -0.9206788 0.1001558 -9.192 < 2e-16 ***
## factor(fid)4841 -0.4914343 0.1311234 -3.748 0.000184 ***
## factor(fid)4847 -0.7149283 0.1311252 -5.452 5.66e-08 ***
## factor(fid)4848 -0.4813111 0.1001447 -4.806 1.67e-06 ***
## factor(fid)4865 -0.5804080 0.1001450 -5.796 8.02e-09 ***
## factor(fid)4870 -0.6032666 0.0874144 -6.901 7.12e-12 ***
## factor(fid)4880 -0.5399488 0.0874133 -6.177 8.06e-10 ***
## factor(fid)4885 -0.4505000 0.0874174 -5.153 2.84e-07 ***
## factor(fid)4893 -0.4479027 0.1001443 -4.473 8.21e-06 ***
## factor(fid)4899 -0.4265508 0.0874131 -4.880 1.16e-06 ***
## factor(fid)4930 -0.3421243 0.0802942 -4.261 2.14e-05 ***
## factor(fid)4964 -0.4045163 0.0757117 -5.343 1.03e-07 ***
## factor(fid)4965 -0.2839532 0.0724814 -3.918 9.28e-05 ***
## factor(fid)4968 -0.7950711 0.1311225 -6.064 1.62e-09 ***
## factor(fid)4971 -0.5841673 0.0724829 -8.059 1.39e-15 ***
## factor(fid)4982 -0.3819650 0.0724793 -5.270 1.53e-07 ***
## factor(fid)6610 -0.5965505 0.1311321 -4.549 5.74e-06 ***
```

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## factor(fid)6616 -0.5450897 0.1311234 -4.157 3.38e-05 ***
## factor(fid)6677 -0.4754354 0.0874135 -5.439 6.10e-08 ***
## factor(fid)6680 -0.5059960 0.0874223 -5.788 8.39e-09 ***
## factor(fid)6683 -0.4913799 0.0874147 -5.621 2.19e-08 ***
## factor(fid)6686 -0.4037908 0.1311267 -3.079 0.002106 **
## factor(fid)6693 -0.1342208 0.0874199 -1.535 0.124872
## factor(fid)6694 -0.4388630 0.1001442 -4.382 1.24e-05 ***
## factor(fid)6701 -0.4872439 0.1001476 -4.865 1.24e-06 ***
## factor(fid)6714 -0.3592316 0.1311286 -2.740 0.006213 **
## factor(fid)6727 -0.4343579 0.0757028 -5.738 1.12e-08 ***
## factor(fid)6730 -0.0039505 0.0874246 -0.045 0.963963
## factor(fid)6736 -0.4680391 0.0724796 -6.458 1.37e-10 ***
## factor(fid)6745 -0.3652190 0.0874186 -4.178 3.08e-05 ***
## factor(fid)6753 -0.2112029 0.0724791 -2.914 0.003613 **
## factor(fid)6756 -0.4849756 0.0724792 -6.691 2.95e-11 ***
## factor(fid)6767 -0.6534442 0.1001447 -6.525 8.82e-11 ***
## factor(fid)6804 -0.5051853 0.0725034 -6.968 4.51e-12 ***
## factor(fid)6811 -0.6490825 0.0725083 -8.952 < 2e-16 ***
## factor(fid)6821 -0.4056021 0.0874161 -4.640 3.74e-06 ***
## factor(fid)6824 -0.4535930 0.0724856 -6.258 4.87e-10 ***
## factor(fid)6825 -0.3298778 0.0802974 -4.108 4.17e-05 ***
## factor(fid)6835 -0.5789550 0.0724981 -7.986 2.47e-15 ***
## factor(fid)6848 -0.4528536 0.0724869 -6.247 5.20e-10 ***
## factor(fid)6849 -0.6504982 0.1311235 -4.961 7.68e-07 ***
## factor(fid)6850 -0.2865162 0.1311343 -2.185 0.029025 *
## factor(fid)6865 -0.4000891 0.0724798 -5.520 3.88e-08 ***
## factor(fid)6867 -0.5230675 0.0724856 -7.216 7.86e-13 ***
## factor(fid)6870 0.0019475 0.1311215 0.015 0.988151
## factor(fid)6876 -0.3620808 0.1311316 -2.761 0.005818 **
## factor(fid)6878 -0.3531815 0.0724805 -4.873 1.20e-06 ***
## factor(fid)6885 -0.5974967 0.0724809 -8.244 3.19e-16 ***
## factor(fid)6894 -0.4852587 0.0724791 -6.695 2.87e-11 ***
## factor(fid)6905 -0.4192874 0.0724893 -5.784 8.58e-09 ***
## factor(fid)6908 -0.2804726 0.0724818 -3.870 0.000113 ***
## factor(fid)6909 -0.4648560 0.0874567 -5.315 1.20e-07 ***
## factor(fid)6915 -0.2776007 0.1001519 -2.772 0.005632 **
## factor(fid)6916 -0.5282206 0.1311536 -4.027 5.87e-05 ***
## factor(fid)6937 -0.5696108 0.1311316 -4.344 1.48e-05 ***
## factor(fid)6941 -0.5342957 0.1311279 -4.075 4.81e-05 ***
## factor(fid)11499 -1.0035351 0.1311257 -7.653 3.18e-14 ***
## factor(fid)11751 -0.4963647 0.1311261 -3.785 0.000159 ***
## factor(fid)11788 -0.9963647 0.1311261 -7.599 4.79e-14 ***
## factor(fid)11984 -0.9954671 0.1001575 -9.939 < 2e-16 ***
## factor(fid)12090 -0.9962602 0.1311265 -7.598 4.82e-14 ***
## factor(fid)12417 -0.9709425 0.1001456 -9.695 < 2e-16 ***
## factor(fid)12424 -0.9959241 0.1001550 -9.944 < 2e-16 ***
## factor(fid)12442 -0.9987640 0.0724804 -13.780 < 2e-16 ***
## factor(fid)12511 -0.9955880 0.1311292 -7.592 5.02e-14 ***
## factor(fid)12540 -0.4176614 0.0757046 -5.517 3.95e-08 ***
## factor(fid)12547 -0.3876722 0.0724996 -5.347 1.01e-07 ***

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## factor(fid)12553 -0.3994304 0.0874354 -4.568 5.25e-06 ***
## factor(fid)12558 -0.6881135 0.0724791 -9.494 < 2e-16 ***
## factor(fid)12560 -0.9972224 0.0724860 -13.757 < 2e-16 ***
## factor(fid)12562 -0.5399751 0.1311407 -4.118 4.00e-05 ***
## factor(fid)12608 -0.6878045 0.1001838 -6.865 9.10e-12 ***
## factor(fid)12624 -0.9955880 0.1311292 -7.592 5.02e-14 ***
## factor(fid)12628 -0.0049417 0.1311316 -0.038 0.969943
## factor(fid)12641 -0.9524018 0.1311265 -7.263 5.61e-13 ***
## factor(fid)12661 -0.7318811 0.1001550 -7.307 4.08e-13 ***
## factor(fid)12662 -0.9981947 0.1001463 -9.967 < 2e-16 ***
## factor(fid)12672 -0.6568433 0.1001511 -6.559 7.09e-11 ***
## factor(fid)12686 -0.9950936 0.1311315 -7.589 5.17e-14 ***
## factor(fid)12755 -0.9962602 0.1311265 -7.598 4.82e-14 ***
## factor(fid)12782 -0.9975511 0.0802988 -12.423 < 2e-16 ***
## factor(fid)12798 -0.6340557 0.0802960 -7.896 4.95e-15 ***
## factor(fid)12802 -0.2158048 0.1001484 -2.155 0.031306 *
## factor(fid)12803 -0.0008014 0.1311199 -0.006 0.995124
## factor(fid)12821 -0.4129860 0.1001469 -4.124 3.90e-05 ***
## factor(fid)12856 -1.0044741 0.1311295 -7.660 3.02e-14 ***
## factor(fid)12862 -0.7247527 0.0874225 -8.290 < 2e-16 ***
## factor(fid)12867 -0.3058492 0.1311381 -2.332 0.019797 *
## factor(fid)12885 -0.7876688 0.1311585 -6.005 2.30e-09 ***
## factor(fid)12898 -0.9911171 0.1311585 -7.557 6.55e-14 ***
## factor(fid)12911 -0.3403604 0.1311316 -2.596 0.009521 **
## factor(fid)12934 -0.0001517 0.1001442 -0.002 0.998791
## factor(fid)31006 -0.4455482 0.1001586 -4.448 9.18e-06 ***
## factor(fid)31024 -0.3157118 0.1311415 -2.407 0.016166 *
## factor(fid)31025 -0.5830101 0.1311282 -4.446 9.28e-06 ***
## factor(fid)31026 -0.4946898 0.1311314 -3.772 0.000167 ***
## factor(fid)31032 -0.6201771 0.1311307 -4.729 2.43e-06 ***
## factor(fid)31036 -0.7993464 0.1311307 -6.096 1.33e-09 ***
## factor(fid)32005 -0.6097496 0.0757096 -8.054 1.45e-15 ***
## factor(fid)32016 -0.4724074 0.0874151 -5.404 7.38e-08 ***
## factor(fid)32019 -0.1532543 0.0874155 -1.753 0.079743 .
## factor(fid)32024 -0.8043125 0.1001551 -8.031 1.74e-15 ***
## factor(fid)32030 -0.9931479 0.1311427 -7.573 5.80e-14 ***
## factor(fid)32032 -0.6868892 0.0757035 -9.073 < 2e-16 ***
## factor(fid)32037 -0.4792524 0.0757188 -6.329 3.10e-10 ***
## factor(fid)32041 -0.4550488 0.0802957 -5.667 1.69e-08 ***
## factor(fid)32043 -0.2776633 0.1311206 -2.118 0.034345 *
## factor(fid)32049 -0.6657611 0.0724846 -9.185 < 2e-16 ***
## factor(fid)32056 -0.4166032 0.1001462 -4.160 3.33e-05 ***
## factor(fid)32060 -0.3494946 0.0874155 -3.998 6.64e-05 ***
## factor(fid)32062 -0.5074402 0.0724810 -7.001 3.58e-12 ***
## factor(fid)32067 -0.2775293 0.1001618 -2.771 0.005649 **
## factor(fid)32069 -0.2164761 0.0725082 -2.986 0.002869 **
## factor(fid)32072 -0.3956807 0.0724800 -5.459 5.45e-08 ***
## factor(fid)32107 -0.2815794 0.0724835 -3.885 0.000106 ***
## factor(fid)32122 -0.7440966 0.0724808 -10.266 < 2e-16 ***
## factor(fid)32176 -0.3588269 0.1001452 -3.583 0.000349 ***
```



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## factor(fid)32184 -0.8071508 0.0874147 -9.234 < 2e-16 ***
## factor(fid)32186 -0.6955436 0.0724834 -9.596 < 2e-16 ***
## factor(fid)32187 -0.3616603 0.0757044 -4.777 1.92e-06 ***
## factor(fid)32188 -0.4130246 0.0757088 -5.455 5.56e-08 ***
## factor(fid)32189 -0.1498959 0.0874209 -1.715 0.086583 .
## factor(fid)32204 -0.2500075 0.0724798 -3.449 0.000575 ***
## factor(fid)32218 -0.2424446 0.0724858 -3.345 0.000841 ***
## factor(fid)32224 -0.3903190 0.0724835 -5.385 8.20e-08 ***
## factor(fid)32225 -0.5117737 0.0757030 -6.760 1.86e-11 ***
## factor(fid)32236 -0.4650636 0.0724856 -6.416 1.79e-10 ***
## factor(fid)32237 -0.5724688 0.0757020 -7.562 6.29e-14 ***
## factor(fid)32239 -0.4225865 0.1311362 -3.223 0.001294 **
## factor(fid)32240 -0.7492660 0.0724840 -10.337 < 2e-16 ***
## factor(fid)32247 -0.9273582 0.0874157 -10.609 < 2e-16 ***
## factor(fid)32253 -0.4878580 0.0725272 -6.727 2.33e-11 ***
## factor(fid)32272 -0.4024428 0.1311213 -3.069 0.002178 **
## factor(fid)32287 -0.4258056 0.0757044 -5.625 2.15e-08 ***
## factor(fid)32298 -0.6855671 0.1311362 -5.228 1.91e-07 ***
## factor(fid)32301 -0.6345837 0.0724861 -8.755 < 2e-16 ***
## factor(fid)32302 -0.2893196 0.1311198 -2.207 0.027473 *
## factor(fid)32304 -0.4619947 0.0874230 -5.285 1.41e-07 ***
## factor(fid)32312 -0.4126672 0.0724888 -5.693 1.46e-08 ***
## factor(fid)32323 -0.5998566 0.0724806 -8.276 2.45e-16 ***
## factor(fid)32340 -0.4110918 0.0724826 -5.672 1.65e-08 ***
## factor(fid)32342 0.0025941 0.0874180 0.030 0.976330
## factor(fid)32344 -0.7140011 0.0874401 -8.166 5.96e-16 ***
## factor(fid)32345 -0.7639792 0.1001603 -7.628 3.86e-14 ***
## factor(fid)32351 -1.0015014 0.0874147 -11.457 < 2e-16 ***
## factor(fid)32352 -0.6357029 0.0757256 -8.395 < 2e-16 ***
## factor(fid)32359 -0.1221278 0.1001453 -1.220 0.222812
## factor(fid)32360 -0.4961595 0.0803028 -6.179 7.98e-10 ***
## factor(fid)32367 -0.9998533 0.0757019 -13.208 < 2e-16 ***
## factor(fid)32372 -0.5402481 0.0724816 -7.454 1.41e-13 ***
## factor(fid)32387 -0.8866494 0.0802955 -11.042 < 2e-16 ***
## factor(fid)32391 -0.7567626 0.0757272 -9.993 < 2e-16 ***
## factor(fid)32395 -0.6882997 0.1311885 -5.247 1.73e-07 ***
## factor(fid)32397 -0.5666947 0.0802994 -7.057 2.42e-12 ***
## factor(fid)32399 -1.0026692 0.1311231 -7.647 3.34e-14 ***
## factor(fid)32415 -0.3751763 0.1311223 -2.861 0.004268 **
## factor(fid)32432 -0.0632004 0.1311427 -0.482 0.629921
## factor(fid)32433 -0.5748532 0.1311898 -4.382 1.24e-05 ***
## factor(fid)32434 -0.4584746 0.1311210 -3.497 0.000483 ***
## factor(fid)32437 -0.9907178 0.1311621 -7.553 6.71e-14 ***
## factor(fid)32439 -0.4433269 0.1002242 -4.423 1.03e-05 ***
## factor(fid)32443 -0.5520769 0.1311210 -4.210 2.67e-05 ***
## factor(fid)32444 -1.0051788 0.1311328 -7.665 2.90e-14 ***
## factor(fid)32451 -0.7288752 0.1001444 -7.278 5.03e-13 ***
## factor(fid)32453 -0.5367727 0.1311427 -4.093 4.45e-05 ***
## factor(fid)32461 -0.7485271 0.1001464 -7.474 1.21e-13 ***
## factor(fid)32462 -0.5635056 0.1003347 -5.616 2.26e-08 ***
```

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## factor(fid)32466 -0.4652054 0.1001542 -4.645 3.65e-06 ***
## factor(fid)32469 -0.7270341 0.1001660 -7.258 5.81e-13 ***
## factor(fid)32471 -0.5331058 0.1001485 -5.323 1.15e-07 ***
## factor(fid)32479 -0.3005734 0.1311415 -2.292 0.022022 *
## factor(fid)32480 -0.3313353 0.1311415 -2.527 0.011604 *
## factor(fid)32500 -0.9999125 0.1311196 -7.626 3.90e-14 ***
## factor(fid)32503 -0.5175063 0.0803013 -6.445 1.49e-10 ***
## factor(fid)32508 -0.8669613 0.0803019 -10.796 < 2e-16 ***
## factor(fid)32513 -0.7517657 0.0802943 -9.363 < 2e-16 ***
## factor(fid)32530 -0.5619303 0.1001511 -5.611 2.33e-08 ***
## factor(fid)32541 -0.9979390 0.1001470 -9.965 < 2e-16 ***
## factor(fid)32546 -0.5222558 0.1311215 -3.983 7.08e-05 ***
## factor(fid)32557 -0.4080684 0.1311200 -3.112 0.001886 **
## factor(fid)33031 -0.5275956 0.1311301 -4.023 5.97e-05 ***
## factor(fid)33065 -0.3414411 0.0874617 -3.904 9.82e-05 ***
## factor(fid)33134 -0.5913650 0.0724859 -8.158 6.32e-16 ***
## factor(fid)33143 -0.3683489 0.0803072 -4.587 4.81e-06 ***
## factor(fid)33166 -0.6003293 0.0757284 -7.927 3.90e-15 ***
## factor(fid)33186 -0.3701556 0.0724936 -5.106 3.64e-07 ***
## factor(fid)33189 -0.5368121 0.1001443 -5.360 9.38e-08 ***
## factor(fid)33248 -0.7687713 0.0803041 -9.573 < 2e-16 ***
## factor(fid)33274 -0.4228959 0.1311881 -3.224 0.001289 **
## factor(fid)33294 -0.4958412 0.0724802 -6.841 1.07e-11 ***
## factor(fid)33301 -0.7452696 0.0724851 -10.282 < 2e-16 ***
## factor(fid)33308 -0.9971847 0.1311235 -7.605 4.57e-14 ***
## factor(fid)33348 -0.4456213 0.1311597 -3.398 0.000695 ***
## factor(fid)34012 -0.4058358 0.0757028 -5.361 9.35e-08 ***
## factor(fid)34014 -0.3479172 0.1311470 -2.653 0.008051 **
## factor(fid)34015 -0.2761171 0.1311252 -2.106 0.035365 *
## factor(fid)34016 -0.4676973 0.1311306 -3.567 0.000371 ***
## factor(fid)34017 -0.5321972 0.1311208 -4.059 5.14e-05 ***
## factor(fid)34018 -0.5324004 0.0724835 -7.345 3.10e-13 ***
## factor(fid)34020 -0.3807498 0.0724861 -5.253 1.68e-07 ***
## factor(fid)34032 -0.6278801 0.0724807 -8.663 < 2e-16 ***
## factor(fid)34070 -0.5066767 0.0724840 -6.990 3.86e-12 ***
## factor(fid)34073 -0.5317043 0.1311577 -4.054 5.25e-05 ***
## factor(fid)34082 -0.4802665 0.0724810 -6.626 4.54e-11 ***
## factor(fid)34083 -0.5635571 0.0802941 -7.019 3.16e-12 ***
## factor(fid)34086 -0.4618330 0.0757094 -6.100 1.30e-09 ***
## factor(fid)34087 -0.4888300 0.0724856 -6.744 2.07e-11 ***
## factor(fid)34088 -0.2081696 0.0724857 -2.872 0.004128 **
## factor(fid)34107 -0.1732373 0.0803241 -2.157 0.031159 *
## factor(fid)34125 -0.5666673 0.0724794 -7.818 9.05e-15 ***
## factor(fid)34133 -0.9952749 0.1311306 -7.590 5.11e-14 ***
## factor(fid)34136 -0.5709818 0.0757184 -7.541 7.37e-14 ***
## factor(fid)34137 -0.3409957 0.0725554 -4.700 2.80e-06 ***
## factor(fid)34141 -0.4629915 0.0725159 -6.385 2.18e-10 ***
## factor(fid)34143 -0.4962439 0.0874208 -5.676 1.60e-08 ***
## factor(fid)34148 -0.3999237 0.0802941 -4.981 6.94e-07 ***
## factor(fid)34149 -0.1918602 0.0874176 -2.195 0.028309 *
```

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## factor(fid)34150 -0.6229609 0.0874174 -7.126 1.49e-12 ***
## factor(fid)34152 0.0062906 0.1001698 0.063 0.949933
## factor(fid)34155 -0.7628470 0.1001589 -7.616 4.19e-14 ***
## factor(fid)34157 -0.3218132 0.0757331 -4.249 2.25e-05 ***
## factor(fid)34160 -0.4958145 0.1001507 -4.951 8.09e-07 ***
## factor(fid)34169 -0.4828849 0.0874133 -5.524 3.80e-08 ***
## factor(fid)34179 -0.4860038 0.1001446 -4.853 1.32e-06 ***
## factor(fid)34181 -0.5638106 0.0725084 -7.776 1.25e-14 ***
## factor(fid)34184 -0.4919863 0.1001459 -4.913 9.80e-07 ***
## factor(fid)34188 -0.5289302 0.0757096 -6.986 3.96e-12 ***
## factor(fid)34189 -0.4063778 0.0724920 -5.606 2.39e-08 ***
## factor(fid)34196 -0.3865723 0.1311335 -2.948 0.003240 **
## factor(fid)34205 -0.6318088 0.0803152 -7.867 6.24e-15 ***
## factor(fid)34206 -0.5256569 0.0724793 -7.253 6.06e-13 ***
## factor(fid)34213 -0.5389029 0.0724791 -7.435 1.61e-13 ***
## factor(fid)34214 -0.6734510 0.0724987 -9.289 < 2e-16 ***
## factor(fid)34219 -0.4645559 0.0724801 -6.409 1.86e-10 ***
## factor(fid)34227 -0.5722681 0.0803135 -7.125 1.50e-12 ***
## factor(fid)34228 -0.6830334 0.0724892 -9.423 < 2e-16 ***
## factor(fid)34230 -0.5994020 0.0724795 -8.270 2.58e-16 ***
## factor(fid)34232 -0.3427378 0.0724798 -4.729 2.44e-06 ***
## factor(fid)34238 -0.5577023 0.0874369 -6.378 2.27e-10 ***
## factor(fid)34239 -0.5409758 0.1001749 -5.400 7.54e-08 ***
## factor(fid)34242 -0.2851199 0.0757094 -3.766 0.000171 ***
## factor(fid)34244 -0.5605750 0.0724791 -7.734 1.72e-14 ***
## factor(fid)34246 -0.3951607 0.0724890 -5.451 5.69e-08 ***
## factor(fid)34251 -0.3362343 0.1001453 -3.357 0.000803 ***
## factor(fid)34253 -0.4352580 0.0724892 -6.004 2.32e-09 ***
## factor(fid)34254 -0.3404034 0.0757022 -4.497 7.35e-06 ***
## factor(fid)34256 -0.5143286 0.0724838 -7.096 1.84e-12 ***
## factor(fid)34261 -0.4315919 0.0725024 -5.953 3.16e-09 ***
## factor(fid)34262 -0.5219950 0.0874275 -5.971 2.84e-09 ***
## factor(fid)34263 -0.7080208 0.0802988 -8.817 < 2e-16 ***
## factor(fid)34265 -0.4154139 0.0724791 -5.732 1.17e-08 ***
## factor(fid)34267 -0.4141648 0.0874131 -4.738 2.33e-06 ***
## factor(fid)34277 -0.4982259 0.0724811 -6.874 8.59e-12 ***
## factor(fid)34282 -1.0033898 0.1311252 -7.652 3.20e-14 ***
## factor(fid)34283 -0.4724717 0.0724919 -6.518 9.26e-11 ***
## factor(fid)34287 -0.7630315 0.1311470 -5.818 7.03e-09 ***
## factor(fid)34289 -0.5023477 0.1311349 -3.831 0.000132 ***
## factor(fid)34300 -0.4178227 0.0757064 -5.519 3.91e-08 ***
## factor(fid)34303 -0.5716730 0.0757019 -7.552 6.80e-14 ***
## factor(fid)34305 -0.4517926 0.0874142 -5.168 2.62e-07 ***
## factor(fid)34307 -0.4987593 0.0757103 -6.588 5.85e-11 ***
## factor(fid)34311 -0.4732454 0.0757019 -6.251 5.07e-10 ***
## factor(fid)34312 -0.4832592 0.1311252 -3.685 0.000235 ***
## factor(fid)34315 -0.4087976 0.1001535 -4.082 4.67e-05 ***
## factor(fid)34318 -0.4683741 0.0757028 -6.187 7.58e-10 ***
## factor(fid)34320 -0.4743987 0.0874132 -5.427 6.51e-08 ***
## factor(fid)34322 -0.6218862 0.0802970 -7.745 1.59e-14 ***
```

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## factor(fid)34327 -0.2891407 0.0757120 -3.819 0.000139 ***
## factor(fid)34329 -0.4805879 0.1001519 -4.799 1.73e-06 ***
## factor(fid)34331 -0.3833581 0.0757049 -5.064 4.53e-07 ***
## factor(fid)34333 -0.4785564 0.0803061 -5.959 3.04e-09 ***
## factor(fid)34335 -0.3947281 0.0803096 -4.915 9.68e-07 ***
## factor(fid)34336 -0.4573523 0.0803006 -5.696 1.43e-08 ***
## factor(fid)34339 -0.5945777 0.0802942 -7.405 2.01e-13 ***
## factor(fid)34346 -0.3135593 0.0803032 -3.905 9.78e-05 ***
## factor(fid)34347 -0.4825167 0.0803106 -6.008 2.27e-09 ***
## factor(fid)34353 -0.5160617 0.0874542 -5.901 4.31e-09 ***
## factor(fid)34360 -0.7263214 0.1001511 -7.252 6.07e-13 ***
## factor(fid)34361 -0.6482871 0.1311894 -4.942 8.47e-07 ***
## factor(fid)34368 -0.3980457 0.0874334 -4.553 5.66e-06 ***
## factor(fid)34370 -0.6765267 0.1001451 -6.755 1.92e-11 ***
## factor(fid)34371 -0.4693648 0.1311894 -3.578 0.000356 ***
## factor(fid)34374 -0.7035477 0.1001549 -7.025 3.04e-12 ***
## factor(fid)34376 -0.4625886 0.1311499 -3.527 0.000431 ***
## factor(fid)34380 -0.3507706 0.1311196 -2.675 0.007536 **
## factor(fid)34382 -0.7990107 0.1311196 -6.094 1.35e-09 ***
## factor(fid)34507 -0.5789054 0.0724921 -7.986 2.47e-15 ***
## factor(fid)34508 -0.3500127 0.1001496 -3.495 0.000486 ***
## factor(fid)34513 -0.4681710 0.0803234 -5.829 6.61e-09 ***
## factor(fid)34518 -0.5462939 0.0724831 -7.537 7.59e-14 ***
## factor(fid)34521 -0.7344822 0.0724798 -10.134 < 2e-16 ***
## factor(fid)34525 -0.4948038 0.0724841 -6.826 1.19e-11 ***
## factor(fid)34529 -1.0028760 0.1311237 -7.648 3.30e-14 ***
## factor(fid)34531 -0.5931579 0.0757019 -7.835 7.94e-15 ***
## factor(fid)34540 -0.5350960 0.1001672 -5.342 1.04e-07 ***
## factor(fid)35179 0.0021483 0.1311219 0.016 0.986930
## factor(fid)35187 -0.5401971 0.1311306 -4.120 3.97e-05 ***
## factor(fid)35211 -0.2607138 0.1311225 -1.988 0.046928 *
## factor(fid)35214 0.0011326 0.1001451 0.011 0.990978
## factor(fid)35215 -0.3540373 0.1001443 -3.535 0.000418 ***
## factor(fid)35218 -0.3979821 0.1001447 -3.974 7.35e-05 ***
## factor(fid)35224 -0.2382725 0.1311261 -1.817 0.069365 .
## factor(fid)35225 -0.3833039 0.1001868 -3.826 0.000135 ***
## factor(fid)35228 -0.4352543 0.1001452 -4.346 1.46e-05 ***
## factor(fid)35239 -0.0649756 0.1002786 -0.648 0.517100
## factor(fid)35241 -0.4104070 0.1001459 -4.098 4.35e-05 ***
## factor(fid)35242 -0.2372614 0.1001502 -2.369 0.017939 *
## factor(fid)35246 -0.7443043 0.1001492 -7.432 1.65e-13 ***
## factor(fid)35248 -0.8749824 0.0874169 -10.009 < 2e-16 ***
## factor(fid)35250 -0.1924807 0.0874241 -2.202 0.027814 *
## factor(fid)35256 -0.3465439 0.0874231 -3.964 7.66e-05 ***
## factor(fid)35257 -0.4160219 0.0874135 -4.759 2.10e-06 ***
## factor(fid)35258 -0.4323387 0.1311288 -3.297 0.000996 ***
## factor(fid)35259 -0.9952749 0.1311306 -7.590 5.11e-14 ***
## factor(fid)35265 -0.4125878 0.0874134 -4.720 2.54e-06 ***
## factor(fid)35269 -0.6517196 0.0874414 -7.453 1.41e-13 ***
## factor(fid)35274 -0.3222316 0.1001471 -3.218 0.001316 **
```

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## factor(fid)35275 -0.4974545 0.0874159 -5.691 1.47e-08 ***
## factor(fid)35288 -0.4740109 0.0803098 -5.902 4.28e-09 ***
## factor(fid)35290 -0.6236848 0.0874136 -7.135 1.40e-12 ***
## factor(fid)35292 -0.7458892 0.0874984 -8.525 < 2e-16 ***
## factor(fid)35294 -0.3514079 0.0802965 -4.376 1.28e-05 ***
## factor(fid)35295 -0.4335608 0.0802945 -5.400 7.57e-08 ***
## factor(fid)35296 -0.4403160 0.1001443 -4.397 1.16e-05 ***
## factor(fid)35298 -0.8277919 0.0757420 -10.929 < 2e-16 ***
## factor(fid)35302 -0.5370552 0.0802962 -6.688 3.00e-11 ***
## factor(fid)35304 -0.9979773 0.0757054 -13.182 < 2e-16 ***
## factor(fid)35314 -0.0159487 0.1001529 -0.159 0.873495
## factor(fid)35322 -0.5002927 0.0757051 -6.608 5.10e-11 ***
## factor(fid)35325 -0.3168621 0.0757230 -4.184 3.00e-05 ***
## factor(fid)35329 -0.4942026 0.0757381 -6.525 8.81e-11 ***
## factor(fid)35332 -0.9478894 0.1311303 -7.229 7.19e-13 ***
## factor(fid)35337 -0.4127497 0.0724966 -5.693 1.45e-08 ***
## factor(fid)35345 -0.3331255 0.0724877 -4.596 4.62e-06 ***
## factor(fid)35357 -0.3529335 0.1001500 -3.524 0.000436 ***
## factor(fid)35373 -0.5182383 0.1001449 -5.175 2.54e-07 ***
## factor(fid)35374 -0.3239706 0.0724791 -4.470 8.32e-06 ***
## factor(fid)35375 -0.3273121 0.0757137 -4.323 1.62e-05 ***
## factor(fid)35378 -0.3327398 0.1001642 -3.322 0.000912 ***
## factor(fid)35386 -0.3401572 0.0724829 -4.693 2.90e-06 ***
## factor(fid)35388 -0.1509928 0.0802982 -1.880 0.060215 .
## factor(fid)35392 -0.2346960 0.0874944 -2.682 0.007376 **
## factor(fid)35393 -0.3710270 0.0724793 -5.119 3.40e-07 ***
## factor(fid)35395 -0.3359373 0.0757021 -4.438 9.65e-06 ***
## factor(fid)35402 -0.6751192 0.0724793 -9.315 < 2e-16 ***
## factor(fid)35403 -0.5560650 0.0757101 -7.345 3.11e-13 ***
## factor(fid)35404 -0.1128236 0.1311470 -0.860 0.389748
## factor(fid)35407 -0.4683017 0.0725135 -6.458 1.36e-10 ***
## factor(fid)35413 -0.3649843 0.0725019 -5.034 5.28e-07 ***
## factor(fid)35422 -0.2223924 0.0724853 -3.068 0.002186 **
## factor(fid)35425 -0.5478337 0.0803024 -6.822 1.22e-11 ***
## factor(fid)35426 -0.3758040 0.0724978 -5.184 2.42e-07 ***
## factor(fid)35427 -0.7882326 0.0874131 -9.017 < 2e-16 ***
## factor(fid)35428 -0.3161479 0.0724854 -4.362 1.36e-05 ***
## factor(fid)35430 -0.3635795 0.0874193 -4.159 3.35e-05 ***
## factor(fid)35431 -0.3275980 0.0874157 -3.748 0.000184 ***
## factor(fid)35435 -0.5406053 0.0874391 -6.183 7.78e-10 ***
## factor(fid)35436 -0.8113592 0.0725302 -11.187 < 2e-16 ***
## factor(fid)35439 -0.3872062 0.0757251 -5.113 3.50e-07 ***
## factor(fid)35447 -0.4625329 0.0803610 -5.756 1.01e-08 ***
## factor(fid)35449 -0.4400322 0.1001494 -4.394 1.18e-05 ***
## factor(fid)35450 -0.3929009 0.0724809 -5.421 6.74e-08 ***
## factor(fid)35453 -0.2653119 0.0724843 -3.660 0.000259 ***
## factor(fid)35454 -0.7011431 0.0725131 -9.669 < 2e-16 ***
## factor(fid)35455 -0.0012721 0.0724805 -0.018 0.985999
## factor(fid)35456 -0.9756951 0.0757045 -12.888 < 2e-16 ***
## factor(fid)35457 -0.6814814 0.1311440 -5.196 2.26e-07 ***
```

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## factor(fid)35461 -0.3624885 0.0874170 -4.147 3.53e-05 ***
## factor(fid)35462 -0.5041950 0.0725082 -6.954 4.97e-12 ***
## factor(fid)35463 -0.4742161 0.0724791 -6.543 7.85e-11 ***
## factor(fid)35464 -0.4882524 0.1001443 -4.875 1.18e-06 ***
## factor(fid)35465 -0.5917991 0.0724807 -8.165 5.99e-16 ***
## factor(fid)35466 -0.9975330 0.0724845 -13.762 < 2e-16 ***
## factor(fid)35479 -0.5897352 0.1311204 -4.498 7.31e-06 ***
## factor(fid)35482 -0.2293447 0.0757107 -3.029 0.002487 **
## factor(fid)35484 -0.3898686 0.0725029 -5.377 8.55e-08 ***
## factor(fid)35488 -0.3625829 0.0874141 -4.148 3.51e-05 ***
## factor(fid)35491 0.0069723 0.0803332 0.087 0.930846
## factor(fid)35492 -0.3196168 0.0874388 -3.655 0.000264 ***
## factor(fid)35493 -0.7658540 0.0803016 -9.537 < 2e-16 ***
## factor(fid)35513 -0.5930900 0.1001471 -5.922 3.80e-09 ***
## factor(fid)35518 -0.3460294 0.0757049 -4.571 5.19e-06 ***
## factor(fid)35519 -0.0022543 0.1311221 -0.017 0.986285
## factor(fid)35524 -0.4948856 0.0725001 -6.826 1.19e-11 ***
## factor(fid)35527 -0.5282670 0.0874427 -6.041 1.85e-09 ***
## factor(fid)35533 -0.3925428 0.0757037 -5.185 2.40e-07 ***
## factor(fid)35535 -0.3433724 0.0874148 -3.928 8.89e-05 ***
## factor(fid)35537 -0.4562561 0.1311228 -3.480 0.000514 ***
## factor(fid)35559 -0.4737452 0.0724865 -6.536 8.23e-11 ***
## factor(fid)35567 -0.2621292 0.0874221 -2.998 0.002751 **
## factor(fid)35568 -0.5256940 0.0724813 -7.253 6.04e-13 ***
## factor(fid)35569 -0.2465498 0.1001453 -2.462 0.013913 *
## factor(fid)35570 -0.0025329 0.0874178 -0.029 0.976888
## factor(fid)35573 -0.0541885 0.0874194 -0.620 0.535424
## factor(fid)35576 -0.3951783 0.0724848 -5.452 5.67e-08 ***
## factor(fid)35579 -0.2681078 0.0724820 -3.699 0.000223 ***
## factor(fid)35580 -0.4196237 0.0724869 -5.789 8.34e-09 ***
## factor(fid)35587 -0.3317361 0.0724854 -4.577 5.05e-06 ***
## factor(fid)35588 -1.0016340 0.0874150 -11.458 < 2e-16 ***
## factor(fid)35591 -0.8106098 0.0724921 -11.182 < 2e-16 ***
## factor(fid)35593 -0.3380310 0.0724808 -4.664 3.33e-06 ***
## factor(fid)35594 -0.5353681 0.0874360 -6.123 1.13e-09 ***
## factor(fid)35595 -0.0057074 0.0725081 -0.079 0.937269
## factor(fid)35596 -0.4326351 0.0803019 -5.388 8.08e-08 ***
## factor(fid)35607 -0.0009863 0.0874138 -0.011 0.990998
## factor(fid)35613 -0.3738933 0.0724844 -5.158 2.77e-07 ***
## factor(fid)35614 -0.6354352 0.0724795 -8.767 < 2e-16 ***
## factor(fid)35620 -0.3098478 0.0757125 -4.092 4.46e-05 ***
## factor(fid)35622 -0.9988246 0.0724803 -13.781 < 2e-16 ***
## factor(fid)35623 -0.3402127 0.0724804 -4.694 2.88e-06 ***
## factor(fid)35624 -0.6189054 0.0757025 -8.175 5.51e-16 ***
## factor(fid)35625 -0.0061443 0.1311382 -0.047 0.962635
## factor(fid)35627 -0.9874771 0.1311969 -7.527 8.19e-14 ***
## factor(fid)35630 -0.4930549 0.0874381 -5.639 1.98e-08 ***
## factor(fid)35631 -0.6036034 0.0803069 -7.516 8.85e-14 ***
## factor(fid)35634 -0.7119762 0.0874191 -8.144 7.06e-16 ***
## factor(fid)35635 -0.3746714 0.0757038 -4.949 8.15e-07 ***
```

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## factor(fid)35636 -0.3765869 0.1311382 -2.872 0.004131 **
## factor(fid)35637 -0.4137530 0.0724813 -5.708 1.33e-08 ***
## factor(fid)35638 -0.4342391 0.0803025 -5.408 7.25e-08 ***
## factor(fid)35640 -0.5622233 0.0874137 -6.432 1.61e-10 ***
## factor(fid)35654 -0.3797064 0.0757952 -5.010 5.99e-07 ***
## factor(fid)35655 -0.4576286 0.0874133 -5.235 1.84e-07 ***
## factor(fid)35657 -0.2150179 0.0724855 -2.966 0.003053 **
## factor(fid)35666 -0.4748162 0.0725250 -6.547 7.64e-11 ***
## factor(fid)35668 -0.5490671 0.0803051 -6.837 1.10e-11 ***
## factor(fid)35672 -0.3613710 0.0725458 -4.981 6.92e-07 ***
## factor(fid)35673 -0.2500132 0.0725163 -3.448 0.000578 ***
## factor(fid)35674 -0.6536663 0.0725061 -9.015 < 2e-16 ***
## factor(fid)35675 -0.3211713 0.0874246 -3.674 0.000246 ***
## factor(fid)35679 -0.5569298 0.0724793 -7.684 2.52e-14 ***
## factor(fid)35680 -0.4634649 0.1311214 -3.535 0.000419 ***
## factor(fid)35681 -0.7528786 0.0724797 -10.387 < 2e-16 ***
## factor(fid)35683 -0.5349601 0.0725297 -7.376 2.48e-13 ***
## factor(fid)35684 -0.3330664 0.0757099 -4.399 1.15e-05 ***
## factor(fid)35685 -0.4036093 0.0724794 -5.569 2.96e-08 ***
## factor(fid)35686 -0.2147371 0.0874639 -2.455 0.014177 *
## factor(fid)35687 -0.2202958 0.1311204 -1.680 0.093111 .
## factor(fid)35688 -0.4328891 0.0757068 -5.718 1.26e-08 ***
## factor(fid)35690 -0.3115405 0.0725071 -4.297 1.83e-05 ***
## factor(fid)35692 -0.4708303 0.0724936 -6.495 1.07e-10 ***
## factor(fid)35696 -0.6016129 0.0802952 -7.493 1.05e-13 ***
## factor(fid)35697 -0.0041560 0.0874258 -0.048 0.962090
## factor(fid)35698 -0.5035015 0.0874209 -5.760 9.90e-09 ***
## factor(fid)35699 -0.1786567 0.1001449 -1.784 0.074595 .
## factor(fid)35702 -0.2746346 0.0874470 -3.141 0.001714 **
## factor(fid)35706 -0.1883366 0.1001463 -1.881 0.060186 .
## factor(fid)35707 -0.2450976 0.0757036 -3.238 0.001227 **
## factor(fid)35708 -0.3096599 0.0724802 -4.272 2.04e-05 ***
## factor(fid)35709 -0.4215890 0.1311237 -3.215 0.001327 **
## factor(fid)35710 -0.2049018 0.0724871 -2.827 0.004755 **
## factor(fid)35712 -0.3631111 0.0874142 -4.154 3.42e-05 ***
## factor(fid)35714 -0.3953059 0.0874293 -4.521 6.54e-06 ***
## factor(fid)35715 -0.4461596 0.0757180 -5.892 4.54e-09 ***
## factor(fid)35718 -0.4880057 0.0724802 -6.733 2.23e-11 ***
## factor(fid)35720 -0.2774375 0.0724851 -3.828 0.000134 ***
## factor(fid)35721 -1.0013478 0.1311205 -7.637 3.60e-14 ***
## factor(fid)35731 -0.3411865 0.0874355 -3.902 9.89e-05 ***
## factor(fid)35732 -0.3953829 0.0724791 -5.455 5.57e-08 ***
## factor(fid)35733 -0.3498888 0.0724804 -4.827 1.50e-06 ***
## factor(fid)35735 -0.6474626 0.0725043 -8.930 < 2e-16 ***
## factor(fid)35738 -0.4539255 0.0724824 -6.263 4.73e-10 ***
## factor(fid)35739 -0.4048294 0.0725014 -5.584 2.71e-08 ***
## factor(fid)35746 -0.2991661 0.0724876 -4.127 3.84e-05 ***
## factor(fid)35748 -0.3423704 0.0728671 -4.699 2.82e-06 ***
## factor(fid)35754 -0.2320043 0.0874131 -2.654 0.008022 **
## factor(fid)35755 -0.4232816 0.1311218 -3.228 0.001268 **
```

```
## factor(fid)35756 -0.3379109 0.0724821 -4.662 3.36e-06 ***
## factor(fid)35757 -0.3144697 0.1311264 -2.398 0.016577 *
## factor(fid)35758 -0.5412995 0.0803478 -6.737 2.17e-11 ***
## factor(fid)35760 -0.6298346 0.0724802 -8.690 < 2e-16 ***
## factor(fid)35761 -0.5197011 0.0724951 -7.169 1.10e-12 ***
## factor(fid)35767 -0.6946951 0.0874131 -7.947 3.34e-15 ***
## factor(fid)35770 -0.2998383 0.1001726 -2.993 0.002798 **
## factor(fid)35772 -0.3451030 0.1001453 -3.446 0.000582 ***
## factor(fid)35773 -0.2571372 0.1001591 -2.567 0.010330 *
## factor(fid)35774 -0.4879344 0.0757388 -6.442 1.51e-10 ***
## factor(fid)35775 -0.5427972 0.1311205 -4.140 3.64e-05 ***
## factor(fid)35777 -0.3814038 0.0757026 -5.038 5.17e-07 ***
## factor(fid)35779 -0.4853218 0.0757125 -6.410 1.85e-10 ***
## factor(fid)35780 -0.2529605 0.1001462 -2.526 0.011625 *
## factor(fid)35782 -0.4227670 0.0874572 -4.834 1.45e-06 ***
## factor(fid)35789 -0.2182206 0.1001517 -2.179 0.029469 *
## factor(fid)35797 -0.3699743 0.0803068 -4.607 4.37e-06 ***
## factor(fid)35798 -0.2692288 0.0804238 -3.348 0.000832 ***
## factor(fid)35799 -0.4245059 0.0805401 -5.271 1.52e-07 ***
## factor(fid)35800 -0.3464662 0.1001694 -3.459 0.000555 ***
## factor(fid)35801 -0.3329924 0.0802997 -4.147 3.53e-05 ***
## factor(fid)35802 -0.3990493 0.1311242 -3.043 0.002374 **
## factor(fid)35804 -0.3540582 0.1311204 -2.700 0.006994 **
## factor(fid)35805 -0.4222908 0.0803037 -5.259 1.62e-07 ***
## factor(fid)35806 -0.5111061 0.0874895 -5.842 6.11e-09 ***
## factor(fid)35807 -0.2932896 0.0802989 -3.652 0.000267 ***
## factor(fid)35808 -0.5135235 0.0874146 -5.875 5.04e-09 ***
## factor(fid)35810 -0.4033124 0.1001465 -4.027 5.88e-05 ***
## factor(fid)35813 -0.4337865 0.0874460 -4.961 7.69e-07 ***
## factor(fid)35822 -0.6742754 0.0803222 -8.395 < 2e-16 ***
## factor(fid)35823 -0.3221514 0.0803057 -4.012 6.28e-05 ***
## factor(fid)35825 -0.5480853 0.1001445 -5.473 5.05e-08 ***
## factor(fid)35826 -0.8073193 0.1311211 -6.157 9.12e-10 ***
## factor(fid)35827 -0.4633681 0.0803644 -5.766 9.55e-09 ***
## factor(fid)35828 -0.5019656 0.0803196 -6.250 5.13e-10 ***
## factor(fid)35829 -0.3248855 0.1001581 -3.244 0.001201 **
## factor(fid)35831 -0.2700389 0.0802998 -3.363 0.000788 ***
## factor(fid)35832 -0.5190464 0.0874488 -5.935 3.51e-09 ***
## factor(fid)35833 -0.3442717 0.1001490 -3.438 0.000600 ***
## factor(fid)35834 -0.7471304 0.0802953 -9.305 < 2e-16 ***
## factor(fid)35838 -0.6492551 0.1001446 -6.483 1.16e-10 ***
## factor(fid)35839 -0.9967489 0.0874209 -11.402 < 2e-16 ***
## factor(fid)35841 -0.8469175 0.1002028 -8.452 < 2e-16 ***
## factor(fid)35842 -0.3638673 0.1001548 -3.633 0.000288 ***
## factor(fid)35844 -0.2419963 0.0874680 -2.767 0.005721 **
## factor(fid)35845 -0.5539042 0.0874627 -6.333 3.03e-10 ***
## factor(fid)35847 -0.5642428 0.1311242 -4.303 1.77e-05 ***
## factor(fid)35853 -0.4679786 0.1311894 -3.567 0.000370 ***
## factor(fid)35855 -0.8843048 0.1311655 -6.742 2.10e-11 ***
## factor(fid)35857 -0.5610618 0.1311655 -4.278 1.99e-05 ***
```



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## factor(fid)35858 -0.3755919 0.0874131 -4.297 1.83e-05 ***
## factor(fid)35865 -0.5706411 0.0874191 -6.528 8.67e-11 ***
## factor(fid)35869 -0.3693454 0.0874194 -4.225 2.51e-05 ***
## factor(fid)35871 -0.5967177 0.0874434 -6.824 1.21e-11 ***
## factor(fid)35882 -0.4039678 0.1001513 -4.034 5.72e-05 ***
## factor(fid)35884 -0.7573782 0.1001743 -7.561 6.36e-14 ***
## factor(fid)35890 -0.2765866 0.1001444 -2.762 0.005806 **
## factor(fid)35891 -0.6420766 0.1001659 -6.410 1.85e-10 ***
## factor(fid)35894 -0.4119125 0.1001507 -4.113 4.08e-05 ***
## factor(fid)35896 -0.4086054 0.1001446 -4.080 4.70e-05 ***
## factor(fid)35905 -0.4688629 0.1001553 -4.681 3.06e-06 ***
## factor(fid)35915 -0.5008363 0.1001447 -5.001 6.26e-07 ***
## factor(fid)35921 -0.4502545 0.1001457 -4.496 7.37e-06 ***
## factor(fid)35923 -0.3342961 0.1001444 -3.338 0.000861 ***
## factor(fid)35929 -0.3857405 0.1311224 -2.942 0.003305 **
## factor(fid)35930 -0.2144557 0.1311242 -1.636 0.102116
## factor(fid)35937 -0.7083262 0.1311224 -5.402 7.47e-08 ***
## factor(fid)35938 -0.6921674 0.1311524 -5.278 1.47e-07 ***
## factor(fid)35939 -0.7140552 0.1311242 -5.446 5.87e-08 ***
## factor(fid)35941 -0.4690141 0.1311224 -3.577 0.000357 ***
## factor(fid)35942 -0.0061443 0.1311382 -0.047 0.962635
## factor(fid)35943 -0.2128164 0.1311382 -1.623 0.104799
## factor(fid)35945 -0.9691685 0.1311224 -7.391 2.22e-13 ***
## factor(fid)35946 -0.6666191 0.1311242 -5.084 4.08e-07 ***
## factor(fid)35948 -0.3950153 0.1311242 -3.013 0.002627 **
## factor(fid)35950 -0.5847512 0.1311224 -4.460 8.72e-06 ***
## factor(fid)35953 -0.7704567 0.1311224 -5.876 5.00e-09 ***
## factor(fid)37051 -0.4677646 0.1311505 -3.567 0.000371 ***
## factor(fid)37068 -0.3261449 0.1311241 -2.487 0.012962 *
## factor(fid)37102 -0.5817180 0.0874134 -6.655 3.76e-11 ***
## factor(fid)37107 -0.4449802 0.0874755 -5.087 4.02e-07 ***
## factor(fid)37127 -0.3437946 0.0802991 -4.281 1.96e-05 ***
## factor(fid)37151 -0.5521543 0.0724959 -7.616 4.19e-14 ***
## factor(fid)37156 -0.2630890 0.0874137 -3.010 0.002651 **
## factor(fid)37159 -0.5128992 0.1311380 -3.911 9.53e-05 ***
## factor(fid)37169 -0.5009364 0.0803042 -6.238 5.51e-10 ***
## factor(fid)37179 -0.4718996 0.0757046 -6.233 5.67e-10 ***
## factor(fid)37182 -0.3655769 0.0757118 -4.829 1.49e-06 ***
## factor(fid)37183 -0.2897011 0.1311264 -2.209 0.027278 *
## factor(fid)37201 -0.5616601 0.1001454 -5.608 2.36e-08 ***
## factor(fid)37239 -0.4213417 0.0724972 -5.812 7.30e-09 ***
## factor(fid)37242 -0.4742076 0.0757199 -6.263 4.72e-10 ***
## factor(fid)37270 -0.3809824 0.0757405 -5.030 5.39e-07 ***
## factor(fid)37284 -0.6756036 0.0725117 -9.317 < 2e-16 ***
## factor(fid)37293 -0.3591582 0.0724981 -4.954 7.95e-07 ***
## factor(fid)37297 -0.9985275 0.0802958 -12.436 < 2e-16 ***
## factor(fid)37303 -0.4820133 0.1002300 -4.809 1.64e-06 ***
## factor(fid)37304 -0.6281104 0.0757162 -8.296 < 2e-16 ***
## factor(fid)37322 -0.6024467 0.0724823 -8.312 < 2e-16 ***
## factor(fid)37326 -0.5411334 0.0874731 -6.186 7.61e-10 ***
```

```
## factor(fid)37327 -0.9980238 0.1001468 -9.966 < 2e-16 ***
## factor(fid)37335 -0.6459924 0.1311435 -4.926 9.17e-07 ***
## factor(fid)37354 -0.4501249 0.0724856 -6.210 6.57e-10 ***
## factor(fid)37359 -0.4706010 0.0725155 -6.490 1.11e-10 ***
## factor(fid)37369 -1.0050245 0.1001605 -10.034 < 2e-16 ***
## factor(fid)37373 -0.5220144 0.0874161 -5.972 2.83e-09 ***
## factor(fid)37380 -0.3975875 0.0874568 -4.546 5.83e-06 ***
## factor(fid)37384 -0.4593597 0.0724880 -6.337 2.95e-10 ***
## factor(fid)37387 -0.0051139 0.1001611 -0.051 0.959286
## factor(fid)37390 -0.6564500 0.1001452 -6.555 7.25e-11 ***
## factor(fid)37391 -0.5457922 0.1311380 -4.162 3.30e-05 ***
## factor(fid)37392 -0.3324557 0.1311522 -2.535 0.011333 *
## factor(fid)37394 -0.1678039 0.0724792 -2.315 0.020714 *
## factor(fid)37399 -0.4589749 0.0724798 -6.332 3.04e-10 ***
## factor(fid)37402 -0.5771598 0.0724813 -7.963 2.96e-15 ***
## factor(fid)37405 -0.6978019 0.0757024 -9.218 < 2e-16 ***
## factor(fid)37423 -0.3853360 0.0874255 -4.408 1.11e-05 ***
## factor(fid)37424 -0.6301855 0.0874141 -7.209 8.26e-13 ***
## factor(fid)37425 -0.5268318 0.0803108 -6.560 7.02e-11 ***
## factor(fid)37428 -0.2964267 0.0757464 -3.913 9.44e-05 ***
## factor(fid)37429 -0.6721571 0.0802975 -8.371 < 2e-16 ***
## factor(fid)37431 -0.3099236 0.0874131 -3.546 0.000402 ***
## factor(fid)37432 -0.3723326 0.1001450 -3.718 0.000207 ***
## factor(fid)37433 -0.5694218 0.0724940 -7.855 6.84e-15 ***
## factor(fid)37442 -0.4327776 0.0874133 -4.951 8.08e-07 ***
## factor(fid)37445 -0.4397643 0.0757024 -5.809 7.41e-09 ***
## factor(fid)37446 -0.5118138 0.0874145 -5.855 5.66e-09 ***
## factor(fid)37448 -0.4854720 0.0874365 -5.552 3.24e-08 ***
## factor(fid)37454 -0.2686384 0.0874131 -3.073 0.002150 **
## factor(fid)37456 -0.3662321 0.0874232 -4.189 2.94e-05 ***
## factor(fid)37457 -0.2218658 0.0803131 -2.763 0.005794 **
## factor(fid)37460 -0.2706364 0.0724797 -3.734 0.000194 ***
## factor(fid)37472 -0.4082070 0.0724800 -5.632 2.06e-08 ***
## factor(fid)37478 -0.8590618 0.0874147 -9.827 < 2e-16 ***
## factor(fid)37479 -0.3859685 0.0724822 -5.325 1.14e-07 ***
## factor(fid)37480 -0.5464443 0.0724950 -7.538 7.55e-14 ***
## factor(fid)37492 -0.9963337 0.1311262 -7.598 4.80e-14 ***
## factor(fid)37493 -0.6177420 0.0724795 -8.523 < 2e-16 ***
## factor(fid)37501 -0.4661768 0.0874193 -5.333 1.09e-07 ***
## factor(fid)37516 -0.6554883 0.0724796 -9.044 < 2e-16 ***
## factor(fid)37539 -0.9962056 0.1311267 -7.597 4.84e-14 ***
## factor(fid)37540 -0.0130332 0.1312033 -0.099 0.920883
## factor(fid)37552 -0.4327594 0.0757118 -5.716 1.28e-08 ***
## factor(fid)37554 -0.5374282 0.0724812 -7.415 1.87e-13 ***
## factor(fid)37560 -0.3288929 0.0724810 -4.538 6.07e-06 ***
## factor(fid)37561 -0.1972783 0.0802940 -2.457 0.014106 *
## factor(fid)37564 -1.0012232 0.1001452 -9.998 < 2e-16 ***
## factor(fid)37568 -0.4090651 0.0874243 -4.679 3.10e-06 ***
## factor(fid)37572 -0.9879018 0.1311918 -7.530 7.98e-14 ***
## factor(fid)37574 -0.5252618 0.0757064 -6.938 5.53e-12 ***
```

```
## factor(fid)37581 -0.6204567 0.0724817 -8.560 < 2e-16 ***
## factor(fid)37583 -0.4594042 0.0724796 -6.338 2.93e-10 ***
## factor(fid)37584 -0.7067531 0.1001448 -7.057 2.42e-12 ***
## factor(fid)37586 -0.2184539 0.0874236 -2.499 0.012550 *
## factor(fid)37597 -0.2699849 0.0802941 -3.362 0.000789 ***
## factor(fid)37605 -0.5702595 0.0724817 -7.868 6.19e-15 ***
## factor(fid)37606 -0.5214464 0.0874199 -5.965 2.94e-09 ***
## factor(fid)37609 -0.5770031 0.0803026 -7.185 9.79e-13 ***
## factor(fid)37619 -0.1364303 0.0874132 -1.561 0.118759
## factor(fid)37637 -0.3180421 0.1311380 -2.425 0.015396 *
## factor(fid)37652 -0.6541397 0.0803100 -8.145 7.01e-16 ***
## factor(fid)37662 0.0001209 0.1311196 0.001 0.999264
## factor(fid)37666 -0.6134352 0.0757048 -8.103 9.81e-16 ***
## factor(fid)37667 -0.5601177 0.0764792 -7.324 3.62e-13 ***
## factor(fid)37675 -0.5623597 0.0874583 -6.430 1.63e-10 ***
## factor(fid)37676 -0.5827399 0.0803201 -7.255 5.94e-13 ***
## factor(fid)37677 -0.9926930 0.1311459 -7.569 5.96e-14 ***
## factor(fid)37695 -1.0016210 0.1311209 -7.639 3.54e-14 ***
## factor(fid)37696 -0.7993195 0.0803071 -9.953 < 2e-16 ***
## factor(fid)37707 -0.4366997 0.0802941 -5.439 6.10e-08 ***
## factor(fid)37711 -0.4055164 0.0874558 -4.637 3.79e-06 ***
## factor(fid)37719 -0.5581356 0.1311434 -4.256 2.19e-05 ***
## factor(fid)37721 -0.4952852 0.0874206 -5.666 1.70e-08 ***
## factor(fid)37728 -0.6352290 0.1311434 -4.844 1.38e-06 ***
## factor(fid)37732 -0.3835838 0.0874147 -4.388 1.21e-05 ***
## factor(fid)37737 -0.3579711 0.0874343 -4.094 4.42e-05 ***
## factor(fid)37747 -0.4942425 0.0874194 -5.654 1.82e-08 ***
## factor(fid)37749 -0.4909641 0.0874172 -5.616 2.26e-08 ***
## factor(fid)37752 -0.6226325 0.0874655 -7.119 1.57e-12 ***
## factor(fid)37755 -0.9547171 0.0874172 -10.921 < 2e-16 ***
## factor(fid)37770 -0.6692191 0.1001487 -6.682 3.13e-11 ***
## factor(fid)37771 -0.3391232 0.1001740 -3.385 0.000726 ***
## factor(fid)37773 -0.4099241 0.1001448 -4.093 4.44e-05 ***
## factor(fid)37776 -0.4755413 0.1001443 -4.749 2.21e-06 ***
## factor(fid)37780 -0.5570122 0.1001443 -5.562 3.07e-08 ***
## factor(fid)37784 -0.3637034 0.1001458 -3.632 0.000289 ***
## factor(fid)37786 -0.6419773 0.1001444 -6.411 1.85e-10 ***
## factor(fid)37787 -0.4910977 0.1001488 -4.904 1.03e-06 ***
## factor(fid)37788 -0.5381136 0.1001442 -5.373 8.74e-08 ***
## factor(fid)37790 -0.6647132 0.1311215 -5.069 4.40e-07 ***
## factor(fid)37796 -0.7027160 0.1001443 -7.017 3.20e-12 ***
## factor(fid)37797 -0.3769645 0.1001475 -3.764 0.000173 ***
## factor(fid)37802 -0.5593628 0.1311404 -4.265 2.10e-05 ***
## factor(fid)37804 -0.6190146 0.1001476 -6.181 7.86e-10 ***
## factor(fid)37805 -0.4636215 0.1001455 -4.629 3.93e-06 ***
## factor(fid)37806 -0.6609602 0.1311404 -5.040 5.12e-07 ***
## factor(fid)37809 -0.5626695 0.1311459 -4.290 1.88e-05 ***
## factor(fid)37812 -0.4986813 0.1001454 -4.980 6.98e-07 ***
## factor(fid)37815 -0.5147794 0.1311434 -3.925 8.99e-05 ***
## factor(fid)37817 -0.4925865 0.1311434 -3.756 0.000178 ***
```

```
## factor(fid)37820 -0.9962706 0.1001532 -9.947 < 2e-16 ***
## factor(fid)37823 -0.6124369 0.1001538 -6.115 1.18e-09 ***
## factor(fid)37824 -0.0046611 0.1311303 -0.036 0.971649
## factor(fid)37827 -0.4279181 0.1311224 -3.264 0.001121 **
## factor(fid)37829 -0.2888964 0.1311328 -2.203 0.027716 *
## factor(fid)37837 -0.5930746 0.1311196 -4.523 6.49e-06 ***
## factor(fid)37838 -0.2349682 0.1311244 -1.792 0.073310 .
## factor(fid)37842 -0.5601902 0.1311344 -4.272 2.04e-05 ***
## factor(fid)37843 -0.4590075 0.1311385 -3.500 0.000476 ***
## factor(fid)37849 -0.4958006 0.1311385 -3.781 0.000161 ***
## factor(fid)37856 -1.0033164 0.1311250 -7.652 3.22e-14 ***
## factor(fid)37858 -0.6483678 0.1311250 -4.945 8.34e-07 ***
## factor(fid)37859 -0.5875895 0.1311250 -4.481 7.89e-06 ***
## factor(fid)37861 -0.5536028 0.1311278 -4.222 2.54e-05 ***
## factor(fid)37866 -0.7767077 0.1311196 -5.924 3.77e-09 ***
## factor(fid)37868 -0.3129006 0.1311385 -2.386 0.017134 *
## factor(fid)39146 -0.7290237 0.1311211 -5.560 3.10e-08 ***
## factor(fid)39157 -0.6611752 0.1004962 -6.579 6.19e-11 ***
## factor(fid)39189 -0.8451818 0.1311336 -6.445 1.48e-10 ***
## factor(fid)39244 -0.9972321 0.1311234 -7.605 4.56e-14 ***
## factor(fid)39280 -0.1914617 0.1311336 -1.460 0.144451
## factor(fid)39389 -0.4799063 0.0874156 -5.490 4.59e-08 ***
## factor(fid)39410 -0.6001517 0.0725130 -8.276 2.45e-16 ***
## factor(fid)39433 -0.7423181 0.0724791 -10.242 < 2e-16 ***
## factor(fid)39461 -0.7322746 0.1311423 -5.584 2.71e-08 ***
## factor(fid)39468 -0.2196991 0.1311315 -1.675 0.094028 .
## factor(fid)39505 -0.3245196 0.1001544 -3.240 0.001216 **
## factor(fid)39525 -0.4633033 0.1001581 -4.626 4.00e-06 ***
## factor(fid)39550 -0.6879936 0.0757078 -9.087 < 2e-16 ***
## factor(fid)39574 -1.0003089 0.0802941 -12.458 < 2e-16 ***
## factor(fid)39578 -0.6179443 0.0874176 -7.069 2.23e-12 ***
## factor(fid)39579 -1.0016980 0.1001461 -10.002 < 2e-16 ***
## factor(fid)39580 -0.5650995 0.0874362 -6.463 1.32e-10 ***
## factor(fid)39582 -0.7056193 0.1001445 -7.046 2.61e-12 ***
## factor(fid)39583 -0.6205279 0.0874687 -7.094 1.86e-12 ***
## factor(fid)39609 -0.3134237 0.0757021 -4.140 3.63e-05 ***
## factor(fid)39620 -0.2896828 0.0724793 -3.997 6.68e-05 ***
## factor(fid)39622 -0.6921430 0.0724908 -9.548 < 2e-16 ***
## factor(fid)39623 -0.5443215 0.0874477 -6.225 6.00e-10 ***
## factor(fid)39658 -0.5425928 0.1311336 -4.138 3.67e-05 ***
## factor(fid)39703 -0.7216583 0.1311234 -5.504 4.26e-08 ***
## factor(fid)39709 -0.6902378 0.0757019 -9.118 < 2e-16 ***
## factor(fid)39735 -0.3919068 0.0757068 -5.177 2.51e-07 ***
## factor(fid)39737 -0.6592856 0.0757062 -8.708 < 2e-16 ***
## factor(fid)39754 -0.1843217 0.1001471 -1.841 0.065858 .
## factor(fid)39767 -1.0001465 0.1311196 -7.628 3.85e-14 ***
## factor(fid)39769 -0.9890182 0.1002221 -9.868 < 2e-16 ***
## factor(fid)39780 -0.4767354 0.0757021 -6.298 3.79e-10 ***
## factor(fid)39796 -0.9854714 0.1312237 -7.510 9.28e-14 ***
## factor(fid)39800 -0.9967307 0.1001511 -9.952 < 2e-16 ***
```

```
## factor(fid)39802 -1.0001443 0.1311196 -7.628 3.85e-14 ***
## factor(fid)39816 -0.9949911 0.0803142 -12.389 < 2e-16 ***
## factor(fid)39832 -0.6567366 0.0874631 -7.509 9.35e-14 ***
## factor(fid)39836 -0.5883457 0.1311483 -4.486 7.71e-06 ***
## factor(fid)39838 -0.4331698 0.1312119 -3.301 0.000981 ***
## factor(fid)39839 -0.7266628 0.1002074 -7.252 6.10e-13 ***
## factor(fid)39855 -0.5372955 0.0874627 -6.143 9.94e-10 ***
## factor(fid)39861 -0.5247025 0.0874492 -6.000 2.38e-09 ***
## factor(fid)39867 -0.5231878 0.1001567 -5.224 1.96e-07 ***
## factor(fid)39872 -0.9890182 0.1002221 -9.868 < 2e-16 ***
## factor(fid)39875 -0.9854714 0.1312237 -7.510 9.28e-14 ***
## factor(fid)39889 -0.9935503 0.1311401 -7.576 5.66e-14 ***
## factor(fid)39893 -0.4333776 0.1311502 -3.304 0.000970 ***
## factor(fid)39900 -0.6762862 0.1001873 -6.750 1.99e-11 ***
## factor(fid)39904 0.0076362 0.1311483 0.058 0.953576
## factor(fid)39906 -0.2972070 0.1311502 -2.266 0.023560 *
## factor(fid)39915 -0.5736765 0.1001523 -5.728 1.19e-08 ***
## factor(fid)39920 -0.7998479 0.1311211 -6.100 1.30e-09 ***
## factor(fid)39928 -0.4448202 0.1311483 -3.392 0.000710 ***
## factor(fid)39929 -0.7949472 0.1311472 -6.061 1.64e-09 ***
## factor(fid)39932 -0.5840767 0.1311196 -4.455 8.93e-06 ***
## factor(fid)39933 -0.4575326 0.1311196 -3.489 0.000496 ***
## factor(fid)39953 -0.5958603 0.1311211 -4.544 5.88e-06 ***
## factor(fid)39957 -0.8326953 0.1311326 -6.350 2.72e-10 ***
## wheat_price 0.0867584 0.0312039 2.780 0.005486 **
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1197 on 1795 degrees of freedom
## Multiple R-squared: 0.8057, Adjusted R-squared: 0.7199
## F-statistic: 9.389 on 793 and 1795 DF, p-value: < 2.2e-16
```

```
output[6,] = coef(summary(m5))[length(coef(summary(m5))[,1]),1:2]
```

```
# Fixed effects can be applied both to individual entities and to groups of
entities. For example,
# if we want to estimate the effects of climate, we can include fixed effects
for groups of entities
# (e.g., by adding fixed effects for regions such as provinces). By doing
this, we assume that the quality
# is the same within each province
# We refer to this as country fixed effects rather than farm fixed effects
m6 = lm(wheat_share ~ factor(county) + wheat_price, data = df_l16)
summary(m6)

##
## Call:
## lm(formula = wheat_share ~ factor(county) + wheat_price, data = df_l16)
##
## Residuals:
```

```

##      Min      1Q  Median      3Q      Max
## -0.6657 -0.1002  0.0036  0.1161  0.8182
##
## Coefficients:
##
## Estimate
## (Intercept)
## 0.395517
## factor(county)Bedfordshire CC
## 0.207300
## factor(county)Berkshire
## 0.010907
## factor(county)Bournemouth and Poole -
## 0.448796
## factor(county)Brighton and Hove
## 0.038911
## factor(county)Buckinghamshire CC
## 0.113419
## factor(county)Calderdale, Kirklees and Wakefield -
## 0.466652
## factor(county)Cambridgeshire CC
## 0.127720
## factor(county)Cardiff and Vale of Glamorgan -
## 0.140198
## factor(county)Cheshire CC -
## 0.050882
## factor(county)Cornwall and Isles of Scilly -
## 0.278407
## factor(county)Darlington -
## 0.043949
## factor(county)Devon CC -
## 0.101028
## factor(county)Dorset CC -
## 0.116763
## factor(county)Durham CC -
## 0.060170
## factor(county)East Cumbria -
## 0.193208
## factor(county)East Derbyshire
## 0.015355
## factor(county)East Merseyside
## 0.195255
## factor(county)East Riding of Yorkshire
## 0.129532
## factor(county)East Sussex CC
## 0.136067
## factor(county)Essex CC
## 0.197543
## factor(county)Flintshire and Wrexham -
## 0.453873

```

## factor(county)Gloucestershire	-
0.030719	
## factor(county)Greater Manchester North	
0.017983	
## factor(county)Greater Manchester South	-
0.024015	
## factor(county)Gwynedd	-
0.458623	
## factor(county)Halton and Warrington	-
0.047921	
## factor(county)Hampshire CC	-
0.046794	
## factor(county)Hartlepool and Stockton-on-Tees	-
0.444447	
## factor(county)Herefordshire, County of	-
0.003503	
## factor(county)Hertfordshire	
0.182000	
## factor(county)Isle of Wight	
0.070355	
## factor(county)Kent CC	
0.116196	
## factor(county)Lancashire CC	-
0.110108	
## factor(county)Leeds	
0.033069	
## factor(county)Leicestershire CC and Rutland	
0.082008	
## factor(county)Lincolnshire	
0.102985	
## factor(county)Luton	
0.211540	
## factor(county)Medway	
0.154173	
## factor(county)Milton Keynes	-
0.453708	
## factor(county)Monmouthshire and Newport	
0.250892	
## factor(county)Norfolk	-
0.045878	
## factor(county)North and North East Lincolnshire	-
0.034333	
## factor(county)North and North East Somerset, South Gloucestershire	-
0.455665	
## factor(county)North Nottinghamshire	
0.073211	
## factor(county)North Yorkshire CC	
0.038052	
## factor(county)Northamptonshire	
0.102427	

## factor(county)Northumberland	-
0.017029	
## factor(county)Outer London - South	-
0.014494	
## factor(county)Oxfordshire	
0.089210	
## factor(county)Peterborough	
0.074150	
## factor(county)Powys	
0.259629	
## factor(county)Shropshire CC	-
0.029765	
## factor(county)Somerset	
0.098230	
## factor(county)South and West Derbyshire	
0.068550	
## factor(county)South Nottinghamshire	
0.080036	
## factor(county)South West Wales	-
0.278134	
## factor(county)Staffordshire CC	-
0.063819	
## factor(county)Suffolk	
0.078366	
## factor(county)Sunderland	-
0.049764	
## factor(county)Surrey	-
0.055428	
## factor(county)Tyneside	-
0.013899	
## factor(county)Walsall and Wolverhampton	-
0.454377	
## factor(county)Warwickshire	
0.152941	
## factor(county)West Cumbria	-
0.391646	
## factor(county)West Sussex	
0.093145	
## factor(county)Wiltshire CC	
0.014557	
## factor(county)Wirral	-
0.003860	
## factor(county)Worcestershire	
0.106592	
## factor(county)York	
0.176975	
## wheat_price	
0.133220	
##	Std.
Error	


```
## (Intercept)
0.061085
## factor(county)Bedfordshire CC
0.068310
## factor(county)Berkshire
0.066576
## factor(county)Bournemouth and Poole
0.207143
## factor(county)Brighton and Hove
0.099533
## factor(county)Buckinghamshire CC
0.066110
## factor(county)Calderdale, Kirklees and Wakefield
0.207132
## factor(county)Cambridgeshire CC
0.059381
## factor(county)Cardiff and Vale of Glamorgan
0.099496
## factor(county)Cheshire CC
0.065898
## factor(county)Cornwall and Isles of Scilly
0.067674
## factor(county)Darlington
0.207126
## factor(county)Devon CC
0.067668
## factor(county)Dorset CC
0.066852
## factor(county)Durham CC
0.067658
## factor(county)East Cumbria
0.070871
## factor(county)East Derbyshire
0.099496
## factor(county)East Merseyside
0.087749
## factor(county)East Riding of Yorkshire
0.064094
## factor(county)East Sussex CC
0.072014
## factor(county)Essex CC
0.059774
## factor(county)Flintshire and Wrexham
0.099510
## factor(county)Gloucestershire
0.067655
## factor(county)Greater Manchester North
0.207118
## factor(county)Greater Manchester South
0.114896
```

```
## factor(county)Gwynedd
0.151982
## factor(county)Halton and Warrington
0.076016
## factor(county)Hampshire CC
0.063233
## factor(county)Hartlepool and Stockton-on-Tees
0.207171
## factor(county)Herefordshire, County of
0.063016
## factor(county)Hertfordshire
0.064973
## factor(county)Isle of Wight
0.105926
## factor(county)Kent CC
0.060965
## factor(county)Lancashire CC
0.062767
## factor(county)Leeds
0.099498
## factor(county)Leicestershire CC and Rutland
0.060765
## factor(county)Lincolnshire
0.058852
## factor(county)Luton
0.152010
## factor(county)Medway
0.087751
## factor(county)Milton Keynes
0.128460
## factor(county)Monmouthshire and Newport
0.087770
## factor(county)Norfolk
0.059234
## factor(county)North and North East Lincolnshire
0.072668
## factor(county)North and North East Somerset, South Gloucestershire
0.151986
## factor(county)North Nottinghamshire
0.062308
## factor(county)North Yorkshire CC
0.060417
## factor(county)Northamptonshire
0.064669
## factor(county)Northumberland
0.062197
## factor(county)Outer London - South
0.207126
## factor(county)Oxfordshire
0.062761
```

```

## factor(county)Peterborough
0.077070
## factor(county)Powys
0.128452
## factor(county)Shropshire CC
0.066570
## factor(county)Somerset
0.064093
## factor(county)South and West Derbyshire
0.073376
## factor(county)South Nottinghamshire
0.068659
## factor(county)South West Wales
0.066584
## factor(county)Staffordshire CC
0.071413
## factor(county)Suffolk
0.059543
## factor(county)Sunderland
0.099498
## factor(county)Surrey
0.099499
## factor(county)Tyne-side
0.099496
## factor(county)Walsall and Wolverhampton
0.207122
## factor(county)Warwickshire
0.064503
## factor(county)West Cumbria
0.094643
## factor(county)West Sussex
0.077084
## factor(county)Wiltshire CC
0.062524
## factor(county)Wirral
0.099502
## factor(county)Worcestershire
0.090827
## factor(county)York
0.105923
## wheat_price
0.043587
##
## (Intercept)
## factor(county)Bedfordshire CC
## factor(county)Berkshire
## factor(county)Bournemouth and Poole
## factor(county)Brighton and Hove
## factor(county)Buckinghamshire CC
## factor(county)Calderdale, Kirklees and Wakefield

```

	t value
## (Intercept)	6.475
## factor(county)Bedfordshire CC	3.035
## factor(county)Berkshire	0.164
## factor(county)Bournemouth and Poole	-2.167
## factor(county)Brighton and Hove	0.391
## factor(county)Buckinghamshire CC	1.716
## factor(county)Calderdale, Kirklees and Wakefield	-2.253

## factor(county)Cambridgeshire CC	2.151
## factor(county)Cardiff and Vale of Glamorgan	-1.409
## factor(county)Cheshire CC	-0.772
## factor(county)Cornwall and Isles of Scilly	-4.114
## factor(county)Darlington	-0.212
## factor(county)Devon CC	-1.493
## factor(county)Dorset CC	-1.747
## factor(county)Durham CC	-0.889
## factor(county)East Cumbria	-2.726
## factor(county)East Derbyshire	0.154
## factor(county)East Merseyside	2.225
## factor(county)East Riding of Yorkshire	2.021
## factor(county)East Sussex CC	1.889
## factor(county)Essex CC	3.305
## factor(county)Flintshire and Wrexham	-4.561
## factor(county)Gloucestershire	-0.454
## factor(county)Greater Manchester North	0.087
## factor(county)Greater Manchester South	-0.209
## factor(county)Gwynedd	-3.018
## factor(county)Halton and Warrington	-0.630
## factor(county)Hampshire CC	-0.740
## factor(county)Hartlepool and Stockton-on-Tees	-2.145
## factor(county)Herefordshire, County of	-0.056
## factor(county)Hertfordshire	2.801
## factor(county)Isle of Wight	0.664
## factor(county)Kent CC	1.906
## factor(county)Lancashire CC	-1.754
## factor(county)Leeds	0.332
## factor(county)Leicestershire CC and Rutland	1.350
## factor(county)Lincolnshire	1.750
## factor(county)Luton	1.392
## factor(county)Medway	1.757
## factor(county)Milton Keynes	-3.532
## factor(county)Monmouthshire and Newport	2.859
## factor(county)Norfolk	-0.775
## factor(county)North and North East Lincolnshire	-0.472
## factor(county)North and North East Somerset, South Gloucestershire	-2.998
## factor(county)North Nottinghamshire	1.175
## factor(county)North Yorkshire CC	0.630
## factor(county)Northamptonshire	1.584
## factor(county)Northumberland	-0.274
## factor(county)Outer London - South	-0.070
## factor(county)Oxfordshire	1.421
## factor(county)Peterborough	0.962
## factor(county)Powys	2.021
## factor(county)Shropshire CC	-0.447
## factor(county)Somerset	1.533
## factor(county)South and West Derbyshire	0.934
## factor(county)South Nottinghamshire	1.166
## factor(county)South West Wales	-4.177

```

## factor(county)Staffordshire CC -0.894
## factor(county)Suffolk 1.316
## factor(county)Sunderland -0.500
## factor(county)Surrey -0.557
## factor(county)Tyneside -0.140
## factor(county)Walsall and Wolverhampton -2.194
## factor(county)Warwickshire 2.371
## factor(county)West Cumbria -4.138
## factor(county)West Sussex 1.208
## factor(county)Wiltshire CC 0.233
## factor(county)Wirral -0.039
## factor(county)Worcestershire 1.174
## factor(county)York 1.671
## wheat_price 3.056
##
Pr(>|t|)
## (Intercept) 1.14e-
10 ***
## factor(county)Bedfordshire CC
0.002432 **
## factor(county)Berkshire
0.869877
## factor(county)Bournemouth and Poole
0.030359 *
## factor(county)Brighton and Hove
0.695875
## factor(county)Buckinghamshire CC
0.086357 .
## factor(county)Calderdale, Kirklees and Wakefield
0.024350 *
## factor(county)Cambridgeshire CC
0.031583 *
## factor(county)Cardiff and Vale of Glamorgan
0.158934
## factor(county)Cheshire CC
0.440104
## factor(county)Cornwall and Isles of Scilly 4.01e-
05 ***
## factor(county)Darlington
0.831979
## factor(county)Devon CC
0.135563
## factor(county)Dorset CC
0.080829 .
## factor(county)Durham CC
0.373911
## factor(county)East Cumbria
0.006451 **
## factor(county)East Derbyshire
0.877361

```

```
## factor(county)East Merseyside
0.026159 *
## factor(county)East Riding of Yorkshire
0.043388 *
## factor(county)East Sussex CC
0.058948 .
## factor(county)Essex CC
0.000964 ***
## factor(county)Flintshire and Wrexham
06 ***
## factor(county)Gloucestershire
0.649826
## factor(county)Greater Manchester North
0.930818
## factor(county)Greater Manchester South
0.834454
## factor(county)Gwynedd
0.002573 **
## factor(county)Halton and Warrington
0.528490
## factor(county)Hampshire CC
0.459352
## factor(county)Hartlepool and Stockton-on-Tees
0.032023 *
## factor(county)Herefordshire, County of
0.955673
## factor(county)Hertfordshire
0.005131 **
## factor(county)Isle of Wight
0.506629
## factor(county)Kent CC
0.056771 .
## factor(county)Lancashire CC
0.079512 .
## factor(county)Leeds
0.739644
## factor(county)Leicestershire CC and Rutland
0.177268
## factor(county)Lincolnshire
0.080255 .
## factor(county)Luton
0.164161
## factor(county)Medway
0.079049 .
## factor(county)Milton Keynes
0.000420 ***
## factor(county)Monmouthshire and Newport
0.004291 **
## factor(county)Norfolk
0.438691
```

5.33e-

```

## factor(county)North and North East Lincolnshire
0.636635
## factor(county)North and North East Somerset, South Gloucestershire
0.002743 **
## factor(county)North Nottinghamshire
0.240115
## factor(county)North Yorkshire CC
0.528873
## factor(county)Northamptonshire
0.113349
## factor(county)Northumberland
0.784266
## factor(county)Outer London - South
0.944217
## factor(county)Oxfordshire
0.155315
## factor(county)Peterborough
0.336088
## factor(county)Powys
0.043363 *
## factor(county)Shropshire CC
0.654824
## factor(county)Somerset
0.125494
## factor(county)South and West Derbyshire
0.350279
## factor(county)South Nottinghamshire
0.243839
## factor(county)South West Wales
05 ***
## factor(county)Staffordshire CC
0.371586
## factor(county)Suffolk
0.188248
## factor(county)Sunderland
0.617014
## factor(county)Surrey
0.577528
## factor(county)Tyneside
0.888911
## factor(county)Walsall and Wolverhampton
0.028343 *
## factor(county)Warwickshire
0.017812 *
## factor(county)West Cumbria
05 ***
## factor(county)West Sussex
0.227025
## factor(county)Wiltshire CC
0.815920

```

3.05e-

3.62e-

```

## factor(county)Wirral
0.969056
## factor(county)Worcestershire
0.240677
## factor(county)York
0.094888 .
## wheat_price
0.002263 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.199 on 2518 degrees of freedom
## Multiple R-squared:  0.2468, Adjusted R-squared:  0.2259
## F-statistic: 11.79 on 70 and 2518 DF,  p-value: < 2.2e-16

output[7,] = coef(summary(m6))[71,1:2]
# We find a result that is intermediate between the two, so we can say that
# there appears to be some
# variability in quality even within the province

# Temperature FE
m7 = lm(wheat_share ~ wheat_price + factor(temp), data = df_l16)
summary(m7)

##
## Call:
## lm(formula = wheat_share ~ wheat_price + factor(temp), data = df_l16)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.65794 -0.05680  0.00000  0.06184  0.69536
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.3072100   0.1586281   1.937 0.052920 .
## wheat_price    0.1114512   0.0381196   2.924 0.003496 **
## factor(temp)10.6612492 -0.3594112   0.2225661  -1.615 0.106493
## factor(temp)10.8516665  0.6399319   0.1724014   3.712 0.000211 ***
## factor(temp)10.9445829  0.0616668   0.1703778   0.362 0.717432
## factor(temp)10.9658337 -0.0515713   0.1759483  -0.293 0.769471
## factor(temp)11.0591669  0.0445480   0.2225566   0.200 0.841371
## factor(temp)11.0620832  0.1333900   0.1817395   0.734 0.463053
## factor(temp)11.2337494  0.0287137   0.2225566   0.129 0.897356
## factor(temp)11.2637501  0.2096451   0.1699990   1.233 0.217634
## factor(temp)11.2820835  0.0668875   0.1759565   0.380 0.703883
## factor(temp)11.3629169 -0.3582872   0.1817332  -1.972 0.048798 *
## factor(temp)11.4162502  0.1957245   0.1927794   1.015 0.310091
## factor(temp)11.44625    0.1584927   0.1723918   0.919 0.358005
## factor(temp)11.4512501 -0.3552267   0.1927714  -1.843 0.065509 .
## factor(temp)11.4775    -0.3667209   0.2225568  -1.648 0.099551 .

```



```

## factor(temp)11.5091667 0.2445479 0.1699959 1.439 0.150427
## factor(temp)11.5193748 0.1925616 0.1759487 1.094 0.273897
## factor(temp)11.527916 -0.3598317 0.1759569 -2.045 0.040979 *
## factor(temp)11.5450001 -0.1297562 0.1724009 -0.753 0.451749
## factor(temp)11.5605564 0.1172226 0.1650523 0.710 0.477650
## factor(temp)11.5737495 0.0448822 0.1658937 0.271 0.786765
## factor(temp)11.5974998 0.1430434 0.1643924 0.870 0.384327
## factor(temp)11.5983334 -0.3553982 0.2225831 -1.597 0.110483
## factor(temp)11.6454163 0.0402578 0.2225822 0.181 0.856489
## factor(temp)11.6879168 0.0051721 0.1629085 0.032 0.974675
## factor(temp)11.6904163 -0.0144706 0.1927488 -0.075 0.940162
## factor(temp)11.7275 -0.0501319 0.2225586 -0.225 0.821805
## factor(temp)11.7383337 0.2552788 0.2225566 1.147 0.251500
## factor(temp)11.7699995 0.1160458 0.2225599 0.521 0.602134
## factor(temp)11.7775002 0.0544581 0.1700034 0.320 0.748746
## factor(temp)11.7825003 0.3374630 0.2225590 1.516 0.129598
## factor(temp)11.7915974 0.0847565 0.1699899 0.499 0.618115
## factor(temp)11.7937498 0.0116457 0.2225790 0.052 0.958277
## factor(temp)11.8266659 0.1446018 0.2225831 0.650 0.515988
## factor(temp)11.9125004 -0.0890866 0.1927464 -0.462 0.643989
## factor(temp)11.9512501 0.0075403 0.1669335 0.045 0.963976
## factor(temp)11.967083 0.0769813 0.1699981 0.453 0.650713
## factor(temp)11.9674997 0.0134991 0.2225569 0.061 0.951640
## factor(temp)11.9716663 -0.1100032 0.1699822 -0.647 0.517609
## factor(temp)11.9954166 0.0557317 0.2225564 0.250 0.802290
## factor(temp)12.0324993 0.0485866 0.1699964 0.286 0.775052
## factor(temp)12.0450001 -0.3564386 0.1700084 -2.097 0.036149 *
## factor(temp)12.0487499 0.1344183 0.1817455 0.740 0.459627
## factor(temp)12.1070833 -0.3616395 0.1927440 -1.876 0.060757 .
## factor(temp)12.11625 0.1320714 0.1699845 0.777 0.437269
## factor(temp)12.1258335 0.3684634 0.1633176 2.256 0.024166 *
## factor(temp)12.1262503 0.4861605 0.1817196 2.675 0.007523 **
## factor(temp)12.1329165 0.3101238 0.1817607 1.706 0.088115 .
## factor(temp)12.1637497 0.0477812 0.1699815 0.281 0.778664
## factor(temp)12.1670837 -0.0502788 0.1724018 -0.292 0.770593
## factor(temp)12.2425003 -0.3339459 0.1700031 -1.964 0.049621 *
## factor(temp)12.2579165 -0.2276216 0.1818025 -1.252 0.210699
## factor(temp)12.2612495 -0.3542451 0.1927778 -1.838 0.066265 .
## factor(temp)12.2620831 0.6335837 0.2225566 2.847 0.004458 **
## factor(temp)12.2866669 -0.3481440 0.2226354 -1.564 0.118029
## factor(temp)12.291667 0.2277131 0.1724192 1.321 0.186747
## factor(temp)12.2941666 -0.0129389 0.1759875 -0.074 0.941398
## factor(temp)12.2979164 -0.0280457 0.1927420 -0.146 0.884323
## factor(temp)12.3058329 0.1809728 0.2225591 0.813 0.416227
## factor(temp)12.3112507 0.2981650 0.2225566 1.340 0.180479
## factor(temp)12.3179169 0.2437901 0.1760005 1.385 0.166148
## factor(temp)12.3216667 0.2728437 0.1817166 1.501 0.133382
## factor(temp)12.3324995 -0.0482321 0.1699895 -0.284 0.776641
## factor(temp)12.333334 0.2996889 0.1724042 1.738 0.082306 .
## factor(temp)12.3337498 -0.1045997 0.1700066 -0.615 0.538444

```

```

## factor(temp)12.3387499 0.1065365 0.1682387 0.633 0.526642
## factor(temp)12.342083 0.1588171 0.1622599 0.979 0.327800
## factor(temp)12.3833332 -0.0466883 0.1699912 -0.275 0.783611
## factor(temp)12.3904171 -0.3577490 0.1927576 -1.856 0.063600 .
## factor(temp)12.3920832 0.2820876 0.1700245 1.659 0.097245 .
## factor(temp)12.395834 0.2263716 0.1927419 1.174 0.240336
## factor(temp)12.3975 0.0701632 0.1700003 0.413 0.679851
## factor(temp)12.4120827 0.0362827 0.1817209 0.200 0.841765
## factor(temp)12.4125004 -0.3646094 0.2225566 -1.638 0.101514
## factor(temp)12.4245834 0.3533047 0.1724090 2.049 0.040564 *
## factor(temp)12.4337492 0.1437642 0.1699856 0.846 0.397792
## factor(temp)12.4354172 -0.0760360 0.1723915 -0.441 0.659211
## factor(temp)12.4404163 0.0763029 0.1759549 0.434 0.664587
## factor(temp)12.4533329 0.2787528 0.1724110 1.617 0.106073
## factor(temp)12.4541664 0.3942245 0.1638185 2.406 0.016193 *
## factor(temp)12.4604168 0.2245382 0.1699907 1.321 0.186683
## factor(temp)12.4641666 0.3081353 0.1658894 1.857 0.063384 .
## factor(temp)12.4750004 -0.3565124 0.2225775 -1.602 0.109363
## factor(temp)12.4879169 0.3040678 0.1927547 1.577 0.114835
## factor(temp)12.4891672 0.0411857 0.1724449 0.239 0.811258
## factor(temp)12.4941664 0.0715366 0.1928237 0.371 0.710679
## factor(temp)12.4954166 0.0915274 0.1669174 0.548 0.583517
## factor(temp)12.498333 0.0873705 0.2225591 0.393 0.694676
## factor(temp)12.5025005 0.1666711 0.1724011 0.967 0.333774
## factor(temp)12.5083332 -0.3366140 0.1817518 -1.852 0.064159 .
## factor(temp)12.510416 0.1789398 0.1724202 1.038 0.299477
## factor(temp)12.5191669 0.2263248 0.1650883 1.371 0.170543
## factor(temp)12.5204163 0.2338056 0.1723972 1.356 0.175180
## factor(temp)12.5245829 0.1619941 0.1633291 0.992 0.321397
## factor(temp)12.5258331 -0.1045548 0.1699848 -0.615 0.538566
## factor(temp)12.5341663 0.1685410 0.1700167 0.991 0.321644
## factor(temp)12.5379171 -0.0384666 0.1817167 -0.212 0.832374
## factor(temp)12.5408335 -0.2225111 0.1724012 -1.291 0.196964
## factor(temp)12.5433331 0.1141220 0.1699879 0.671 0.502069
## factor(temp)12.5499992 0.1795737 0.2226194 0.807 0.419965
## factor(temp)12.5504169 0.2623226 0.1927414 1.361 0.173657
## factor(temp)12.5512505 0.0287422 0.1643696 0.175 0.861204
## factor(temp)12.5541668 -0.2067698 0.2225570 -0.929 0.352963
## factor(temp)12.5591669 0.1337775 0.2226035 0.601 0.547926
## factor(temp)12.5650005 0.1812209 0.1699953 1.066 0.286530
## factor(temp)12.5678339 -0.0159863 0.1927674 -0.083 0.933915
## factor(temp)12.5766668 0.1284824 0.1724075 0.745 0.456219
## factor(temp)12.5783329 0.1729259 0.1817174 0.952 0.341399
## factor(temp)12.5791664 -0.0809387 0.2225775 -0.364 0.716162
## factor(temp)12.5799999 0.1739529 0.2226689 0.781 0.434763
## factor(temp)12.5987492 -0.0877652 0.1638073 -0.536 0.592165
## factor(temp)12.5999994 0.2726478 0.1817167 1.500 0.133661
## factor(temp)12.6004162 0.1447136 0.1759773 0.822 0.410975
## factor(temp)12.6012497 0.6397370 0.1927478 3.319 0.000919 ***
## factor(temp)12.6120834 0.2136818 0.2225813 0.960 0.337157

```

```

## factor(temp)12.614584 0.2518499 0.2225569 1.132 0.257923
## factor(temp)12.61625 0.2258199 0.1817268 1.243 0.214142
## factor(temp)12.6208324 -0.3602534 0.2225636 -1.619 0.105672
## factor(temp)12.625 0.1708922 0.2225565 0.768 0.442657
## factor(temp)12.6389999 0.6389024 0.2225614 2.871 0.004137 **
## factor(temp)12.6400003 -0.0723482 0.1817724 -0.398 0.690659
## factor(temp)12.6424999 0.0973659 0.1669320 0.583 0.559776
## factor(temp)12.6470833 0.0027258 0.2225596 0.012 0.990229
## factor(temp)12.6512499 0.0828596 0.1927475 0.430 0.667322
## factor(temp)12.6575003 0.0592167 0.1927444 0.307 0.758699
## factor(temp)12.6583328 0.2380167 0.2225724 1.069 0.285017
## factor(temp)12.6629162 -0.3601080 0.1927483 -1.868 0.061862 .
## factor(temp)12.6662502 0.1616581 0.1699950 0.951 0.341735
## factor(temp)12.6679163 0.1741005 0.1699816 1.024 0.305844
## factor(temp)12.6695824 0.3273311 0.1759778 1.860 0.063015 .
## factor(temp)12.6766672 0.1653924 0.1817239 0.910 0.362858
## factor(temp)12.6779165 0.0467631 0.1724012 0.271 0.786228
## factor(temp)12.6804161 0.3626689 0.2225701 1.629 0.103366
## factor(temp)12.6816673 0.6400872 0.2225645 2.876 0.004069 **
## factor(temp)12.6879168 0.1495929 0.1927632 0.776 0.437810
## factor(temp)12.6890984 -0.3507259 0.1817866 -1.929 0.053825 .
## factor(temp)12.6920834 0.0435646 0.2225590 0.196 0.844830
## factor(temp)12.6983328 0.3051618 0.2225631 1.371 0.170483
## factor(temp)12.6983337 0.1267001 0.1622303 0.781 0.434897
## factor(temp)12.7008333 0.1171120 0.2225586 0.526 0.598799
## factor(temp)12.7042494 0.0404455 0.1699975 0.238 0.811968
## factor(temp)12.7049999 0.6231892 0.2225901 2.800 0.005162 **
## factor(temp)12.7062502 0.2788780 0.1607786 1.735 0.082968 .
## factor(temp)12.7070827 0.1143982 0.1759885 0.650 0.515743
## factor(temp)12.71 0.0189824 0.1699838 0.112 0.911094
## factor(temp)12.7145834 0.2146106 0.1724110 1.245 0.213358
## factor(temp)12.7174997 0.1501562 0.1669458 0.899 0.368527
## factor(temp)12.7183332 0.0419184 0.1659224 0.253 0.800572
## factor(temp)12.71875 0.1107282 0.2226297 0.497 0.618984
## factor(temp)12.7191677 0.0452461 0.1669673 0.271 0.786427
## factor(temp)12.7275 -0.0889137 0.1927398 -0.461 0.644621
## factor(temp)12.7279167 0.0633618 0.1699980 0.373 0.709394
## factor(temp)12.7333336 0.3358279 0.2226028 1.509 0.131541
## factor(temp)12.7445831 0.1252938 0.2225580 0.563 0.573514
## factor(temp)12.7487507 -0.0907892 0.1927739 -0.471 0.637717
## factor(temp)12.7545834 0.2698438 0.1927397 1.400 0.161648
## factor(temp)12.7558336 0.2800960 0.1817250 1.541 0.123390
## factor(temp)12.7570839 -0.1215608 0.1927798 -0.631 0.528392
## factor(temp)12.7645836 0.0690635 0.1759920 0.392 0.694785
## factor(temp)12.7666674 0.2083661 0.1817195 1.147 0.251663
## factor(temp)12.7691669 0.0852920 0.1927407 0.443 0.658157
## factor(temp)12.7737494 -0.0759612 0.2225567 -0.341 0.732903
## factor(temp)12.7766676 -0.0093799 0.2225568 -0.042 0.966386
## factor(temp)12.7783327 0.1123824 0.1700290 0.661 0.508710
## factor(temp)12.779583 0.3517676 0.1724241 2.040 0.041462 *

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## factor(temp)12.7820835 -0.3643285 0.2225568 -1.637 0.101777
## factor(temp)12.782917 0.0459297 0.1669293 0.275 0.783232
## factor(temp)12.7858334 0.1794289 0.1638064 1.095 0.273479
## factor(temp)12.7933331 0.0401253 0.1612774 0.249 0.803542
## factor(temp)12.7941666 0.1919376 0.1927471 0.996 0.319462
## factor(temp)12.7945833 0.2227747 0.1724115 1.292 0.196461
## factor(temp)12.7949991 0.1232816 0.1759749 0.701 0.483653
## factor(temp)12.7962503 0.1259932 0.1817889 0.693 0.488340
## factor(temp)12.7995834 0.4188329 0.2225566 1.882 0.059986 .
## factor(temp)12.8005905 -0.3548322 0.1927739 -1.841 0.065812 .
## factor(temp)12.8099995 0.1231603 0.1643796 0.749 0.453795
## factor(temp)12.8220825 0.3183180 0.1723920 1.846 0.064964 .
## factor(temp)12.8270826 -0.1632154 0.1659004 -0.984 0.325320
## factor(temp)12.8295841 0.2464569 0.1759870 1.400 0.161533
## factor(temp)12.8308334 0.2346374 0.1700168 1.380 0.167708
## factor(temp)12.835 0.6497414 0.2226173 2.919 0.003553 **
## factor(temp)12.8375006 0.1234382 0.1612807 0.765 0.444142
## factor(temp)12.8408337 -0.0140925 0.1633433 -0.086 0.931256
## factor(temp)12.8495836 -0.3537653 0.2225925 -1.589 0.112144
## factor(temp)12.8537502 0.1446085 0.1817460 0.796 0.426318
## factor(temp)12.8554173 0.3413907 0.1638234 2.084 0.037290 *
## factor(temp)12.8566666 0.0270219 0.1724120 0.157 0.875474
## factor(temp)12.8570833 -0.0720444 0.1658880 -0.434 0.664119
## factor(temp)12.8616667 0.2872917 0.1682913 1.707 0.087949 .
## factor(temp)12.8654165 0.2703122 0.1659130 1.629 0.103412
## factor(temp)12.8708334 -0.3439810 0.2226778 -1.545 0.122558
## factor(temp)12.8741665 0.2412059 0.1683369 1.433 0.152042
## factor(temp)12.8781672 0.1452463 0.1760074 0.825 0.409335
## factor(temp)12.8812504 -0.0713601 0.1760470 -0.405 0.685264
## factor(temp)12.8829165 0.1081659 0.1700038 0.636 0.524679
## factor(temp)12.8833332 0.1081898 0.2225710 0.486 0.626953
## factor(temp)12.8850002 -0.3565000 0.1700080 -2.097 0.036116 *
## factor(temp)12.8858328 0.0580285 0.1817233 0.319 0.749513
## factor(temp)12.8895836 0.1346935 0.1629064 0.827 0.408436
## factor(temp)12.8933334 0.0882207 0.1682530 0.524 0.600102
## factor(temp)12.8979168 -0.1023848 0.1699904 -0.602 0.547041
## factor(temp)12.9004164 0.3284940 0.1927590 1.704 0.088498 .
## factor(temp)12.904583 0.3299898 0.1817257 1.816 0.069533 .
## factor(temp)12.9087505 -0.3548322 0.1927739 -1.841 0.065812 .
## factor(temp)12.9099998 0.0406144 0.1643800 0.247 0.804874
## factor(temp)12.9125004 0.0203404 0.1682654 0.121 0.903795
## factor(temp)12.9129162 -0.0942990 0.1699950 -0.555 0.579148
## factor(temp)12.9137497 -0.3569223 0.1759706 -2.028 0.042655 *
## factor(temp)12.9206944 -0.3114055 0.2225838 -1.399 0.161946
## factor(temp)12.9208336 0.2961831 0.1817246 1.630 0.103284
## factor(temp)12.9220839 -0.0121693 0.1700338 -0.072 0.942951
## factor(temp)12.9233322 0.1029441 0.1699991 0.606 0.544874
## factor(temp)12.9274998 -0.1582423 0.1759835 -0.899 0.368656
## factor(temp)12.9279165 0.2282026 0.1700123 1.342 0.179653
## factor(temp)12.9283333 0.1922858 0.1643940 1.170 0.242269

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## factor(temp)12.9316673 -0.3564516 0.2225778 -1.601 0.109423
## factor(temp)12.9337502 -0.1859111 0.1724599 -1.078 0.281159
## factor(temp)12.9354172 0.2729968 0.1604987 1.701 0.089105 .
## factor(temp)12.9362497 0.1695894 0.1617004 1.049 0.294397
## factor(temp)12.9366665 0.2320128 0.1699958 1.365 0.172457
## factor(temp)12.9370842 0.2686287 0.1699803 1.580 0.114177
## factor(temp)12.9429169 -0.0107797 0.1699816 -0.063 0.949441
## factor(temp)12.9455204 0.5292315 0.2226155 2.377 0.017527 *
## factor(temp)12.9508333 -0.0299034 0.1759644 -0.170 0.865074
## factor(temp)12.9520836 0.0130365 0.1700183 0.077 0.938888
## factor(temp)12.9554167 0.0094125 0.1817214 0.052 0.958696
## factor(temp)12.96 0.0160052 0.1817225 0.088 0.929825
## factor(temp)12.965416 0.2616364 0.1682426 1.555 0.120070
## factor(temp)12.9720831 0.0095816 0.1759941 0.054 0.956588
## factor(temp)12.9737501 -0.3604650 0.1759546 -2.049 0.040623 *
## factor(temp)12.9779177 -0.3414044 0.2227087 -1.533 0.125435
## factor(temp)12.9787502 0.2341306 0.1644020 1.424 0.154556
## factor(temp)12.9812508 0.3039467 0.1724479 1.763 0.078123 .
## factor(temp)12.9824991 0.4771814 0.1682635 2.836 0.004613 **
## factor(temp)12.9858341 0.1717373 0.1682389 1.021 0.307470
## factor(temp)12.9859715 -0.1155044 0.1928005 -0.599 0.549179
## factor(temp)12.9887505 -0.0594547 0.1700415 -0.350 0.726638
## factor(temp)12.9945841 0.0732402 0.1817176 0.403 0.686957
## factor(temp)12.9954166 0.2193638 0.1817922 1.207 0.227694
## factor(temp)12.9970837 0.1315331 0.1658962 0.793 0.427947
## factor(temp)12.9979172 0.1952245 0.1699971 1.148 0.250935
## factor(temp)12.9987497 -0.0615218 0.1669318 -0.369 0.712504
## factor(temp)12.9995842 0.1444547 0.1699822 0.850 0.395521
## factor(temp)13.005764 0.2410625 0.1700432 1.418 0.156440
## factor(temp)13.0070839 0.1670524 0.1817200 0.919 0.358052
## factor(temp)13.0114584 -0.2416252 0.2226398 -1.085 0.277925
## factor(temp)13.0129166 -0.0733510 0.1622369 -0.452 0.651227
## factor(temp)13.0141668 0.1541291 0.1927516 0.800 0.424018
## factor(temp)13.0149994 -0.3558917 0.1817461 -1.958 0.050341 .
## factor(temp)13.0225 -0.0926394 0.1724026 -0.537 0.591087
## factor(temp)13.0254173 0.3952224 0.1724484 2.292 0.022014 *
## factor(temp)13.026041 -0.3552639 0.2225838 -1.596 0.110619
## factor(temp)13.0266666 0.3477754 0.1658928 2.096 0.036167 *
## factor(temp)13.027916 0.0675383 0.1724027 0.392 0.695285
## factor(temp)13.0308332 0.2534290 0.1817165 1.395 0.163272
## factor(temp)13.0383339 0.2284343 0.1817385 1.257 0.208915
## factor(temp)13.0420837 0.0371110 0.1659793 0.224 0.823100
## factor(temp)13.0424995 0.0822741 0.1927444 0.427 0.669528
## factor(temp)13.0429163 -0.3414044 0.2227087 -1.533 0.125435
## factor(temp)13.0433331 -0.0942748 0.2225593 -0.424 0.671905
## factor(temp)13.0441666 0.1572123 0.1817287 0.865 0.387087
## factor(temp)13.0450001 0.1819138 0.1617102 1.125 0.260744
## factor(temp)13.0454168 0.2807503 0.1927439 1.457 0.145377
## factor(temp)13.0470829 0.1228653 0.1817828 0.676 0.499184
## factor(temp)13.0487499 0.1253487 0.1759484 0.712 0.476285

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## factor(temp)13.0504169 0.2069754 0.1651237 1.253 0.210179
## factor(temp)13.0512495 0.3076981 0.1759722 1.749 0.080513 .
## factor(temp)13.0529165 0.0513984 0.2225568 0.231 0.817380
## factor(temp)13.053751 -0.0576591 0.1724052 -0.334 0.738081
## factor(temp)13.0566673 0.1603231 0.1927688 0.832 0.405681
## factor(temp)13.0594435 -0.0451685 0.1669451 -0.271 0.786757
## factor(temp)13.0595837 -0.0854600 0.1927675 -0.443 0.657571
## factor(temp)13.0600004 0.2535063 0.2225578 1.139 0.254809
## factor(temp)13.0633335 -0.0285396 0.1927629 -0.148 0.882313
## factor(temp)13.0662498 0.3715073 0.1759504 2.111 0.034853 *
## factor(temp)13.0704174 -0.3637627 0.2225572 -1.634 0.102310
## factor(temp)13.07125 0.1975662 0.1818119 1.087 0.277316
## factor(temp)13.0737495 0.3063802 0.1650779 1.856 0.063597 .
## factor(temp)13.0820837 0.1219408 0.1629098 0.749 0.454232
## factor(temp)13.0837498 0.1423691 0.2225581 0.640 0.522441
## factor(temp)13.0895834 0.3188653 0.1759816 1.812 0.070141 .
## factor(temp)13.0904865 -0.0491898 0.1682814 -0.292 0.770081
## factor(temp)13.0912504 0.0228696 0.1659550 0.138 0.890407
## factor(temp)13.09375 0.1642897 0.1927470 0.852 0.394112
## factor(temp)13.0949993 0.4720205 0.1699886 2.777 0.005539 **
## factor(temp)13.1004171 0.2352986 0.1682717 1.398 0.162163
## factor(temp)13.1031246 0.1870215 0.1619738 1.155 0.248369
## factor(temp)13.1054163 -0.3552773 0.1927711 -1.843 0.065470 .
## factor(temp)13.1054173 -0.3604825 0.1699888 -2.121 0.034070 *
## factor(temp)13.1090975 0.0672619 0.1927696 0.349 0.727182
## factor(temp)13.1104164 0.2186268 0.1759786 1.242 0.214247
## factor(temp)13.1112499 0.1901062 0.1927559 0.986 0.324122
## factor(temp)13.1137495 0.2322133 0.1927716 1.205 0.228492
## factor(temp)13.1166668 0.2964680 0.1638165 1.810 0.070477 .
## factor(temp)13.1170845 0.2123385 0.1633150 1.300 0.193683
## factor(temp)13.1179171 -0.1347169 0.1724037 -0.781 0.434653
## factor(temp)13.1304169 0.1048809 0.1650597 0.635 0.525229
## factor(temp)13.1308336 0.3473424 0.1759707 1.974 0.048528 *
## factor(temp)13.1320829 0.2288559 0.1617017 1.415 0.157130
## factor(temp)13.1329165 0.0891932 0.1638128 0.544 0.586167
## factor(temp)13.1345835 -0.2815945 0.1682574 -1.674 0.094359 .
## factor(temp)13.1350002 0.2708563 0.1682831 1.610 0.107651
## factor(temp)13.135417 0.1664934 0.1759599 0.946 0.344155
## factor(temp)13.1387501 0.0061449 0.1700082 0.036 0.971170
## factor(temp)13.1466656 0.3087754 0.1927873 1.602 0.109386
## factor(temp)13.1475 0.4221568 0.1817214 2.323 0.020269 *
## factor(temp)13.1479168 0.3706571 0.1759724 2.106 0.035294 *
## factor(temp)13.1525002 0.2423839 0.1629441 1.488 0.137026
## factor(temp)13.1529169 -0.0316308 0.1759681 -0.180 0.857364
## factor(temp)13.1575003 0.2536233 0.1700263 1.492 0.135936
## factor(temp)13.1599998 0.0046994 0.1699940 0.028 0.977948
## factor(temp)13.1608334 0.0374675 0.1759833 0.213 0.831423
## factor(temp)13.1633339 0.2371570 0.1927581 1.230 0.218710
## factor(temp)13.164999 0.2908890 0.1625456 1.790 0.073665 .
## factor(temp)13.1654167 0.3245429 0.1700071 1.909 0.056399 .

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## factor(temp)13.1737499 0.1098696 0.1650558 0.666 0.505707
## factor(temp)13.1758327 -0.2042748 0.1928340 -1.059 0.289571
## factor(temp)13.1804161 0.2866122 0.1614758 1.775 0.076050 .
## factor(temp)13.1879158 -0.0191805 0.2226061 -0.086 0.931345
## factor(temp)13.1916666 -0.3506815 0.2226139 -1.575 0.115340
## factor(temp)13.1916676 0.2033040 0.1759572 1.155 0.248051
## factor(temp)13.195714 -0.0251194 0.1700058 -0.148 0.882549
## factor(temp)13.1991673 0.2753220 0.1724239 1.597 0.110467
## factor(temp)13.2004166 0.0632255 0.1699994 0.372 0.709993
## factor(temp)13.2008333 0.2572378 0.1682917 1.529 0.126533
## factor(temp)13.2012501 0.2215957 0.1633301 1.357 0.175011
## factor(temp)13.2020836 0.1465198 0.1817435 0.806 0.420225
## factor(temp)13.2108335 0.0716753 0.1700194 0.422 0.673381
## factor(temp)13.2116671 0.2455265 0.1817375 1.351 0.176843
## factor(temp)13.2141666 0.2180584 0.1609208 1.355 0.175542
## factor(temp)13.21875 0.1066608 0.1650988 0.646 0.518323
## factor(temp)13.2212496 -0.1294535 0.1700412 -0.761 0.446560
## factor(temp)13.2224998 0.3511644 0.1638341 2.143 0.032194 *
## factor(temp)13.2258329 0.1655998 0.1625697 1.019 0.308492
## factor(temp)13.2279167 0.2157645 0.1616998 1.334 0.182233
## factor(temp)13.2304163 -0.0552198 0.1700224 -0.325 0.745380
## factor(temp)13.2312498 -0.2195491 0.1817205 -1.208 0.227118
## factor(temp)13.2333336 0.3252691 0.2225581 1.462 0.144027
## factor(temp)13.2379169 0.2440452 0.2225570 1.097 0.272963
## factor(temp)13.2433329 0.2294028 0.1700020 1.349 0.177350
## factor(temp)13.2433338 -0.0340288 0.1928163 -0.176 0.859932
## factor(temp)13.2487497 0.2474375 0.1699983 1.456 0.145672
## factor(temp)13.2525005 0.0215684 0.1927607 0.112 0.910920
## factor(temp)13.253334 -0.0547294 0.1633536 -0.335 0.737631
## factor(temp)13.2566662 0.1815534 0.1650976 1.100 0.271601
## factor(temp)13.25875 0.1792239 0.1760471 1.018 0.308774
## factor(temp)13.2591667 0.4359043 0.1643821 2.652 0.008067 **
## factor(temp)13.2650003 0.2767824 0.1817184 1.523 0.127875
## factor(temp)13.2687502 -0.0243722 0.1682429 -0.145 0.884833
## factor(temp)13.2691669 0.2282000 0.1682507 1.356 0.175147
## factor(temp)13.2712498 0.1879196 0.1700094 1.105 0.269136
## factor(temp)13.2729168 0.2664083 0.1610824 1.654 0.098305 .
## factor(temp)13.2749996 0.2509900 0.1650766 1.520 0.128550
## factor(temp)13.2758331 0.0554602 0.1650957 0.336 0.736959
## factor(temp)13.2791672 0.2153381 0.1650833 1.304 0.192233
## factor(temp)13.2799997 0.0816178 0.2226398 0.367 0.713961
## factor(temp)13.2800007 -0.0838058 0.1817487 -0.461 0.644769
## factor(temp)13.2804165 0.3002482 0.1629095 1.843 0.065465 .
## factor(temp)13.2808342 0.2710903 0.1759831 1.540 0.123605
## factor(temp)13.28125 0.1567688 0.1669286 0.939 0.347768
## factor(temp)13.2820835 -0.1668879 0.2225718 -0.750 0.453450
## factor(temp)13.2825003 0.3720206 0.1650524 2.254 0.024302 *
## factor(temp)13.2845831 0.4415556 0.1669407 2.645 0.008230 **
## factor(temp)13.2862501 -0.0545562 0.2225631 -0.245 0.806382
## factor(temp)13.2879171 -0.0278933 0.1929231 -0.145 0.885054

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## factor(temp)13.2895832 0.1026101 0.1759596 0.583 0.559858
## factor(temp)13.2908335 0.2349105 0.1817373 1.293 0.196298
## factor(temp)13.2924995 0.1065347 0.1927914 0.553 0.580603
## factor(temp)13.2937498 0.1485241 0.1817653 0.817 0.413952
## factor(temp)13.2950001 0.1823582 0.2225636 0.819 0.412678
## factor(temp)13.2991657 0.2515328 0.1700302 1.479 0.139199
## factor(temp)13.2995825 0.3003120 0.1817667 1.652 0.098647 .
## factor(temp)13.3012495 0.1859150 0.1669728 1.113 0.265645
## factor(temp)13.3022223 0.2006529 0.1682661 1.192 0.233210
## factor(temp)13.3024998 0.2009444 0.1724168 1.165 0.243966
## factor(temp)13.3045835 -0.1695896 0.1700169 -0.997 0.318643
## factor(temp)13.3066664 0.2964348 0.1927636 1.538 0.124244
## factor(temp)13.3112497 0.3182964 0.1927594 1.651 0.098835 .
## factor(temp)13.3175001 0.1703855 0.1633334 1.043 0.296987
## factor(temp)13.3187504 0.2236690 0.1619359 1.381 0.167359
## factor(temp)13.3199997 -0.3585582 0.1699967 -2.109 0.035045 *
## factor(temp)13.3204174 0.1802205 0.1759895 1.024 0.305934
## factor(temp)13.3211117 -0.3621672 0.1817201 -1.993 0.046391 *
## factor(temp)13.3241663 0.1555392 0.1682512 0.924 0.355360
## factor(temp)13.3258343 0.0593667 0.1638410 0.362 0.717132
## factor(temp)13.3429165 0.1948962 0.1619580 1.203 0.228967
## factor(temp)13.3466663 0.1362328 0.1700308 0.801 0.423092
## factor(temp)13.3474998 0.3765816 0.1817223 2.072 0.038360 *
## factor(temp)13.3533335 -0.1604231 0.2225590 -0.721 0.471106
## factor(temp)13.3545828 0.1977188 0.1659028 1.192 0.233484
## factor(temp)13.3551388 0.0005402 0.1817173 0.003 0.997628
## factor(temp)13.355834 0.2106557 0.2226952 0.946 0.344290
## factor(temp)13.3562498 0.0994064 0.1669178 0.596 0.551546
## factor(temp)13.3570833 0.3022922 0.1699980 1.778 0.075514 .
## factor(temp)13.3641663 0.2623108 0.1625723 1.614 0.106786
## factor(temp)13.3670826 0.4079936 0.1817270 2.245 0.024866 *
## factor(temp)13.3686457 0.0936615 0.1817202 0.515 0.606317
## factor(temp)13.3716669 0.2000624 0.1658870 1.206 0.227947
## factor(temp)13.378334 0.3799079 0.2225755 1.707 0.087994 .
## factor(temp)13.3811111 -0.3536336 0.1759929 -2.009 0.044626 *
## factor(temp)13.3845835 0.0086126 0.1669393 0.052 0.958859
## factor(temp)13.3858337 0.1797802 0.1669401 1.077 0.281642
## factor(temp)13.3937492 0.2301623 0.1683086 1.368 0.171614
## factor(temp)13.3966665 0.1010806 0.2225911 0.454 0.649797
## factor(temp)13.4017715 0.1172177 0.1817831 0.645 0.519113
## factor(temp)13.4029169 0.2621786 0.1724226 1.521 0.128521
## factor(temp)13.4033337 0.3599561 0.1700004 2.117 0.034345 *
## factor(temp)13.4104176 0.2077216 0.1724158 1.205 0.228427
## factor(temp)13.4120827 0.2463196 0.1614946 1.525 0.127348
## factor(temp)13.4129162 0.0448144 0.2225935 0.201 0.840461
## factor(temp)13.4137497 0.2771803 0.1817435 1.525 0.127380
## factor(temp)13.4162502 -0.0547199 0.1817267 -0.301 0.763360
## factor(temp)13.4174995 0.1009591 0.1760304 0.574 0.566346
## factor(temp)13.4179173 0.6424336 0.2225729 2.886 0.003937 **
## factor(temp)13.4183331 0.3930186 0.1927438 2.039 0.041568 *

```



```

## factor(temp)13.4191675 0.2656789 0.1724095 1.541 0.123473
## factor(temp)13.4212494 0.1674647 0.1700157 0.985 0.324740
## factor(temp)13.4229164 0.0558141 0.2225636 0.251 0.802010
## factor(temp)13.427084 -0.1367326 0.2225647 -0.614 0.539051
## factor(temp)13.4279165 0.2615962 0.2225580 1.175 0.239965
## factor(temp)13.4287491 0.0786519 0.1927549 0.408 0.683285
## factor(temp)13.4304171 0.2423900 0.1669350 1.452 0.146651
## factor(temp)13.439167 0.1363610 0.1759474 0.775 0.438421
## factor(temp)13.4487505 -0.1419079 0.1927398 -0.736 0.461651
## factor(temp)13.4541664 0.2944372 0.1724122 1.708 0.087830 .
## factor(temp)13.4545832 0.0739704 0.1759716 0.420 0.674270
## factor(temp)13.458333 -0.3617996 0.2225600 -1.626 0.104179
## factor(temp)13.4641666 -0.0130826 0.1724437 -0.076 0.939533
## factor(temp)13.4662495 0.1744206 0.2226202 0.783 0.433428
## factor(temp)13.467083 0.2321532 0.1759519 1.319 0.187175
## factor(temp)13.4716663 -0.0173277 0.1682979 -0.103 0.918006
## factor(temp)13.4753122 0.0264000 0.1927396 0.137 0.891066
## factor(temp)13.4766674 -0.0395475 0.2226112 -0.178 0.859013
## factor(temp)13.4849997 -0.1735811 0.1699867 -1.021 0.307303
## factor(temp)13.4854164 0.1654724 0.1614628 1.025 0.305560
## factor(temp)13.4858332 0.1685396 0.1724116 0.978 0.328413
## factor(temp)13.4891663 0.4469503 0.2225570 2.008 0.044744 *
## factor(temp)13.4891672 -0.0097686 0.2225777 -0.044 0.964997
## factor(temp)13.4908333 0.1481255 0.1817205 0.815 0.415091
## factor(temp)13.4925003 -0.3558684 0.1927675 -1.846 0.065018 .
## factor(temp)13.4970837 0.1632439 0.1650626 0.989 0.322786
## factor(temp)13.5037498 0.0380269 0.1700015 0.224 0.823023
## factor(temp)13.5216665 0.2399653 0.1619531 1.482 0.138571
## factor(temp)13.5291662 0.2056628 0.1629134 1.262 0.206943
## factor(temp)13.5358334 0.6339442 0.2225565 2.848 0.004436 **
## factor(temp)13.5391665 0.0428436 0.1699984 0.252 0.801047
## factor(temp)13.5395832 0.1140744 0.2226243 0.512 0.608420
## factor(temp)13.5433331 0.2567733 0.1817338 1.413 0.157831
## factor(temp)13.5445833 0.1464284 0.1700269 0.861 0.389222
## factor(temp)13.5645838 0.4200105 0.2225697 1.887 0.059285 .
## factor(temp)13.5675001 0.2665994 0.1622155 1.643 0.100432
## factor(temp)13.5775003 0.2773087 0.1724042 1.608 0.107880
## factor(temp)13.5795832 0.2081402 0.1724239 1.207 0.227513
## factor(temp)13.5816669 0.2652476 0.1643796 1.614 0.106758
## factor(temp)13.5829163 0.6348570 0.1817166 3.494 0.000486 ***
## factor(temp)13.6029167 -0.3517828 0.2226057 -1.580 0.114190
## factor(temp)13.6070833 -0.0763753 0.1682379 -0.454 0.649896
## factor(temp)13.6204166 0.0537596 0.2226173 0.241 0.809200
## factor(temp)13.6229172 0.1178766 0.1625386 0.725 0.468397
## factor(temp)13.6324997 0.2871107 0.1699973 1.689 0.091385 .
## factor(temp)13.6383333 0.5966917 0.1759464 3.391 0.000708 ***
## factor(temp)13.6416664 0.2764456 0.2225566 1.242 0.214325
## factor(temp)13.6441669 0.1546338 0.1699897 0.910 0.363103
## factor(temp)13.6616669 0.6333624 0.1927399 3.286 0.001033 **
## factor(temp)13.6670837 0.1972850 0.2226173 0.886 0.375607

```

```

## factor(temp)13.6674995 0.6426917 0.2225739 2.888 0.003922 **
## factor(temp)13.6829166 0.3460317 0.1658948 2.086 0.037113 *
## factor(temp)13.6941671 0.4010284 0.1622159 2.472 0.013508 *
## factor(temp)13.7008047 0.3165427 0.1927730 1.642 0.100730
## factor(temp)13.7037497 0.2018917 0.1629134 1.239 0.215389
## factor(temp)13.7179165 0.5753938 0.1650539 3.486 0.000500 ***
## factor(temp)13.7337494 0.0890118 0.1700218 0.524 0.600660
## factor(temp)13.736167 0.2216083 0.1700130 1.303 0.192555
## factor(temp)13.7562504 0.2058656 0.1724068 1.194 0.232586
## factor(temp)13.759409 0.4660236 0.1759465 2.649 0.008142 **
## factor(temp)13.7633333 0.1778313 0.1669572 1.065 0.286939
## factor(temp)13.7658339 0.1792486 0.1650754 1.086 0.277666
## factor(temp)13.7662506 0.6386648 0.1817221 3.515 0.000450 ***
## factor(temp)13.7825003 -0.3575295 0.1927587 -1.855 0.063764 .
## factor(temp)13.7833338 0.3297091 0.1669215 1.975 0.048372 *
## factor(temp)13.7950001 0.1728891 0.1817229 0.951 0.341517
## factor(temp)13.8112497 -0.3553583 0.2225833 -1.597 0.110524
## factor(temp)13.8699999 -0.0253431 0.2225586 -0.114 0.909351
## factor(temp)13.8718328 -0.0137530 0.1927452 -0.071 0.943123
## factor(temp)13.8908339 0.3189652 0.1658929 1.923 0.054651 .
## factor(temp)13.9091663 0.1647150 0.1817297 0.906 0.364842
## factor(temp)13.9750004 0.0851644 0.2225564 0.383 0.702008
## factor(temp)13.9904156 0.3185704 0.1759479 1.811 0.070346 .
## factor(temp)14.0508327 0.3106407 0.1759679 1.765 0.077654 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1574 on 2099 degrees of freedom
## Multiple R-squared:  0.6073, Adjusted R-squared:  0.5159
## F-statistic: 6.639 on 489 and 2099 DF,  p-value: < 2.2e-16

output[8,] <-coef(summary(m7))[2,1:2]
# There is a slight reduction in bias compared to the previous model. It
# seems that we have captured
# most of the variability in quality, but some bias remains. The choice
# depends on the analysis we
# want to perform (whether we want to focus on price, price and climate, or
# climate)

# Including a trend (in farm FE model)
# Creating the trend
df_l16$trend = df_l16$year - 2005
m8 = lm(wheat_share ~ wheat_price + factor(fid) + trend, data = df_l16)
summary(m8)

##
## Call:
## lm(formula = wheat_share ~ wheat_price + factor(fid) + trend,
##     data = df_l16)
##

```

```

## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.67563 -0.03663  0.00000  0.03749  0.63783
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.9449404  0.0558725  16.912 < 2e-16 ***
## wheat_price    0.0900479  0.0312125   2.885 0.003961 **
## factor(fid)1717 -0.5857954  0.1310620  -4.470 8.33e-06 ***
## factor(fid)1723 -0.6952102  0.0724206  -9.600 < 2e-16 ***
## factor(fid)1724 -0.8121048  0.1310813  -6.195 7.19e-10 ***
## factor(fid)1747 -0.5710580  0.0732474  -7.796 1.07e-14 ***
## factor(fid)1753 -0.9958969  0.0873395 -11.403 < 2e-16 ***
## factor(fid)1759 -0.6748775  0.0724093  -9.320 < 2e-16 ***
## factor(fid)1764 -0.6205707  0.1310189  -4.736 2.35e-06 ***
## factor(fid)1769 -0.5919855  0.0724104  -8.175 5.51e-16 ***
## factor(fid)1784 -0.8128464  0.0873393  -9.307 < 2e-16 ***
## factor(fid)1788 -0.5555152  0.0724093  -7.672 2.76e-14 ***
## factor(fid)1797 -0.6175947  0.0873377  -7.071 2.19e-12 ***
## factor(fid)1799 -0.5863735  0.0724134  -8.098 1.02e-15 ***
## factor(fid)1833 -0.9974308  0.0724163 -13.774 < 2e-16 ***
## factor(fid)1837 -0.4875734  0.0724102  -6.733 2.22e-11 ***
## factor(fid)1863 -0.7646927  0.1001091  -7.639 3.55e-14 ***
## factor(fid)1876 -0.4030391  0.0802316  -5.023 5.58e-07 ***
## factor(fid)1883 -0.6194547  0.1310840  -4.726 2.47e-06 ***
## factor(fid)1891 -1.0019888  0.0802231 -12.490 < 2e-16 ***
## factor(fid)1903 -0.3330442  0.1000862  -3.328 0.000894 ***
## factor(fid)1906 -0.4972428  0.0724216  -6.866 9.07e-12 ***
## factor(fid)1911 -0.4310280  0.0724113  -5.952 3.17e-09 ***
## factor(fid)1912 -0.5707097  0.0802243  -7.114 1.62e-12 ***
## factor(fid)1916 -0.5916471  0.1310813  -4.514 6.79e-06 ***
## factor(fid)1923 -0.6543110  0.1001084  -6.536 8.21e-11 ***
## factor(fid)1926 -0.6990209  0.1310723  -5.333 1.09e-07 ***
## factor(fid)1927 -0.6422790  0.0756381  -8.491 < 2e-16 ***
## factor(fid)1929 -0.9747664  0.0724133 -13.461 < 2e-16 ***
## factor(fid)1932 -0.4916620  0.0724209  -6.789 1.53e-11 ***
## factor(fid)1933 -0.3564773  0.1001095  -3.561 0.000379 ***
## factor(fid)1935 -0.4481156  0.0802227  -5.586 2.68e-08 ***
## factor(fid)1947 -0.4955816  0.0802337  -6.177 8.08e-10 ***
## factor(fid)1965 -0.6642210  0.1000615  -6.638 4.20e-11 ***
## factor(fid)1968 -0.9943954  0.1001176  -9.932 < 2e-16 ***
## factor(fid)1970 -0.6374396  0.1310032  -4.866 1.24e-06 ***
## factor(fid)1987 -1.0037178  0.1001193 -10.025 < 2e-16 ***
## factor(fid)1993 -0.5129363  0.0873747  -5.871 5.16e-09 ***
## factor(fid)1995 -0.3928896  0.1310840  -2.997 0.002762 **
## factor(fid)1997 -1.0089152  0.1310689  -7.698 2.27e-14 ***
## factor(fid)1999 -0.6339727  0.1310436  -4.838 1.42e-06 ***
## factor(fid)2888 -0.6203092  0.1310640  -4.733 2.39e-06 ***
## factor(fid)2891 -0.4989663  0.1310804  -3.807 0.000146 ***
## factor(fid)2917 -0.3580870  0.1310245  -2.733 0.006338 **

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```
## factor(fid)2923 -0.4224994 0.1001095 -4.220 2.56e-05 ***
## factor(fid)2940 -0.3546929 0.0873617 -4.060 5.12e-05 ***
## factor(fid)2943 -0.5556369 0.0873723 -6.359 2.56e-10 ***
## factor(fid)2953 -0.5206950 0.1310186 -3.974 7.34e-05 ***
## factor(fid)2984 -0.3608935 0.0873745 -4.130 3.79e-05 ***
## factor(fid)4792 -0.3879567 0.1310874 -2.960 0.003122 **
## factor(fid)4803 -0.3093973 0.1310631 -2.361 0.018348 *
## factor(fid)4827 -0.2284154 0.1001008 -2.282 0.022615 *
## factor(fid)4835 -0.7211059 0.1001062 -7.203 8.61e-13 ***
## factor(fid)4837 -0.9136153 0.1001149 -9.126 < 2e-16 ***
## factor(fid)4841 -0.4826095 0.1310633 -3.682 0.000238 ***
## factor(fid)4847 -0.7099705 0.1310196 -5.419 6.81e-08 ***
## factor(fid)4848 -0.4744395 0.1001007 -4.740 2.31e-06 ***
## factor(fid)4865 -0.5735461 0.1001009 -5.730 1.18e-08 ***
## factor(fid)4870 -0.5982313 0.0873624 -6.848 1.03e-11 ***
## factor(fid)4880 -0.5348423 0.0873623 -6.122 1.13e-09 ***
## factor(fid)4885 -0.4453218 0.0873673 -5.097 3.81e-07 ***
## factor(fid)4893 -0.4410121 0.1001007 -4.406 1.12e-05 ***
## factor(fid)4899 -0.4214661 0.0873618 -4.824 1.52e-06 ***
## factor(fid)4930 -0.3397824 0.0802244 -4.235 2.40e-05 ***
## factor(fid)4964 -0.4029348 0.0756423 -5.327 1.13e-07 ***
## factor(fid)4965 -0.2843779 0.0724117 -3.927 8.92e-05 ***
## factor(fid)4968 -0.7862594 0.1310622 -5.999 2.39e-09 ***
## factor(fid)4971 -0.5844520 0.0724130 -8.071 1.26e-15 ***
## factor(fid)4982 -0.3823461 0.0724095 -5.280 1.45e-07 ***
## factor(fid)6610 -0.5876402 0.1310732 -4.483 7.81e-06 ***
## factor(fid)6616 -0.5362651 0.1310632 -4.092 4.47e-05 ***
## factor(fid)6677 -0.4703200 0.0873626 -5.384 8.27e-08 ***
## factor(fid)6680 -0.5007760 0.0873727 -5.731 1.17e-08 ***
## factor(fid)6683 -0.4863504 0.0873627 -5.567 2.98e-08 ***
## factor(fid)6686 -0.3988482 0.1310209 -3.044 0.002367 **
## factor(fid)6693 -0.1292501 0.0873672 -1.479 0.139212
## factor(fid)6694 -0.4319585 0.1001008 -4.315 1.68e-05 ***
## factor(fid)6701 -0.4802539 0.1001055 -4.797 1.74e-06 ***
## factor(fid)6714 -0.3503497 0.1310694 -2.673 0.007586 **
## factor(fid)6727 -0.4328658 0.0756330 -5.723 1.22e-08 ***
## factor(fid)6730 0.0009860 0.0873714 0.011 0.990997
## factor(fid)6736 -0.4683726 0.0724098 -6.468 1.27e-10 ***
## factor(fid)6745 -0.3602361 0.0873659 -4.123 3.91e-05 ***
## factor(fid)6753 -0.2115625 0.0724093 -2.922 0.003524 **
## factor(fid)6756 -0.4853550 0.0724095 -6.703 2.73e-11 ***
## factor(fid)6767 -0.6465734 0.1001008 -6.459 1.35e-10 ***
## factor(fid)6804 -0.5053506 0.0724334 -6.977 4.23e-12 ***
## factor(fid)6811 -0.6496628 0.0724388 -8.968 < 2e-16 ***
## factor(fid)6821 -0.4004385 0.0873659 -4.583 4.89e-06 ***
## factor(fid)6824 -0.4538538 0.0724157 -6.267 4.59e-10 ***
## factor(fid)6825 -0.3337960 0.0802413 -4.160 3.33e-05 ***
## factor(fid)6835 -0.5791432 0.0724282 -7.996 2.28e-15 ***
## factor(fid)6848 -0.4531048 0.0724170 -6.257 4.90e-10 ***
## factor(fid)6849 -0.6416726 0.1310633 -4.896 1.07e-06 ***
```

```

## factor(fid)6850 -0.2775900 0.1310756 -2.118 0.034330 *
## factor(fid)6865 -0.4004181 0.0724100 -5.530 3.68e-08 ***
## factor(fid)6867 -0.5235333 0.0724159 -7.230 7.14e-13 ***
## factor(fid)6870 0.0107407 0.1310608 0.082 0.934694
## factor(fid)6876 -0.3571818 0.1310255 -2.726 0.006472 **
## factor(fid)6878 -0.3534968 0.0724107 -4.882 1.14e-06 ***
## factor(fid)6885 -0.5978056 0.0724111 -8.256 2.89e-16 ***
## factor(fid)6894 -0.4856273 0.0724093 -6.707 2.66e-11 ***
## factor(fid)6905 -0.4195224 0.0724194 -5.793 8.15e-09 ***
## factor(fid)6908 -0.2807698 0.0724119 -3.877 0.000109 ***
## factor(fid)6909 -0.4600610 0.0874017 -5.264 1.58e-07 ***
## factor(fid)6915 -0.2780947 0.1000555 -2.779 0.005503 **
## factor(fid)6916 -0.5337187 0.1310527 -4.073 4.85e-05 ***
## factor(fid)6937 -0.5647118 0.1310255 -4.310 1.72e-05 ***
## factor(fid)6941 -0.5399532 0.1310286 -4.121 3.95e-05 ***
## factor(fid)11499 -0.9985828 0.1310201 -7.622 4.03e-14 ***
## factor(fid)11751 -0.4875075 0.1310664 -3.720 0.000206 ***
## factor(fid)11788 -0.9875075 0.1310664 -7.534 7.73e-14 ***
## factor(fid)11984 -0.9956585 0.1000608 -9.951 < 2e-16 ***
## factor(fid)12090 -0.9910321 0.1310232 -7.564 6.22e-14 ***
## factor(fid)12417 -0.9676170 0.1000613 -9.670 < 2e-16 ***
## factor(fid)12424 -0.9888667 0.1001139 -9.877 < 2e-16 ***
## factor(fid)12442 -0.9990804 0.0724106 -13.797 < 2e-16 ***
## factor(fid)12511 -0.9867014 0.1310700 -7.528 8.11e-14 ***
## factor(fid)12540 -0.4175943 0.0756315 -5.521 3.85e-08 ***
## factor(fid)12547 -0.3878538 0.0724296 -5.355 9.66e-08 ***
## factor(fid)12553 -0.3941359 0.0873868 -4.510 6.89e-06 ***
## factor(fid)12558 -0.6884835 0.0724093 -9.508 < 2e-16 ***
## factor(fid)12560 -0.9974804 0.0724161 -13.774 < 2e-16 ***
## factor(fid)12562 -0.5310076 0.1310827 -4.051 5.32e-05 ***
## factor(fid)12608 -0.6811982 0.1001358 -6.803 1.39e-11 ***
## factor(fid)12624 -0.9867014 0.1310700 -7.528 8.11e-14 ***
## factor(fid)12628 -0.0145750 0.1310842 -0.111 0.911479
## factor(fid)12641 -0.9471737 0.1310232 -7.229 7.17e-13 ***
## factor(fid)12661 -0.7248237 0.1001139 -7.240 6.63e-13 ***
## factor(fid)12662 -0.9930400 0.1000793 -9.923 < 2e-16 ***
## factor(fid)12672 -0.6534503 0.1000672 -6.530 8.53e-11 ***
## factor(fid)12686 -1.0007205 0.1310319 -7.637 3.59e-14 ***
## factor(fid)12755 -0.9910321 0.1310232 -7.564 6.22e-14 ***
## factor(fid)12782 -1.0014547 0.0802426 -12.480 < 2e-16 ***
## factor(fid)12798 -0.6379926 0.0802401 -7.951 3.24e-15 ***
## factor(fid)12802 -0.2178881 0.1000566 -2.178 0.029562 *
## factor(fid)12803 0.0006215 0.1309950 0.005 0.996215
## factor(fid)12821 -0.4206919 0.1001165 -4.202 2.78e-05 ***
## factor(fid)12856 -1.0140897 0.1310817 -7.736 1.70e-14 ***
## factor(fid)12862 -0.7304304 0.0873793 -8.359 < 2e-16 ***
## factor(fid)12867 -0.3114296 0.1310381 -2.377 0.017576 *
## factor(fid)12885 -0.7895119 0.1310348 -6.025 2.04e-09 ***
## factor(fid)12898 -0.9929601 0.1310348 -7.578 5.60e-14 ***
## factor(fid)12911 -0.3499938 0.1310842 -2.670 0.007654 **

```

```
## factor(fid)12934 -0.0077869 0.1001127 -0.078 0.938010
## factor(fid)31006 -0.4529991 0.1001239 -4.524 6.45e-06 ***
## factor(fid)31024 -0.3254104 0.1310951 -2.482 0.013147 *
## factor(fid)31025 -0.5926146 0.1310803 -4.521 6.56e-06 ***
## factor(fid)31026 -0.5043216 0.1310840 -3.847 0.000124 ***
## factor(fid)31032 -0.6298029 0.1310831 -4.805 1.68e-06 ***
## factor(fid)31036 -0.8089723 0.1310831 -6.171 8.35e-10 ***
## factor(fid)32005 -0.6081824 0.0756402 -8.040 1.61e-15 ***
## factor(fid)32016 -0.4673840 0.0873630 -5.350 9.93e-08 ***
## factor(fid)32019 -0.1518699 0.0873335 -1.739 0.082213 .
## factor(fid)32024 -0.7975650 0.1001092 -7.967 2.86e-15 ***
## factor(fid)32030 -0.9987010 0.1310424 -7.621 4.05e-14 ***
## factor(fid)32032 -0.6853842 0.0756338 -9.062 < 2e-16 ***
## factor(fid)32037 -0.4783572 0.0756469 -6.324 3.22e-10 ***
## factor(fid)32041 -0.4554669 0.0802184 -5.678 1.59e-08 ***
## factor(fid)32043 -0.2688906 0.1310596 -2.052 0.040347 *
## factor(fid)32049 -0.6660298 0.0724148 -9.197 < 2e-16 ***
## factor(fid)32056 -0.4097673 0.1001018 -4.094 4.44e-05 ***
## factor(fid)32060 -0.3444773 0.0873633 -3.943 8.35e-05 ***
## factor(fid)32062 -0.5078595 0.0724113 -7.014 3.28e-12 ***
## factor(fid)32067 -0.2708245 0.1001154 -2.705 0.006892 **
## factor(fid)32069 -0.2170561 0.0724387 -2.996 0.002769 **
## factor(fid)32072 -0.3960045 0.0724102 -5.469 5.16e-08 ***
## factor(fid)32107 -0.2818578 0.0724137 -3.892 0.000103 ***
## factor(fid)32122 -0.7445118 0.0724110 -10.282 < 2e-16 ***
## factor(fid)32176 -0.3519713 0.1001011 -3.516 0.000449 ***
## factor(fid)32184 -0.8021212 0.0873627 -9.182 < 2e-16 ***
## factor(fid)32186 -0.6959901 0.0724137 -9.611 < 2e-16 ***
## factor(fid)32187 -0.3601430 0.0756347 -4.762 2.07e-06 ***
## factor(fid)32188 -0.4150971 0.0756420 -5.488 4.65e-08 ***
## factor(fid)32189 -0.1446865 0.0873712 -1.656 0.097897 .
## factor(fid)32204 -0.2503369 0.0724100 -3.457 0.000559 ***
## factor(fid)32218 -0.2427036 0.0724159 -3.352 0.000820 ***
## factor(fid)32224 -0.3905980 0.0724136 -5.394 7.81e-08 ***
## factor(fid)32225 -0.5139103 0.0756367 -6.794 1.47e-11 ***
## factor(fid)32236 -0.4655292 0.0724159 -6.429 1.65e-10 ***
## factor(fid)32237 -0.5710056 0.0756321 -7.550 6.90e-14 ***
## factor(fid)32239 -0.4177202 0.1310298 -3.188 0.001457 **
## factor(fid)32240 -0.7497185 0.0724143 -10.353 < 2e-16 ***
## factor(fid)32247 -0.9223440 0.0873635 -10.558 < 2e-16 ***
## factor(fid)32253 -0.4879428 0.0724572 -6.734 2.21e-11 ***
## factor(fid)32272 -0.3936531 0.1310606 -3.004 0.002705 **
## factor(fid)32287 -0.4279209 0.0756379 -5.657 1.78e-08 ***
## factor(fid)32298 -0.6807008 0.1310298 -5.195 2.28e-07 ***
## factor(fid)32301 -0.6348409 0.0724162 -8.767 < 2e-16 ***
## factor(fid)32302 -0.2806236 0.1310577 -2.141 0.032391 *
## factor(fid)32304 -0.4570474 0.0873699 -5.231 1.88e-07 ***
## factor(fid)32312 -0.4129055 0.0724189 -5.702 1.38e-08 ***
## factor(fid)32323 -0.6001706 0.0724108 -8.288 2.22e-16 ***
## factor(fid)32340 -0.4113802 0.0724127 -5.681 1.56e-08 ***
```

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## factor(fid)32342 0.0077787 0.0873680 0.089 0.929065
## factor(fid)32344 -0.7147406 0.0873564 -8.182 5.23e-16 ***
## factor(fid)32345 -0.7568869 0.1001198 -7.560 6.40e-14 ***
## factor(fid)32351 -0.9964720 0.0873627 -11.406 < 2e-16 ***
## factor(fid)32352 -0.6362299 0.0756529 -8.410 < 2e-16 ***
## factor(fid)32359 -0.1152736 0.1001011 -1.152 0.249651
## factor(fid)32360 -0.4927643 0.0802414 -6.141 1.01e-09 ***
## factor(fid)32367 -0.9998477 0.0756289 -13.220 < 2e-16 ***
## factor(fid)32372 -0.5405482 0.0724117 -7.465 1.29e-13 ***
## factor(fid)32387 -0.8905943 0.0802397 -11.099 < 2e-16 ***
## factor(fid)32391 -0.7587363 0.0756598 -10.028 < 2e-16 ***
## factor(fid)32395 -0.6900312 0.1310644 -5.265 1.57e-07 ***
## factor(fid)32397 -0.5705934 0.0802430 -7.111 1.66e-12 ***
## factor(fid)32399 -1.0013172 0.1309981 -7.644 3.41e-14 ***
## factor(fid)32415 -0.3738118 0.1309973 -2.854 0.004373 **
## factor(fid)32432 -0.0687535 0.1310424 -0.525 0.599880
## factor(fid)32433 -0.5765805 0.1310657 -4.399 1.15e-05 ***
## factor(fid)32434 -0.4679851 0.1310716 -3.570 0.000366 ***
## factor(fid)32437 -0.9925457 0.1310383 -7.574 5.74e-14 ***
## factor(fid)32439 -0.4469013 0.1001417 -4.463 8.60e-06 ***
## factor(fid)32443 -0.5615874 0.1310716 -4.285 1.93e-05 ***
## factor(fid)32444 -1.0148212 0.1310855 -7.742 1.63e-14 ***
## factor(fid)32451 -0.7365237 0.1001131 -7.357 2.85e-13 ***
## factor(fid)32453 -0.5423258 0.1310424 -4.139 3.66e-05 ***
## factor(fid)32461 -0.7560870 0.1001136 -7.552 6.77e-14 ***
## factor(fid)32462 -0.5717864 0.1003143 -5.700 1.40e-08 ***
## factor(fid)32466 -0.4726858 0.1001200 -4.721 2.53e-06 ***
## factor(fid)32469 -0.7344437 0.1001306 -7.335 3.34e-13 ***
## factor(fid)32471 -0.5406374 0.1001152 -5.400 7.55e-08 ***
## factor(fid)32479 -0.3102719 0.1310951 -2.367 0.018050 *
## factor(fid)32480 -0.3410338 0.1310951 -2.601 0.009360 **
## factor(fid)32500 -0.9984560 0.1309948 -7.622 4.02e-14 ***
## factor(fid)32503 -0.5213886 0.0802448 -6.497 1.06e-10 ***
## factor(fid)32508 -0.8708387 0.0802454 -10.852 < 2e-16 ***
## factor(fid)32513 -0.7557397 0.0802388 -9.419 < 2e-16 ***
## factor(fid)32530 -0.5694357 0.1001174 -5.688 1.50e-08 ***
## factor(fid)32541 -1.0054903 0.1001140 -10.043 < 2e-16 ***
## factor(fid)32546 -0.5317769 0.1310723 -4.057 5.18e-05 ***
## factor(fid)32557 -0.4175505 0.1310702 -3.186 0.001469 **
## factor(fid)33031 -0.5187010 0.1310710 -3.957 7.87e-05 ***
## factor(fid)33065 -0.3366623 0.0874065 -3.852 0.000121 ***
## factor(fid)33134 -0.5918329 0.0724162 -8.173 5.63e-16 ***
## factor(fid)33143 -0.3649260 0.0802459 -4.548 5.79e-06 ***
## factor(fid)33166 -0.5986652 0.0756593 -7.913 4.37e-15 ***
## factor(fid)33186 -0.3706718 0.0724240 -5.118 3.42e-07 ***
## factor(fid)33189 -0.5371662 0.1000477 -5.369 8.94e-08 ***
## factor(fid)33248 -0.7665441 0.0802335 -9.554 < 2e-16 ***
## factor(fid)33274 -0.4218895 0.1310623 -3.219 0.001309 **
## factor(fid)33294 -0.4962480 0.0724105 -6.853 9.89e-12 ***
## factor(fid)33301 -0.7455346 0.0724152 -10.295 < 2e-16 ***
```

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## factor(fid)33308 -0.9883586 0.1310634 -7.541 7.36e-14 ***
## factor(fid)33348 -0.4474592 0.1310359 -3.415 0.000653 ***
## factor(fid)34012 -0.4080544 0.0756370 -5.395 7.77e-08 ***
## factor(fid)34014 -0.3534473 0.1310465 -2.697 0.007060 **
## factor(fid)34015 -0.2711593 0.1310196 -2.070 0.038632 *
## factor(fid)34016 -0.4773221 0.1310830 -3.641 0.000279 ***
## factor(fid)34017 -0.5234172 0.1310600 -3.994 6.77e-05 ***
## factor(fid)34018 -0.5326792 0.0724136 -7.356 2.87e-13 ***
## factor(fid)34020 -0.3810068 0.0724162 -5.261 1.60e-07 ***
## factor(fid)34032 -0.6281919 0.0724109 -8.675 < 2e-16 ***
## factor(fid)34070 -0.5071294 0.0724144 -7.003 3.52e-12 ***
## factor(fid)34073 -0.5371841 0.1310566 -4.099 4.34e-05 ***
## factor(fid)34082 -0.4806852 0.0724113 -6.638 4.19e-11 ***
## factor(fid)34083 -0.5621134 0.0802194 -7.007 3.43e-12 ***
## factor(fid)34086 -0.4639008 0.0756426 -6.133 1.06e-09 ***
## factor(fid)34087 -0.4890911 0.0724157 -6.754 1.94e-11 ***
## factor(fid)34088 -0.2084299 0.0724158 -2.878 0.004046 **
## factor(fid)34107 -0.1715525 0.0802505 -2.138 0.032675 *
## factor(fid)34125 -0.5670522 0.0724096 -7.831 8.20e-15 ***
## factor(fid)34133 -0.9863764 0.1310716 -7.525 8.26e-14 ***
## factor(fid)34136 -0.5733283 0.0756535 -7.578 5.58e-14 ***
## factor(fid)34137 -0.3410082 0.0724854 -4.705 2.74e-06 ***
## factor(fid)34141 -0.4631113 0.0724459 -6.393 2.08e-10 ***
## factor(fid)34143 -0.5019342 0.0873778 -5.744 1.08e-08 ***
## factor(fid)34148 -0.3984608 0.0802195 -4.967 7.44e-07 ***
## factor(fid)34149 -0.1868679 0.0873651 -2.139 0.032576 *
## factor(fid)34150 -0.6177825 0.0873674 -7.071 2.19e-12 ***
## factor(fid)34152 -0.0011003 0.1001341 -0.011 0.991234
## factor(fid)34155 -0.7630299 0.1000622 -7.626 3.92e-14 ***
## factor(fid)34157 -0.3201309 0.0756642 -4.231 2.44e-05 ***
## factor(fid)34160 -0.5033242 0.1001170 -5.027 5.47e-07 ***
## factor(fid)34169 -0.4777765 0.0873623 -5.469 5.16e-08 ***
## factor(fid)34179 -0.4790742 0.1001015 -4.786 1.84e-06 ***
## factor(fid)34181 -0.5643914 0.0724389 -7.791 1.11e-14 ***
## factor(fid)34184 -0.4922888 0.1000493 -4.920 9.42e-07 ***
## factor(fid)34188 -0.5273637 0.0756401 -6.972 4.38e-12 ***
## factor(fid)34189 -0.4065968 0.0724221 -5.614 2.28e-08 ***
## factor(fid)34196 -0.3962194 0.1310863 -3.023 0.002542 **
## factor(fid)34205 -0.6283447 0.0802543 -7.829 8.32e-15 ***
## factor(fid)34206 -0.5260406 0.0724096 -7.265 5.55e-13 ***
## factor(fid)34213 -0.5392668 0.0724093 -7.447 1.47e-13 ***
## factor(fid)34214 -0.6736363 0.0724288 -9.301 < 2e-16 ***
## factor(fid)34219 -0.4648779 0.0724103 -6.420 1.74e-10 ***
## factor(fid)34227 -0.5688118 0.0802526 -7.088 1.95e-12 ***
## factor(fid)34228 -0.6832691 0.0724193 -9.435 < 2e-16 ***
## factor(fid)34230 -0.5997392 0.0724097 -8.283 2.33e-16 ***
## factor(fid)34232 -0.3430659 0.0724100 -4.738 2.33e-06 ***
## factor(fid)34238 -0.5528313 0.0873829 -6.327 3.16e-10 ***
## factor(fid)34239 -0.5379675 0.1000883 -5.375 8.66e-08 ***
## factor(fid)34242 -0.2857346 0.0756368 -3.778 0.000163 ***
```



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## factor(fid)34244 -0.5609439 0.0724093 -7.747 1.56e-14 ***
## factor(fid)34246 -0.3953974 0.0724191 -5.460 5.43e-08 ***
## factor(fid)34251 -0.3438144 0.1001128 -3.434 0.000608 ***
## factor(fid)34253 -0.4354938 0.0724193 -6.014 2.19e-09 ***
## factor(fid)34254 -0.3403820 0.0756291 -4.501 7.21e-06 ***
## factor(fid)34256 -0.5146050 0.0724139 -7.106 1.71e-12 ***
## factor(fid)34261 -0.4317614 0.0724324 -5.961 3.01e-09 ***
## factor(fid)34262 -0.5167412 0.0873784 -5.914 3.99e-09 ***
## factor(fid)34263 -0.7046587 0.0802370 -8.782 < 2e-16 ***
## factor(fid)34265 -0.4157745 0.0724093 -5.742 1.10e-08 ***
## factor(fid)34267 -0.4114935 0.0873378 -4.712 2.65e-06 ***
## factor(fid)34277 -0.4985325 0.0724112 -6.885 7.98e-12 ***
## factor(fid)34282 -0.9984321 0.1310196 -7.620 4.07e-14 ***
## factor(fid)34283 -0.4726910 0.0724220 -6.527 8.71e-11 ***
## factor(fid)34287 -0.7685616 0.1310465 -5.865 5.34e-09 ***
## factor(fid)34289 -0.4974729 0.1310286 -3.797 0.000152 ***
## factor(fid)34300 -0.4199160 0.0756398 -5.552 3.26e-08 ***
## factor(fid)34303 -0.5738513 0.0756358 -7.587 5.23e-14 ***
## factor(fid)34305 -0.4528086 0.0873311 -5.185 2.40e-07 ***
## factor(fid)34307 -0.5008205 0.0756435 -6.621 4.71e-11 ***
## factor(fid)34311 -0.4754273 0.0756359 -6.286 4.09e-10 ***
## factor(fid)34312 -0.4783015 0.1310196 -3.651 0.000269 ***
## factor(fid)34315 -0.4053841 0.1000698 -4.051 5.32e-05 ***
## factor(fid)34318 -0.4705916 0.0756369 -6.222 6.11e-10 ***
## factor(fid)34320 -0.4778083 0.0873437 -5.470 5.12e-08 ***
## factor(fid)34322 -0.6232304 0.0802220 -7.769 1.32e-14 ***
## factor(fid)34327 -0.2911904 0.0756451 -3.849 0.000123 ***
## factor(fid)34329 -0.4771877 0.1000681 -4.769 2.00e-06 ***
## factor(fid)34331 -0.3854667 0.0756384 -5.096 3.83e-07 ***
## factor(fid)34333 -0.4824056 0.0802493 -6.011 2.22e-09 ***
## factor(fid)34335 -0.3985575 0.0802525 -4.966 7.47e-07 ***
## factor(fid)34336 -0.4612400 0.0802442 -5.748 1.06e-08 ***
## factor(fid)34339 -0.5985921 0.0802391 -7.460 1.34e-13 ***
## factor(fid)34346 -0.3174280 0.0802465 -3.956 7.93e-05 ***
## factor(fid)34347 -0.4863412 0.0802534 -6.060 1.65e-09 ***
## factor(fid)34353 -0.5215918 0.0874089 -5.967 2.90e-09 ***
## factor(fid)34360 -0.7338270 0.1001174 -7.330 3.47e-13 ***
## factor(fid)34361 -0.6500159 0.1310653 -4.959 7.74e-07 ***
## factor(fid)34368 -0.4036600 0.0873893 -4.619 4.13e-06 ***
## factor(fid)34370 -0.6842010 0.1001142 -6.834 1.13e-11 ***
## factor(fid)34371 -0.4710936 0.1310653 -3.594 0.000334 ***
## factor(fid)34374 -0.7110230 0.1001206 -7.102 1.77e-12 ***
## factor(fid)34376 -0.4681044 0.1310492 -3.572 0.000364 ***
## factor(fid)34380 -0.3602212 0.1310692 -2.748 0.006050 **
## factor(fid)34382 -0.8084613 0.1310692 -6.168 8.52e-10 ***
## factor(fid)34507 -0.5791237 0.0724222 -7.996 2.27e-15 ***
## factor(fid)34508 -0.3432192 0.1001045 -3.429 0.000620 ***
## factor(fid)34513 -0.4646723 0.0802629 -5.789 8.32e-09 ***
## factor(fid)34518 -0.5465769 0.0724132 -7.548 6.99e-14 ***
## factor(fid)34521 -0.7348121 0.0724100 -10.148 < 2e-16 ***
```

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## factor(fid)34525 -0.4952568 0.0724144 -6.839 1.09e-11 ***
## factor(fid)34529 -0.9978988 0.1310182 -7.616 4.19e-14 ***
## factor(fid)34531 -0.5917061 0.0756320 -7.823 8.70e-15 ***
## factor(fid)34540 -0.5388661 0.1000864 -5.384 8.24e-08 ***
## factor(fid)35179 0.0109492 0.1310614 0.084 0.933430
## factor(fid)35187 -0.5312985 0.1310716 -4.053 5.26e-05 ***
## factor(fid)35211 -0.2519025 0.1310621 -1.922 0.054763 .
## factor(fid)35214 0.0080783 0.1001023 0.081 0.935689
## factor(fid)35215 -0.3471446 0.1001007 -3.468 0.000537 ***
## factor(fid)35218 -0.3910475 0.1001017 -3.907 9.71e-05 ***
## factor(fid)35224 -0.2294155 0.1310664 -1.750 0.080224 .
## factor(fid)35225 -0.3760933 0.1001481 -3.755 0.000179 ***
## factor(fid)35228 -0.4283045 0.1001025 -4.279 1.98e-05 ***
## factor(fid)35239 -0.0586199 0.1002269 -0.585 0.558707
## factor(fid)35241 -0.4035647 0.1001015 -4.032 5.77e-05 ***
## factor(fid)35242 -0.2304735 0.1001050 -2.302 0.021431 *
## factor(fid)35246 -0.7375069 0.1001042 -7.367 2.64e-13 ***
## factor(fid)35248 -0.8699825 0.0873645 -9.958 < 2e-16 ***
## factor(fid)35250 -0.1875407 0.0873709 -2.146 0.031968 *
## factor(fid)35256 -0.3415974 0.0873700 -3.910 9.58e-05 ***
## factor(fid)35257 -0.4109063 0.0873626 -4.703 2.75e-06 ***
## factor(fid)35258 -0.4234551 0.1310696 -3.231 0.001257 **
## factor(fid)35259 -0.9863764 0.1310716 -7.525 8.26e-14 ***
## factor(fid)35265 -0.4075256 0.0873618 -4.665 3.32e-06 ***
## factor(fid)35269 -0.6463987 0.0873932 -7.396 2.14e-13 ***
## factor(fid)35274 -0.3152493 0.1001048 -3.149 0.001664 **
## factor(fid)35275 -0.4922937 0.0873656 -5.635 2.03e-08 ***
## factor(fid)35288 -0.4705732 0.0802488 -5.864 5.37e-09 ***
## factor(fid)35290 -0.6186307 0.0873619 -7.081 2.04e-12 ***
## factor(fid)35292 -0.7403955 0.0874525 -8.466 < 2e-16 ***
## factor(fid)35294 -0.3482051 0.0802333 -4.340 1.50e-05 ***
## factor(fid)35295 -0.4302631 0.0802321 -5.363 9.26e-08 ***
## factor(fid)35296 -0.4334255 0.1001007 -4.330 1.57e-05 ***
## factor(fid)35298 -0.8260790 0.0756732 -10.916 < 2e-16 ***
## factor(fid)35302 -0.5337232 0.0802341 -6.652 3.83e-11 ***
## factor(fid)35304 -0.9964473 0.0756358 -13.174 < 2e-16 ***
## factor(fid)35314 -0.0089066 0.1001117 -0.089 0.929118
## factor(fid)35322 -0.4987666 0.0756354 -6.594 5.60e-11 ***
## factor(fid)35325 -0.3152207 0.0756538 -4.167 3.24e-05 ***
## factor(fid)35329 -0.4925027 0.0756692 -6.509 9.81e-11 ***
## factor(fid)35332 -0.9389931 0.1310713 -7.164 1.14e-12 ***
## factor(fid)35337 -0.4129449 0.0724267 -5.702 1.39e-08 ***
## factor(fid)35345 -0.3333708 0.0724178 -4.603 4.45e-06 ***
## factor(fid)35357 -0.3461444 0.1001048 -3.458 0.000557 ***
## factor(fid)35373 -0.5112983 0.1001020 -5.108 3.61e-07 ***
## factor(fid)35374 -0.3243330 0.0724093 -4.479 7.97e-06 ***
## factor(fid)35375 -0.3257183 0.0756443 -4.306 1.75e-05 ***
## factor(fid)35378 -0.3256260 0.1001240 -3.252 0.001166 **
## factor(fid)35386 -0.3404424 0.0724130 -4.701 2.78e-06 ***
## factor(fid)35388 -0.1476371 0.0802363 -1.840 0.065929 .
```

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## factor(fid)35392 -0.2292122 0.0874483 -2.621 0.008838 **
## factor(fid)35393 -0.3713733 0.0724095 -5.129 3.23e-07 ***
## factor(fid)35395 -0.3374091 0.0756322 -4.461 8.66e-06 ***
## factor(fid)35402 -0.6755020 0.0724096 -9.329 < 2e-16 ***
## factor(fid)35403 -0.5544947 0.0756406 -7.331 3.45e-13 ***
## factor(fid)35404 -0.1183537 0.1310465 -0.903 0.366571
## factor(fid)35407 -0.4684294 0.0724435 -6.466 1.29e-10 ***
## factor(fid)35413 -0.3651560 0.0724319 -5.041 5.09e-07 ***
## factor(fid)35422 -0.2228561 0.0724157 -3.077 0.002119 **
## factor(fid)35425 -0.5498915 0.0802307 -6.854 9.85e-12 ***
## factor(fid)35426 -0.3759935 0.0724279 -5.191 2.33e-07 ***
## factor(fid)35427 -0.7831506 0.0873617 -8.964 < 2e-16 ***
## factor(fid)35428 -0.3164101 0.0724155 -4.369 1.32e-05 ***
## factor(fid)35430 -0.3583829 0.0873695 -4.102 4.28e-05 ***
## factor(fid)35431 -0.3225835 0.0873635 -3.692 0.000229 ***
## factor(fid)35435 -0.5357438 0.0873849 -6.131 1.07e-09 ***
## factor(fid)35436 -0.8120094 0.0724608 -11.206 < 2e-16 ***
## factor(fid)35439 -0.3855556 0.0756560 -5.096 3.83e-07 ***
## factor(fid)35447 -0.4589173 0.0803016 -5.715 1.28e-08 ***
## factor(fid)35449 -0.4332365 0.1001043 -4.328 1.59e-05 ***
## factor(fid)35450 -0.3932101 0.0724111 -5.430 6.40e-08 ***
## factor(fid)35453 -0.2655835 0.0724144 -3.668 0.000252 ***
## factor(fid)35454 -0.7012724 0.0724431 -9.680 < 2e-16 ***
## factor(fid)35455 -0.0016836 0.0724108 -0.023 0.981453
## factor(fid)35456 -0.9749021 0.0756324 -12.890 < 2e-16 ***
## factor(fid)35457 -0.6724953 0.1310863 -5.130 3.21e-07 ***
## factor(fid)35461 -0.3574902 0.0873646 -4.092 4.47e-05 ***
## factor(fid)35462 -0.5043416 0.0724383 -6.962 4.68e-12 ***
## factor(fid)35463 -0.4745802 0.0724093 -6.554 7.29e-11 ***
## factor(fid)35464 -0.4813381 0.1001010 -4.809 1.65e-06 ***
## factor(fid)35465 -0.5921119 0.0724108 -8.177 5.44e-16 ***
## factor(fid)35466 -0.9978028 0.0724146 -13.779 < 2e-16 ***
## factor(fid)35479 -0.5883313 0.1309955 -4.491 7.53e-06 ***
## factor(fid)35482 -0.2314030 0.0756439 -3.059 0.002253 **
## factor(fid)35484 -0.3900361 0.0724329 -5.385 8.21e-08 ***
## factor(fid)35488 -0.3574510 0.0873634 -4.092 4.48e-05 ***
## factor(fid)35491 0.0095982 0.0802652 0.120 0.904828
## factor(fid)35492 -0.3143068 0.0873905 -3.597 0.000331 ***
## factor(fid)35493 -0.7624679 0.0802400 -9.502 < 2e-16 ***
## factor(fid)35513 -0.5861069 0.1001049 -5.855 5.66e-09 ***
## factor(fid)35518 -0.3459582 0.0756319 -4.574 5.11e-06 ***
## factor(fid)35519 0.0063797 0.1310591 0.049 0.961182
## factor(fid)35524 -0.4950648 0.0724302 -6.835 1.12e-11 ***
## factor(fid)35527 -0.5234207 0.0873883 -5.990 2.54e-09 ***
## factor(fid)35533 -0.3939413 0.0756335 -5.209 2.12e-07 ***
## factor(fid)35535 -0.3382272 0.0873643 -3.871 0.000112 ***
## factor(fid)35537 -0.4474393 0.1310626 -3.414 0.000655 ***
## factor(fid)35559 -0.4739992 0.0724166 -6.545 7.72e-11 ***
## factor(fid)35567 -0.2571752 0.0873691 -2.944 0.003286 **
## factor(fid)35568 -0.5259973 0.0724115 -7.264 5.58e-13 ***
```

```
## factor(fid)35569 -0.2396954 0.1001011 -2.395 0.016744 *
## factor(fid)35570 0.0024574 0.0873653 0.028 0.977563
## factor(fid)35573 -0.0492133 0.0873667 -0.563 0.573304
## factor(fid)35576 -0.3954457 0.0724149 -5.461 5.40e-08 ***
## factor(fid)35579 -0.2684022 0.0724122 -3.707 0.000216 ***
## factor(fid)35580 -0.4198747 0.0724170 -5.798 7.91e-09 ***
## factor(fid)35587 -0.3319988 0.0724155 -4.585 4.86e-06 ***
## factor(fid)35588 -0.9966096 0.0873629 -11.408 < 2e-16 ***
## factor(fid)35591 -0.8108281 0.0724222 -11.196 < 2e-16 ***
## factor(fid)35593 -0.3383422 0.0724109 -4.673 3.20e-06 ***
## factor(fid)35594 -0.5312817 0.0873729 -6.081 1.46e-09 ***
## factor(fid)35595 -0.0062871 0.0724386 -0.087 0.930847
## factor(fid)35596 -0.4294841 0.0802382 -5.353 9.78e-08 ***
## factor(fid)35607 0.0040626 0.0873620 0.047 0.962915
## factor(fid)35613 -0.3741643 0.0724145 -5.167 2.64e-07 ***
## factor(fid)35614 -0.6357715 0.0724097 -8.780 < 2e-16 ***
## factor(fid)35620 -0.3111675 0.0756420 -4.114 4.07e-05 ***
## factor(fid)35622 -0.9991434 0.0724105 -13.798 < 2e-16 ***
## factor(fid)35623 -0.3405299 0.0724106 -4.703 2.76e-06 ***
## factor(fid)35624 -0.6189367 0.0756294 -8.184 5.15e-16 ***
## factor(fid)35625 -0.0158232 0.1310915 -0.121 0.903939
## factor(fid)35627 -0.9891821 0.1310727 -7.547 7.05e-14 ***
## factor(fid)35630 -0.4901701 0.0873643 -5.611 2.33e-08 ***
## factor(fid)35631 -0.6001819 0.0802457 -7.479 1.16e-13 ***
## factor(fid)35634 -0.7067813 0.0873693 -8.090 1.09e-15 ***
## factor(fid)35635 -0.3731624 0.0756340 -4.934 8.81e-07 ***
## factor(fid)35636 -0.3862659 0.1310915 -2.947 0.003255 **
## factor(fid)35637 -0.4140568 0.0724114 -5.718 1.26e-08 ***
## factor(fid)35638 -0.4326625 0.0802285 -5.393 7.85e-08 ***
## factor(fid)35640 -0.5571736 0.0873620 -6.378 2.28e-10 ***
## factor(fid)35654 -0.3786495 0.0757237 -5.000 6.28e-07 ***
## factor(fid)35655 -0.4525192 0.0873623 -5.180 2.47e-07 ***
## factor(fid)35657 -0.2154829 0.0724158 -2.976 0.002963 **
## factor(fid)35666 -0.4749075 0.0724550 -6.555 7.28e-11 ***
## factor(fid)35668 -0.5456566 0.0802438 -6.800 1.42e-11 ***
## factor(fid)35672 -0.3614065 0.0724757 -4.987 6.74e-07 ***
## factor(fid)35673 -0.2501315 0.0724463 -3.453 0.000568 ***
## factor(fid)35674 -0.6538211 0.0724361 -9.026 < 2e-16 ***
## factor(fid)35675 -0.3159353 0.0873753 -3.616 0.000308 ***
## factor(fid)35679 -0.5572732 0.0724095 -7.696 2.30e-14 ***
## factor(fid)35680 -0.4548176 0.1310586 -3.470 0.000532 ***
## factor(fid)35681 -0.7532094 0.0724099 -10.402 < 2e-16 ***
## factor(fid)35683 -0.5350378 0.0724597 -7.384 2.34e-13 ***
## factor(fid)35684 -0.3322236 0.0756379 -4.392 1.19e-05 ***
## factor(fid)35685 -0.4039948 0.0724096 -5.579 2.78e-08 ***
## factor(fid)35686 -0.2099651 0.0874086 -2.402 0.016402 *
## factor(fid)35687 -0.2115265 0.1310595 -1.614 0.106709
## factor(fid)35688 -0.4342519 0.0756364 -5.741 1.10e-08 ***
## factor(fid)35690 -0.3116913 0.0724371 -4.303 1.78e-05 ***
## factor(fid)35692 -0.4713464 0.0724240 -6.508 9.84e-11 ***
```

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## factor(fid)35696 -0.5982974 0.0802330 -7.457 1.37e-13 ***
## factor(fid)35697 0.0007727 0.0873725 0.009 0.992945
## factor(fid)35698 -0.4982914 0.0873713 -5.703 1.37e-08 ***
## factor(fid)35699 -0.1717922 0.1001009 -1.716 0.086300 .
## factor(fid)35702 -0.2698050 0.0873924 -3.087 0.002051 **
## factor(fid)35706 -0.1831818 0.1000793 -1.830 0.067361 .
## factor(fid)35707 -0.2473300 0.0756378 -3.270 0.001096 **
## factor(fid)35708 -0.3100664 0.0724105 -4.282 1.95e-05 ***
## factor(fid)35709 -0.4166119 0.1310182 -3.180 0.001499 **
## factor(fid)35710 -0.2051511 0.0724172 -2.833 0.004664 **
## factor(fid)35712 -0.3580723 0.0873623 -4.099 4.34e-05 ***
## factor(fid)35714 -0.3900416 0.0873804 -4.464 8.56e-06 ***
## factor(fid)35715 -0.4467215 0.0756454 -5.905 4.20e-09 ***
## factor(fid)35718 -0.4884113 0.0724105 -6.745 2.06e-11 ***
## factor(fid)35720 -0.2777026 0.0724152 -3.835 0.000130 ***
## factor(fid)35721 -0.9963126 0.1310155 -7.605 4.58e-14 ***
## factor(fid)35731 -0.3358915 0.0873869 -3.844 0.000125 ***
## factor(fid)35732 -0.3957369 0.0724093 -5.465 5.27e-08 ***
## factor(fid)35733 -0.3502053 0.0724106 -4.836 1.44e-06 ***
## factor(fid)35735 -0.6476243 0.0724343 -8.941 < 2e-16 ***
## factor(fid)35738 -0.4542151 0.0724126 -6.273 4.44e-10 ***
## factor(fid)35739 -0.4050032 0.0724314 -5.592 2.60e-08 ***
## factor(fid)35746 -0.2994125 0.0724177 -4.135 3.72e-05 ***
## factor(fid)35748 -0.3435254 0.0727988 -4.719 2.56e-06 ***
## factor(fid)35754 -0.2269092 0.0873619 -2.597 0.009472 **
## factor(fid)35755 -0.4144811 0.1310613 -3.162 0.001590 **
## factor(fid)35756 -0.3382048 0.0724122 -4.671 3.23e-06 ***
## factor(fid)35757 -0.3056096 0.1310668 -2.332 0.019826 *
## factor(fid)35758 -0.5377198 0.0802881 -6.697 2.83e-11 ***
## factor(fid)35760 -0.6302398 0.0724104 -8.704 < 2e-16 ***
## factor(fid)35761 -0.5202252 0.0724255 -7.183 9.96e-13 ***
## factor(fid)35767 -0.6932361 0.0873314 -7.938 3.59e-15 ***
## factor(fid)35770 -0.2968200 0.1000861 -2.966 0.003060 **
## factor(fid)35772 -0.3417837 0.1000610 -3.416 0.000650 ***
## factor(fid)35773 -0.2536856 0.1000757 -2.535 0.011331 *
## factor(fid)35774 -0.4898652 0.0756712 -6.474 1.23e-10 ***
## factor(fid)35775 -0.5377620 0.1310155 -4.105 4.23e-05 ***
## factor(fid)35777 -0.3835509 0.0756363 -5.071 4.37e-07 ***
## factor(fid)35779 -0.4876352 0.0756473 -6.446 1.47e-10 ***
## factor(fid)35780 -0.2496239 0.1000620 -2.495 0.012696 *
## factor(fid)35782 -0.4210208 0.0873767 -4.818 1.57e-06 ***
## factor(fid)35789 -0.2150795 0.1000660 -2.149 0.031738 *
## factor(fid)35797 -0.3738198 0.0802498 -4.658 3.42e-06 ***
## factor(fid)35798 -0.2737067 0.0803741 -3.405 0.000675 ***
## factor(fid)35799 -0.4291655 0.0804925 -5.332 1.10e-07 ***
## factor(fid)35800 -0.3506991 0.1000927 -3.504 0.000470 ***
## factor(fid)35801 -0.3368877 0.0802434 -4.198 2.82e-05 ***
## factor(fid)35802 -0.3977127 0.1309992 -3.036 0.002432 **
## factor(fid)35804 -0.3526542 0.1309955 -2.692 0.007166 **
## factor(fid)35805 -0.4261559 0.0802470 -5.311 1.23e-07 ***
```

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## factor(fid)35806 -0.5136714 0.0874134 -5.876 4.99e-09 ***
## factor(fid)35807 -0.2971927 0.0802426 -3.704 0.000219 ***
## factor(fid)35808 -0.5180702 0.0873567 -5.931 3.61e-09 ***
## factor(fid)35810 -0.4054207 0.1000548 -4.052 5.30e-05 ***
## factor(fid)35813 -0.4357134 0.0873663 -4.987 6.72e-07 ***
## factor(fid)35822 -0.6780475 0.0802645 -8.448 < 2e-16 ***
## factor(fid)35823 -0.3260033 0.0802489 -4.062 5.07e-05 ***
## factor(fid)35825 -0.5556913 0.1001124 -5.551 3.27e-08 ***
## factor(fid)35826 -0.8057996 0.1309965 -6.151 9.45e-10 ***
## factor(fid)35827 -0.4670101 0.0803052 -5.815 7.14e-09 ***
## factor(fid)35828 -0.5061759 0.0802668 -6.306 3.59e-10 ***
## factor(fid)35829 -0.3250729 0.1000615 -3.249 0.001181 **
## factor(fid)35831 -0.2739335 0.0802434 -3.414 0.000655 ***
## factor(fid)35832 -0.5209625 0.0873691 -5.963 2.98e-09 ***
## factor(fid)35833 -0.3445318 0.1000524 -3.444 0.000587 ***
## factor(fid)35834 -0.7510797 0.0802395 -9.360 < 2e-16 ***
## factor(fid)35838 -0.6568546 0.1001125 -6.561 6.97e-11 ***
## factor(fid)35839 -1.0024385 0.0873779 -11.472 < 2e-16 ***
## factor(fid)35841 -0.8505527 0.1001208 -8.495 < 2e-16 ***
## factor(fid)35842 -0.3680173 0.1000774 -3.677 0.000243 ***
## factor(fid)35844 -0.2474824 0.0874221 -2.831 0.004694 **
## factor(fid)35845 -0.5594063 0.0874170 -6.399 1.99e-10 ***
## factor(fid)35847 -0.5738049 0.1310756 -4.378 1.27e-05 ***
## factor(fid)35853 -0.4697074 0.1310653 -3.584 0.000348 ***
## factor(fid)35855 -0.8861186 0.1310417 -6.762 1.83e-11 ***
## factor(fid)35857 -0.5628756 0.1310417 -4.295 1.84e-05 ***
## factor(fid)35858 -0.3814049 0.0873719 -4.365 1.34e-05 ***
## factor(fid)35865 -0.5763459 0.0873763 -6.596 5.54e-11 ***
## factor(fid)35869 -0.3750475 0.0873766 -4.292 1.86e-05 ***
## factor(fid)35871 -0.6022877 0.0873987 -6.891 7.63e-12 ***
## factor(fid)35882 -0.4114716 0.1001175 -4.110 4.14e-05 ***
## factor(fid)35884 -0.7647489 0.1001383 -7.637 3.59e-14 ***
## factor(fid)35890 -0.2842380 0.1001132 -2.839 0.004574 **
## factor(fid)35891 -0.6499255 0.1001380 -6.490 1.11e-10 ***
## factor(fid)35894 -0.4194222 0.1001170 -4.189 2.93e-05 ***
## factor(fid)35896 -0.4162063 0.1001125 -4.157 3.37e-05 ***
## factor(fid)35905 -0.4763353 0.1001210 -4.758 2.12e-06 ***
## factor(fid)35915 -0.5084975 0.1001136 -5.079 4.18e-07 ***
## factor(fid)35921 -0.4578268 0.1001131 -4.573 5.13e-06 ***
## factor(fid)35923 -0.3419038 0.1001124 -3.415 0.000652 ***
## factor(fid)35929 -0.3952778 0.1310735 -3.016 0.002600 **
## factor(fid)35930 -0.2240178 0.1310756 -1.709 0.087610 .
## factor(fid)35937 -0.7178634 0.1310735 -5.477 4.94e-08 ***
## factor(fid)35938 -0.7019225 0.1311069 -5.354 9.72e-08 ***
## factor(fid)35939 -0.7236172 0.1310756 -5.521 3.87e-08 ***
## factor(fid)35941 -0.4785513 0.1310735 -3.651 0.000269 ***
## factor(fid)35942 -0.0158232 0.1310915 -0.121 0.903939 .
## factor(fid)35943 -0.2224953 0.1310915 -1.697 0.089823 .
## factor(fid)35945 -0.9787058 0.1310735 -7.467 1.27e-13 ***
## factor(fid)35946 -0.6761812 0.1310756 -5.159 2.76e-07 ***
```

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## factor(fid)35948 -0.4045774 0.1310756 -3.087 0.002056 **
## factor(fid)35950 -0.5942884 0.1310735 -4.534 6.17e-06 ***
## factor(fid)35953 -0.7799939 0.1310735 -5.951 3.20e-09 ***
## factor(fid)37051 -0.4587450 0.1310933 -3.499 0.000478 ***
## factor(fid)37068 -0.3211734 0.1310186 -2.451 0.014327 *
## factor(fid)37102 -0.5766564 0.0873618 -6.601 5.37e-11 ***
## factor(fid)37107 -0.4395456 0.0874288 -5.027 5.47e-07 ***
## factor(fid)37127 -0.3404298 0.0802373 -4.243 2.32e-05 ***
## factor(fid)37151 -0.5523532 0.0724259 -7.626 3.89e-14 ***
## factor(fid)37156 -0.2580375 0.0873619 -2.954 0.003181 **
## factor(fid)37159 -0.5080445 0.1310315 -3.877 0.000109 ***
## factor(fid)37169 -0.4975318 0.0802428 -6.200 6.98e-10 ***
## factor(fid)37179 -0.4703788 0.0756350 -6.219 6.21e-10 ***
## factor(fid)37182 -0.3639949 0.0756424 -4.812 1.62e-06 ***
## factor(fid)37183 -0.2847555 0.1310206 -2.173 0.029883 *
## factor(fid)37201 -0.5547066 0.1001027 -5.541 3.45e-08 ***
## factor(fid)37239 -0.4215342 0.0724273 -5.820 6.95e-09 ***
## factor(fid)37242 -0.4725805 0.0756507 -6.247 5.22e-10 ***
## factor(fid)37270 -0.3814541 0.0756677 -5.041 5.09e-07 ***
## factor(fid)37284 -0.6757378 0.0724417 -9.328 < 2e-16 ***
## factor(fid)37293 -0.3593464 0.0724281 -4.961 7.66e-07 ***
## factor(fid)37297 -0.9952019 0.0802337 -12.404 < 2e-16 ***
## factor(fid)37303 -0.4855728 0.1001473 -4.849 1.35e-06 ***
## factor(fid)37304 -0.6301356 0.0756491 -8.330 < 2e-16 ***
## factor(fid)37322 -0.6027379 0.0724125 -8.324 < 2e-16 ***
## factor(fid)37326 -0.5375999 0.0874047 -6.151 9.49e-10 ***
## factor(fid)37327 -1.0055784 0.1001138 -10.044 < 2e-16 ***
## factor(fid)37335 -0.6370089 0.1310858 -4.859 1.28e-06 ***
## factor(fid)37354 -0.4505906 0.0724159 -6.222 6.09e-10 ***
## factor(fid)37359 -0.4712065 0.0724460 -6.504 1.01e-10 ***
## factor(fid)37369 -0.9983122 0.1001142 -9.972 < 2e-16 ***
## factor(fid)37373 -0.5170044 0.0873638 -5.918 3.90e-09 ***
## factor(fid)37380 -0.3927928 0.0874018 -4.494 7.43e-06 ***
## factor(fid)37384 -0.4596033 0.0724181 -6.347 2.78e-10 ***
## factor(fid)37387 -0.0056712 0.1000648 -0.057 0.954811
## factor(fid)37390 -0.6495010 0.1001025 -6.488 1.12e-10 ***
## factor(fid)37391 -0.5409375 0.1310315 -4.128 3.82e-05 ***
## factor(fid)37392 -0.3313108 0.1310267 -2.529 0.011538 *
## factor(fid)37394 -0.1681815 0.0724094 -2.323 0.020310 *
## factor(fid)37399 -0.4593031 0.0724100 -6.343 2.84e-10 ***
## factor(fid)37402 -0.5774627 0.0724115 -7.975 2.69e-15 ***
## factor(fid)37405 -0.6963206 0.0756325 -9.207 < 2e-16 ***
## factor(fid)37423 -0.3804052 0.0873722 -4.354 1.41e-05 ***
## factor(fid)37424 -0.6251437 0.0873622 -7.156 1.21e-12 ***
## factor(fid)37425 -0.5233891 0.0802497 -6.522 9.00e-11 ***
## factor(fid)37428 -0.2954266 0.0756747 -3.904 9.82e-05 ***
## factor(fid)37429 -0.6688081 0.0802356 -8.336 < 2e-16 ***
## factor(fid)37431 -0.3048397 0.0873617 -3.489 0.000496 ***
## factor(fid)37432 -0.3653873 0.1001022 -3.650 0.000270 ***
## factor(fid)37433 -0.5696299 0.0724241 -7.865 6.31e-15 ***
```

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## factor(fid)37442 -0.4276692 0.0873623 -4.895 1.07e-06 ***
## factor(fid)37445 -0.4397915 0.0756293 -5.815 7.16e-09 ***
## factor(fid)37446 -0.5067799 0.0873625 -5.801 7.78e-09 ***
## factor(fid)37448 -0.4805992 0.0873825 -5.500 4.35e-08 ***
## factor(fid)37454 -0.2720429 0.0873436 -3.115 0.001871 **
## factor(fid)37456 -0.3612859 0.0873701 -4.135 3.71e-05 ***
## factor(fid)37457 -0.2256779 0.0802558 -2.812 0.004977 **
## factor(fid)37460 -0.2710304 0.0724099 -3.743 0.000188 ***
## factor(fid)37472 -0.4085320 0.0724102 -5.642 1.95e-08 ***
## factor(fid)37478 -0.8625085 0.0873455 -9.875 < 2e-16 ***
## factor(fid)37479 -0.3862608 0.0724124 -5.334 1.08e-07 ***
## factor(fid)37480 -0.5466474 0.0724251 -7.548 7.00e-14 ***
## factor(fid)37492 -0.9874753 0.1310666 -7.534 7.75e-14 ***
## factor(fid)37493 -0.6180786 0.0724097 -8.536 < 2e-16 ***
## factor(fid)37501 -0.4612009 0.0873666 -5.279 1.46e-07 ***
## factor(fid)37516 -0.6558225 0.0724098 -9.057 < 2e-16 ***
## factor(fid)37539 -0.9873424 0.1310671 -7.533 7.81e-14 ***
## factor(fid)37540 -0.0120741 0.1310774 -0.092 0.926617
## factor(fid)37552 -0.4333570 0.0756392 -5.729 1.18e-08 ***
## factor(fid)37554 -0.5377329 0.0724114 -7.426 1.72e-13 ***
## factor(fid)37560 -0.3292001 0.0724112 -4.546 5.83e-06 ***
## factor(fid)37561 -0.1940090 0.0802314 -2.418 0.015700 *
## factor(fid)37564 -0.9943668 0.1001010 -9.934 < 2e-16 ***
## factor(fid)37568 -0.4041269 0.0873711 -4.625 4.01e-06 ***
## factor(fid)37572 -0.9896229 0.1310676 -7.550 6.86e-14 ***
## factor(fid)37574 -0.5237218 0.0756368 -6.924 6.09e-12 ***
## factor(fid)37581 -0.6208856 0.0724121 -8.574 < 2e-16 ***
## factor(fid)37583 -0.4597371 0.0724098 -6.349 2.74e-10 ***
## factor(fid)37584 -0.7143486 0.1001125 -7.135 1.39e-12 ***
## factor(fid)37586 -0.2135105 0.0873704 -2.444 0.014632 *
## factor(fid)37597 -0.2721769 0.0802233 -3.393 0.000707 ***
## factor(fid)37605 -0.5705574 0.0724119 -7.879 5.66e-15 ***
## factor(fid)37606 -0.5201082 0.0873378 -5.955 3.12e-09 ***
## factor(fid)37609 -0.5756737 0.0802275 -7.176 1.05e-12 ***
## factor(fid)37619 -0.1313614 0.0873617 -1.504 0.132848
## factor(fid)37637 -0.3131874 0.1310315 -2.390 0.016943 *
## factor(fid)37652 -0.6543340 0.0802325 -8.155 6.46e-16 ***
## factor(fid)37662 0.0052118 0.1310151 0.040 0.968273
## factor(fid)37666 -0.6155450 0.0756383 -8.138 7.43e-16 ***
## factor(fid)37667 -0.5634441 0.0764215 -7.373 2.54e-13 ***
## factor(fid)37675 -0.5678761 0.0874128 -6.496 1.06e-10 ***
## factor(fid)37676 -0.5865205 0.0802625 -7.308 4.08e-13 ***
## factor(fid)37677 -0.9982289 0.1310454 -7.617 4.16e-14 ***
## factor(fid)37695 -1.0002292 0.1309959 -7.636 3.63e-14 ***
## factor(fid)37696 -0.8031633 0.0802501 -10.008 < 2e-16 ***
## factor(fid)37707 -0.4406865 0.0802387 -5.492 4.54e-08 ***
## factor(fid)37711 -0.4110412 0.0874104 -4.702 2.77e-06 ***
## factor(fid)37719 -0.5678450 0.1310972 -4.331 1.56e-05 ***
## factor(fid)37721 -0.5009769 0.0873777 -5.733 1.15e-08 ***
## factor(fid)37728 -0.6449384 0.1310972 -4.920 9.47e-07 ***
```



```
## factor(fid)37732 -0.3893400 0.0873727 -4.456 8.86e-06 ***
## factor(fid)37737 -0.3635809 0.0873901 -4.160 3.33e-05 ***
## factor(fid)37747 -0.4999448 0.0873766 -5.722 1.23e-08 ***
## factor(fid)37749 -0.4966872 0.0873747 -5.685 1.53e-08 ***
## factor(fid)37752 -0.6281262 0.0874196 -7.185 9.80e-13 ***
## factor(fid)37755 -0.9604407 0.0873747 -10.992 < 2e-16 ***
## factor(fid)37770 -0.6767490 0.1001153 -6.760 1.86e-11 ***
## factor(fid)37771 -0.3464951 0.1001380 -3.460 0.000552 ***
## factor(fid)37773 -0.4175902 0.1001138 -4.171 3.18e-05 ***
## factor(fid)37776 -0.4831842 0.1001129 -4.826 1.51e-06 ***
## factor(fid)37780 -0.5646497 0.1001127 -5.640 1.97e-08 ***
## factor(fid)37784 -0.3713912 0.1001151 -3.710 0.000214 ***
## factor(fid)37786 -0.6496284 0.1001132 -6.489 1.12e-10 ***
## factor(fid)37787 -0.4986261 0.1001155 -4.981 6.95e-07 ***
## factor(fid)37788 -0.5457453 0.1001126 -5.451 5.69e-08 ***
## factor(fid)37790 -0.6706010 0.1310245 -5.118 3.42e-07 ***
## factor(fid)37796 -0.7103339 0.1001124 -7.095 1.85e-12 ***
## factor(fid)37797 -0.3846798 0.1001174 -3.842 0.000126 ***
## factor(fid)37802 -0.5649295 0.1310402 -4.311 1.71e-05 ***
## factor(fid)37804 -0.6265573 0.1001145 -6.258 4.85e-10 ***
## factor(fid)37805 -0.4711987 0.1001129 -4.707 2.71e-06 ***
## factor(fid)37806 -0.6665270 0.1310402 -5.086 4.03e-07 ***
## factor(fid)37809 -0.5682053 0.1310454 -4.336 1.53e-05 ***
## factor(fid)37812 -0.5062607 0.1001129 -5.057 4.70e-07 ***
## factor(fid)37815 -0.5244888 0.1310972 -4.001 6.57e-05 ***
## factor(fid)37817 -0.5022958 0.1310972 -3.831 0.000132 ***
## factor(fid)37820 -1.0037586 0.1001192 -10.026 < 2e-16 ***
## factor(fid)37823 -0.6202122 0.1001246 -6.194 7.24e-10 ***
## factor(fid)37824 -0.0142838 0.1310827 -0.109 0.913240
## factor(fid)37827 -0.4336402 0.1310238 -3.310 0.000953 ***
## factor(fid)37829 -0.2985385 0.1310855 -2.277 0.022878 *
## factor(fid)37837 -0.6025148 0.1310690 -4.597 4.59e-06 ***
## factor(fid)37838 -0.2445328 0.1310759 -1.866 0.062263 .
## factor(fid)37842 -0.5698438 0.1310873 -4.347 1.46e-05 ***
## factor(fid)37843 -0.4686882 0.1310918 -3.575 0.000359 ***
## factor(fid)37849 -0.5054814 0.1310918 -3.856 0.000119 ***
## factor(fid)37856 -1.0128882 0.1310766 -7.727 1.81e-14 ***
## factor(fid)37858 -0.6579396 0.1310766 -5.020 5.69e-07 ***
## factor(fid)37859 -0.5971613 0.1310766 -4.556 5.57e-06 ***
## factor(fid)37861 -0.5632040 0.1310799 -4.297 1.83e-05 ***
## factor(fid)37866 -0.7861479 0.1310690 -5.998 2.41e-09 ***
## factor(fid)37868 -0.3225814 0.1310918 -2.461 0.013959 *
## factor(fid)39146 -0.7276368 0.1309961 -5.555 3.20e-08 ***
## factor(fid)39157 -0.6624244 0.1004009 -6.598 5.48e-11 ***
## factor(fid)39189 -0.8366649 0.1310689 -6.383 2.20e-10 ***
## factor(fid)39244 -0.9884078 0.1310632 -7.541 7.34e-14 ***
## factor(fid)39280 -0.1829448 0.1310689 -1.396 0.162950
## factor(fid)39389 -0.4748901 0.0873634 -5.436 6.20e-08 ***
## factor(fid)39410 -0.6002811 0.0724430 -8.286 2.26e-16 ***
## factor(fid)39433 -0.7426812 0.0724093 -10.257 < 2e-16 ***
```

```
## factor(fid)39461 -0.7274457 0.1310356 -5.552 3.26e-08 ***
## factor(fid)39468 -0.2147993 0.1310254 -1.639 0.101311
## factor(fid)39505 -0.3319984 0.1001202 -3.316 0.000931 ***
## factor(fid)39525 -0.4565759 0.1001119 -4.561 5.44e-06 ***
## factor(fid)39550 -0.6864411 0.0756382 -9.075 < 2e-16 ***
## factor(fid)39574 -1.0025005 0.0802233 -12.496 < 2e-16 ***
## factor(fid)39578 -0.6163967 0.0873363 -7.058 2.41e-12 ***
## factor(fid)39579 -0.9966760 0.1000776 -9.959 < 2e-16 ***
## factor(fid)39580 -0.5602253 0.0873822 -6.411 1.84e-10 ***
## factor(fid)39582 -0.6986937 0.1001014 -6.980 4.14e-12 ***
## factor(fid)39583 -0.6151127 0.0874218 -7.036 2.80e-12 ***
## factor(fid)39609 -0.3156226 0.0756362 -4.173 3.15e-05 ***
## factor(fid)39620 -0.2900265 0.0724095 -4.005 6.44e-05 ***
## factor(fid)39622 -0.6923687 0.0724209 -9.560 < 2e-16 ***
## factor(fid)39623 -0.5455499 0.0873652 -6.244 5.30e-10 ***
## factor(fid)39658 -0.5340759 0.1310689 -4.075 4.81e-05 ***
## factor(fid)39703 -0.7128340 0.1310632 -5.439 6.10e-08 ***
## factor(fid)39709 -0.6924140 0.0756358 -9.155 < 2e-16 ***
## factor(fid)39735 -0.3939959 0.0756402 -5.209 2.12e-07 ***
## factor(fid)39737 -0.6613811 0.0756396 -8.744 < 2e-16 ***
## factor(fid)39754 -0.1811312 0.1000617 -1.810 0.070433 .
## factor(fid)39767 -0.9986988 0.1309948 -7.624 3.96e-14 ***
## factor(fid)39769 -0.9925982 0.1001396 -9.912 < 2e-16 ***
## factor(fid)39780 -0.4789322 0.0756361 -6.332 3.05e-10 ***
## factor(fid)39796 -0.9871003 0.1310992 -7.529 8.03e-14 ***
## factor(fid)39800 -0.9969701 0.1000545 -9.964 < 2e-16 ***
## factor(fid)39802 -1.0095957 0.1310692 -7.703 2.19e-14 ***
## factor(fid)39816 -0.9987975 0.0802569 -12.445 < 2e-16 ***
## factor(fid)39832 -0.6622375 0.0874174 -7.576 5.69e-14 ***
## factor(fid)39836 -0.5938691 0.1310477 -4.532 6.24e-06 ***
## factor(fid)39838 -0.4348310 0.1310875 -3.317 0.000928 ***
## factor(fid)39839 -0.7302842 0.1001253 -7.294 4.50e-13 ***
## factor(fid)39855 -0.5427978 0.0874170 -6.209 6.60e-10 ***
## factor(fid)39861 -0.5302505 0.0874041 -6.067 1.59e-09 ***
## factor(fid)39867 -0.5288345 0.1000956 -5.283 1.42e-07 ***
## factor(fid)39872 -0.9925982 0.1001396 -9.912 < 2e-16 ***
## factor(fid)39875 -0.9871003 0.1310992 -7.529 8.03e-14 ***
## factor(fid)39889 -0.9991187 0.1310399 -7.625 3.95e-14 ***
## factor(fid)39893 -0.4388917 0.1310495 -3.349 0.000828 ***
## factor(fid)39900 -0.6836058 0.1001504 -6.826 1.19e-11 ***
## factor(fid)39904 0.0021128 0.1310477 0.016 0.987139
## factor(fid)39906 -0.3027211 0.1310495 -2.310 0.021003 *
## factor(fid)39915 -0.5811718 0.1001184 -5.805 7.60e-09 ***
## factor(fid)39920 -0.8093614 0.1310718 -6.175 8.17e-10 ***
## factor(fid)39928 -0.4503436 0.1310477 -3.436 0.000603 ***
## factor(fid)39929 -0.8004765 0.1310466 -6.108 1.23e-09 ***
## factor(fid)39932 -0.5935282 0.1310692 -4.528 6.34e-06 ***
## factor(fid)39933 -0.4669841 0.1310692 -3.563 0.000376 ***
## factor(fid)39953 -0.6053738 0.1310718 -4.619 4.14e-06 ***
## factor(fid)39957 -0.8423361 0.1310853 -6.426 1.68e-10 ***
```

```

## trend                0.0036331  0.0017181   2.115 0.034607 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1196 on 1794 degrees of freedom
## Multiple R-squared:  0.8062, Adjusted R-squared:  0.7205
## F-statistic: 9.401 on 794 and 1794 DF,  p-value: < 2.2e-16

output[9,] = coef(summary(m8))[2,1:2]
# We find that the impact of the initial price remains the same, and the
impact of the trend is
# significant and positive. This means that, on average, the wheat share
increases by 0.36% each year.

# Time FE
m9 = lm(wheat_share ~ wheat_price + factor(year), data = df_l16)
summary(m9)

##
## Call:
## lm(formula = wheat_share ~ wheat_price + factor(year), data = df_l16)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54160 -0.11010  0.02038  0.13749  0.54386
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.454245   0.030448  14.919  <2e-16 ***
## wheat_price     0.103759   0.065054   1.595   0.1108
## factor(year)2007 0.002639   0.015587   0.169   0.8656
## factor(year)2008 0.028389   0.015718   1.806   0.0710 .
## factor(year)2009 -0.032112   0.016696  -1.923   0.0545 .
## factor(year)2010 -0.005579   0.015457  -0.361   0.7182
## factor(year)2011 -0.009058   0.016146  -0.561   0.5748
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2252 on 2582 degrees of freedom
## Multiple R-squared:  0.0107, Adjusted R-squared:  0.008405
## F-statistic: 4.656 on 6 and 2582 DF,  p-value: 0.0001021

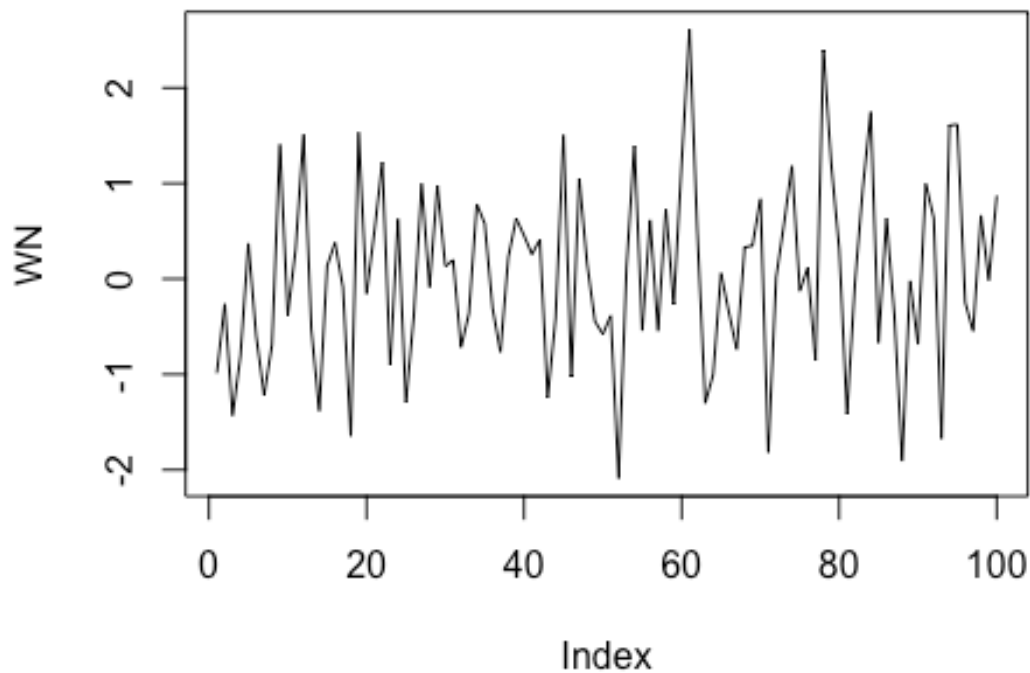
output[10,] = coef(summary(m9))[2,1:2]

# Monte Carlo simulation with time series ----
set.seed(226091)
t = 100

# White noise

```

```
WN = rnorm(t)
plot(WN, type = "l")
```



```
# Correlation for Two Nonstationary Processes in Levels and First Differences
R = 100
y = numeric(t)
x = numeric(t)

corlevels = numeric(R)
cordiff = numeric(R)

for(i in 1:R) {
  # y
  WN = rnorm(t)
  y[1] = WN[1]
  for (t in 2:t) {
    y[t] <- y[t-1] + WN[t]
  }

  # x
  WN = rnorm(t)
  x[1] = WN[1]
  for (t in 2:t) {
```

```

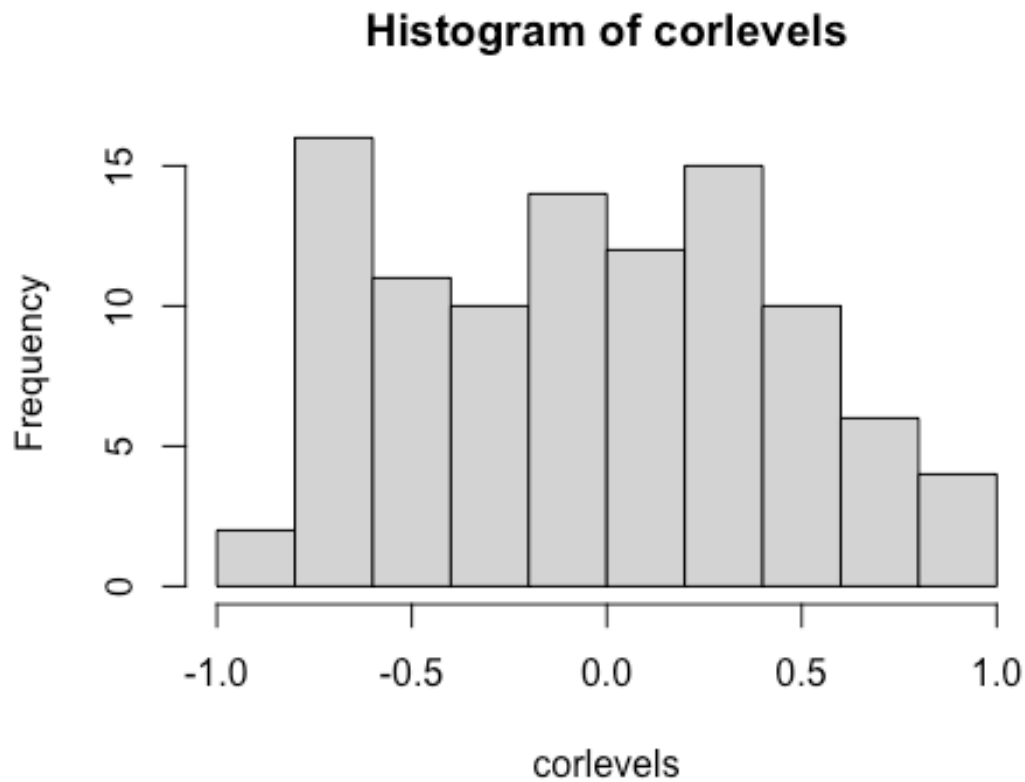
    x[t] = x[t-1] + WN[t]
}

# First difference
dx = x - c(NA,x[-t])
dy = y - c(NA,y[-t])

# Saving the correlations
cordiff[i] = cor(dx[-1],dy[-1])
corlevels[i] = cor(x,y)
}

hist(corlevels)

```



```

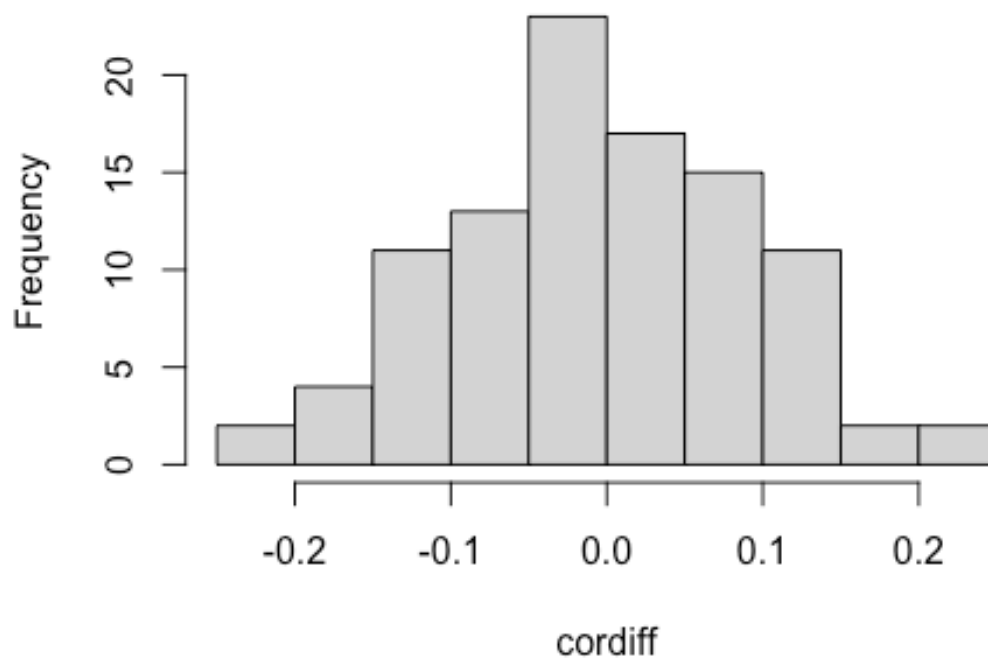
summary(corlevels)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -0.89047 -0.44352 -0.02809 -0.04138  0.34305  0.88396

hist(cordiff)

```

Histogram of cordiff



```
summary(cordiff)

##      Min.   1st Qu.   Median     Mean   3rd Qu.    Max.
## -0.236574 -0.063881 -0.007453 -0.005843  0.063081  0.230485

# Bias Estimation in AR(1) coefficients
rm(list=ls())
set.seed(226091)
R = 1000
t = 100

beta = numeric(R)

times = c(10,20,30,40,50,75,100,150,200,500)
bias = numeric(length(times))
j = 1
phi = 0.9

for(t in times) {
  for(i in 1:R) {
    y = numeric(t)
    WN = rnorm(t)
    y[1] = WN[1]
```

```

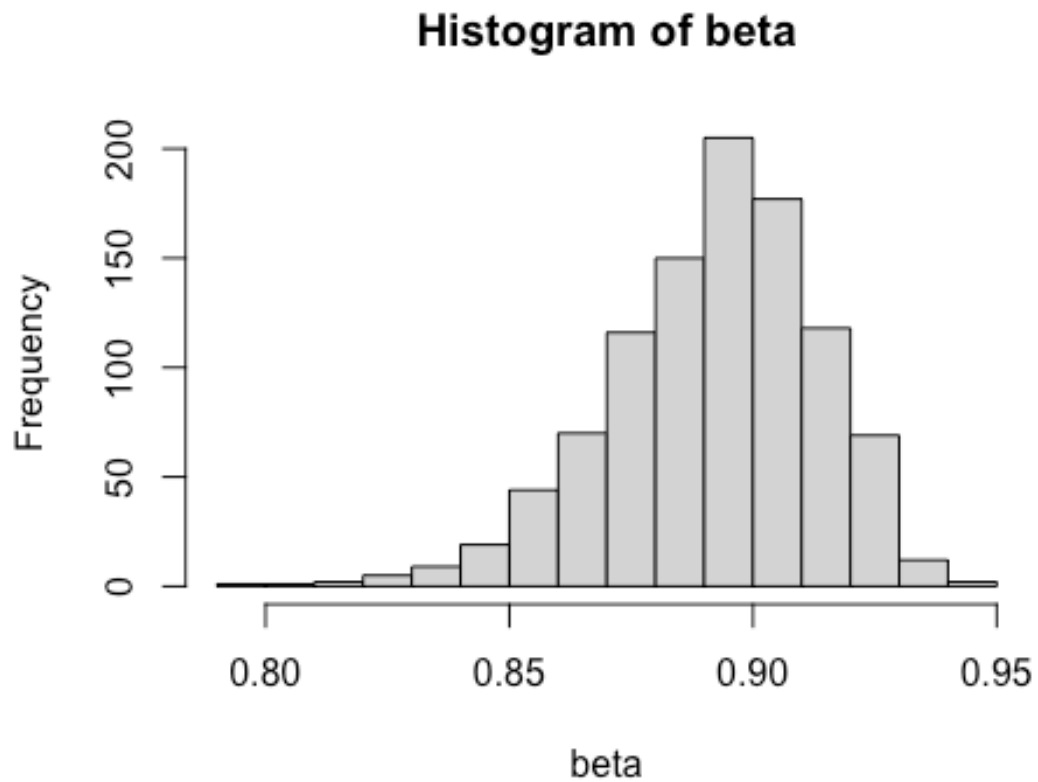
for (t in 2:t) {
  y[t] = phi*y[t-1] + WN[t]
}

lagy = c(NA,y[-t])
beta[i] = coef(lm(y ~ lagy))[2]
}

bias[j] = mean(beta) - phi
j = j+1
}

hist(beta)

```



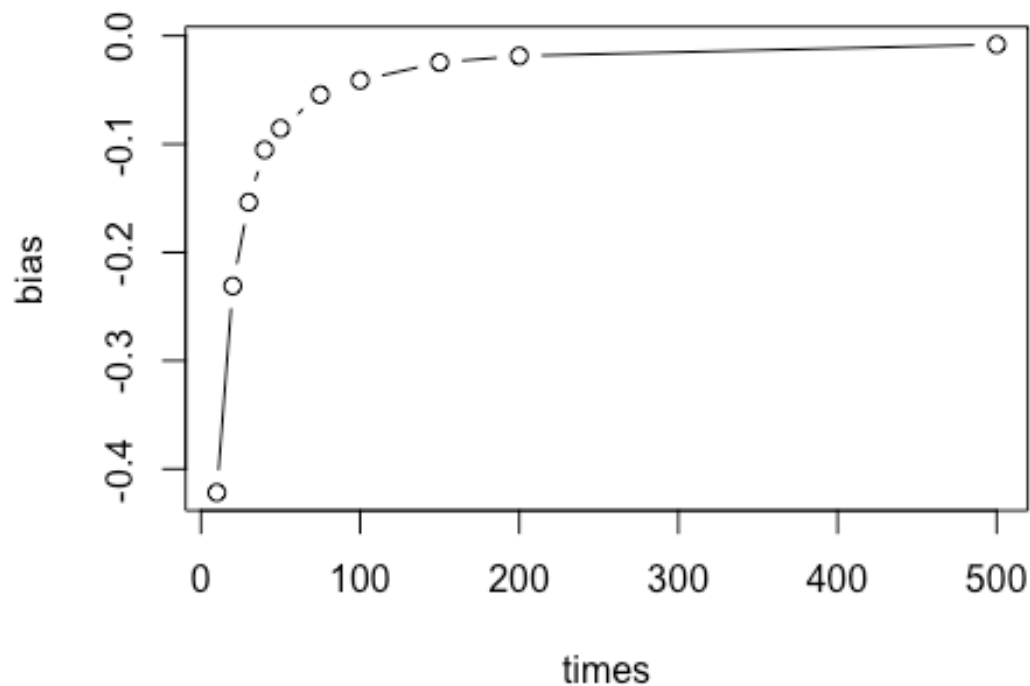
```

summary(beta)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.7907  0.8789  0.8938  0.8919  0.9067  0.9437

plot(times, bias, type = "b")

```



```
# An empirical application of CAPM (Sharpe, 1963) and Portfolio Selection
(Markowitz, 1952) -----
# The data of stocks are downloaded through the package "quantmod"
# SP500
sp500 = new.env()
getSymbols("^GSPC", env = sp500, src = "yahoo", from = as.Date("2013-01-02"),
to = as.Date("2023-12-31"))

## [1] "GSPC"

sp500_data = sp500$GSPC
# AAPL
aapl = new.env()
getSymbols("AAPL", env = aapl, src = "yahoo", from = as.Date("2013-01-02"),
to = as.Date("2023-12-31"))

## [1] "AAPL"

aapl_data = aapl$AAPL
# BA
ba = new.env()
getSymbols("BA", env = ba, src = "yahoo", from = as.Date("2013-01-02"), to =
as.Date("2023-12-31"))
```



```

## [1] "BA"

ba_data = ba$BA
# XOM
xom = new.env()
getSymbols("XOM", env = xom, src = "yahoo", from = as.Date("2013-01-02"), to
= as.Date("2023-12-31"))

## [1] "XOM"

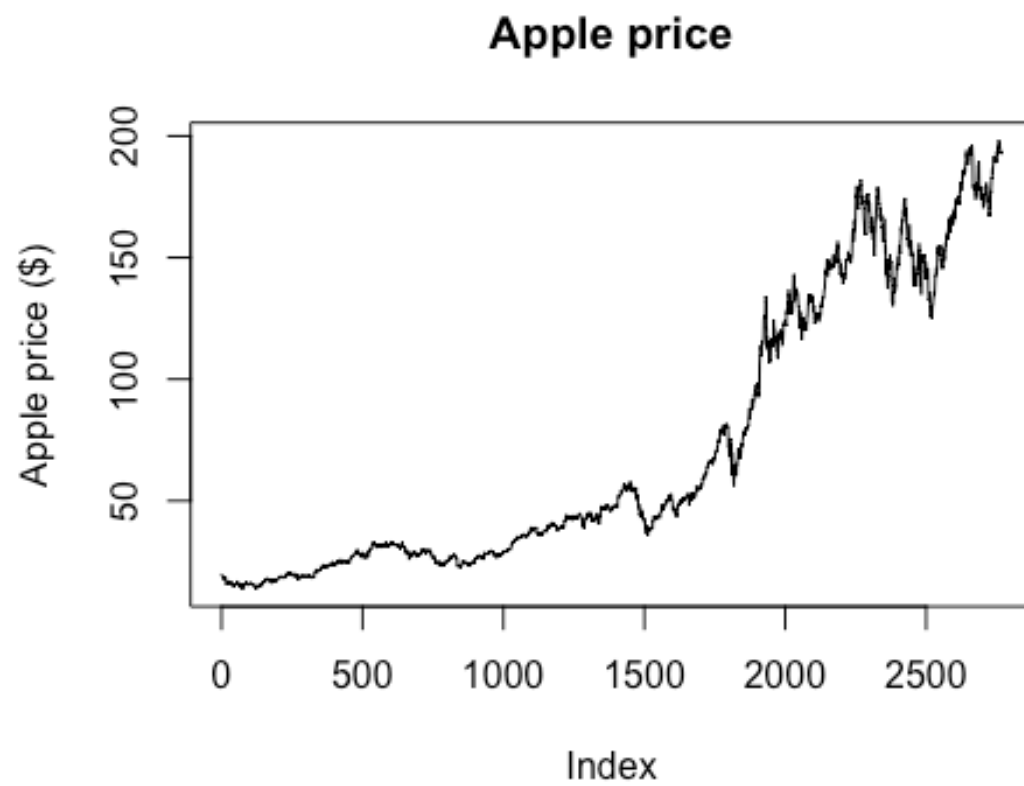
xom_data = xom$XOM

data = data.frame(sp500_data$GSPC.Close, aapl_data$AAPL.Close,
ba_data$BA.Close, xom_data$XOM.Close)
colnames(data) = c("sp500", "aapl", "ba", "xom")

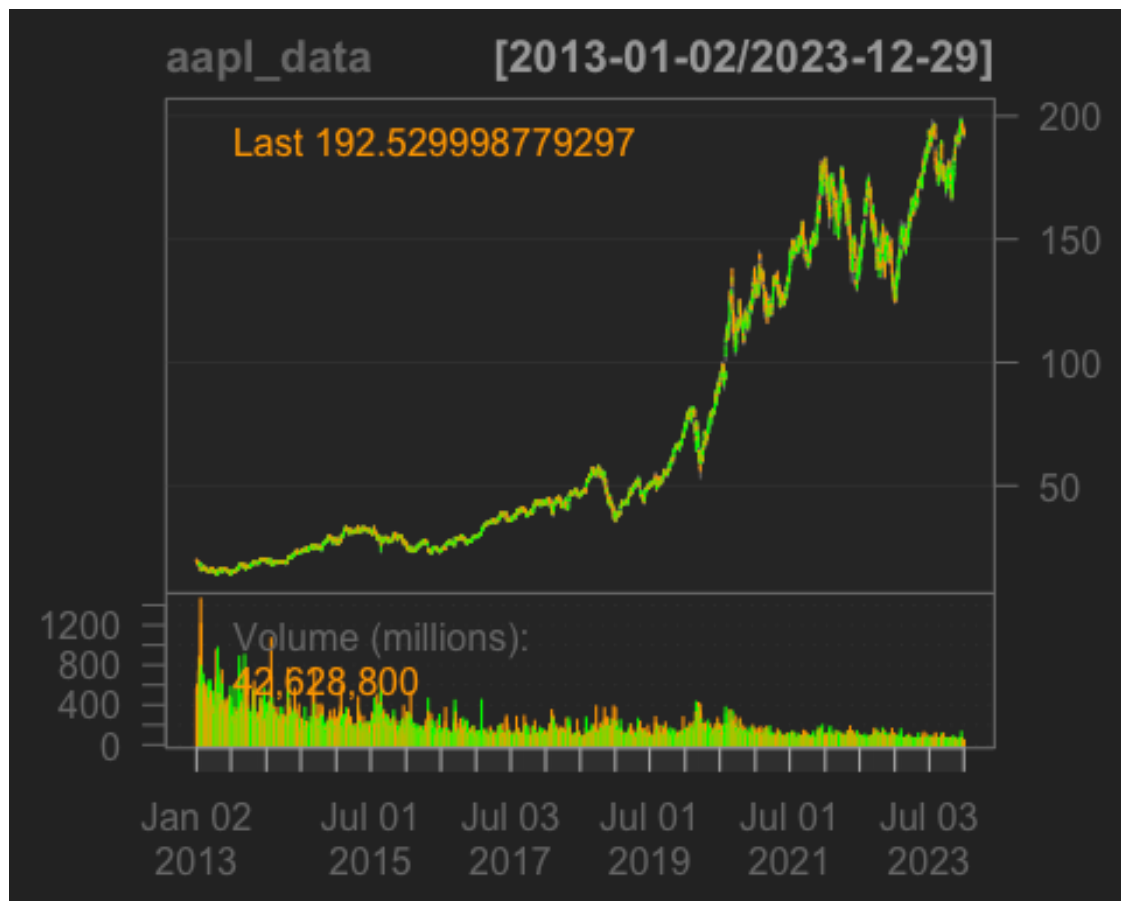
dates = index(sp500_data)
month = month(dates)
data$month = month

# GRAPHICAL ANALYSIS
# APPL
# Prices
plot(data$aapl, ylab="Apple price ($)", main="Apple price", type="l")

```

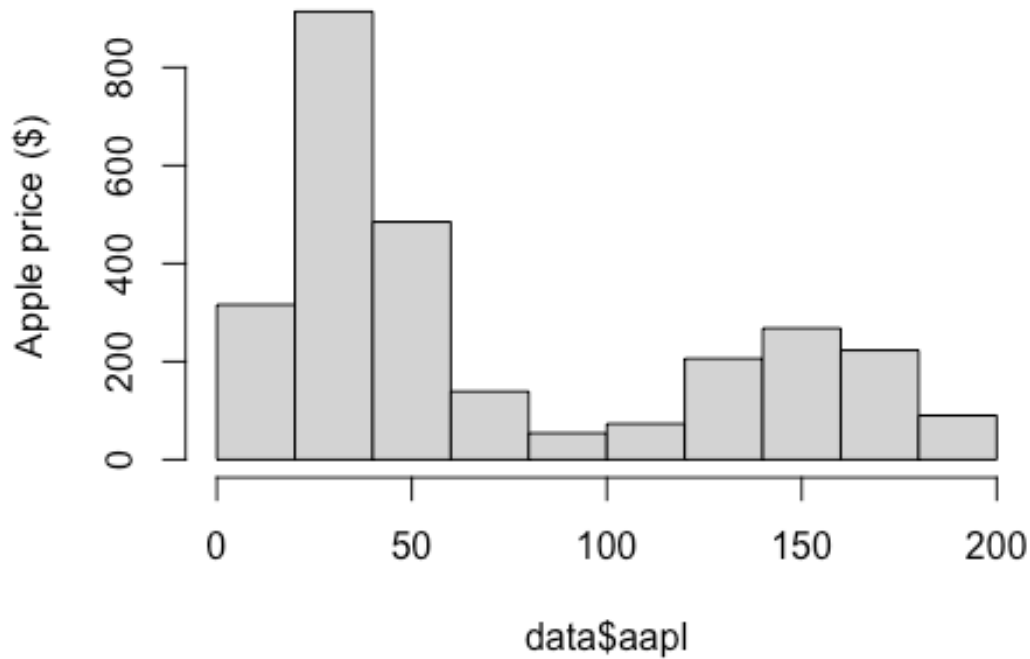


```
chartSeries(aapl_data)
```



```
# Distribution  
hist(data$aapl, ylab = "Apple price ($)", main = "Apple price")
```

Apple price



```
kurtosis(data$aapl) + 3
```

```
## [1] 2.038568  
## attr(,"method")  
## [1] "excess"
```

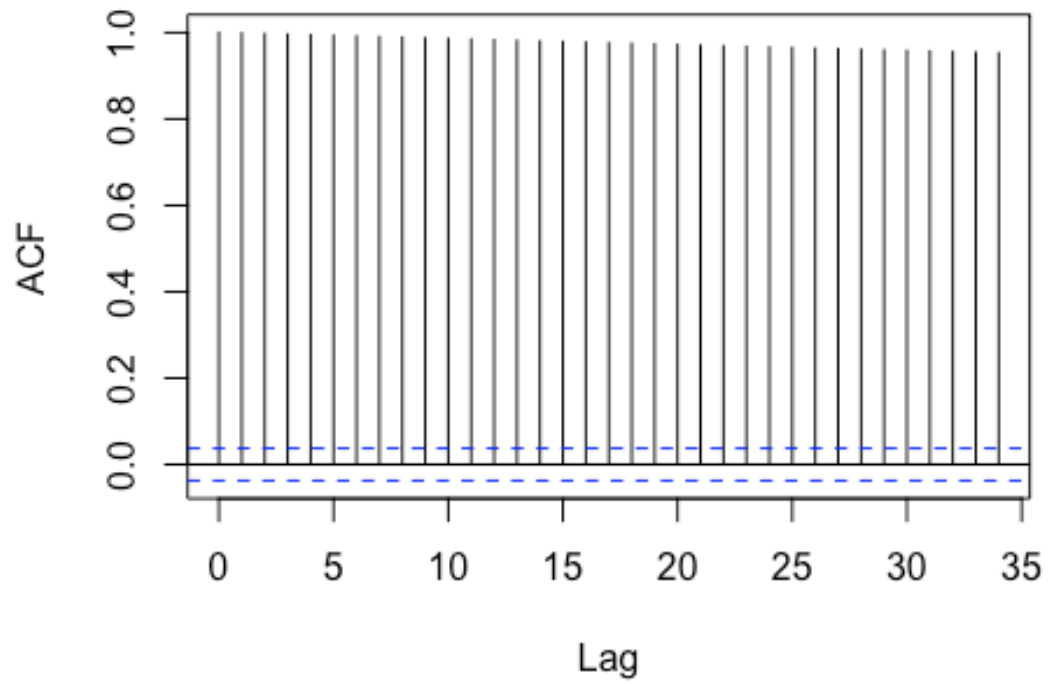
```
skewness(data$aapl)
```

```
## [1] 0.7899989  
## attr(,"method")  
## [1] "moment"
```

```
# (P)ACF
```

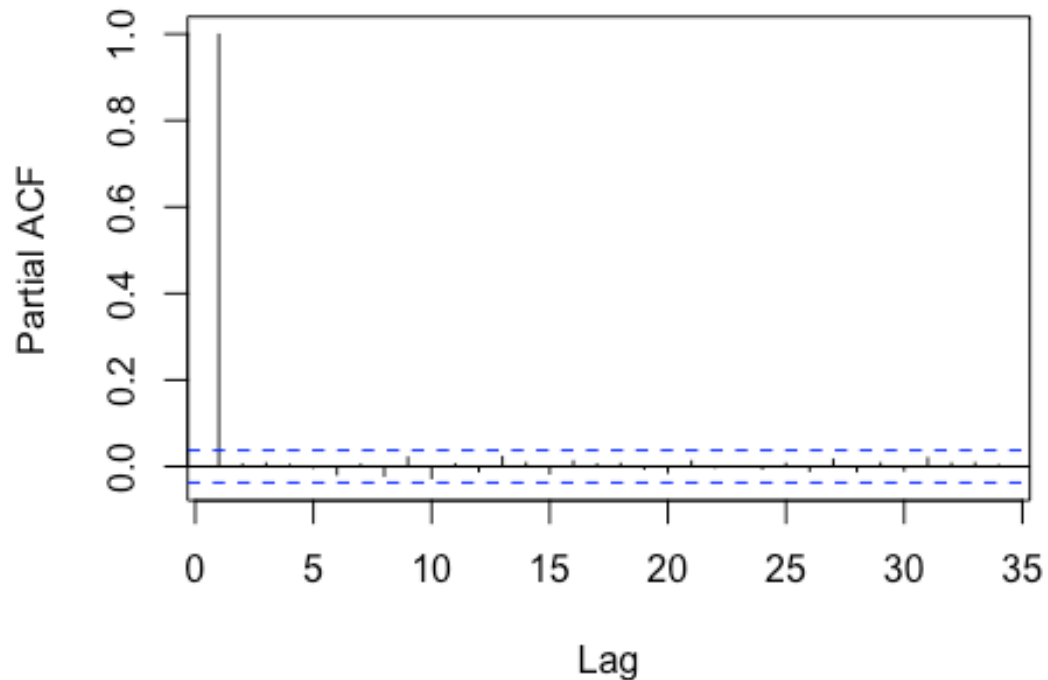
```
acf(data$aapl)
```

Series data\$aapl



```
pacf(data$aapl)
```

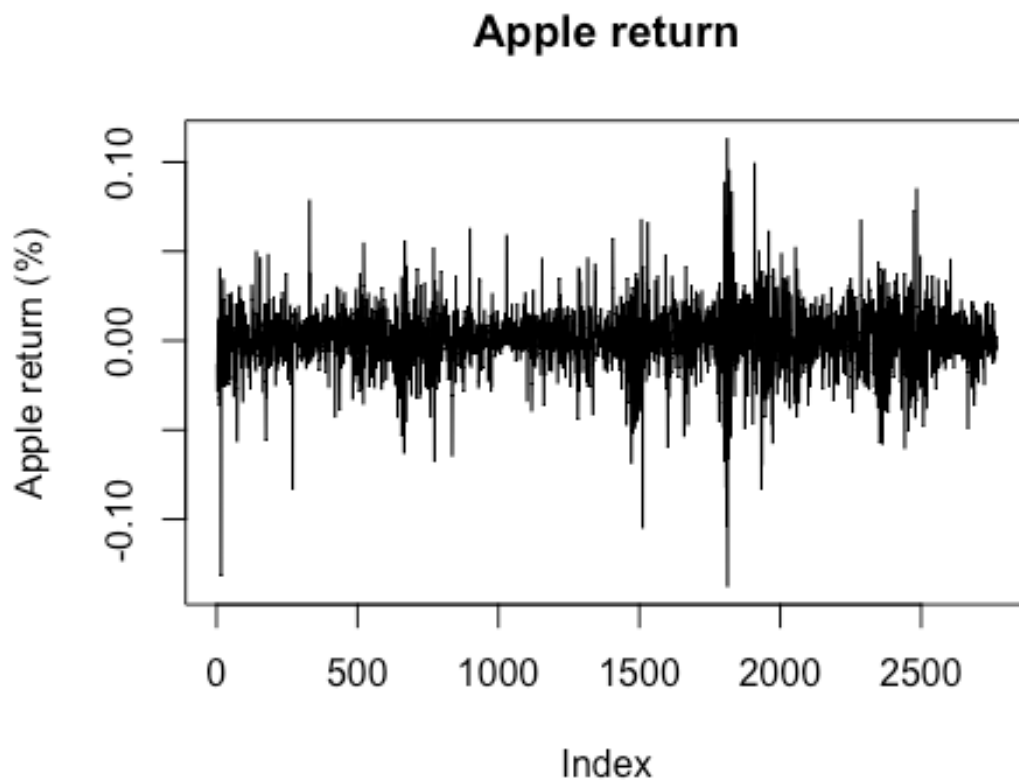
Series data\$aapl



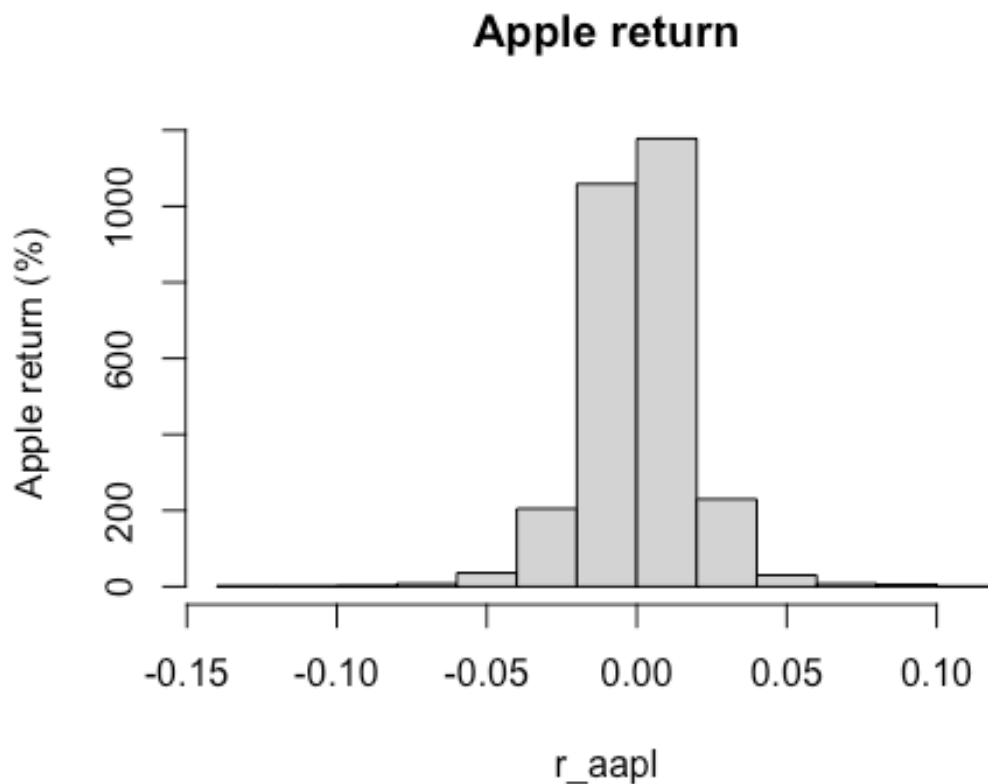
```
# AR(1) with a trend
data$trend = 1:nrow(data)
arima(data$aapl, c(1,0,0), xreg = data$trend)

##
## Call:
## arima(x = data$aapl, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      0.9977   -15.9937    0.0668
## s.e.  0.0013    19.7993    0.0115
##
## sigma^2 estimated as 2.734:  log likelihood = -5322.12,  aic = 10652.23

# Returns
r_aapl = returns(data$aapl)
plot(r_aapl, ylab = "Apple return (%)", main = "Apple return", type = "l")
```



```
# Distribution  
hist(r_aapl, ylab = "Apple return (%)", main = "Apple return")
```



```
skewness(as.numeric(r_aapl), na.rm = TRUE)

## [1] -0.3509064
## attr(,"method")
## [1] "moment"

kurtosis(as.numeric(r_aapl), na.rm = TRUE) + 3

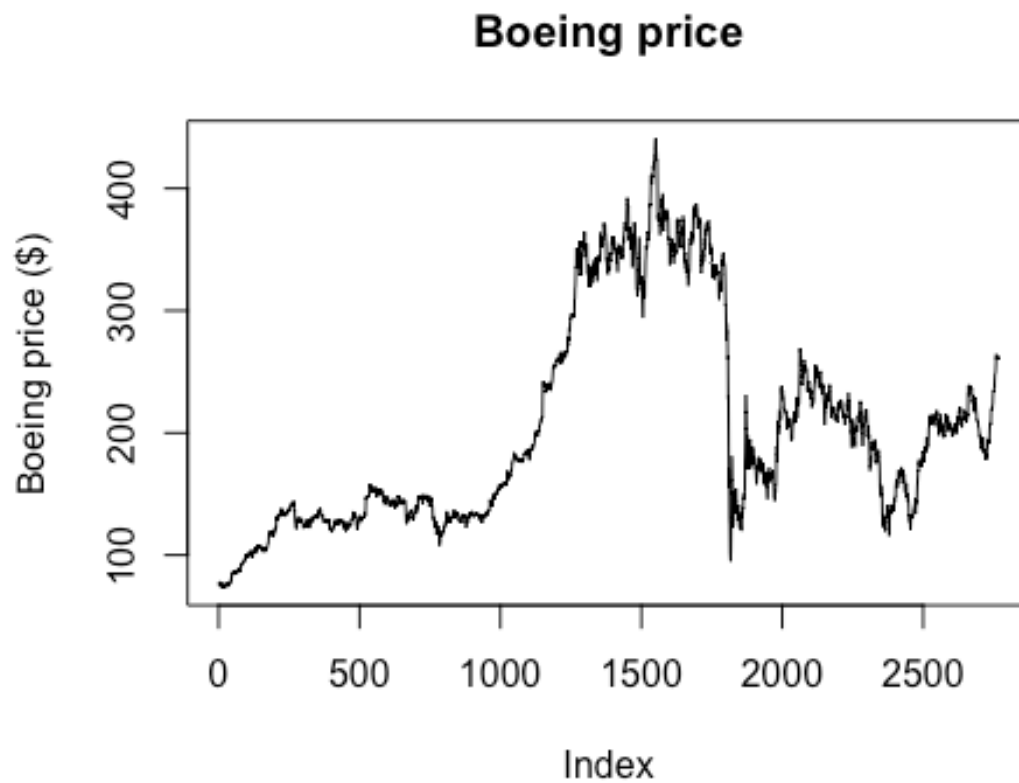
## [1] 9.170645
## attr(,"method")
## [1] "excess"

# AR(1) with trend
arima(r_aapl, c(1,0,0), xreg = data$trend)

##
## Call:
## arima(x = r_aapl, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      -0.0566      5e-04           0
## s.e.   0.0190      6e-04           0
##
```



```
## sigma^2 estimated as 0.0003197: log likelihood = 7208.29, aic = -  
14408.57  
  
# BA  
# Prices  
plot(data$ba, ylab = "Boeing price ($)", main = "Boeing price", type = "l")
```

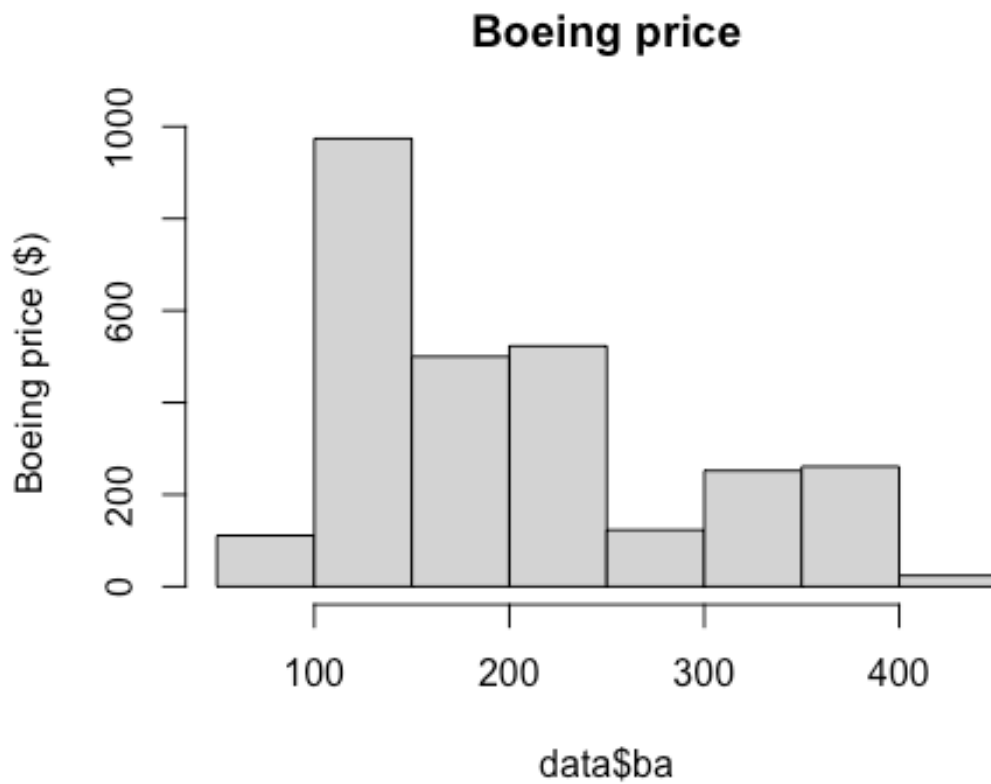


```
chartSeries(ba_data)
```



Distribution

```
hist(data$ba, ylab = "Boeing price ($)", main = "Boeing price")
```



```
kurtosis(data$ba) + 3
```

```
## [1] 2.495604  
## attr(,"method")  
## [1] "excess"
```

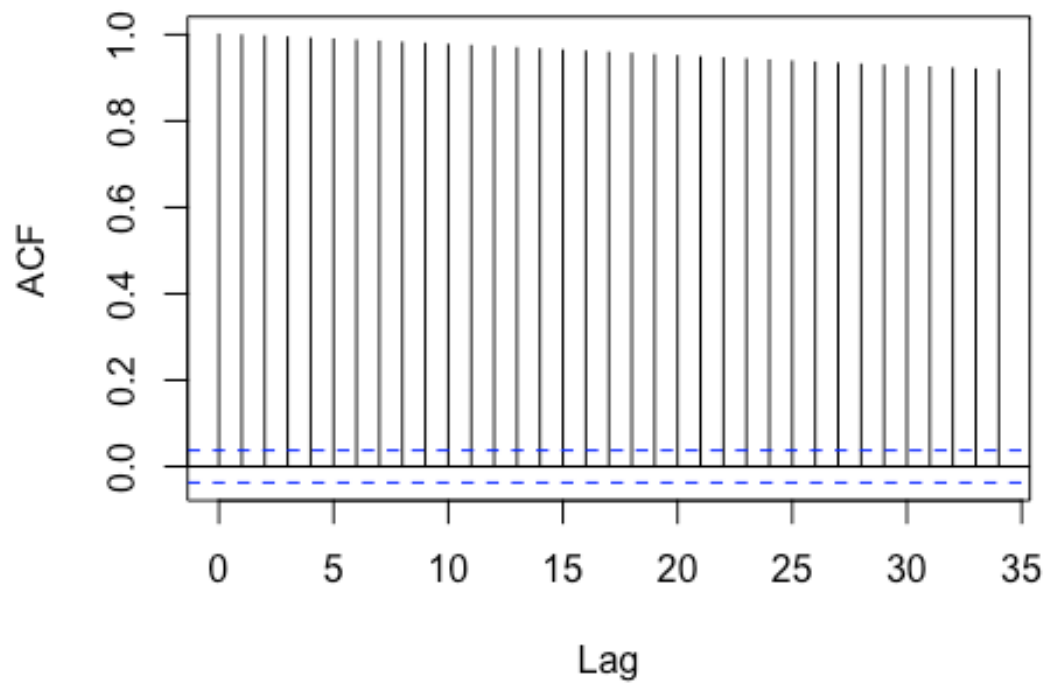
```
skewness(data$ba)
```

```
## [1] 0.8108339  
## attr(,"method")  
## [1] "moment"
```

```
# (P)ACF
```

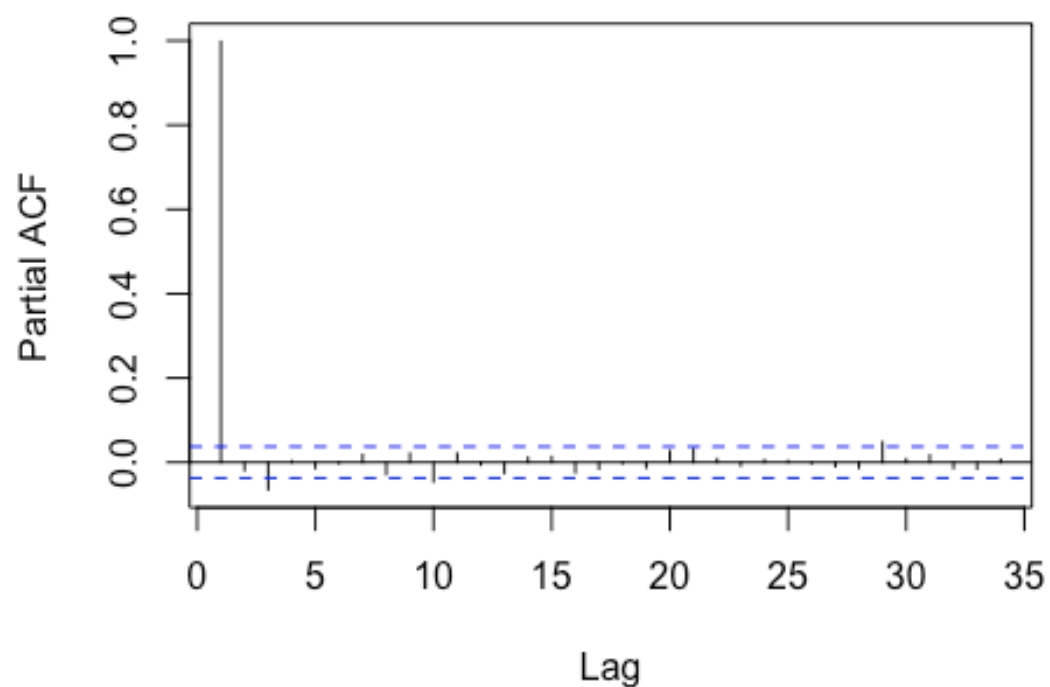
```
acf(data$ba)
```

Series data\$ba



```
pacf(data$ba)
```

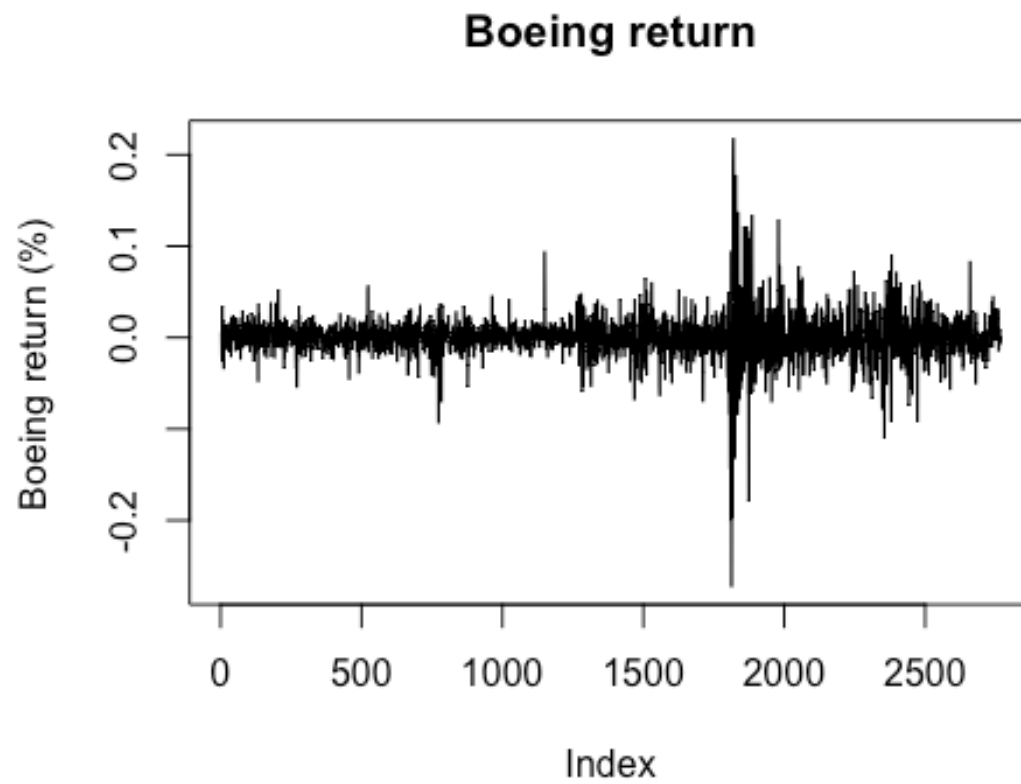
Series data\$ba



```
# AR(1) with a trend
arima(data$ba, c(1,0,0), xreg = data$trend)

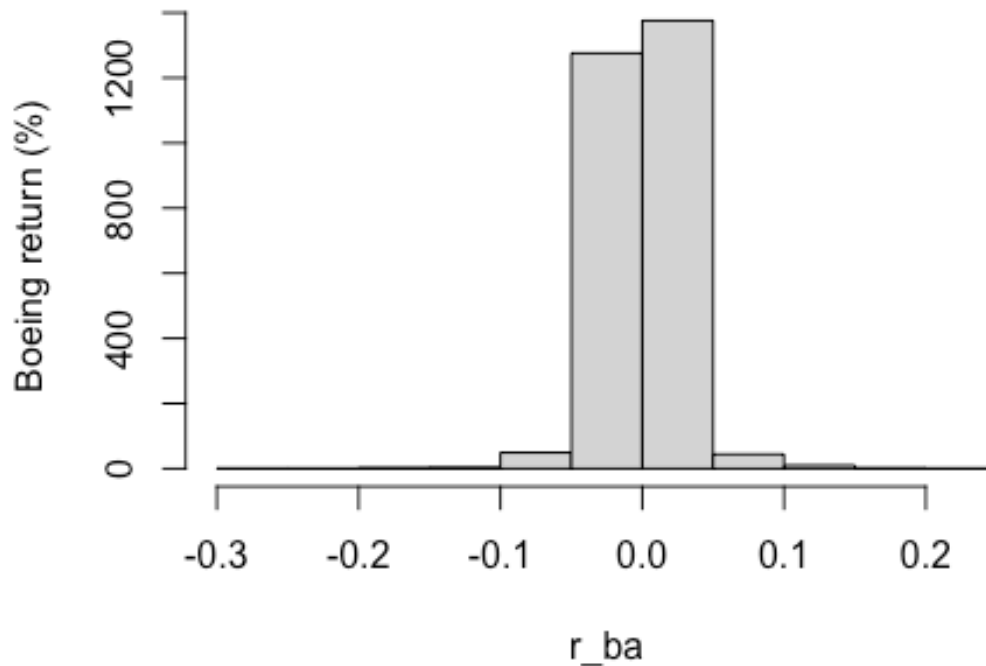
##
## Call:
## arima(x = data$ba, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      0.9980   142.2468    0.0438
## s.e.  0.0011    64.6935    0.0366
##
## sigma^2 estimated as 23.38:  log likelihood = -8292.77,  aic = 16593.54

# Returns
r_ba = returns(data$ba)
plot(r_ba, ylab = "Boeing return (%)", main = "Boeing return", type = "l")
```



```
# Distribution  
hist(r_ba, ylab = "Boeing return (%)", main = "Boeing return")
```

Boeing return



```
skewness(as.numeric(r_ba), na.rm = TRUE)

## [1] -0.5306967
## attr(,"method")
## [1] "moment"

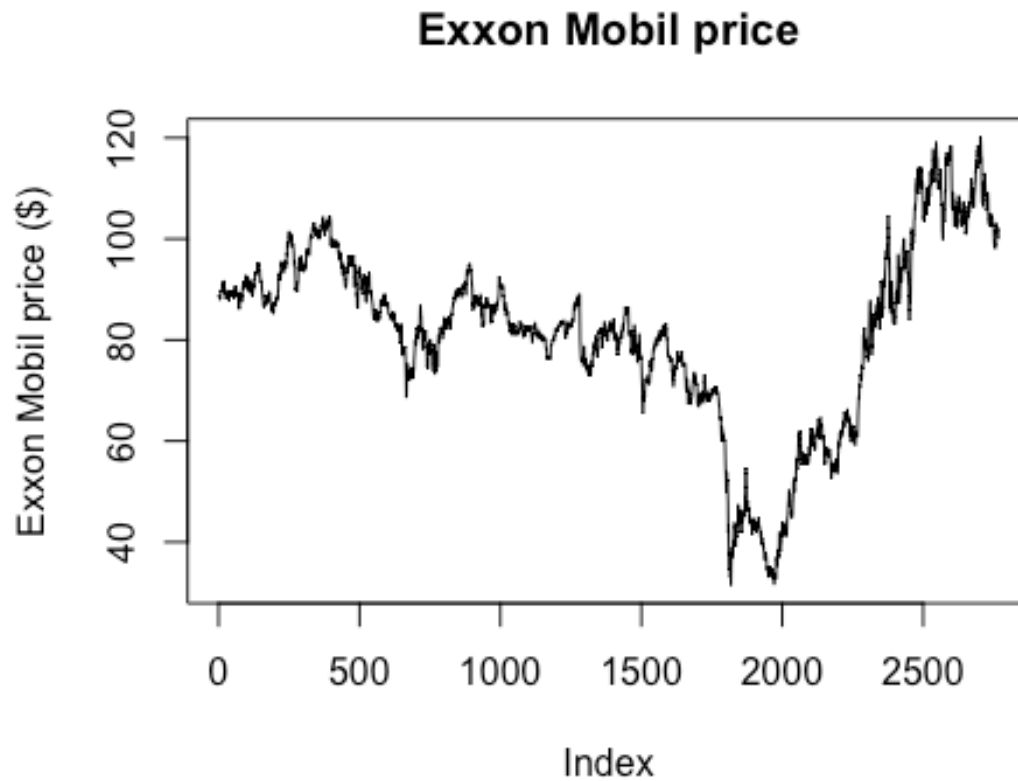
kurtosis(as.numeric(r_ba), na.rm = TRUE) + 3

## [1] 23.37201
## attr(,"method")
## [1] "excess"

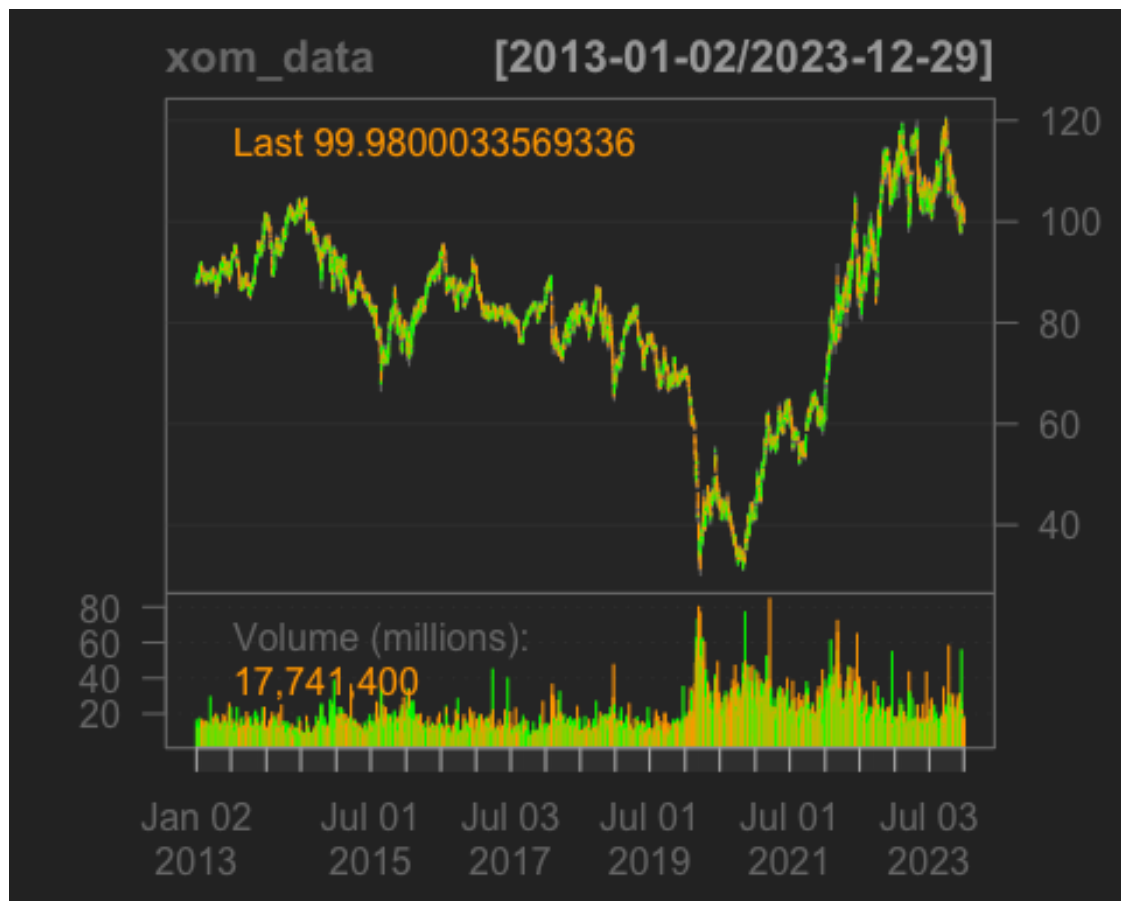
# AR(1) with trend
arima(r_ba, c(1,0,0), xreg = data$trend)

##
## Call:
## arima(x = r_ba, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      0.0528      0.001           0
## s.e. 0.0190      0.001           0
##
```

```
## sigma^2 estimated as 0.0005738: log likelihood = 6399.07, aic = -  
12790.13  
  
# XOM  
# Prices  
plot(data$xom, ylab = "Exxon Mobil price ($)", main = "Exxon Mobil price",  
type = "l")
```



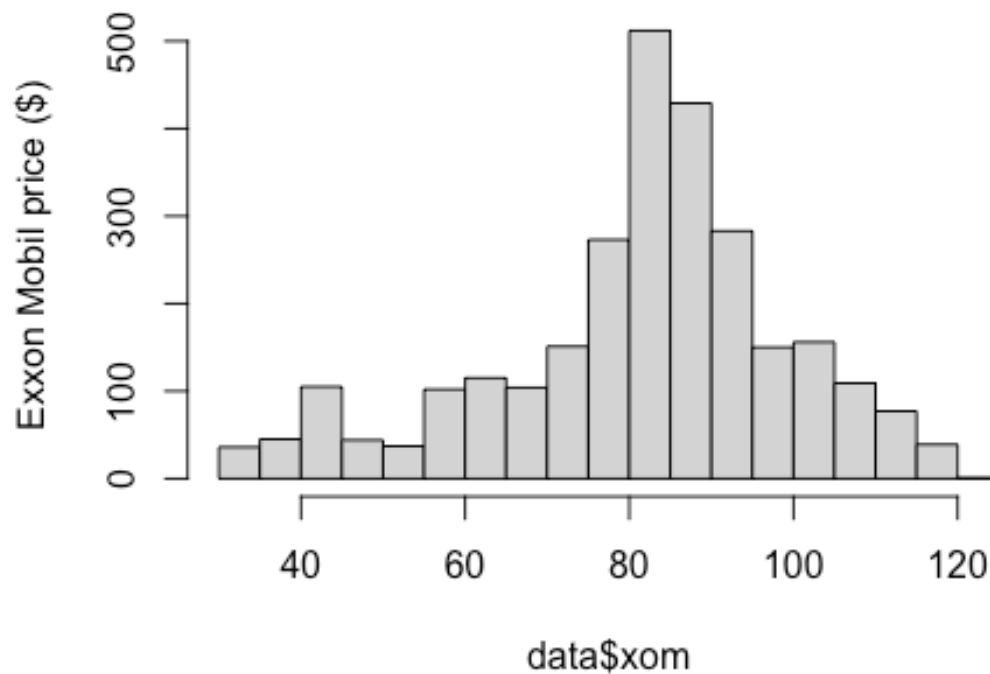
```
chartSeries(xom_data)
```

Distribution

```
hist(data$xom, ylab = "Exxon Mobil price ($)", main = "Exxon Mobil price")
```

Exxon Mobil price



```
kurtosis(data$xom) + 3
```

```
## [1] 3.264644  
## attr(,"method")  
## [1] "excess"
```

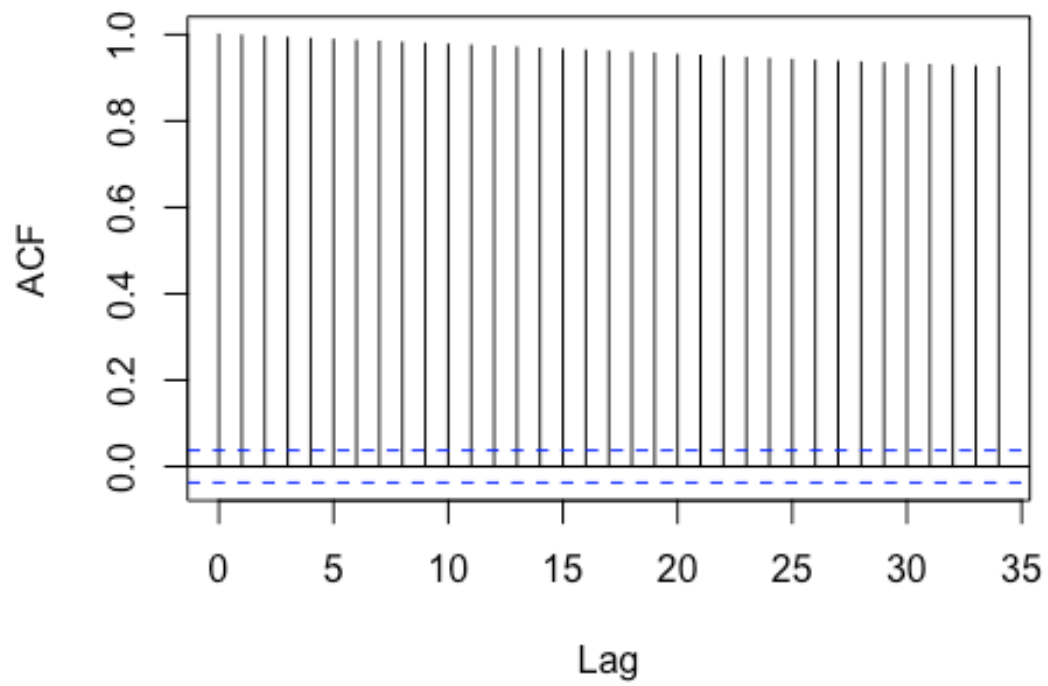
```
skewness(data$xom)
```

```
## [1] -0.6308751  
## attr(,"method")  
## [1] "moment"
```

```
# (P)ACF
```

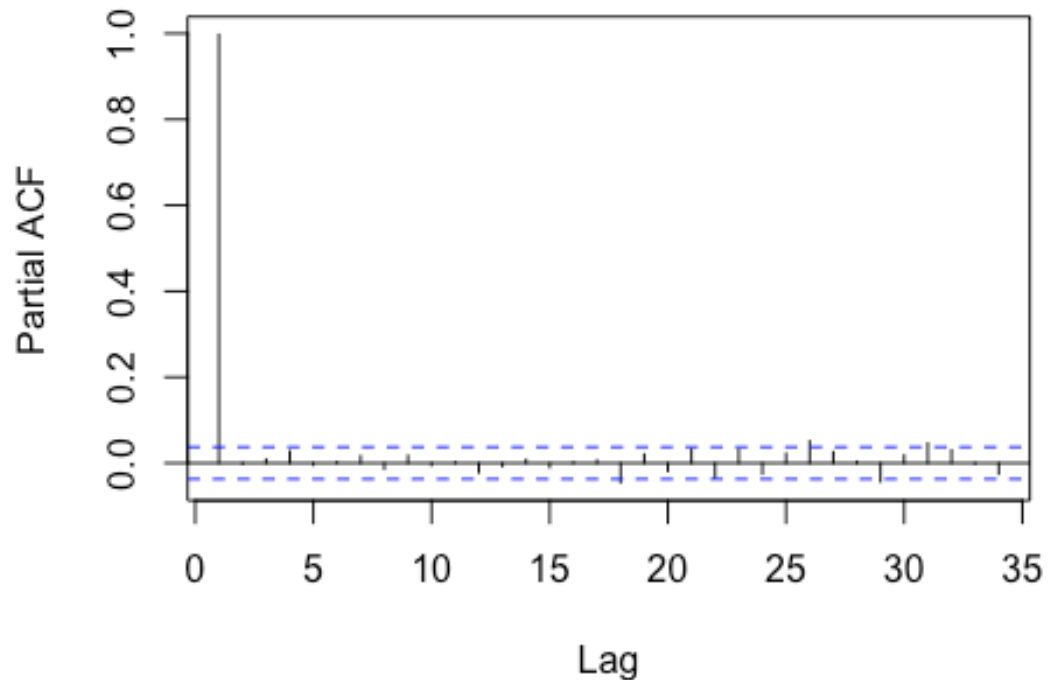
```
acf(data$xom)
```

Series data\$xom



```
pacf(data$xom)
```

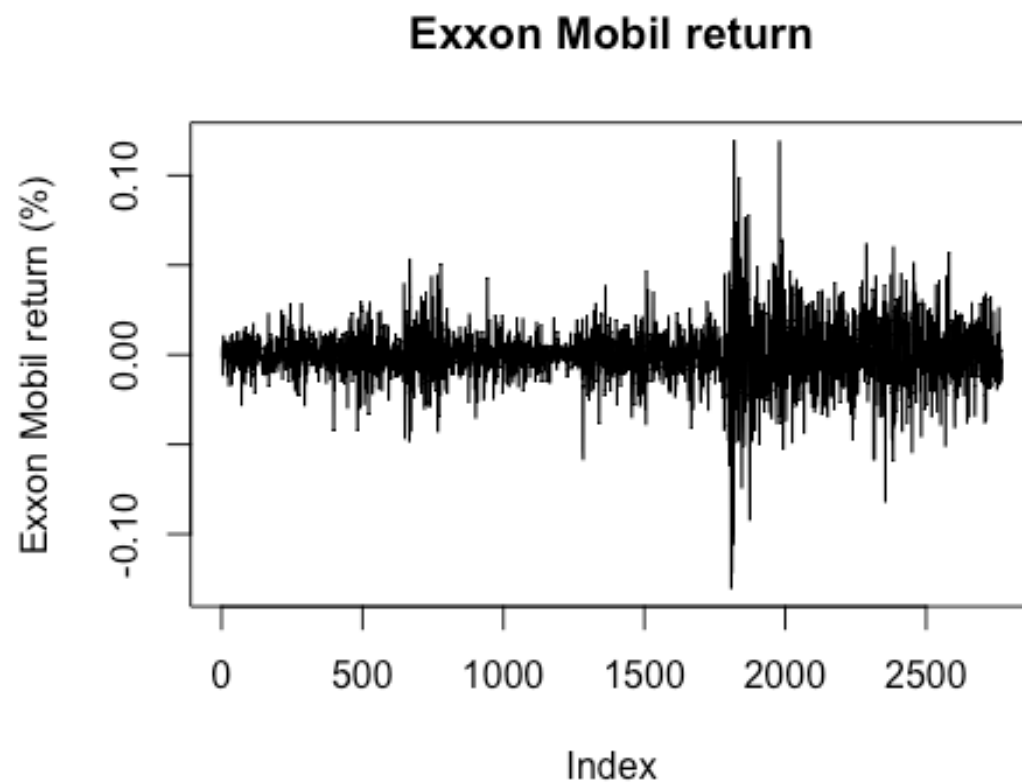
Series data\$xom



```
# AR(1) with a trend
arima(data$xom, c(1,0,0), xreg = data$trend)

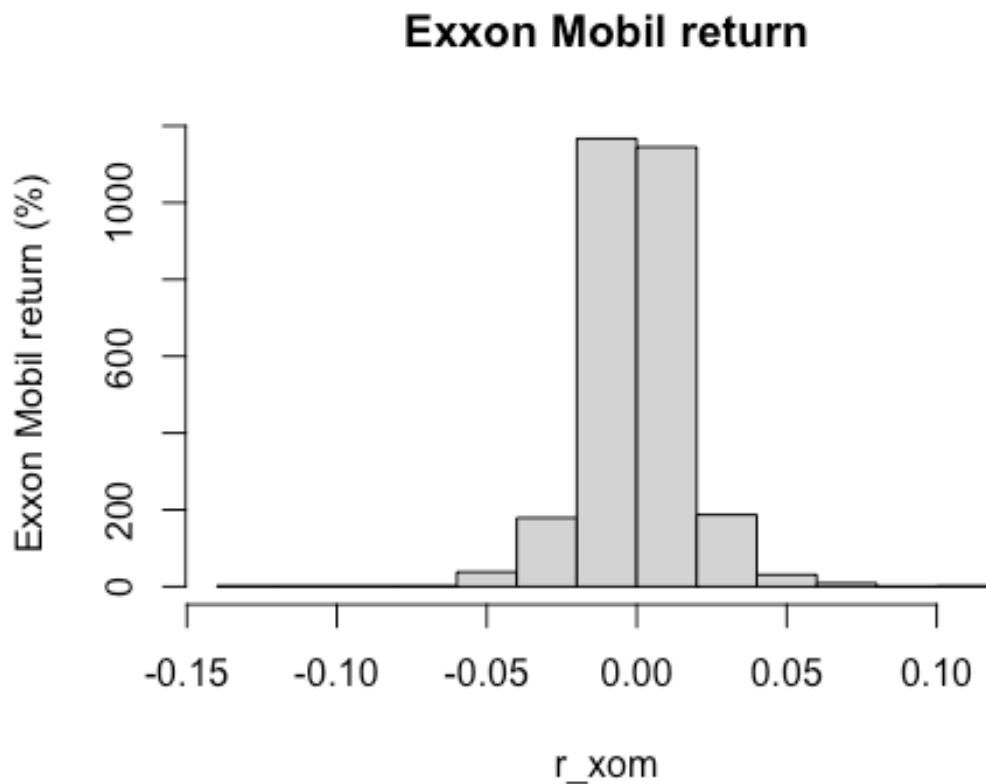
##
## Call:
## arima(x = data$xom, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      0.9977    79.9642    0.0026
## s.e.  0.0012    14.7920    0.0087
##
## sigma^2 estimated as 1.479:  log likelihood = -4471.54,  aic = 8951.07

# Returns
r_xom = returns(data$xom)
plot(r_xom, ylab = "Exxon Mobil return (%)", main = "Exxon Mobil return",
type = "l")
```



```
# Distribution
```

```
hist(r_xom, ylab = "Exxon Mobil return (%)", main = "Exxon Mobil return")
```



```
skewness(as.numeric(r_xom), na.rm = TRUE)

## [1] -0.1412015
## attr(,"method")
## [1] "moment"

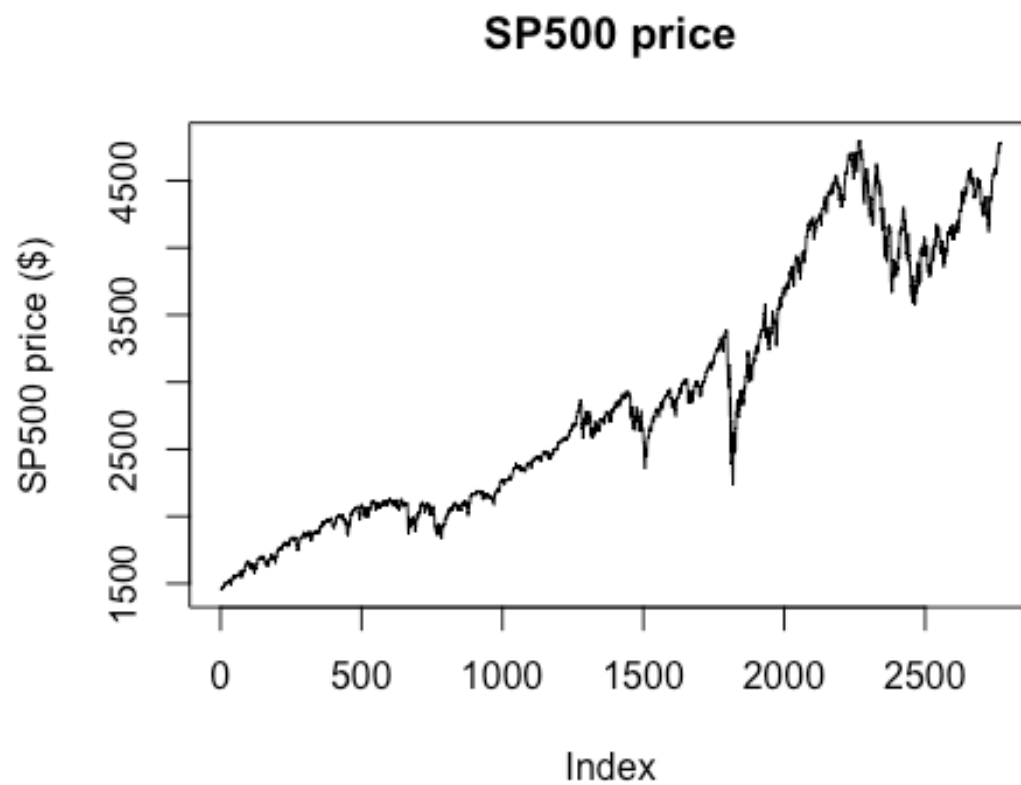
kurtosis(as.numeric(r_xom), na.rm = TRUE) + 3

## [1] 10.1421
## attr(,"method")
## [1] "excess"

# AR(1) with trend
arima(r_xom, c(1,0,0), xreg = data$trend)

##
## Call:
## arima(x = r_xom, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      -0.0261    -3e-04           0
## s.e.   0.0190     6e-04           0
```

```
##  
## sigma^2 estimated as 0.0002834: log likelihood = 7374.9, aic = -14741.8  
# SP500  
# Prices  
plot(data$sp500, ylab = "SP500 price ($)", main = "SP500 price", type = "l")
```



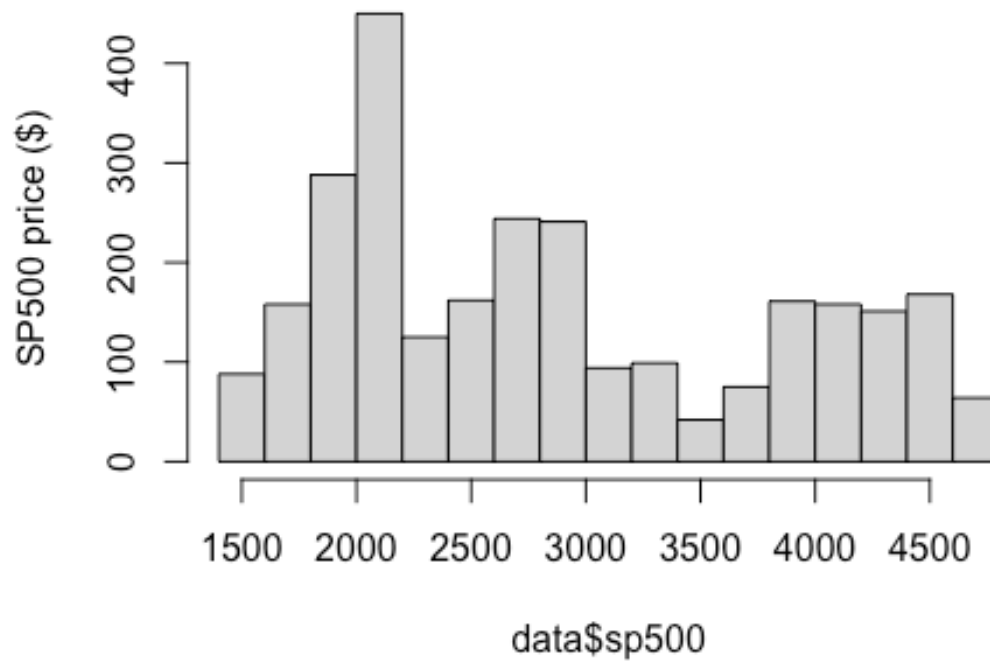
```
chartSeries(sp500_data)
```



Distribution

```
hist(data$sp500, ylab = "SP500 price ($)", main = "SP500 price")
```


SP500 price



```
kurtosis(data$sp500) + 3
```

```
## [1] 1.879935  
## attr(,"method")  
## [1] "excess"
```

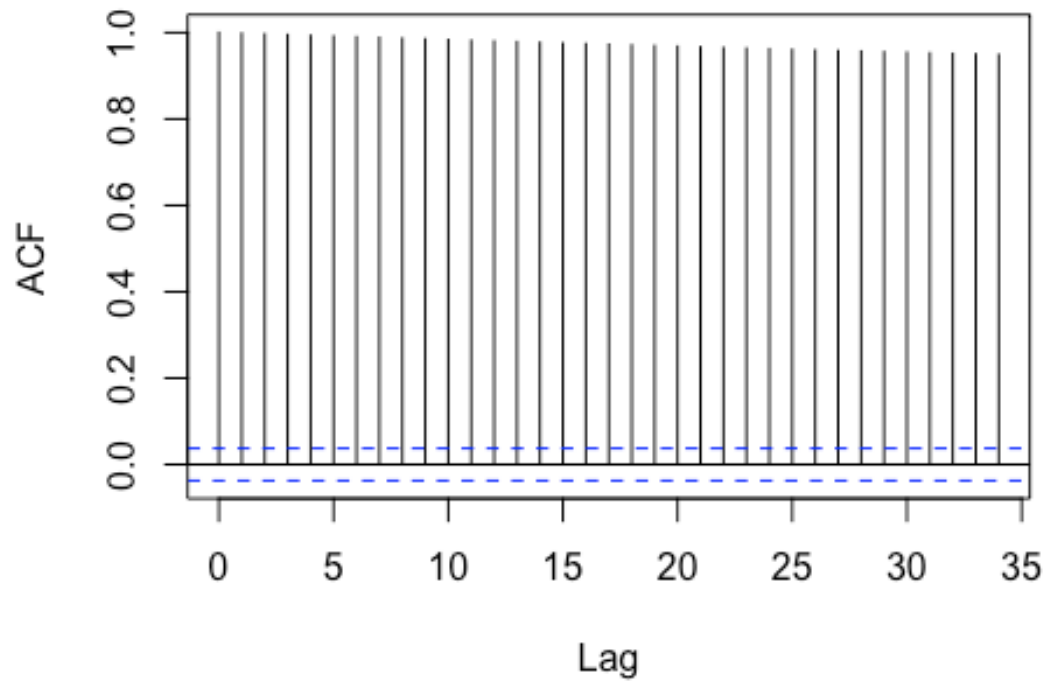
```
skewness(data$sp500)
```

```
## [1] 0.4565497  
## attr(,"method")  
## [1] "moment"
```

```
# (P)ACF
```

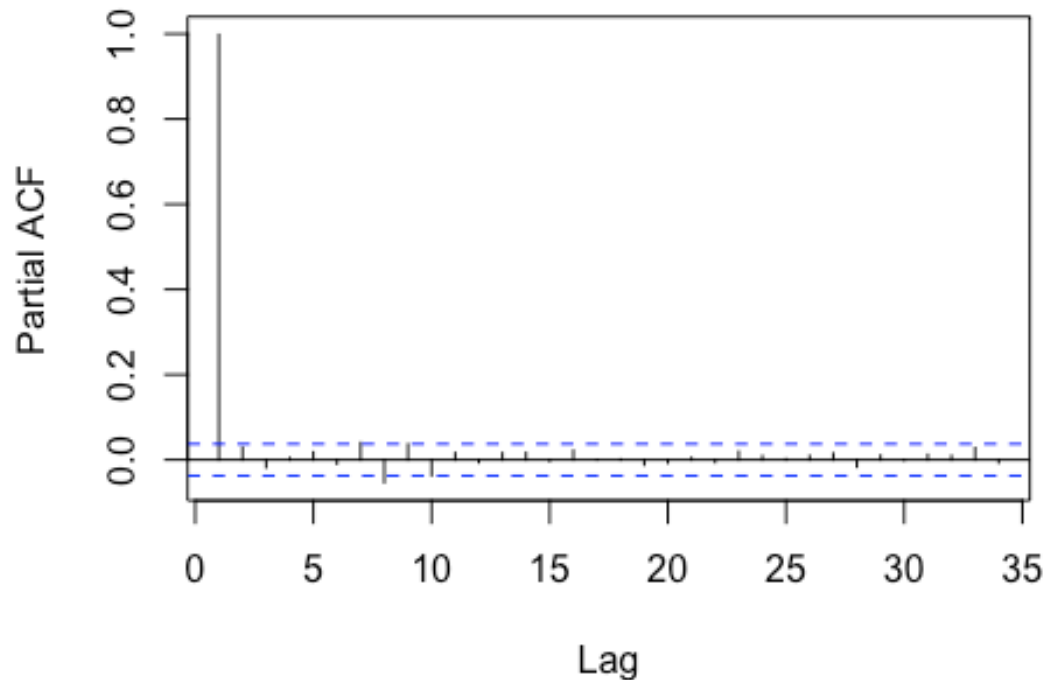
```
acf(data$sp500)
```

Series data\$sp500



```
pacf(data$sp500)
```

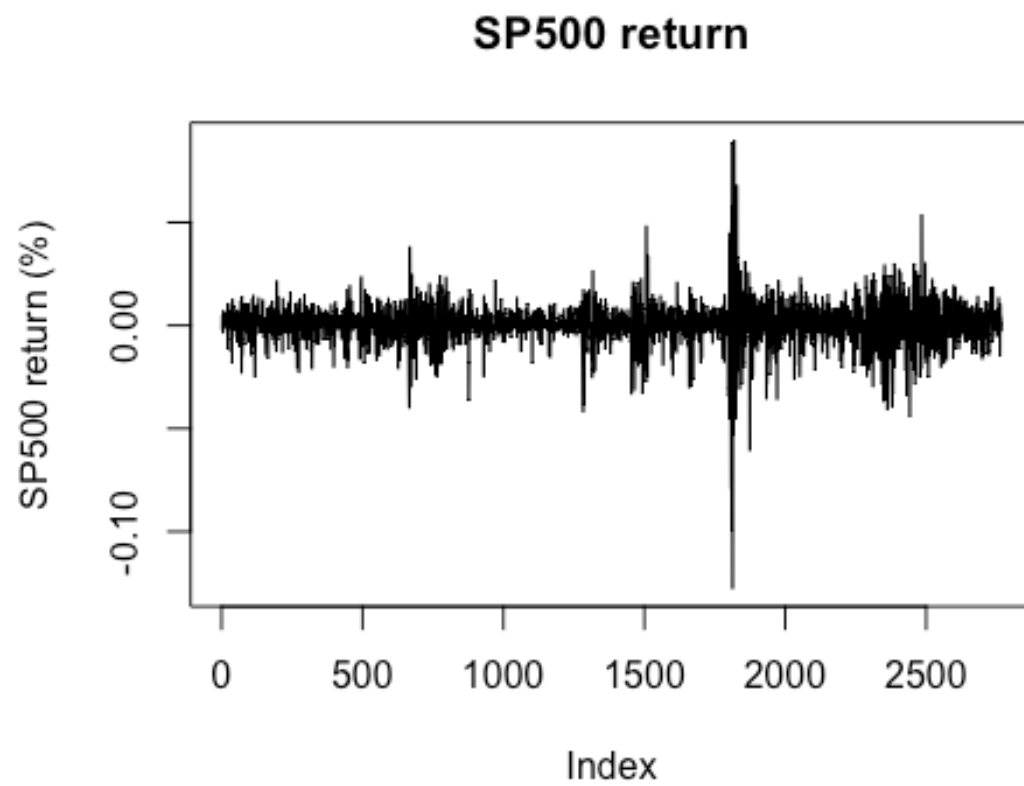
Series data\$sp500



```
# AR(1) with a trend
arima(data$sp500, c(1,0,0), xreg = data$trend)

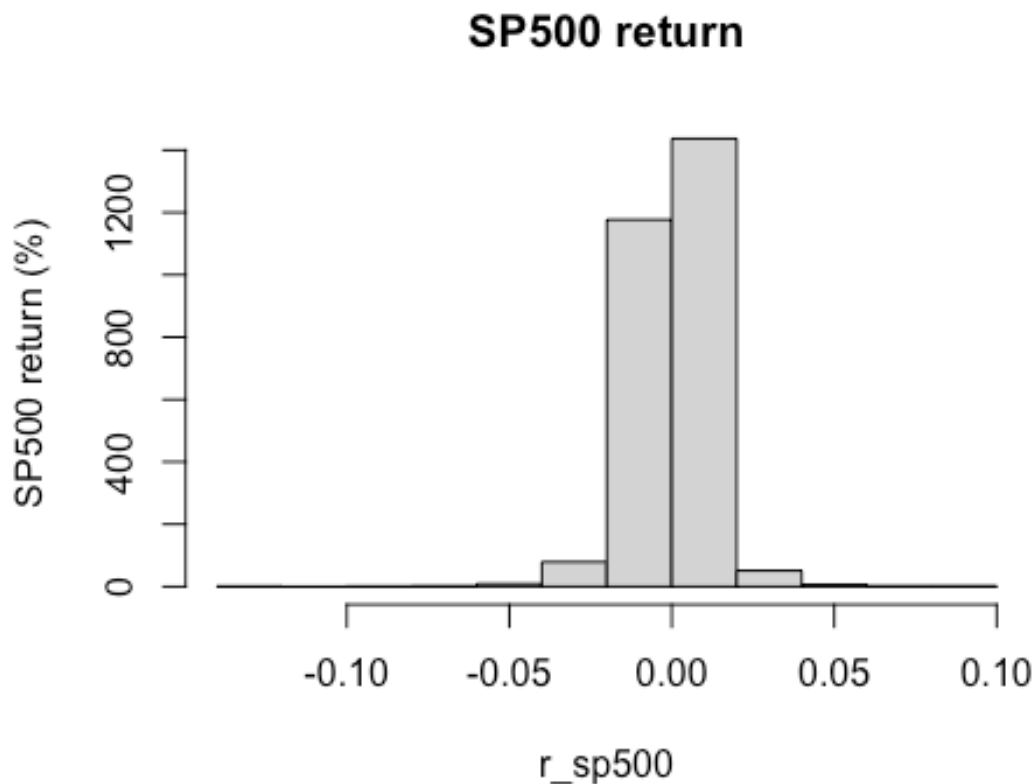
##
## Call:
## arima(x = data$sp500, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      0.9929  1320.5322      1.1279
## s.e.  0.0022   160.0822      0.0977
##
## sigma^2 estimated as 1121:  log likelihood = -13648.11,  aic = 27304.22

# Returns
r_sp500 = returns(data$sp500)
plot(r_sp500, ylab = "SP500 return (%)", main = "SP500 return", type = "l")
```



```
# Distribution
```

```
hist(r_sp500, ylab = "SP500 return (%)", main = "SP500 return")
```



```
skewness(as.numeric(r_sp500), na.rm = TRUE)

## [1] -0.8219723
## attr(,"method")
## [1] "moment"

kurtosis(as.numeric(r_sp500), na.rm = TRUE) + 3

## [1] 19.52988
## attr(,"method")
## [1] "excess"

# AR(1) with trend
arima(r_ba, c(1,0,0), xreg = data$trend)

##
## Call:
## arima(x = r_ba, order = c(1, 0, 0), xreg = data$trend)
##
## Coefficients:
##          ar1  intercept  data$trend
##      0.0528      0.001          0
## s.e. 0.0190      0.001          0
##
```

```
## sigma^2 estimated as 0.0005738: log likelihood = 6399.07, aic = -12790.13
```

MARKET MODEL

```
market_model_aapl = lm(r_aapl ~ r_sp500, data = data)
summary(market_model_aapl)
```

```
##
## Call:
## lm(formula = r_aapl ~ r_sp500, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.132220 -0.006146 -0.000082  0.006236  0.090327
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0003274  0.0002405   1.361   0.174
## r_sp500      1.1659046  0.0220788  52.807 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01264 on 2765 degrees of freedom
## (1 observation deleted due to missingness)
## Multiple R-squared:  0.5021, Adjusted R-squared:  0.5019
## F-statistic: 2789 on 1 and 2765 DF, p-value: < 2.2e-16
```

beta_aapl = 1.1659046

```
market_model_ba = lm(r_ba ~ r_sp500, data = data)
summary(market_model_ba)
```

```
##
## Call:
## lm(formula = r_ba ~ r_sp500, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.131054 -0.007899 -0.000096  0.007765  0.202011
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.0001488  0.0003562  -0.418   0.676
## r_sp500      1.3789165  0.0326967  42.173 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01872 on 2765 degrees of freedom
## (1 observation deleted due to missingness)
## Multiple R-squared:  0.3914, Adjusted R-squared:  0.3912
## F-statistic: 1779 on 1 and 2765 DF, p-value: < 2.2e-16
```

```

# beta_ba = 1.3789165

market_model_xom = lm(r_xom ~ r_sp500, data = data)
summary(market_model_xom)

##
## Call:
## lm(formula = r_xom ~ r_sp500, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.080928 -0.006522 -0.000282  0.006222  0.109120
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.0003397  0.0002613   -1.30   0.194
## r_sp500      0.8962688  0.0239864   37.37 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01373 on 2765 degrees of freedom
## (1 observation deleted due to missingness)
## Multiple R-squared:  0.3355, Adjusted R-squared:  0.3353
## F-statistic: 1396 on 1 and 2765 DF, p-value: < 2.2e-16

# beta_xom = 0.8962688

# Does the beta vary across different quarters?
# Creating the filters
data$Q = 1
data$Q[data$month == 4 | data$month == 5 | data$month == 6] = 2
data$Q[data$month == 7 | data$month == 8 | data$month == 9] = 3
data$Q[data$month == 10 | data$month == 11 | data$month == 12] = 4

beta_quaterly_aapl = lm(r_aapl ~ r_sp500*factor(Q), data = data)
summary(beta_quaterly_aapl)

##
## Call:
## lm(formula = r_aapl ~ r_sp500 * factor(Q), data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.132129 -0.006082 -0.000272  0.006343  0.088692
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.367e-04  4.866e-04   0.486  0.62666
## r_sp500      1.121e+00  3.391e-02  33.066 < 2e-16 ***
## factor(Q)2   -5.773e-05  6.832e-04  -0.084  0.93267

```

```
## factor(Q)3          7.472e-04  6.812e-04   1.097  0.27285
## factor(Q)4          -3.869e-04  6.831e-04  -0.566  0.57114
## r_sp500:factor(Q)2  -2.600e-02  5.720e-02  -0.454  0.64954
## r_sp500:factor(Q)3   1.729e-01  6.540e-02   2.643  0.00825 **
## r_sp500:factor(Q)4   1.277e-01  6.063e-02   2.107  0.03524 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01262 on 2759 degrees of freedom
## (1 observation deleted due to missingness)
## Multiple R-squared:  0.5048, Adjusted R-squared:  0.5036
## F-statistic: 401.8 on 7 and 2759 DF, p-value: < 2.2e-16
```

Yes, the beta of Apple vary across different quarters (3rd and 4th)

```
beta_quaterly_ba = lm(r_ba ~ r_sp500*factor(Q), data = data)
summary(beta_quaterly_ba)
```

```
##
## Call:
## lm(formula = r_ba ~ r_sp500 * factor(Q), data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.129003 -0.007865 -0.00262  0.007851  0.201086
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.0004048  0.0007172  -0.564  0.572526
## r_sp500         1.4819451  0.0499790  29.651 < 2e-16 ***
## factor(Q)2     -0.0003374  0.0010071  -0.335  0.737670
## factor(Q)3       0.0003224  0.0010042   0.321  0.748206
## factor(Q)4       0.0012105  0.0010069   1.202  0.229380
## r_sp500:factor(Q)2  0.1153907  0.0843197   1.368  0.171270
## r_sp500:factor(Q)3 -0.3318022  0.0964016  -3.442  0.000586 ***
## r_sp500:factor(Q)4 -0.4082863  0.0893710  -4.568  5.13e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01861 on 2759 degrees of freedom
## (1 observation deleted due to missingness)
## Multiple R-squared:  0.4003, Adjusted R-squared:  0.3988
## F-statistic: 263.1 on 7 and 2759 DF, p-value: < 2.2e-16
```

Yes, the beta of Boeing vary across different quarters (3rd and 4th)

```
beta_quaterly_xom = lm(r_xom ~ r_sp500*factor(Q), data = data)
summary(beta_quaterly_xom)
```



```
##
## Call:
## lm(formula = r_xom ~ r_sp500 * factor(Q), data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.080259 -0.006537 -0.000219  0.006112  0.108882
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -2.685e-04  5.295e-04  -0.507   0.612
## r_sp500        8.671e-01  3.689e-02  23.502 <2e-16 ***
## factor(Q)2     4.620e-04  7.434e-04   0.621   0.534
## factor(Q)3    -6.852e-04  7.413e-04  -0.924   0.355
## factor(Q)4    -9.242e-05  7.433e-04  -0.124   0.901
## r_sp500:factor(Q)2  9.855e-02  6.224e-02   1.583   0.113
## r_sp500:factor(Q)3 -2.360e-02  7.116e-02  -0.332   0.740
## r_sp500:factor(Q)4  5.143e-02  6.597e-02   0.780   0.436
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01373 on 2759 degrees of freedom
## (1 observation deleted due to missingness)
## Multiple R-squared:  0.337, Adjusted R-squared:  0.3353
## F-statistic: 200.3 on 7 and 2759 DF, p-value: < 2.2e-16
```

No, the beta of Exxon Mobil does not vary across different quarters

Portfolio Selection (Markowitz 1962) with XOM and BA
NB: I wrote a more general function to implement Portfolio Selection in
Python, available in
the Project section of my LinkedIn profile in the file "Some fun Python
scripts involving XOM
and JPM stocks".

```
weights_ba = NULL
weights_xom = NULL
portfolio_returns = NULL
portfolio_sds = NULL

potential_weights = seq(0, 1, by = 0.001)

for (i in 1:1000){
  weight_ba_tmp = sample(potential_weights, 1)
  weight_xom_tmp = 1 - weight_ba_tmp

  r_ba_clean = na.omit(r_ba)
  r_xom_clean = na.omit(r_xom)
```

```

    portfolio_return_tmp = (mean(r_ba_clean)*weight_ba_tmp) +
    (mean(r_xom_clean)*weight_xom_tmp)
    portfolio_sd_tmp = cov(r_ba_clean,
r_xom_clean)*weight_ba_tmp*weight_xom_tmp

    weights_ba[i] = round(weight_ba_tmp, 5)
    weights_xom[i] = round(weight_xom_tmp, 5)
    portfolio_returns[i] = portfolio_return_tmp
    portfolio_sds[i] = sqrt(weight_ba_tmp^2 * var(r_ba_clean) +
weight_xom_tmp^2 * var(r_xom_clean)
+ 2 * weight_ba_tmp * weight_xom_tmp *
cov(r_ba_clean, r_xom_clean))
}
# Dataframe
markowitz = data.frame(weights_ba, weights_xom, portfolio_returns,
portfolio_sds)

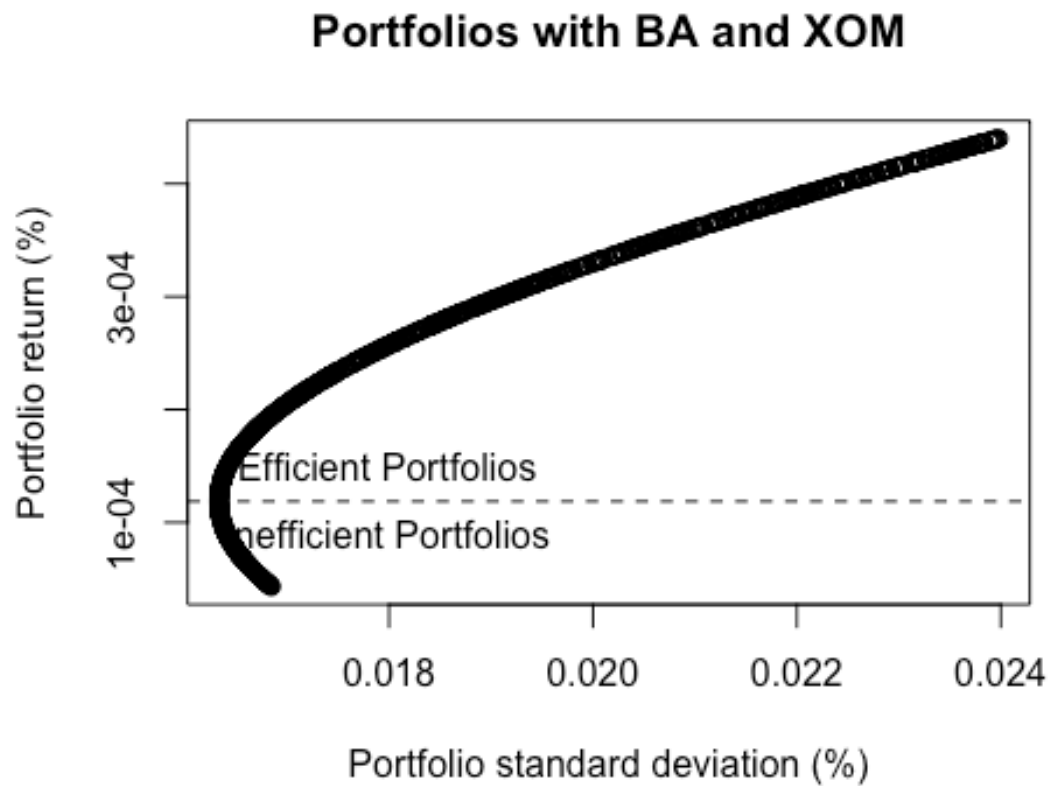
# Plot
sd = markowitz$portfolio_sds
r = markowitz$portfolio_returns
plot(sd, r, main = "Portfolios with BA and XOM", xlab = "Portfolio standard
deviation (%)",
      ylab = "Portfolio return (%)")

abline(h = markowitz$portfolio_returns[which.min(markowitz$portfolio_sds)],
col = "black", lty = 2)

min_sd_y = markowitz$portfolio_returns[which.min(markowitz$portfolio_sds)]
three_quarters_sd = 0.75 * max(markowitz$portfolio_sds)

text(x = three_quarters_sd, y = min_sd_y, labels = "Efficient Portfolios",
pos = 3,
     col = "black")
text(x = three_quarters_sd, y = min_sd_y, labels = "Inefficient Portfolios",
pos = 1,
     col = "black")

```



```
# Ordering the dataframe
markowitz = markowitz[order(markowitz$weights_ba), ]
markowitz = markowitz*100
colnames(markowitz) = c("weight_BA", "weigh_XOM", "return", "sd")
```