‹Simulation Scenario result 기록›

- 1월 12일 Version

‹What TO DO›

: Exposure prevalence가 0.12 ~ 0.2 사이일 때 이전에 설정한 4가지 시나리오 적용한 결과 확인

‹Share & Result›

1) PS model의 parameter 조합은 최대한 target paper와 동일하게 설정

: target paper에서 δ_B, δ_C 조합이 log(1.2), log(1.5)가 있었으나 (δ_B, δ_C) = (log(1.5), log(1.5))인 경우, PS의 최솟값이 0.02여서 log(1.5)는 후보에서 제외함.

: A ~ inv.logit(-2, log(1.2), log(1.2))

2) 각 Scenario 별 결과

Exposure ratio p = 0.446 ~ 0.561 (mean=0.509)								
Scenario		추정량 종류	Bias	rMSE	Coverage probability Naive_var	SD Ratio Naive_var	Coverage probability Sandwich_ var	SD Ratio Sandwich_ var
(i)	ATE	Outcome regression	-0.00130	0.003853	0.954	1.001		
		IPW Estimator	-0.00139	0.003858	0.983	1.502	0.983	1.53
		DR Estimator	-0.00143	0.00384	0.955	0.998	0.965	1.05
	ATT	Outcome regression	-0.00130	0.0038	0.954	1.00		
		IPW Estimator	-0.00204	0.00393	0.983	1.45	0.995	2.015
		DR Estimator	-0.0015	0.00390	0.694	0.254	0.974	1.161
(ii)	ATE	Outcome regression	-0.00139	0.00503	0.936	0.99		
		IPW Estimator	-0.00137	0.00502	0.977	1.43	0.978	1.46
		DR Estimator	-0.00142	0.00503	0.934	0.98	0.945	1.04
	ATT	Outcome regression	-0.00139	0.00503	0.936	0.99		
		IPW Estimator	-0.00131	0.00508	0.972	1.39	0.989	1.88
		DR Estimator	-0.00121	0.00504	0.667	0.27	0.958	1.13
(iii)	ATE	Outcome regression	0.00117	0.000412	0.946	1.00		
		IPW Estimator	0.00118	0.00413	0.981	1.49	0.983	1.53
		DR Estimator	0.00110	0.00413	0.946	0.99	0.951	1.05
	ATT	Outcome regression	0.00117	0.00412	0.946	1.00		
		IPW Estimator	0.00095	0.0042	0.977	1.45	0.994	2.013
		DR Estimator	0.0011	0.00419	0.680	0.260	0.959	1.138

(iv)	ATE	Outcome regression	0.0326	0.00573	0.912	1.00		
		IPW Estimator	0.0326	0.00574	0.968	1.43	0.971	1.47
		DR Estimator	0.0325	0.00573	0.910	0.997	0.931	1.05
	ATT	Outcome regression	0.0326	0.0057	0.912	1.00		
		IPW Estimator	0.0322	0.0058	0.965	1.398	0.988	1.90
		DR Estimator	0.0323	0.00578	0.654	0.283	0.938	1.133

Exposure ratio p = 0.21 ~ 0.289 (mean=0.25)

Scenario		추정량 종류	Bias	rMSE	Coverage probability Naive_var	SD Ratio Naive_var	Coverage probability Sandwich_ var	SD Ratio Sandwich_ var
(i)	ATE	Outcome regression	-3.07e-04	0.0056	0.944	0.99		
		IPW Estimator	-7.13e-05	0.00578	0.956	1.1	0.975	1.51
		DR Estimator	-4.94e-04	0.00576	0.936	0.993	0.965	1.15
	ATT	Outcome regression	-0.0003	0.0056	0.944	0.996		
		IPW Estimator	-0.00032	0.0056	0.958	1.114	0.994	2.018
		DR Estimator	-0.00014	0.0055	0.549	0.142	0.989	1.78
(ii)	ATE	Outcome regression	-0.00158	0.00613	0.940	1.00		
		IPW Estimator	-0.0011	0.00614	0.950	1.06	0.984	1.45
		DR Estimator	-0.0017	0.00606	0.949	0.995	0.969	1.130
	ATT	Outcome regression	-0.00030	0.0056	0.944	0.89		
		IPW Estimator	-0.00032	0.0056	0.958	1.00	0.994	1.817
		DR Estimator	-0.00014	0.0055	0.549	0.127	0.989	1.60
(iii)	ATE	Outcome regression	-0.00232	0.0052	0.942	0.999		
		IPW Estimator	-0.00206	0.0052	0.961	1.15	0.985	1.51
		DR Estimator	-0.00235	0.0051	0.949	0.995	0.965	1.13
	ATT	Outcome regression	-0.00232	0.00520	0.942	0.99		
		IPW Estimator	-0.00240	0.00529	0.964	1.17	0.998	2.02
		DR Estimator	-0.00223	0.00528	0.557	0.15	0.992	1.68
(iv)	ATE	Outcome regression	0.0305	0.0068	0.926	1.00		
		IPW Estimator	0.0308	0.0068	0.942	1.11	0.971	1.46
		DR Estimator	0.0305	0.0067	0.929	0.99	0.959	1.152
	ATT	Outcome regression	0.0305	0.0068	0.926	1.00		
		IPW Estimator	0.0305	0.0069	0.938	1.13	0.988	1.91
		DR Estimator	0.0307	0.0069	0.519	0.16	0.992	1.65

Exposure ratio = 0.12 ~ 0.2 (mean=0.125)								
Scenario		추정량 종류	Bias	rMSE	Coverage probability Naive_var	SD Ratio Naive_var	Coverage probability Sandwich_ var	SD Ratio Sandwich_ var
(i)	ATE	Outcome regression	-0.0023	0.0089	0.952	0.99		
		IPW Estimator	-0.0020	0.0096	0.884	0.637	0.987	1.48
		DR Estimator	-0.0027	0.0093	0.949	0.985	0.981	1.237
	ATT	Outcome regression	-0.00226	0.00896	0.952	0.9919		
		IPW Estimator	-0.00223	0.00897	0.899	0.675	0.993	2.01
		DR Estimator	-0.0021	0.00895	0.392	0.071	1.00	3.39
(ii)	ATE	Outcome regression	-4.38e-04	0.0100	0.946	0.997		
		IPW Estimator	1.208e-03	0.0105	0.878	0.612	0.979	1.414
		DR Estimator	-2.01e-05	0.01010	0.945	0.982	0.979	1.204
	ATT	Outcome regression	-0.00043	0.0100	0.946	0.997		
		IPW Estimator	-0.00066	0.0101	0.878	0.649	0.991	1.88
		DR Estimator	-0.00048	0.01012	0.418	0.069	1.00	3.20
(iii)	ATE	Outcome regression	-0.0039	0.0080	0.952	1.00		
		IPW Estimator	-0.00245	0.0084	0.899	0.686	0.981	1.477
		DR Estimator	-0.00349	0.0081	0.952	0.988	0.980	1.204
	ATT	Outcome regression	-0.00395	0.00805	0.952	1.00		
		IPW Estimator	-0.04222	0.00809	0.902	0.725	0.991	2.01
		DR Estimator	-0.00405	0.00810	0.437	0.077	1.00	3.059
(iv)	ATE	Outcome regression	0.0296	0.0102	0.930	0.997		
		IPW Estimator	0.0310	0.0107	0.888	0.660	0.962	1.419
		DR Estimator	0.0300	0.0103	0.938	0.983	0.975	1.227
	ATT	Outcome regression	0.029	0.0102	0.930	0.997		
		IPW Estimator	0.0294	0.0103	0.889	0.695	0.984	1.892
		DR Estimator	0.0295	0.01035	0.404	0.080	1.00	2.948

(해석)

2)-1. ATT

: PS model, Outcome model 둘 다 올바르게 specified 되었을 때 비편향성, 효율성(rMSE) 측면에서는 DR estimator의 성능이 제일 best

: PS model, Outcome model 두 model 중 하나라도 잘못 특정되면 Outcome regression estimator가 다른 두 추정량보다 성능이 더 낫다.

: DR estimator의 경우 분산을 과대추정하는 경향이 강하다.

2)-2. ATE

: 전체적으로 모든 시나리오에서 IPW Estimator의 성능이 좋지 않다.

Exposure ratio = 0.043 ~ 0.085 (mean=0.0625)								
Scenario		추정량 종류	Bias	rMSE	Coverage probability Naive_var	SD Ratio Naive_var	Coverage probability Sandwich_ var	SD Ratio Sandwich_ var
(i)	ATE	Outcome regression	-0.0065	0.018	0.942	0.99		
		IPW Estimator	-0.0061	0.02	0.712	0.309	0.976	1.43
		DR Estimator	-0.0068	0.019	0.943	0.983	0.995	1.40
	ATT	Outcome regression	-0.0065	0.01815	0.942	0.994		
		IPW Estimator	-0.00629	0.01816	0.736	0.346	0.993	2.00
		DR Estimator	-0.00626	0.01814	0.275	0.03	1.00	10.38
(ii)	ATE	Outcome regression	0.00514	0.0204	0.945	0.99		
		IPW Estimator	0.00789	0.022	0.717	0.295	0.967	1.36
		DR Estimator	0.00563	0.021	0.937	0.967	0.989	1.373
	ATT	Outcome regression	-0.0065	0.01815	0.942	0.88		
		IPW Estimator	-0.00629	0.01816	0.736	0.307	0.993	1.78
		DR Estimator	-0.00626	0.01814	0.275	0.0285	1.00	9.21
(iii)	ATE	Outcome regression	2.812e-05	0.016	0.944	0.99		
		IPW Estimator	2.316e-03	0.018	0.753	0.33	0.965	1.425
		DR Estimator	6.337e-04	0.0169	0.935	0.974	0.993	1.354
	ATT	Outcome regression	2.812e-05	0.016	0.944	0.99		
		IPW Estimator	-2.25e-04	0.0161	0.775	0.373	0.99	1.95
		DR Estimator	-6.54e-05	0.0162	0.259	0.035	1.00	8.76
(iv)	ATE	Outcome regression	0.0342	0.0198	0.939	0.99		
		IPW Estimator	0.0362	0.0219	0.716	0.99	0.962	1.36
		DR Estimator	0.0346	0.0207	0.931	0.324	0.994	1.38
	ATT	Outcome regression	0.0342	0.0198	0.939	0.99		
		IPW Estimator	0.033	0.0198	0.731	0.358	0.984	1.84
		DR Estimator	0.034	0.0199	0.248	0.036	1.00	8.41