Result comparison for covariance matrix generated and linear generated data in simulation

0.1 Aim

To validate the results of adding predictors sequentially, we used two measures: the PMSE (Predictive Mean Squared Error) and the correlation value between the predicted and true values. Each result was calculated by taking the mean of 1000 iterations. We generated the data using two methods: a linear model and a covariance matrix.

For the linear model method, we generated the response variable using multinormal predictors, given the covariance matrix, and calculated $\sigma_k^2 = \sigma_{00} - \boldsymbol{\sigma'}\boldsymbol{\Sigma^{-1}}\boldsymbol{\sigma}$, the coefficients β is calculated by $\boldsymbol{\Sigma^{-1}}\boldsymbol{\sigma}$ For the covariance matrix method, we generated the response variable directly using the covariance matrix.

Our assumption was that the results from the two different methods should be the same or almost the same. We compared the results using the PMSE and the correlation value between the prediction and true value, as shown in the following tables.

0.2 Result

For a PMSE, the result is shown in 1 and 2we found that the results from the two methods were similar for most scenarios as expected. The trend on PMSE when adding significant or insignificant predictors was also the same. In terms of the correlation value between the true value and predictions, as shown in 3 and 4

Sample Size	Basic Model	Comorbidities	Pain Locations	Medications	Physical Functioning	Depressive Symptoms	Life Satisfaction	LOC chance	LOC powerful	LOC internal
30	1.1550	0.9927	0.9753	1.0254	1.0019	1.0468	1.0848	0.9956	1.0431	1.0807
60	1.0829	0.9237	0.8950	0.9252	0.8905	0.9092	0.9252	0.8344	0.8515	0.8602
90	1.0575	0.8956	0.8621	0.8823	0.8411	0.8491	0.8546	0.7620	0.7687	0.7662
120	1.0376	0.8751	0.8382	0.8534	0.8091	0.8111	0.8110	0.7179	0.7186	0.7108
150	1.0244	0.8617	0.8227	0.8340	0.7873	0.7851	0.7811	0.6880	0.6851	0.6733
180	1.0146	0.8515	0.8109	0.8196	0.7714	0.7663	0.7598	0.6666	0.6610	0.6469
210	1.0073	0.8439	0.8020	0.8087	0.7592	0.7522	0.7437	0.6506	0.6432	0.6273
240	1.0009	0.8374	0.7945	0.7996	0.7492	0.7408	0.7308	0.6378	0.6288	0.6117
270	0.9960	0.8323	0.7888	0.7925	0.7413	0.7316	0.7204	0.6276	0.6174	0.5991
300	0.9923	0.8283	0.7842	0.7869	0.7352	0.7244	0.7121	0.6192	0.6081	0.5890
330	0.9891	0.8248	0.7800	0.7818	0.7296	0.7179	0.7048	0.6119	0.6000	0.5803
360	0.9859	0.8215	0.7763	0.7773	0.7247	0.7123	0.6985	0.6058	0.5932	0.5729
390	0.9833	0.8186	0.7730	0.7734	0.7204	0.7074	0.6931	0.6005	0.5873	0.5665
420	0.9810	0.8162	0.7702	0.7700	0.7167	0.7031	0.6884	0.5957	0.5820	0.5608
450	0.9788	0.8140	0.7677	0.7670	0.7134	0.6994	0.6841	0.5915	0.5773	0.5557
480	0.9770	0.8120	0.7654	0.7642	0.7105	0.6960	0.6804	0.5878	0.5732	0.5513
510	0.9752	0.8101	0.7633	0.7617	0.7078	0.6930	0.6770	0.5845	0.5696	0.5473
540	0.9739	0.8086	0.7616	0.7597	0.7055	0.6904	0.6740	0.5816	0.5663	0.5438
570	0.9726	0.8073	0.7600	0.7578	0.7035	0.6880	0.6713	0.5789	0.5634	0.5406
600	0.9714	0.8060	0.7585	0.7560	0.7015	0.6857	0.6687	0.5764	0.5606	0.5376

Table 1: Prediction Mean Square Error by sequentially added predictors over the "basic" 3 predictors, PMSE(using y = XB +error)

Sample Size	Basic Model	Comorbidities	Pain Locations	Medications	Physical Functioning	Depressive Symptoms	Life Satisfaction	LOC chance	LOC powerful	LOC internal
30	1.1291	0.9936	0.9737	1.0336	1.0021	1.0435	1.0837	0.9929	1.0443	1.0860
60	1.0744	0.9265	0.8960	0.9303	0.8897	0.9088	0.9249	0.8301	0.8490	0.8634
90	1.0479	0.8946	0.8600	0.8839	0.8390	0.8473	0.8533	0.7590	0.7663	0.7690
120	1.0308	0.8747	0.8372	0.8546	0.8074	0.8099	0.8103	0.7156	0.7162	0.7122
150	1.0192	0.8612	0.8220	0.8353	0.7863	0.7847	0.7818	0.6867	0.6835	0.6753
180	1.0103	0.8511	0.8105	0.8211	0.7706	0.7663	0.7609	0.6657	0.6596	0.6487
210	1.0043	0.8442	0.8025	0.8109	0.7591	0.7527	0.7455	0.6504	0.6419	0.6291
240	0.9983	0.8376	0.7948	0.8015	0.7492	0.7411	0.7325	0.6376	0.6277	0.6133
270	0.9935	0.8323	0.7887	0.7940	0.7411	0.7316	0.7220	0.6272	0.6161	0.6006
300	0.9897	0.8280	0.7839	0.7879	0.7344	0.7239	0.7133	0.6187	0.6066	0.5900
330	0.9865	0.8244	0.7797	0.7827	0.7288	0.7173	0.7060	0.6116	0.5987	0.5812
360	0.9836	0.8213	0.7760	0.7782	0.7239	0.7117	0.6996	0.6055	0.5918	0.5737
390	0.9812	0.8186	0.7728	0.7743	0.7198	0.7069	0.6943	0.6002	0.5859	0.5672
420	0.9789	0.8160	0.7699	0.7708	0.7161	0.7026	0.6894	0.5955	0.5807	0.5616
450	0.9768	0.8138	0.7675	0.7678	0.7128	0.6988	0.6852	0.5913	0.5761	0.5565
480	0.9753	0.8120	0.7654	0.7653	0.7100	0.6956	0.6815	0.5877	0.5720	0.5520
510	0.9737	0.8103	0.7635	0.7628	0.7074	0.6926	0.6782	0.5844	0.5684	0.5481
540	0.9723	0.8088	0.7618	0.7608	0.7052	0.6900	0.6753	0.5815	0.5652	0.5445
570	0.9709	0.8073	0.7600	0.7587	0.7029	0.6874	0.6724	0.5787	0.5621	0.5412
600	0.9697	0.8060	0.7585	0.7568	0.7009	0.6851	0.6698	0.5762	0.5594	0.5382

Table 2: Prediction Mean Square Error by sequentially added predictors over the "basic" 3 predictors, PMSE(using covariance matrix)

Sample Size	Basic Model	Comorbidities	Pain Locations	Medications	Physical Functioning	Depressive Symptoms	Life Satisfaction	LOC chance	LOC powerful	LOC internal
30	0.1110	0.3377	0.3778	0.3709	0.4104	0.4069	0.4151	0.4781	0.4798	0.4894
60	0.1400	0.3722	0.4160	0.4101	0.4528	0.4574	0.4664	0.5356	0.5427	0.5565
90	0.1547	0.3917	0.4358	0.4328	0.4786	0.4855	0.4971	0.5682	0.5770	0.5919
120	0.1664	0.4045	0.4501	0.4479	0.4951	0.5035	0.5164	0.5883	0.5980	0.6137
150	0.1748	0.4130	0.4593	0.4586	0.5067	0.5170	0.5305	0.6027	0.6130	0.6295
180	0.1823	0.4199	0.4668	0.4671	0.5157	0.5271	0.5411	0.6132	0.6242	0.6408
210	0.1872	0.4250	0.4724	0.4735	0.5226	0.5346	0.5491	0.6211	0.6326	0.6494
240	0.1914	0.4291	0.4770	0.4787	0.5281	0.5407	0.5555	0.6274	0.6393	0.6563
270	0.1956	0.4329	0.4809	0.4831	0.5329	0.5459	0.5610	0.6327	0.6449	0.6622
300	0.1987	0.4358	0.4839	0.4867	0.5366	0.5500	0.5654	0.6372	0.6496	0.6670
330	0.2015	0.4384	0.4869	0.4900	0.5400	0.5539	0.5695	0.6411	0.6537	0.6712
360	0.2036	0.4405	0.4892	0.4927	0.5428	0.5570	0.5727	0.6442	0.6570	0.6746
390	0.2057	0.4427	0.4915	0.4952	0.5454	0.5598	0.5757	0.6471	0.6599	0.6777
420	0.2075	0.4443	0.4933	0.4973	0.5476	0.5623	0.5782	0.6496	0.6626	0.6804
450	0.2092	0.4458	0.4949	0.4992	0.5496	0.5644	0.5805	0.6519	0.6650	0.6829
480	0.2108	0.4474	0.4965	0.5010	0.5514	0.5664	0.5826	0.6539	0.6671	0.6851
510	0.2123	0.4486	0.4979	0.5025	0.5530	0.5681	0.5844	0.6557	0.6690	0.6870
540	0.2136	0.4499	0.4992	0.5040	0.5545	0.5698	0.5862	0.6573	0.6707	0.6888
570	0.2148	0.4509	0.5003	0.5053	0.5559	0.5713	0.5878	0.6589	0.6723	0.6904
600	0.2159	0.4518	0.5013	0.5065	0.5571	0.5727	0.5893	0.6602	0.6738	0.6919

Table 3: Correlation between true value and prediction by sequentially added predictors over the "basic" 3 predictors, CORR(using XB+error)

Sample Size	Basic Model	Comorbidities	Pain Locations	Medications	Physical Functioning	Depressive Symptoms	Life Satisfaction	LOC chance	LOC powerful	LOC internal
30	0.1210	0.3252	0.3684	0.3584	0.4012	0.4009	0.4074	0.4729	0.4753	0.4752
60	0.1464	0.3657	0.4115	0.4052	0.4516	0.4561	0.4659	0.5370	0.5436	0.5498
90	0.1594	0.3868	0.4328	0.4288	0.4762	0.4841	0.4957	0.5673	0.5763	0.5858
120	0.1701	0.4007	0.4472	0.4450	0.4933	0.5026	0.5149	0.5876	0.5978	0.6096
150	0.1789	0.4108	0.4573	0.4563	0.5054	0.5161	0.5286	0.6019	0.6129	0.6257
180	0.1850	0.4180	0.4648	0.4646	0.5143	0.5259	0.5388	0.6124	0.6239	0.6377
210	0.1900	0.4233	0.4705	0.4712	0.5214	0.5337	0.5469	0.6204	0.6326	0.6469
240	0.1943	0.4279	0.4756	0.4769	0.5272	0.5400	0.5535	0.6268	0.6394	0.6542
270	0.1977	0.4316	0.4795	0.4814	0.5319	0.5452	0.5589	0.6322	0.6450	0.6600
300	0.2010	0.4348	0.4829	0.4853	0.5361	0.5497	0.5637	0.6368	0.6498	0.6652
330	0.2037	0.4376	0.4860	0.4887	0.5396	0.5536	0.5678	0.6406	0.6538	0.6695
360	0.2058	0.4398	0.4884	0.4915	0.5426	0.5568	0.5712	0.6438	0.6573	0.6731
390	0.2079	0.4418	0.4906	0.4940	0.5451	0.5597	0.5741	0.6467	0.6603	0.6763
420	0.2096	0.4436	0.4926	0.4961	0.5474	0.5622	0.5768	0.6492	0.6630	0.6791
450	0.2115	0.4452	0.4943	0.4981	0.5494	0.5644	0.5791	0.6515	0.6654	0.6817
480	0.2131	0.4468	0.4959	0.4999	0.5513	0.5665	0.5813	0.6536	0.6677	0.6840
510	0.2144	0.4481	0.4973	0.5015	0.5529	0.5683	0.5832	0.6554	0.6695	0.6860
540	0.2157	0.4491	0.4985	0.5029	0.5544	0.5698	0.5849	0.6570	0.6712	0.6878
570	0.2168	0.4502	0.4996	0.5042	0.5557	0.5713	0.5865	0.6585	0.6728	0.6895
600	0.2178	0.4511	0.5007	0.5054	0.5570	0.5727	0.5879	0.6599	0.6742	0.6910

Table 4: Correlation between true value and prediction by sequentially added predictors over the "basic" 3 predictors, CORR(using covariance matrix)