hw04

2022/4/27

7.2

Refer to the law data (bootstrap). Use the jackknife-after-bootstrap method to estimate the standard error of the bootstrap estimate of se(R).

```
data_law <- as_tibble(bootstrap::law)

# Bootstrap
n <- 10
boot <- data_law %>%
  bootstrap(n)

grp_boot <- boot$strap %>% map(as_tibble)

# define function of R
r <- function(tib, col1=1, col2=2) {
  return(cor(tib[, col1], tib[, col2])[[1]])
  }

# jackknife
r_boot <-  grp_boot %>% map_dbl(r)

jknf <- r_boot %>% jackknife(mean)

#result
jknf$jack.se
```

```
## [1] 0.03459108
```

7.3

Obtain a bootstrap t confidence interval estimate for the correlation statistic in Example 7.2 (law data in bootstrap).

First compute the $\hat{R}$.

```
r_mu <- r(data_law)
```

Then use bootstrap to compute the $\hat{se}\widehat{R^{(b)}}$ for every sample in 7.2.

```
# bootstrap again
boot_grp_boot <- list()

for (i in 1:n){
boot_grp_boot[i] <- bootstrap(grp_boot[i] %>% as.data.frame(), n)
```

```r
}

grp_boot_grp_boot <- list()
sd_r_boot <- list()

for (i in 1:n){
    grp_boot_grp_boot[[i]] <- boot_grp_boot[[i]] %>% map(as_tibble)
    sd_r_boot <- grp_boot_grp_boot[[i]] %>% map_dbl(r) %>% sd()
}
```

Then Compute the t-statistics for every $\hat{se}\widehat{R^{(b)}}$ and compute the quantile of them.

```r
t_boot <- (r_boot - r_mu) / sd_r_boot

alpha <- 0.05

Qt <- quantile(t_boot, c(alpha/2, 1-alpha/2), type = 1)
```

In the end, compute the sample standard deviation $\hat{se}\hat{R}$ in the first resampling and compute the Bootstrap t CI.

```r
se_boot <- sd(r_boot)

r_mu + Qt * se_boot
```

```
##      2.5%     97.5%
## 0.6061524 0.9272639
```