Causal inference

hw6　　陈区 21304027

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5.Analysis of the role of anxiety in the media framing effects] 2

配套环境

省略号代表同理

```
library(tidyverse)
library(mediation)
xfun::session_info()
```

```
R version 4.4.0 (2024-04-24 ucrt)
Platform: x86_64-w64-mingw32/x64
Running under: Windows 11 x64 (build 22631)

Locale:
  LC_COLLATE=Chinese (Simplified)_China.utf8
  LC_CTYPE=Chinese (Simplified)_China.utf8
  LC_MONETARY=Chinese (Simplified)_China.utf8
  LC_NUMERIC=C
  LC_TIME=Chinese (Simplified)_China.utf8

Package version:
  askpass_1.2.0       backports_1.5.0     base64enc_0.1-3
  bit_4.0.5           bit64_4.0.5         blob_1.2.4
  boot_1.3-30         brio_1.1.5          broom_1.0.6
  bslib_0.8.0         cachem_1.1.0        callr_3.7.6
  cellranger_1.1.0    checkmate_2.3.1     cli_3.6.2
  clipr_0.8.0         cluster_2.1.6       colorspace_2.1-0
  compiler_4.4.0      conflicted_1.2.0    cpp11_0.4.7
  crayon_1.5.3        curl_5.2.1          data.table_1.15.4
  DBI_1.2.3           dbplyr_2.5.0        desc_1.4.3
  diffobj_0.3.5       digest_0.6.35       dplyr_1.1.4
  dtplyr_1.3.1        evaluate_0.24.0     fansi_1.0.6
  farver_2.1.2        fastmap_1.2.0       fontawesome_0.5.2
  forcats_1.0.0       foreign_0.8-86      Formula_1.2-5
  fs_1.6.4            gargle_1.5.2        generics_0.1.3
  ggplot2_3.5.1       ggthemr_1.1.0       glue_1.7.0
  googledrive_2.1.1   googlesheets4_1.1.1 graphics_4.4.0
  grDevices_4.4.0     grid_4.4.0          gridExtra_2.3
  gtable_0.3.5        haven_2.5.4         highr_0.11
  Hmisc_5.1-3         hms_1.1.3           htmlTable_2.4.3
  htmltools_0.5.8.1   htmlwidgets_1.6.4   httr_1.4.7
  ids_1.0.1           isoband_0.2.7       jquerylib_0.1.4
  jsonlite_1.8.8      knitr_1.48          labeling_0.4.3
  lattice_0.22-6      lifecycle_1.0.4     lme4_1.1-35.3
  lpSolve_5.6.20      lubridate_1.9.3     magrittr_2.0.3
  MASS_7.3-60.2       Matrix_1.7-0        mediation_4.5.0
  memoise_2.0.1       methods_4.4.0       mgcv_1.9.1
  mime_0.12           minqa_1.2.7         modelr_0.1.11
  munsell_0.5.1       mvtnorm_1.2-5       nlme_3.1-164
  nloptr_2.0.3        nnet_7.3-19         openssl_2.2.0
  parallel_4.4.0      pillar_1.9.0        pkgbuild_1.4.4
  pkgconfig_2.0.3     pkgload_1.4.0       praise_1.0.0
  prettyunits_1.2.0   processx_3.8.4      progress_1.2.3
  ps_1.7.7            purrr_1.0.2         R6_2.5.1
  ragg_1.3.2          rappdirs_0.3.3      RColorBrewer_1.1.3
  Rcpp_1.0.12         RcppEigen_0.3.4.0.2 readr_2.1.5
```

丁鹏

$$
\begin{aligned}
w_{1,(1,0)}(X) &= \frac{\pi_{(1,0)}(X)}{\pi_{(1,0)}(X)+\pi_{(1,1)}(X)} \Big/ \frac{\pi_{(1,0)}}{\pi_{(1,0)}+\pi_{(1,1)}}, \\
w_{0,(1,0)}(X) &= \frac{\pi_{(1,0)}(X)}{\pi_{(1,0)}(X)+\pi_{(0,0)}(X)} \Big/ \frac{\pi_{(1,0)}}{\pi_{(1,0)}+\pi_{(0,0)}}, \\
w_{0,(0,0)}(X) &= \frac{\pi_{(0,0)}(X)}{\pi_{(1,0)}(X)+\pi_{(0,0)}(X)} \Big/ \frac{\pi_{(0,0)}}{\pi_{(1,0)}+\pi_{(0,0)}}, \\
w_{1,(1,1)}(X) &= \frac{\pi_{(1,1)}(X)}{\pi_{(1,0)}(X)+\pi_{(1,1)}(X)} \Big/ \frac{\pi_{(1,1)}}{\pi_{(1,0)}+\pi_{(1,1)}}.
\end{aligned}
$$

{eq-1}

5.Analysis of the role of anxiety in the media framing effects]

```
data(framing)

framing <- framing |> as.tibble()

glimpse(framing)
```

```
Rows: 265
Columns: 15
$ cond      <fct> 3, 4, 2, 1, 3, 1, 1, 2, 1, 4, 4, 4, 4, 1, 1, 2, 1, 3, 1, 1, …
$ anx       <fct> a little anxious, somewhat anxious, a little anxious, not an…
$ age       <int> 45, 73, 53, 45, 55, 85, 58, 53, 52, 42, 38, 38, 26, 52, 48, …
$ educ      <fct> high school, bachelor's degree or higher, some college, high…
$ gender    <fct> male, male, female, male, female, female, female, male, fema…
$ income    <int> 13, 16, 3, 14, 12, 3, 10, 9, 14, 15, 9, 6, 10, 11, 19, 10, 7…
$ emo       <dbl> 7, 6, 8, 9, 5, 5, 10, 8, 8, 3, 11, 9, 8, 10, 3, 12, 9, 6, 8,…
$ p_harm    <dbl> 6, 3, 7, 8, 5, 6, 8, 7, 5, 2, 8, 8, 6, 8, 3, 8, 8, 6, 7, 6, …
$ tone      <int> 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, …
$ eth       <int> 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, …
$ treat     <dbl> 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1, 1, …
$ english   <fct> Oppose, Favor, Strongly Oppose, Strongly Oppose, Strongly Op…
$ immigr    <int> 4, 3, 3, 4, 2, 4, 4, 4, 3, 2, 4, 4, 3, 4, 2, 4, 4, 4, 4, 1, …
$ anti_info <int> 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, …
$ cong_mesg <int> 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, …
```

```r
table(framing$anx)
```

```
        not asked           refused      very anxious   somewhat anxious
                0                 0                60                 86
  a little anxious not anxious at all
               74                45
```

```r
framing$anx <- as.numeric(framing$anx)
```

```r
mediator_model <- lm(anx~treat,data=framing)

outcome_model <- glm(cong_mesg ~ treat + anx,
                     data = framing, family = binomial)



mediation_results <- mediate(mediator_model, outcome_model,
                             treat = "treat", mediator = "anx",
                             boot = TRUE, sims = 1000)



summary(mediation_results)
```

```
Causal Mediation Analysis

Nonparametric Bootstrap Confidence Intervals with the Percentile Method

                         Estimate 95% CI Lower 95% CI Upper p-value
ACME (control)             0.0708       0.0256         0.12  <2e-16 ***
ACME (treated)             0.0735       0.0255         0.12  <2e-16 ***
ADE (control)              0.0323      -0.0940         0.16    0.61
ADE (treated)              0.0351      -0.1057         0.17    0.61
Total Effect               0.1059      -0.0361         0.23    0.16
Prop. Mediated (control)   0.6687      -4.9822         4.50    0.16
Prop. Mediated (treated)   0.6945      -4.6905         4.30    0.16
ACME (average)             0.0721       0.0254         0.12  <2e-16 ***
ADE (average)              0.0337      -0.0998         0.16    0.61
Prop. Mediated (average)   0.6816      -4.8554         4.40    0.16
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Sample Size Used: 265
```

```
Simulations: 1000
```

```
# Confidence intervals
ci_nde <- mediation_results$d1.ci
ci_nie <- mediation_results$d0.ci

# Variances
var_nde <- mediation_results$d1.var
var_nie <- mediation_results$d0.var
```

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```
ACME (average)            0.0720       0.0297         0.12
ADE (average)             0.0336      -0.0821         0.17
```

ACME(NIE)

ADE(A=NDE)