simulation summary

Joakim Wallmark

11/2/2019

Simulation study

Investigate bias from model misspecification when estimating NDE and NIE.

Simulation scenarios

Table 1: Variables used for simulations

variable	type	true model
X(additional covariate)	continous	$X \sim gamma(8, 4.5)$
Z(exposure)	binary	$Z = I(Y* > 0)$ where $Z* \sim U_0 + U_1 X + N(0,1)$
M(mediator)	continous	$M \sim B_0 + B_1 Z + B_2 X + N(0,1)$
Y(outcome)	continous	$Y \sim \theta_0 + \theta_1 Z + \theta_2 M + \theta_3 ZM + \theta_4 X + N(0,1)$

Coefficient values used(Only positive effects. Maybe test with negatives?):

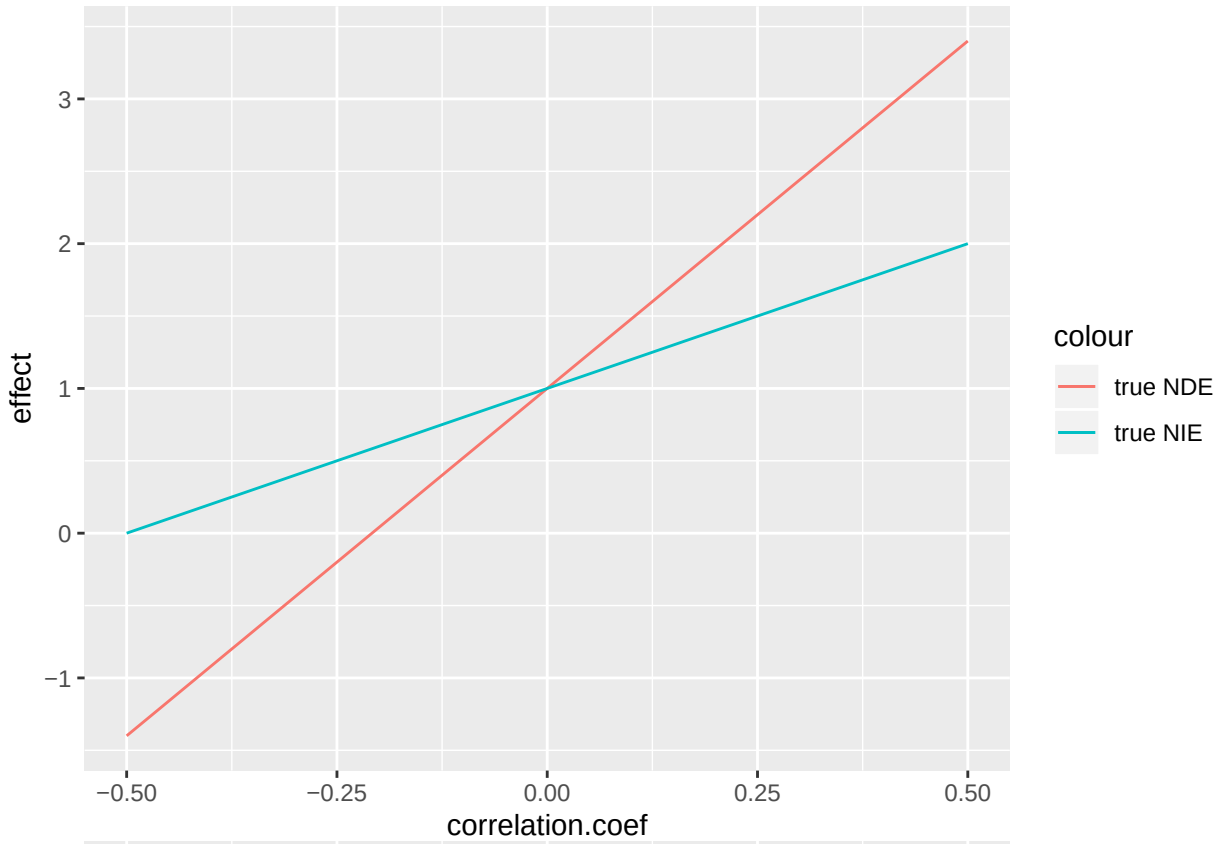
- $U_0 = -0.4$
- $U_1 = 0.01$
- $B_0 = 3$
- $B_1 = 2$
- $B_2 = 0.05$
- $\theta_0 = 5$
- $\theta_1 = 1$
- $\theta_2 = 0.5$
- $\theta_3 =$ varied[-0.5, 0.5]
- $\theta_4 = 0.05$

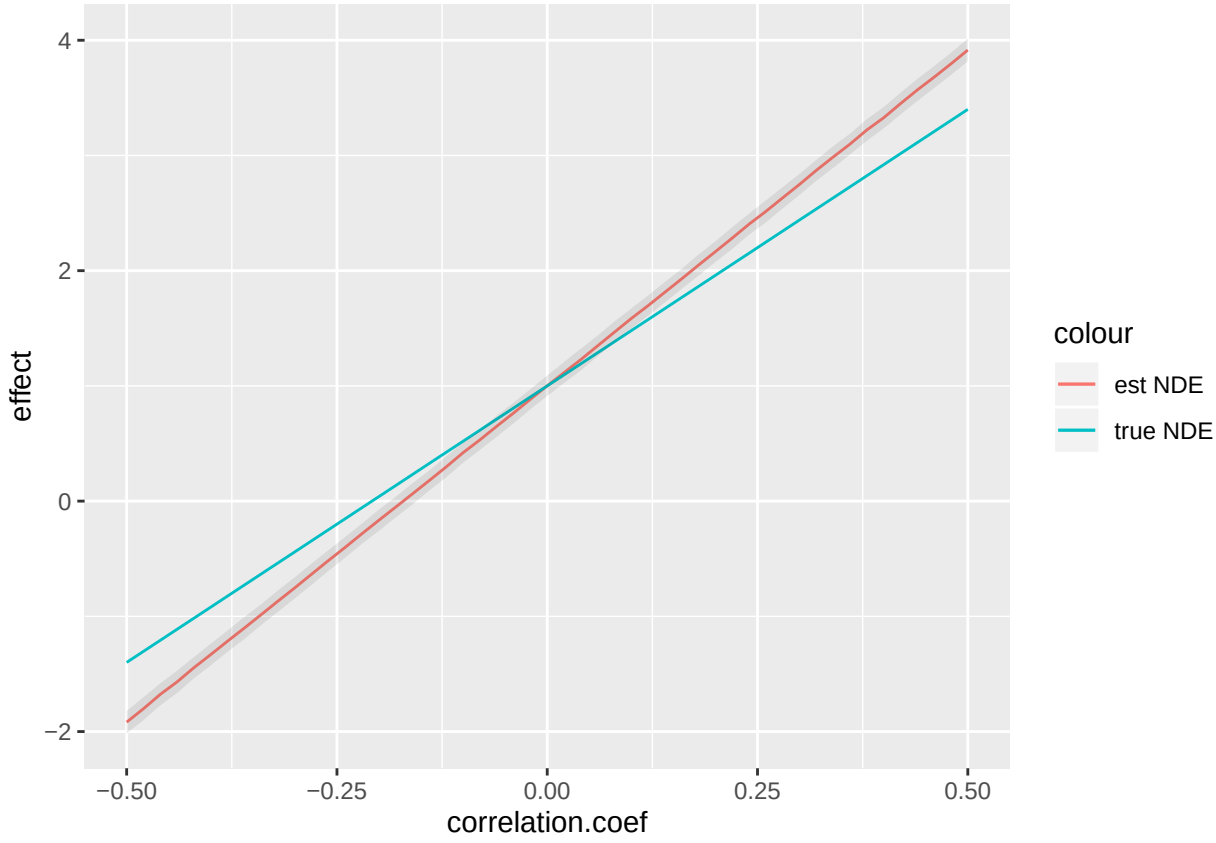
Estimated mediator model was set to the correct one. Estimated outcome model was linear but misspecified without ZM interaction: $Y \sim Z + M + X$.

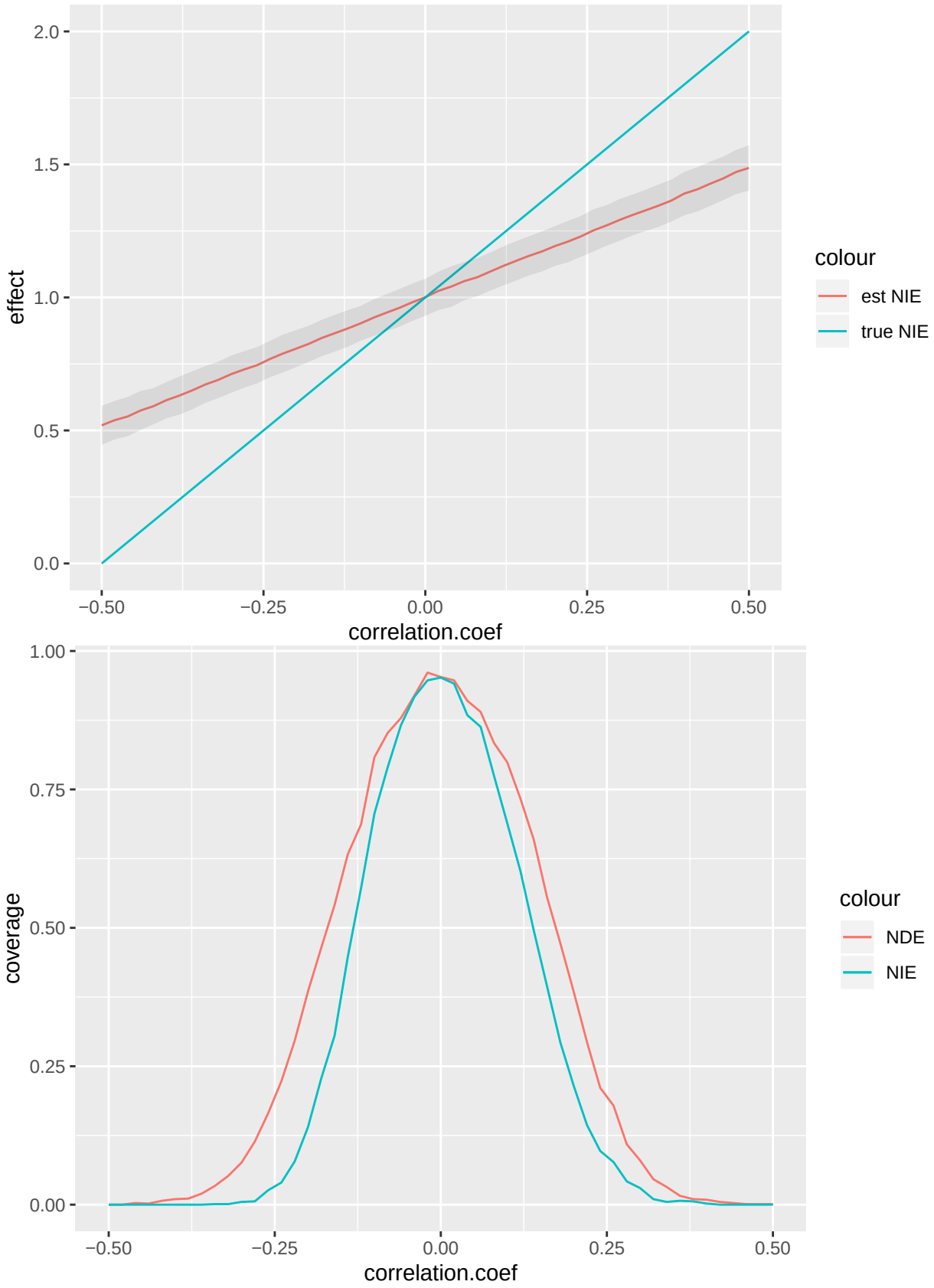
Results

coef.val	true.nde	true.nie	est.nde	est.nie	nde.emp.SE	nie.emp.SE	nde.cov	nie.cov
-0.50	-1.3999687	0.00	-1.9183934	0.5192634	0.0983610	0.0731042	0.000	0.000
-0.48	-1.3039799	0.04	-1.8017319	0.5386205	0.0986049	0.0724076	0.000	0.000
-0.46	-1.2080985	0.08	-1.6769787	0.5523938	0.0956447	0.0737777	0.003	0.000
-0.44	-1.1120050	0.12	-1.5683793	0.5749264	0.0970610	0.0735970	0.002	0.000
-0.42	-1.0161317	0.16	-1.4455852	0.5912402	0.0923648	0.0679858	0.007	0.000
-0.40	-0.9200497	0.20	-1.3316795	0.6138369	0.0937202	0.0681869	0.010	0.000
-0.38	-0.8239437	0.24	-1.2151736	0.6310165	0.0923313	0.0717141	0.011	0.000
-0.36	-0.7280290	0.28	-1.1011248	0.6507935	0.0956556	0.0716062	0.020	0.000
-0.34	-0.6320130	0.32	-0.9846334	0.6726070	0.0906024	0.0691355	0.034	0.001
-0.32	-0.5359864	0.36	-0.8674340	0.6901144	0.0936811	0.0686955	0.052	0.001
-0.30	-0.4400434	0.40	-0.7518270	0.7116174	0.0916313	0.0699086	0.076	0.005
-0.28	-0.3440628	0.44	-0.6333832	0.7292138	0.0923153	0.0686754	0.114	0.006
-0.26	-0.2479304	0.48	-0.5152214	0.7451851	0.0903696	0.0683289	0.165	0.026

coef.val	true.nde	true.nie	est.nde	est.nie	nde.emp.SE	nie.emp.SE	nde.cov	nie.cov
-0.24	-0.1519789	0.52	-0.4001531	0.7685826	0.0897833	0.0682280	0.223	0.040
-0.22	-0.0560352	0.56	-0.2812982	0.7891098	0.0879507	0.0713754	0.296	0.078
-0.20	0.0400014	0.60	-0.1650797	0.8070624	0.0920058	0.0695182	0.385	0.140
-0.18	0.1359322	0.64	-0.0508508	0.8255216	0.0895853	0.0682172	0.464	0.228
-0.16	0.2320231	0.68	0.0645032	0.8476008	0.0921924	0.0686082	0.541	0.305
-0.14	0.3280086	0.72	0.1801182	0.8654183	0.0870777	0.0692223	0.633	0.448
-0.12	0.4240023	0.76	0.2976225	0.8832305	0.0901558	0.0688900	0.687	0.572
-0.10	0.5199996	0.80	0.4205810	0.9025098	0.0878575	0.0655206	0.808	0.706
-0.08	0.6160063	0.84	0.5316364	0.9239317	0.0873183	0.0690122	0.852	0.790
-0.06	0.7119907	0.88	0.6500014	0.9427653	0.0916800	0.0695595	0.879	0.866
-0.04	0.8080023	0.92	0.7651123	0.9608890	0.0901561	0.0709372	0.919	0.917
-0.02	0.9039983	0.96	0.8840952	0.9819242	0.0871650	0.0703512	0.961	0.947
0.00	1.0000000	1.00	1.0008698	1.0006576	0.0890854	0.0695023	0.953	0.952
0.02	1.0959953	1.04	1.1152559	1.0243371	0.0908437	0.0723217	0.947	0.941
0.04	1.1919831	1.08	1.2283032	1.0407796	0.0939265	0.0762579	0.910	0.884
0.06	1.2879836	1.12	1.3481767	1.0611095	0.0892616	0.0720229	0.890	0.863
0.08	1.3839910	1.16	1.4670288	1.0756302	0.0925172	0.0716331	0.834	0.775
0.10	1.4799757	1.20	1.5853750	1.0968861	0.0877519	0.0717030	0.799	0.689
0.12	1.5759998	1.24	1.6972301	1.1179204	0.0879218	0.0732167	0.733	0.602
0.14	1.6720136	1.28	1.8137561	1.1372421	0.0891530	0.0741251	0.659	0.495
0.16	1.7679868	1.32	1.9299313	1.1560890	0.0871196	0.0735399	0.555	0.394
0.18	1.8640142	1.36	2.0491267	1.1726797	0.0918190	0.0753918	0.472	0.293
0.20	1.9599359	1.40	2.1656095	1.1927456	0.0898850	0.0746192	0.385	0.215
0.22	2.0560570	1.44	2.2834619	1.2095663	0.0949088	0.0777478	0.294	0.144
0.24	2.1519222	1.48	2.4041431	1.2290620	0.0914131	0.0768046	0.211	0.097
0.26	2.2480337	1.52	2.5149378	1.2521998	0.0958240	0.0794154	0.179	0.077
0.28	2.3440360	1.56	2.6328613	1.2707149	0.0931823	0.0761139	0.109	0.042
0.30	2.4401444	1.60	2.7491262	1.2912096	0.0910834	0.0784252	0.080	0.030
0.32	2.5360126	1.64	2.8713507	1.3097090	0.0904322	0.0768821	0.046	0.010
0.34	2.6319537	1.68	2.9868552	1.3270294	0.0945643	0.0773729	0.032	0.005
0.36	2.7279861	1.72	3.0989000	1.3447077	0.0906211	0.0796505	0.016	0.007
0.38	2.8241733	1.76	3.2216736	1.3638585	0.0937107	0.0787715	0.010	0.006
0.40	2.9199727	1.80	3.3273032	1.3902770	0.0927025	0.0815806	0.009	0.002
0.42	3.0159251	1.84	3.4498962	1.4060228	0.0944640	0.0834200	0.005	0.000
0.44	3.1119678	1.88	3.5684511	1.4272470	0.0960759	0.0832255	0.003	0.000
0.46	3.2079675	1.92	3.6797412	1.4470165	0.0955651	0.0818425	0.001	0.000
0.48	3.3039411	1.96	3.7953907	1.4713378	0.0961068	0.0830373	0.001	0.000
0.50	3.3999945	2.00	3.9150481	1.4868448	0.0985832	0.0854119	0.001	0.000


3
2
1
0
−1
effect
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
true NDE
true NIE


4
2
0
−2
effect
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
est NDE
true NDE


2.0
1.5
1.0
0.5
0.0
effect
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
est NIE
true NIE
1.00
0.75
0.50
0.25
0.00
coverage
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
NDE
NIE