

## 〈1월 12일 Simulation result〉

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		
		DR Estimator	0.00110	0.00413	0.946	0.99		
	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  $p = 0.21 \sim 0.289$  (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

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