HW3_Problem 1

2025-06-26

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```r
library(gssr)
```

```
## Package loaded. To attach the GSS data, type data(gss_all) at the console.
## For the panel data and documentation, type e.g. data(gss_panel08_long) and data(gss_panel_doc).
## For help on a specific GSS variable, type ?varname at the console.
```

```r
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----------------------- tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.2     v tibble    3.2.1
## v lubridate 1.9.4     v tidyr     1.3.1
## v purrr     1.0.4

## -- Conflicts --------------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```r
library(dplyr)

data(gss_all)

gss_2018 <- gss_get_yr(2018)
```

```
## Fetching: https://gss.norc.org/documents/stata/2018_stata.zip
```

```r
dim(gss_2018)
```

```
## [1] 2348 1083
```

```r
colnames(gss_2018)
```

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##     [5] "hrs2"            "evwork"          "wrkslf"          "wrkgovt"
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## [1041] "issp"          "formwt"        "sampcode"      "sample"
## [1045] "oversamp"      "phase"         "spanself"      "spanint"
## [1049] "spaneng"       "hlthstrt"      "huadd"         "huaddwhy"
## [1053] "dwellpre"      "kidsinhh"      "respond"       "incuspop"
## [1057] "neisafe"       "rlooks"        "rgroomed"      "rweight"
## [1061] "rhlthend"      "wtss"          "wtssnr"        "wtssall"
## [1065] "vstrat"        "vpsu"          "wtssps"        "wtssnrps"
```

```
## [1069] "fileversion"    "spwrkslf2"      "spwrkslffam"    "cowrkslf2"
## [1073] "cowrkslffam"    "cowksup"        "subsamprate"    "hispanic_0022"
## [1077] "numemps_0422"   "uscitzn_0822"   "sibs_7222"      "racecen1_0022"
## [1081] "racecen2_0022"  "racecen3_0022"  "earnrs_7222"
```

```r
head(gss_2018)
```

```
## # A tibble: 6 x 1,083
##   year        id wrkstat    hrs1       hrs2       evwork      wrkslf  wrkgovt
##   <dbl+lbl> <dbl> <dbl+lbl>  <dbl+lbl>  <dbl+lbl>  <dbl+lbl>   <dbl+l> <dbl+l>
## 1 2018         1 3 [with a~ NA(i) [iap]    41        NA(i) [iap] 2 [som~ 2 [pri~
## 2 2018         2 5 [retire~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~ 2 [pri~
## 3 2018         3 1 [workin~    40        NA(i) [iap] NA(i) [iap] 2 [som~ 2 [pri~
## 4 2018         4 1 [workin~    40        NA(i) [iap] NA(i) [iap] 2 [som~ 2 [pri~
## 5 2018         5 5 [retire~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~ 2 [pri~
## 6 2018         6 5 [retire~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~ 2 [pri~
## # i 1,075 more variables: occ10 <dbl+lbl>, prestg10 <dbl+lbl>,
## #   prestg105plus <dbl+lbl>, indus10 <dbl+lbl>, marital <dbl+lbl>,
## #   martype <dbl+lbl>, divorce <dbl+lbl>, widowed <dbl+lbl>,
## #   spwrksta <dbl+lbl>, sphrs1 <dbl+lbl>, sphrs2 <dbl+lbl>, spevwork <dbl+lbl>,
## #   cowrksta <dbl+lbl>, cowrkslf <dbl+lbl>, coevwork <dbl+lbl>,
## #   cohrs1 <dbl+lbl>, cohrs2 <dbl+lbl>, spwrkslf <dbl+lbl>, spocc10 <dbl+lbl>,
## #   sppres10 <dbl+lbl>, sppres105plus <dbl+lbl>, spind10 <dbl+lbl>, ...
```

```r
view(gss_2018)


gss_subset <- gss_2018 %>%
  select(bible, trustsci) %>%
  na.omit()


gss_subset <- gss_2018 %>%
  select(bible, trustsci) %>%
  filter(!is.na(bible), !is.na(trustsci)) %>%
  filter(trustsci %in% c(1, 2, 3)) %>%
  mutate(
    bible_binary = ifelse(bible == 1, 1, 0)
  )

str(gss_subset)
```

```
## tibble [767 x 3] (S3: tbl_df/tbl/data.frame)
##  $ bible       : dbl+lbl [1:767] 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 2, 2, 2, 1, 2, 1, 2, 2, ...
##    ..@ label       : chr "Feelings about the bible"
##    ..@ format.stata: chr "%29.0g"
##    ..@ labels       : Named num [1:16] 1 2 3 4 NA NA NA NA NA NA ...
##    .. ..- attr(*, "names")= chr [1:16] "word of god" "inspired word" "ancient book" "other (vol)" ..
##  $ trustsci    : dbl+lbl [1:767] 1, 3, 3, 3, 1, 2, 2, 3, 2, 2, 3, 2, 3, 2, 2, 3, 3, 2, ...
##    ..@ label       : chr "We trust too much in science"
##    ..@ format.stata: chr "%29.0g"
##    ..@ labels       : Named num [1:17] 1 2 3 4 5 NA NA NA NA NA ...
##    .. ..- attr(*, "names")= chr [1:17] "strongly agree" "agree" "neither agree nor disagree" "disagre
##  $ bible_binary: num [1:767] 1 0 1 1 1 1 1 1 0 1 ...
```

```r
head(gss_subset)
```

```
## # A tibble: 6 x 3
##   bible             trustsci                          bible_binary
##   <dbl+lbl>         <dbl+lbl>                                <dbl>
## 1 1 [word of god]   1 [strongly agree]                          1
## 2 2 [inspired word] 3 [neither agree nor disagree]              0
## 3 1 [word of god]   3 [neither agree nor disagree]              1
## 4 1 [word of god]   3 [neither agree nor disagree]              1
## 5 1 [word of god]   1 [strongly agree]                          1
## 6 1 [word of god]   2 [agree]                                   1
```

```r
summary(gss_subset)
```

```
##      bible          trustsci       bible_binary
##  Min.   :1.000   Min.   :1.000   Min.   :0.0000
##  1st Qu.:1.000   1st Qu.:2.000   1st Qu.:0.0000
##  Median :2.000   Median :2.000   Median :0.0000
##  Mean   :1.692   Mean   :2.296   Mean   :0.4237
##  3rd Qu.:2.000   3rd Qu.:3.000   3rd Qu.:1.0000
##  Max.   :4.000   Max.   :3.000   Max.   :1.0000
```

```r
mean_trust <- gss_subset %>%
  group_by(bible_binary) %>%
  summarise(mean_trustsci = mean(trustsci, na.rm = TRUE))
print(mean_trust)
```

```
## # A tibble: 2 x 2
##   bible_binary mean_trustsci
##          <dbl>         <dbl>
## 1            0          2.50
## 2            1          2.01
```

```r
group1 <- gss_subset %>% filter(bible_binary == 1)
group0 <- gss_subset %>% filter(bible_binary == 0)

n1 <- nrow(group1)
n0 <- nrow(group0)

mean1 <- mean(group1$trustsci)
mean0 <- mean(group0$trustsci)

sd1 <- sd(group1$trustsci)
sd0 <- sd(group0$trustsci)


diff_in_means <- mean0 - mean1
se_diff <- sqrt((sd1^2 / n1) + (sd0^2 / n0))
z_score <- diff_in_means / se_diff

# Safe printing to LaTeX/PDF
cat("Difference in means:", round(diff_in_means, 3), "\n")
```

```
## Difference in means: 0.492
```

```r
cat("Standard error:", round(se_diff, 3), "\n")
```

```
## Standard error: 0.051
```

```r
cat("Z-score:", round(z_score, 3), "\n")
```

```
## Z-score: 9.602
```

```r
model <- lm(trustsci ~ bible_binary, data = gss_subset)
summary(model)
```

```
##
## Call:
## lm(formula = trustsci ~ bible_binary, data = gss_subset)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.50452 -0.50452 -0.01231  0.49548  0.98769
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.50452    0.03274  76.498   <2e-16 ***
## bible_binary -0.49222    0.05030  -9.786   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6883 on 765 degrees of freedom
## Multiple R-squared:  0.1113, Adjusted R-squared:  0.1101
## F-statistic: 95.77 on 1 and 765 DF,  p-value: < 2.2e-16
```

```r
library(lmtest)
```

```
## Loading required package: zoo
##
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```r
library(sandwich)
```

```r
coeftest(model, vcov = vcovHC(model, type = "HC1"))
```

```
##
## t test of coefficients:
##
##               Estimate Std. Error t value  Pr(>|t|)
```

```
## (Intercept)    2.504525   0.030937  80.957 < 2.2e-16 ***
## bible_binary -0.492217   0.051257  -9.603 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```
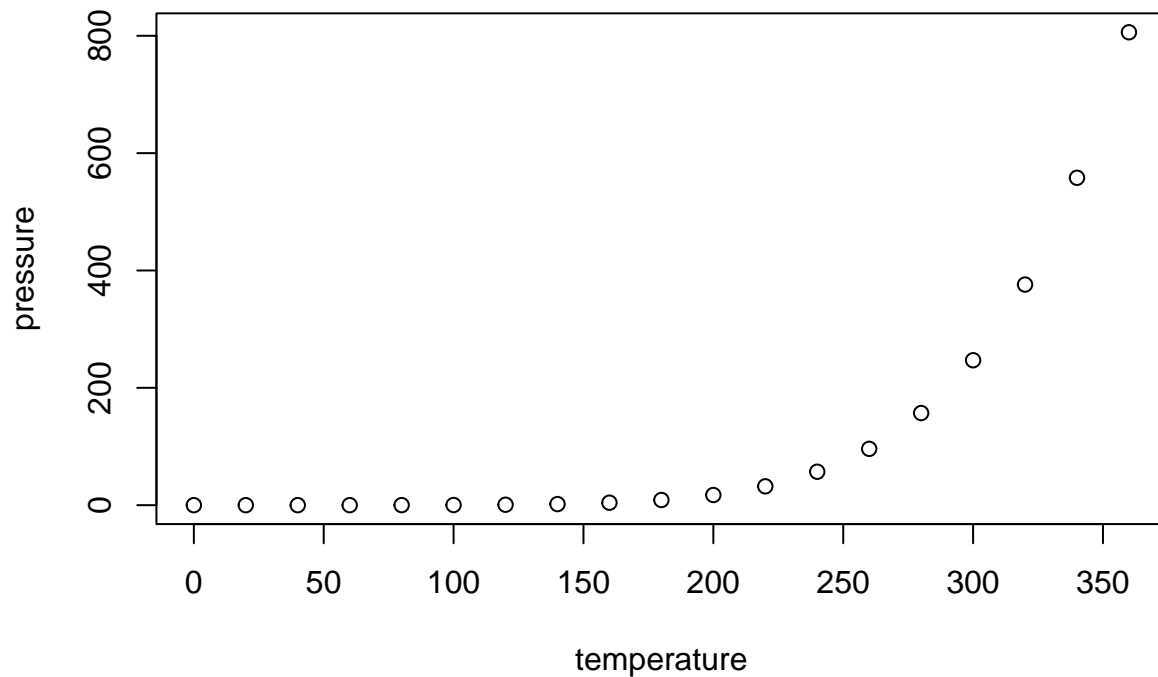
```
# Coefficient matches the difference in means
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

Including Plots

You can also embed plots, for example:

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

library(gssr) library(tidyverse) library(dplyr)

data(gss_all)
```

gss_2018 <- gss_get_yr(2018)

dim(gss_2018) colnames(gss_2018) head(gss_2018) view(gss_2018)

gss_subset <- gss_2018 %>% select(bible, trustsci) %>% na.omit()

gss_subset <- gss_2018 %>% select(bible, trustsci) %>% filter(!is.na(bible), !is.na(trustsci)) %>% filter(trustsci %in% c(1, 2, 3)) %>% mutate( bible_binary = ifelse(bible == 1, 1, 0) )

str(gss_subset) head(gss_subset) summary(gss_subset)

mean_trust <- gss_subset %>% group_by(bible_binary) %>% summarise(mean_trustsci = mean(trustsci, na.rm = TRUE)) print(mean_trust)

group1 <- gss_subset %>% filter(bible_binary == 1) group0 <- gss_subset %>% filter(bible_binary == 0)

n1 <- nrow(group1) n0 <- nrow(group0)

mean1 <- mean(group1$trustsci) mean0 <- mean(group0$trustsci)

sd1 <- sd(group1$trustsci) sd0 <- sd(group0$trustsci)

```r
# Calculate values
diff_in_means <- mean0 - mean1
se_diff <- sqrt((sd1^2 / n1) + (sd0^2 / n0))
z_score <- diff_in_means / se_diff

# Safe printing to LaTeX/PDF
cat("Difference in means:", round(diff_in_means, 3), "\n")
```

```
## Difference in means: 0.492
```

```r
cat("Standard error:", round(se_diff, 3), "\n")
```

```
## Standard error: 0.051
```

```r
cat("Z-score:", round(z_score, 3), "\n")
```

```
## Z-score: 9.602
```

```r
model <- lm(trustsci ~ bible_binary, data = gss_subset)
summary(model)
```

```
##
## Call:
## lm(formula = trustsci ~ bible_binary, data = gss_subset)
##
## Residuals:
##      Min      1Q  Median      3Q     Max
## -1.50452 -0.50452 -0.01231  0.49548  0.98769
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.50452    0.03274  76.498   <2e-16 ***
## bible_binary -0.49222    0.05030  -9.786   <2e-16 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6883 on 765 degrees of freedom
## Multiple R-squared:  0.1113, Adjusted R-squared:  0.1101
## F-statistic: 95.77 on 1 and 765 DF,  p-value: < 2.2e-16
```

```r
library(lmtest)
library(sandwich)

coeftest(model, vcov = vcovHC(model, type = "HC1"))
```

```
##
## t test of coefficients:
##
##              Estimate Std. Error t value  Pr(>|t|)
## (Intercept)  2.504525   0.030937  80.957 < 2.2e-16 ***
## bible_binary -0.492217   0.051257  -9.603 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Coefficient matches the difference in means
```