

# Neyman

```
setwd(dirname(rstudioapi::getActiveDocumentContext())$path))
df <- read_dta("dataverse_files/AER merged.dta")
df <- na.omit(df)
```

```
# Input: Two treatment groups
# Function that returns:
#   (1) difference in means estimator
#   (2) estimate of variance
#   (3) p-value as a list
neyman <- function(Y1, Y0){
  est <- mean(Y1) - mean(Y0)

  n1 <- length(Y1)
  n0 <- length(Y0)
  var1 <- var(Y1)
  var0 <- var(Y0)
  est_var <- var1/n1 + var0/n0

  pval <- 2 * pnorm(abs(est), lower.tail=FALSE)
  out <- list("est" = est, "se" = sqrt(est_var), "p" = pval)

  return(out)
}
```

```
treated <- df %>% filter(treatment == 1)
control <- df %>% filter(treatment == 0)
```

```
# Treatment vs. control -----
```

```
neyman(treated$amount, control$amount)
```

```
## $est
## [1] 0.1828991
##
## $se
## [1] 0.08320044
##
## $p
## [1] 0.8548772
```

```
# Match ratio -----
```

```
## 1:1
neyman(treated$amount[treated$ratio == 1], control$amount)
```

```
## $est
## [1] 0.1226974
##
```

```

## $se
## [1] 0.1123439
##
## $p
## [1] 0.9023468

## 2:1
neyman(treated$amount[treated$ratio == 2], control$amount)

## $est
## [1] 0.2563545
##
## $se
## [1] 0.1150728
##
## $p
## [1] 0.7976771

## 3:1
neyman(treated$amount[treated$ratio == 3], control$amount)

## $est
## [1] 0.1701284
##
## $se
## [1] 0.1045112
##
## $p
## [1] 0.8649092

# Threshold -----

## $25k
neyman(treated$amount[treated$size == 1], control$amount)

## $est
## [1] 0.2862921
##
## $se
## [1] 0.1328482
##
## $p
## [1] 0.7746544

## $50k
neyman(treated$amount[treated$size == 2], control$amount)

## $est
## [1] 0.1041568
##
## $se
## [1] 0.1162334
##
## $p
## [1] 0.9170449

## $100k

```

```
neyman(treated$amount[treated$size == 3], control$amount)
```

```
## $est  
## [1] 0.1064115  
##  
## $se  
## [1] 0.1082822  
##  
## $p  
## [1] 0.9152559
```

```
# Example amount -----
```

```
# Low
```

```
neyman(treated$amount[treated$ask == 1], control$amount)
```

```
## $est  
## [1] 0.154777  
##  
## $se  
## [1] 0.1073161  
##  
## $p  
## [1] 0.8769971
```

```
# Med
```

```
neyman(treated$amount[treated$ask == 2], control$amount)
```

```
## $est  
## [1] 0.2039597  
##  
## $se  
## [1] 0.1151514  
##  
## $p  
## [1] 0.838385
```

```
# High
```

```
neyman(treated$amount[treated$ask == 3], control$amount)
```

```
## $est  
## [1] 0.1899811  
##  
## $se  
## [1] 0.109537  
##  
## $p  
## [1] 0.8493239
```

```
# Treatment vs. control -----
```

```
neyman(treated$gave, control$gave)
```

```
## $est  
## [1] 0.004852237  
##  
## $se
```

```

## [1] 0.001351028
##
## $p
## [1] 0.9961285

# Match ratio -----

## 1:1
neyman(treated$gave[treated$ratio == 1], control$gave)

## $est
## [1] 0.003222787
##
## $se
## [1] 0.001756789
##
## $p
## [1] 0.9974286

## 2:1
neyman(treated$gave[treated$ratio == 2], control$gave)

## $est
## [1] 0.005402297
##
## $se
## [1] 0.001817126
##
## $p
## [1] 0.9956896

## 3:1
neyman(treated$gave[treated$ratio == 3], control$gave)

## $est
## [1] 0.005935811
##
## $se
## [1] 0.001826898
##
## $p
## [1] 0.9952639

# Threshold -----

## $25k
neyman(treated$gave[treated$size == 1], control$gave)

## $est
## [1] 0.004098063
##
## $se
## [1] 0.00196563
##
## $p
## [1] 0.9967302

```

```
## $50k
neyman(treated$gave[treated$size == 2], control$gave)
```

```
## $est
## [1] 0.005099885
##
## $se
## [1] 0.001995842
##
## $p
## [1] 0.9959309
```

```
## $100k
neyman(treated$gave[treated$size == 3], control$gave)
```

```
## $est
## [1] 0.004859129
##
## $se
## [1] 0.001988947
##
## $p
## [1] 0.996123
```

```
# Example amount -----
```

```
# Low
neyman(treated$gave[treated$ask == 1], control$gave)
```

```
## $est
## [1] 0.004515571
##
## $se
## [1] 0.00179146
##
## $p
## [1] 0.9963971
```

```
# Med
neyman(treated$gave[treated$ask == 2], control$gave)
```

```
## $est
## [1] 0.004622976
##
## $se
## [1] 0.001794511
##
## $p
## [1] 0.9963114
```

```
# High
neyman(treated$gave[treated$ask == 3], control$gave)
```

```
## $est
## [1] 0.005418873
##
## $se
```

```
## [1] 0.001815451
##
## $p
## [1] 0.9956764
```