

<Simulation Scenario Debugging>

- 12월 28일 Version

<What TO DO>

1) N=1000, REPL=1000으로 하여 각 방법론 별 ATE, ATT 추정치가 동일한 경우에서의

$E[Y^1]$, $E[Y^1 | A=1]$ 추정치 또한 차이가 없는지 확인

2) DR Sandwich robust variance 추정량 이전에 Debugging 할 때 사용했던 $\hat{D}(\hat{\theta})$ 이용해 SD Ratio, Coverage probability 다시 확인

<Result>

1) ATE, ATT 추정치가 동일한 경우가 없는 것으로 확인됨.

: 추정치 차이를 계산할 때 “차이의 절댓값”이 1e-06보다 적은가?”로 coding하지 않았다.

code 수정한 결과, 추정치가 방법론 별 ATT, ATE 추정치가 동일한 경우는 없는 것으로 보인다.

2)-①. $A \sim \text{inv.logit}(1 + 0.01B + 0.01C)$ / N=REPL=1000

```
print(ATE_1_performance)
#           Bias           rMSE Naive_var_coverage Naive_var_SD_Ratio Sandwich_robust_var_coverage Sandwich_var_SD_Ratio
# Outcome_reg -0.002379192 0.009928812           0.941           1.865495                NA                NA
# IPW          -0.002150330 0.010115352           0.867           1.180995                0.982           2.850673
# DR           -0.002304139 0.009961594           0.938           1.869170                0.980           2.323911

print(ATT_1_performance)
#           Bias           rMSE Naive_var_coverage Naive_var_SD_Ratio Sandwich_robust_var_coverage Sandwich_var_SD_Ratio
# Outcome_reg -0.002379192 0.009928812           0.941           1.865495                NA                NA
# IPW          -0.002438935 0.009934539           0.870           1.1740513                0.995           3.739305
# DR           -0.002399891 0.009940280           0.377           0.1196043                1.000           20.269324
```

2)-②. $A \sim \text{inv.logit}(0 + 0.6B + 0.6C)$ / N=REPL=1000

```
print(ATE_1_performance)
#           Bias           rMSE Naive_var_coverage Naive_var_SD_Ratio Sandwich_robust_var_coverage Sandwich_var_SD_Ratio
# Outcome_reg -0.002941931 0.004282521           0.962           0.9971873                NA                NA
# IPW          -0.003451570 0.004709817           0.974           1.2522184                0.983           1.577980
# DR           -0.003431347 0.004399258           0.957           0.9953517                0.961           1.054439

print(ATT_1_performance)
#           Bias           rMSE Naive_var_coverage Naive_var_SD_Ratio Sandwich_robust_var_coverage Sandwich_var_SD_Ratio
# Outcome_reg -0.002941931 0.004282521           0.962           0.9971873                NA                NA
# IPW          -0.005151964 0.006159374           0.936           0.9573452                0.991           1.773160
# DR           -0.004043887 0.004997942           0.656           0.2137094                0.976           1.169281
```

: DR ATT Sandwich variance 얻는 방식을 바꾼 후, Exposure ratio가 0.5 ~ 0.6 사이일 때 결과 관측해보니 SD Ratio가 1.5 근방일 때, Coverage probability가 0.976임을 확인함.

2)-③. $A \sim \text{inv.logit}(-2 + 0.2B + 0.2C)$ / N=REPL=1000

```
print(ATE_1_performance)
#           Bias           rMSE Naive_var_coverage Naive_var_SD_Ratio Sandwich_robust_var_coverage Sandwich_var_SD_Ratio
# Outcome_reg -0.001817516 0.008770811           0.955           0.9927099                NA                NA
# IPW          -0.001943531 0.009628179           0.886           0.6381045                0.987           1.482649
# DR           -0.002539970 0.009200259           0.953           0.9875051                0.982           1.239156

print(ATT_1_performance)
#           Bias           rMSE Naive_var_coverage Naive_var_SD_Ratio Sandwich_robust_var_coverage Sandwich_var_SD_Ratio
# Outcome_reg -0.001817516 0.008770811           0.955           0.99270988                NA                NA
# IPW          -0.001722056 0.008771304           0.905           0.68148855                0.995           2.016187
# DR           -0.001581589 0.008754451           0.385           0.07198237                1.000           3.357375
```