Exercise2

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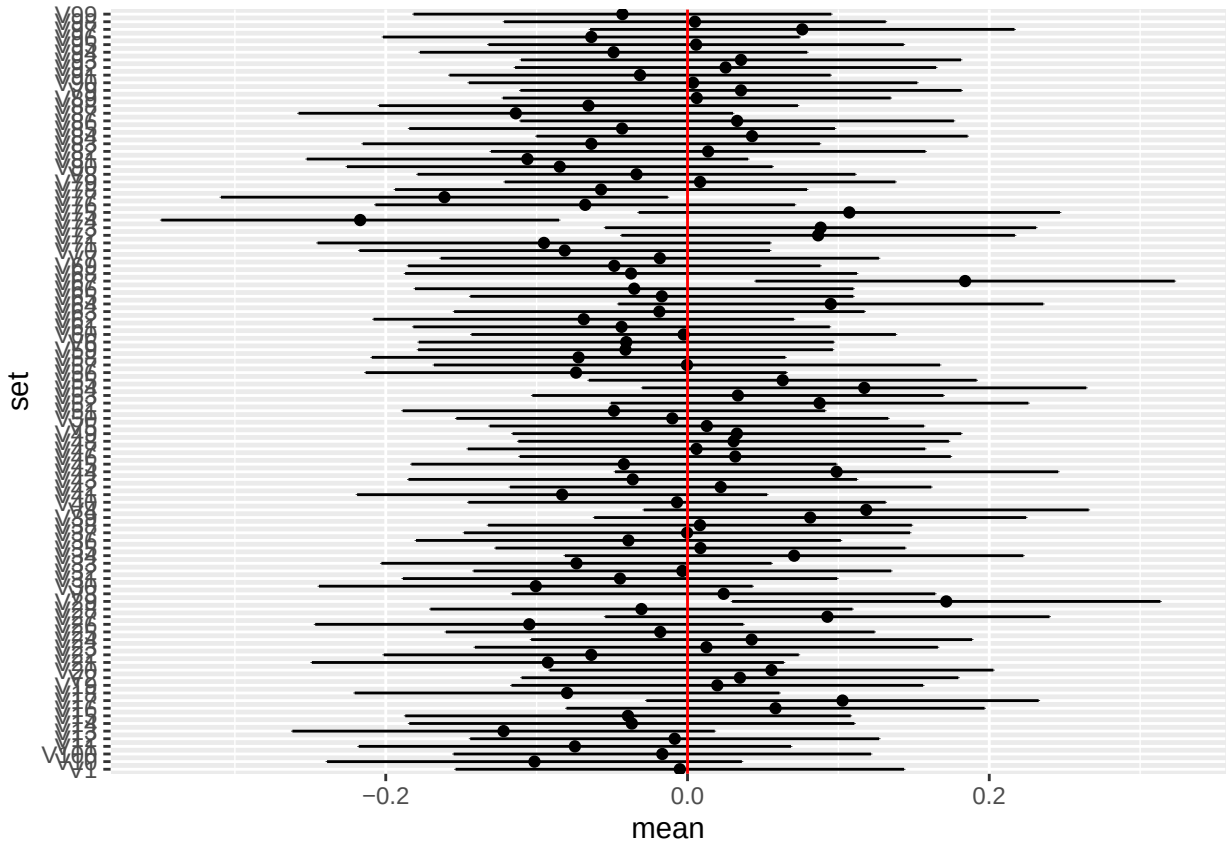
Monte Carlo simulation

```
set.seed(15)
library(dplyr)
library(tidyr)
library(plotrix)

data <- replicate (100, rnorm(200)) %>% as.data.frame()# 100 samples from a standard normal distributio

data <- data %>% pivot_longer(cols=everything(), names_to = "set", values_to = "val")

sumdata <- data %>%  # means, bias, standard errors, CIs
  group_by(set) %>%
  summarise_each(funs(mean,
                      bias= 0-mean,
                      se=sd(.)/sqrt(n()),
                      lower = mean - qnorm(0.975)*sd(.)/sqrt(n()),
                      upper= mean + qnorm(0.975)*sd(.)/sqrt(n())))


sumdata
```

```
## # A tibble: 100 x 6
##    set       mean     bias     se   lower  upper
##    <chr>    <dbl>    <dbl>  <dbl>   <dbl>  <dbl>
##  1 V1    -0.00510  0.00510 0.0743 -0.151  0.141
##  2 V10   -0.101    0.101   0.0687 -0.236  0.0333
##  3 V100  -0.0167   0.0167  0.0691 -0.152  0.119
##  4 V11   -0.0746   0.0746  0.0716 -0.215  0.0657
##  5 V12   -0.00851  0.00851 0.0678 -0.141  0.124
##  6 V13   -0.122    0.122   0.0700 -0.259  0.0153
##  7 V14   -0.0369   0.0369  0.0738 -0.181  0.108
##  8 V15   -0.0394   0.0394  0.0738 -0.184  0.105
##  9 V16    0.0583  -0.0583  0.0693 -0.0774 0.194
## 10 V17    0.103   -0.103   0.0650 -0.0247 0.230
## # ... with 90 more rows
```

```
library(ggplot2)
library(gghighlight)
```

```
pd <- position_dodge(0.78)

ggplot(sumdata, aes(x=mean, y = set)) +
   #draws the means
      geom_point(position = pd) +
   #draws the CI error bars
      geom_errorbar(data=sumdata, aes(xmin=mean-2*se, xmax=mean+2*se), width=.1, position = pd)+
      geom_vline(xintercept = 0, color ="red")
```




```
sumdata %>% filter(lower>0 | upper <0)
```

```
## # A tibble: 4 x 6
##   set     mean   bias     se   lower   upper
##   <chr>  <dbl>  <dbl>  <dbl>   <dbl>   <dbl>
## 1 V29    0.172 -0.172 0.0710  0.0324  0.311
## 2 V67    0.184 -0.184 0.0695  0.0479  0.320
## 3 V74   -0.217  0.217 0.0659 -0.346  -0.0878
## 4 V77   -0.161  0.161 0.0740 -0.306  -0.0160
```