

Supplementary Material
for
Lakshmi & Sajes
Robust Multivariate Regression Based on Shrinkage \mathbf{S}_n
Estimator

1 Shrinkage S_n estimator

The robust version of covariance matrix based on Shrinkage S_n is:

$$\hat{\Sigma}_{Sh} = (1 - \eta)\hat{E} + \eta\hat{T}, \quad (1)$$

where $\hat{E} = \hat{S}_n$

In our procedure, we use shrinkage target $\hat{T} = \nu_\Sigma \mathbf{I}$. Thus, Equation (1) becomes:

$$\hat{\Sigma}_{Sh} = (1 - \eta)\hat{E} + \eta\nu_\Sigma \mathbf{I}, \quad (2)$$

where $\hat{E} = \hat{S}_n$. We need to estimate η and ν_Σ . The parameters are selected such that minimizing the expected quadratic loss:

$$i.e., \quad \min_{\nu_\Sigma, \eta} \mathbf{E} \left[\|\hat{\Sigma}_{Sh} - \Sigma\|^2 \right], \quad \text{s.t. } \hat{\Sigma}_{Sh} = (1 - \eta)\hat{S}_n + \eta\nu_\Sigma \mathbf{I}, \quad (3)$$

where $\|A\|^2 = \text{trace}(AA^T)/p$. Consider the above function to be minimized:

$$\begin{aligned} \mathbf{E} \left[\|\hat{\Sigma}_{Sh} - \Sigma\|^2 \right] &= \mathbf{E} \left[\|(1 - \eta)\hat{S}_n + \eta\nu_\Sigma \mathbf{I} - \Sigma\|^2 \right] \\ &= \mathbf{E} \left[\|(1 - \eta)\hat{S}_n + \eta\nu_\Sigma \mathbf{I} - \Sigma + \eta\Sigma - \eta\Sigma\|^2 \right] \\ &= (1 - \eta)^2 \mathbf{E} \left[\|\hat{S}_n - \Sigma\|^2 \right] + \eta^2 \|\nu_\Sigma \mathbf{I} - \Sigma\|^2 + \\ &\quad 2\mathbf{E} \left[\langle (1 - \eta)(\hat{S}_n - \Sigma), \eta(\nu_\Sigma \mathbf{I} - \Sigma) \rangle \right]. \end{aligned}$$

Let our associated inner product is $\langle A_1, A_2 \rangle = \text{trace}(A_1 A_2^t)/p$. The latter element in the above expression is zero as $\mathbf{E}(\hat{S}_n) = \Sigma$ which is shown above. As a result, the above minimization expression reduces to:

$$\mathbf{E} \left[\|\hat{\Sigma}_{Sh} - \Sigma\|^2 \right] = [(1 - \eta)^2 \mathbf{E} \left[\|\hat{S}_n - \Sigma\|^2 \right] + \eta^2 \|\nu_\Sigma \mathbf{I} - \Sigma\|^2]. \quad (4)$$

Parameter ν_Σ presents only on the right side element in the above expression. Thus minimizing right element gives the optimum value of ν_Σ . Also, $\|\nu_\Sigma \mathbf{I} -$

$\|\Sigma\|^2 = \nu_\Sigma^2 \|\mathbf{I}\|^2 + \|\Sigma\|^2 - 2\nu_\Sigma \langle \mathbf{I}, \Sigma \rangle$. Thus the first - order minimization condition with respect to ν_Σ be:

$$\begin{aligned} 2\nu_\Sigma - 2\langle \Sigma, \mathbf{I} \rangle &= 0, \\ \nu_\Sigma &= \text{trace}(\Sigma)/p. \end{aligned} \quad (5)$$

Since Σ is unknown, we propose to estimate with \hat{S}_n , thus $\hat{\nu}_\Sigma = \text{trace}(\hat{S}_n)/p$. The first - order optimal condition of Equation (4) with respect to η be:

$$\begin{aligned} &2(1 - \eta)\mathbb{E}\left[\|\hat{S}_n - \Sigma\|^2\right] + 2\eta\|\nu_\Sigma\mathbf{I} - \Sigma\|^2, \\ \text{and there by } \hat{\eta} &= \frac{\mathbb{E}\left[\|\hat{S}_n - \Sigma\|^2\right]}{\mathbb{E}\left[\|\hat{S}_n - \Sigma\|^2\right] + \|\nu_\Sigma\mathbf{I} - \Sigma\|^2} \end{aligned} \quad (6)$$

where,

$$\begin{aligned} \|\hat{S}_n - \Sigma\|^2 &= \langle \hat{S}_n, \hat{S}_n \rangle - 2\langle \hat{S}_n, \Sigma \rangle + \langle \Sigma, \Sigma \rangle, \\ \text{and } \mathbb{E}\left[\|\hat{S}_n - \Sigma\|^2\right] &= \mathbb{E}\|\hat{S}_n\|^2 - \|\Sigma\|^2. \end{aligned} \quad (7)$$

The right element in denominator of η in (6) can be expressed as:

$$\|\nu_\Sigma\mathbf{I} - \Sigma\|^2 = \nu_\Sigma^2 \|\mathbf{I}\|^2 - 2\langle \nu_\Sigma\mathbf{I}, \Sigma \rangle + \|\Sigma\|^2. \quad (8)$$

From (7) and (8) it is clear that denominator of η in (6) is $\mathbb{E}\|\hat{S}_n - \nu_\Sigma\mathbf{I}\|^2$.

$$\hat{\eta} = \frac{\mathbb{E}\left[\|\hat{S}_n - \Sigma\|^2\right]}{\mathbb{E}\left[\|\hat{S}_n - \nu_\Sigma\mathbf{I}\|^2\right]}. \quad (9)$$

Substituting $\hat{\eta}$ and $\hat{\nu}_\Sigma$ in (2) gives the robust shrinkage S_n estimator.

Table 1: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 \times I_q)$ and $(p, q) = (4, 8)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.026368	0.025535	0.898845	0.021827	-0.00054	-0.0024	0.924452	-0.00526
MCD	0.051203	0.036295	0.887359	0.029132	-0.00179	-1.34e-3	0.893941	-0.00536
Comedian	0.026599	0.02533	0.887046	0.02133	-0.00068	0.003809	0.917734	-0.00195
OGK	0.032623	0.029198	0.883143	0.023087	0.001405	0.005655	0.908097	-0.00088
SS_n	0.02599	0.024524	0.849369	0.020729	-0.00123	3.60e-3	0.898265	-0.00183
		$n = 100$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.01207	0.011584	0.935365	0.011002	0.00052	0.001621	0.955791	0.001446
MCD	0.017647	0.013201	0.950804	0.013175	0.000476	-0.00092	0.950689	0.002867
Comedian	0.012224	0.011975	0.928054	0.010863	0.000587	0.000461	0.951575	0.002234
OGK	0.013814	0.011857	0.945729	0.011493	-0.00083	0.00274	0.960208	0.004591
SS_n	0.011325	0.011505	0.884337	0.01069	-0.00068	0.001695	0.928422	0.001768
		$n = 200$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.005859	0.005726	0.943262	0.005523	6.59e-4	-0.00039	0.965365	0.004226
MCD	0.006482	0.005635	0.970071	0.005925	0.000157	3.95e-4	0.964094	0.004519
Comedian	0.005881	0.005699	0.944197	0.005567	-1.60e-4	-9.90e-5	0.965948	0.004217
OGK	0.006364	0.005658	0.928352	0.005751	-0.00016	0.000539	0.968439	0.004844
SS_n	0.005851	0.005604	0.91682	0.00553	0.000377	0.000142	0.951738	0.003961
		$n = 500$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.002333	0.002207	0.957668	0.002265	2.36e-4	0.000351	0.976269	0.00084
MCD	0.002394	0.002244	0.944019	0.002312	-4.50e-4	0.000588	0.968785	0.00059
Comedian	0.002303	0.002211	0.954446	0.002251	-0.0004	0.000591	0.974639	0.001185
OGK	0.002394	0.002237	0.952555	0.002337	6.94e-4	0.001017	0.968018	0.000802
SS_n	0.00263	0.00254	0.94306	0.00254	5.1323e-06	0.00098	0.96847	0.00010

Table 2: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 \times I_q)$ and $(p, q) = (8, 4)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 8$	$q = 4$	diag = 0.1		
S_n	0.030071	0.029982	0.710073	0.020074	-0.00024	0.001393	0.818126	-0.00602
MCD	0.071754	0.040567	0.702425	0.025876	-0.00251	2.57e-3	0.832953	-0.00422
Comedian	0.03016	0.0283	0.702836	0.019552	0.000189	0.001694	0.814418	-0.00497
OGK	0.036603	0.029532	0.681802	0.019494	0.001023	0.007873	0.796853	0.002305
SS_n	0.021185	0.02856	0.6768	0.019388	0.000149	5.77e-4	0.797973	-0.00343
		$n = 100$	$\delta = 10\%$	$p = 8$	$q = 4$	diag = 0.1		
S_n	0.01468	0.011625	0.822838	0.010568	0.000283	-0.00167	0.895149	0.005459
MCD	0.018414	0.012494	0.832756	0.012816	-6.80e-4	0.00015	0.878974	0.005181
Comedian	0.013838	0.011703	0.814563	0.010544	0.000571	0.001131	0.890538	0.005298
OGK	0.014344	0.012224	0.794691	0.011096	5.24e-6	0.0003	0.882167	0.009678
SS_n	0.013151	0.011495	0.786627	0.010442	0.000276	0.001099	0.875251	0.007938
		$n = 200$	$\delta = 10\%$	$p = 8$	$q = 4$	diag = 0.1		
S_n	0.006087	0.005765	0.887469	0.005593	-9.50e-5	0.000937	0.936072	0.003351
MCD	0.006688	0.005708	0.854231	0.005953	-1.50e-4	7.88e-4	0.949898	0.002215
Comedian	0.006099	0.005683	0.87817	0.00559	1.93e-4	7.88e-4	0.930824	0.005072
OGK	0.006438	0.005796	0.863996	0.00575	-0.00015	-0.00057	0.90655	0.00307
SS_n	0.006072	0.005668	0.859239	0.005493	-0.00018	-0.00071	0.920615	0.001929
		$n = 500$	$\delta = 10\%$	$p = 8$	$q = 4$	diag = 0.1		
S_n	0.002327	0.002167	0.919339	0.00227	4.89e-4	-4.70e-4	0.956496	0.000819
MCD	0.006688	0.005708	0.914231	0.005953	-1.50e-4	0.000788	0.969898	0.002215
Comedian	0.002319	0.002195	0.919471	0.002271	-0.00012	0.000267	0.956583	0.000463
OGK	0.002443	0.002253	0.885856	0.002292	4.43e-4	3.71e-5	0.948705	0.002677
SS_n	0.00269	0.00242	0.90464	0.00249	1.1846e-05	0.00105	0.94839	0.00027

Table 3: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 \times I_q)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 10$	$q = 10$	diag = 0.1		
S_n	0.035379	0.034299	0.644847	0.019899	0.000192	0.001867	0.764586	0.027986
MCD	0.052203	0.044448	0.637251	0.023585	-0.00015	2.92e-4	0.781854	0.035432
Comedian	0.03154	0.029931	0.679281	0.019648	0.000477	0.000523	0.800382	0.02496
OGK	0.04065	0.037191	0.682545	0.02048	0.000208	0.006032	0.785208	0.032768
SS_n	0.03277	0.030403	0.639593	0.018907	0.000251	1.97e-3	0.775733	0.023259
		$n = 100$	$\delta = 10\%$	$p = 10$	$q = 10$	diag = 0.1		
S_n	0.014004	0.013292	0.762375	0.010382	0.000578	0.000734	0.880593	0.011466
MCD	0.02302	0.017691	0.808272	0.013155	6.72e-5	0.001166	0.873183	0.01508
Comedian	0.012894	0.012416	0.806761	0.010174	-0.00035	-0.00078	0.886806	0.01022
OGK	0.01515	0.013676	0.781858	0.010639	-3.70e-4	0.001832	0.876498	0.012231
SS_n	0.013372	0.012622	0.773067	0.010031	0.000441	0.001128	0.867663	0.010838
		$n = 200$	$\delta = 10\%$	$p = 10$	$q = 10$	diag = 0.1		
S_n	0.00634	0.005954	0.859439	0.005492	1.40e-5	0.000272	0.918432	0.00517
MCD	0.007377	0.006179	0.875626	0.006039	8.47e-5	-3.50e-4	0.933666	0.004764
Comedian	0.006077	0.005807	0.892463	0.005505	8.34e-4	-9.50e-4	0.938882	0.004963
OGK	0.006604	0.006088	0.890516	0.005617	-0.00017	0.002482	0.950209	0.005521
SS_n	0.00613	0.005825	0.858965	0.005326	-0.00024	0.001276	0.920977	0.005581
		$n = 500$	$\delta = 10\%$	$p = 10$	$q = 10$	diag = 0.1		
S_n	0.002376	0.002208	0.919783	0.002225	-1.10e-4	-5.20e-5	0.9566	0.001779
MCD	0.002418	0.002309	0.900211	0.002273	1.25e-4	0.000241	0.94635	0.001675
Comedian	0.002348	0.002271	0.936253	0.002213	-0.00012	-0.00116	0.965302	0.002007
OGK	0.002436	0.002339	0.903601	0.002292	-1.50e-4	3.31e-4	0.948139	0.0024
SS_n	0.03154	0.029931	0.679281	0.019648	0.000477	0.000523	0.800382	0.02496

Table 4: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$ and $(p, q) = (4, 4)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 4$	$q = 4$			
S_n	0.027104	0.026141	0.871365	0.022099	-0.00017	-0.0017	0.909667	-0.00548
MCD	0.054961	0.030504	0.860277	0.028164	-2.90e-5	-2.78e-3	0.936767	-0.001
Comedian	0.032238	0.026643	0.861882	0.022298	0.002052	0.003696	0.845044	-0.00103
OGK	0.032483	0.025911	0.846421	0.022184	0.000958	0.004303	0.836388	0.001282
SS_n	0.026918	0.024661	0.826234	0.021195	0.0004	1.17e-3	0.883227	-0.00357
		$n = 100$	$\delta = 10\%$	$p = 4$	$q = 4$			
S_n	0.01222	0.011744	0.909175	0.011397	0.000622	0.000536	0.941562	0.006297
MCD	0.015602	0.01156	0.8766	0.01277	-2.80e-5	-0.00137	0.959509	0.005811
Comedian	0.013078	0.011632	0.881849	0.011563	0.000731	0.001822	0.930843	0.008888
OGK	0.013281	0.011338	0.875212	0.011239	1.36e-3	-0.00072	0.951882	0.007572
SS_n	0.012423	0.011437	0.864166	0.010954	0.000505	0.00206	0.917553	0.005991
		$n = 200$	$\delta = 10\%$	$p = 4$	$q = 4$			
S_n	0.006075	0.00561	0.927595	0.005794	-2.20e-4	-0.00045	0.956908	0.002803
MCD	0.006341	0.005631	0.89913	0.005914	1.24e-4	1.23e-3	0.942112	0.003357
Comedian	0.006279	0.005663	0.89852	0.005857	-3.30e-4	8.01e-4	0.946773	0.004161
OGK	0.006323	0.00565	0.906304	0.006013	-1.70e-5	0.000297	0.944135	0.005033
SS_n	0.006041	0.005542	0.893558	0.00544	-0.00019	0.00033	0.939649	0.004496
		$n = 500$	$\delta = 10\%$	$p = 4$	$q = 4$			
S_n	0.002324	0.002114	0.93284	0.002287	7.79e-5	-3.00e-5	0.963423	0.002273
MCD	0.002454	0.002223	0.924046	0.002375	-1.80e-5	-0.00058	0.968241	0.002253
Comedian	0.002425	0.002141	0.92591	0.002396	-0.00048	0.001091	0.962233	0.002711
OGK	0.002397	0.002234	0.922206	0.002297	-4.10e-5	6.97e-4	0.957776	0.00134
SS_n	0.002367	0.00227	0.914538	0.002251	0.000522	0.000228	0.953882	0.00139

Table 5: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$ and $(p, q) = (4, 8)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 4$	$q = 8$			
S_n	0.026036	0.024352	0.898834	0.021601	0.000235	6.76e-5	0.925397	-0.00177
MCD	0.052629	0.036653	0.87425	0.028786	3.13e-3	-4.60e-4	0.904536	-0.00185
Comedian	0.026419	0.02595	0.895646	0.021803	-7.60e-5	-0.00015	0.922931	-0.00296
OGK	0.032762	0.027617	0.881278	0.022477	0.001767	0.003449	0.905827	-0.00057
SS_n	0.026652	0.02444	0.852299	0.020924	-0.00079	4.28e-3	0.898662	-0.00315
		$n = 100$	$\delta = 10\%$	$p = 4$	$q = 8$			
S_n	0.01207	0.011492	0.93025	0.010913	0.000931	-0.00204	0.953118	0.00125
MCD	0.017246	0.012694	0.895446	0.013573	2.71e-4	-0.00177	0.95355	0.00309
Comedian	0.013746	0.012192	0.897849	0.011448	0.000796	0.002605	0.932437	0.003119
OGK	0.013819	0.012194	0.890424	0.011384	5.36e-4	0.002834	0.93012	0.004237
SS_n	0.012228	0.011432	0.885593	0.010725	4.20e-6	-0.00143	0.929856	0.001533
		$n = 200$	$\delta = 10\%$	$p = 4$	$q = 8$			
S_n	0.005922	0.005727	0.951432	0.00569	2.68e-5	0.000311	0.969582	0.004796
MCD	0.006504	0.005943	0.923553	0.005972	-2.10e-4	2.88e-4	0.972869	0.004187
Comedian	0.006353	0.005859	0.926311	0.005809	-3.90e-4	1.94e-3	0.956359	0.005867
OGK	0.006369	0.005742	0.951858	0.005715	-6.10e-4	0.001927	0.970761	0.004887
SS_n	0.00598	0.005617	0.919595	0.005549	-0.00052	0.001082	0.953175	0.004802
		$n = 500$	$\delta = 10\%$	$p = 4$	$q = 8$			
S_n	0.002305	0.002237	0.955434	0.00224	-4.50e-4	6.80e-4	0.975091	0.000792
MCD	0.002346	0.002193	0.96329	0.002277	-9.80e-5	0.000793	0.978386	0.000411
Comedian	0.002286	0.002301	0.965494	0.002256	3.59e-5	-0.00134	0.975122	0.00014
OGK	0.002397	0.002234	0.962206	0.002297	-4.10e-5	6.97e-4	0.975776	0.00134
SS_n	0.002327	0.002199	0.938934	0.002256	0.000349	0.001011	0.96662	0.000289

Table 6: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$ and $(p, q) = (8, 4)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non diagonal elements MSE	Slope bias	Intercept bias	Diagonal element bias	Non diagonal element bias
		$n = 50$	$\delta = 10\%$	$p = 8$	$q = 4$			
S_n	0.030228	0.027111	0.709027	0.019555	0.000525	2.45e-3	0.817944	-0.00341
MCD	0.071942	0.042172	0.696495	0.026127	2.23e-3	-1.87e-3	0.842774	-0.00385
Comedian	0.036868	0.029341	0.682844	0.018968	-2.20e-4	0.002407	0.84797	0.001453
OGK	0.037403	0.030711	0.686282	0.01967	0.000517	0.006056	0.851147	-0.00039
SS_n	0.030355	0.027533	0.66581	0.019232	-0.00012	1.43e-3	0.791538	-0.00179
		$n = 100$	$\delta = 10\%$	$p = 8$	$q = 4$			
S_n	0.012977	0.012155	0.819943	0.010506	0.000567	-0.0014	0.894061	0.006268
MCD	0.018887	0.012857	0.842024	0.013133	1.03e-3	-0.0009	0.884671	0.008915
Comedian	0.014252	0.012338	0.849359	0.010878	-0.00105	0.000931	0.882171	0.009796
OGK	0.014383	0.012097	0.849174	0.010909	6.13e-4	-0.0002	0.88233	0.009278
SS_n	0.013304	0.011938	0.791517	0.010294	2.01e-4	0.003988	0.877971	0.004615
		$n = 200$	$\delta = 10\%$	$p = 8$	$q = 4$			
S_n	0.006025	0.005856	0.878332	0.005491	-7.90e-5	0.000477	0.931262	0.002079
MCD	0.006612	0.005562	0.889249	0.006022	4.23e-4	-2.70e-3	0.892674	0.001315
Comedian	0.006405	0.005796	0.887204	0.005455	3.07e-4	1.76e-3	0.903246	0.003814
OGK	0.006369	0.005742	0.858358	0.005715	-6.10e-4	0.001927	0.907761	0.004887
SS_n	0.006235	0.00583	0.857884	0.005459	-0.00031	0.000102	0.920022	0.003575
		$n = 500$	$\delta = 10\%$	$p = 8$	$q = 4$			
S_n	0.00234	0.00226	0.916931	0.002298	-4.70e-4	-5.70e-4	0.95514	0.001272
MCD	0.002443	0.002189	0.906638	0.002319	6.42e-5	-0.00048	0.959115	0.000909
Comedian	0.002436	0.002232	0.89865	0.0023	-2.40e-4	-0.00032	0.957966	0.001095
OGK	0.002441	0.002285	0.901099	0.002305	-1.20e-4	7.61e-4	0.956845	0.002174
SS_n	0.002357	0.002254	0.897109	0.00224	2.94e-5	-0.00028	0.944794	0.000946

Table 7: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$ and $(p, q) = (10, 10)$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.035186	0.033186	0.682093	0.019893	-0.00029	1.92e-3	0.776835	0.026861
MCD	0.05331	0.045228	0.648384	0.024382	-4.90e-4	9.81e-4	0.780176	0.036003
Comedian	0.031939	0.030156	0.674917	0.019562	-2.60e-4	-0.00049	0.797826	0.024018
OGK	0.041184	0.036058	0.641502	0.020469	0.000189	0.003186	0.784167	0.030117
SS_n	0.032333	0.029723	0.637209	0.018516	-0.0005	1.36e-3	0.774981	0.022447
		$n = 100$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.013988	0.013156	0.766434	0.010543	-2.20e-5	0.000967	0.863244	0.011695
MCD	0.023567	0.017868	0.802532	0.013419	8.36e-4	0.000879	0.885948	0.016278
Comedian	0.013097	0.012964	0.818361	0.010321	-0.00027	2.16e-5	0.893156	0.011145
OGK	0.015392	0.01365	0.780919	0.010768	-1.90e-4	0.004502	0.875836	0.01286
SS_n	0.013361	0.012747	0.771019	0.010076	2.26e-4	0.002149	0.866525	0.009514
		$n = 200$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.006289	0.005989	0.857448	0.005516	3.12e-4	0.002718	0.919868	0.004935
MCD	0.007359	0.00635	0.873152	0.006109	3.28e-4	2.85e-5	0.912256	0.005688
Comedian	0.006057	0.005785	0.886198	0.005354	-8.00e-5	1.56e-3	0.935541	0.004612
OGK	0.006611	0.006031	0.829817	0.005625	1.22e-4	0.001466	0.90463	0.005339
SS_n	0.006175	0.005768	0.806194	0.005371	-0.0003	0.00143	0.901546	0.005657
		$n = 500$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.002381	0.002312	0.91882	0.002253	-3.20e-4	4.00e-4	0.95622	0.001573
MCD	0.002433	0.002329	0.921059	0.002315	-4.00e-4	-0.00067	0.974311	0.002049
Comedian	0.00234	0.002267	0.935814	0.002231	-8.50e-5	0.000351	0.965056	0.001224
OGK	0.002441	0.002285	0.921099	0.002305	-1.20e-4	7.61e-4	0.961845	0.002174
SS_n	0.002338	0.002314	0.902812	0.00223	-1.60e-5	0.001107	0.957193	0.001919

Table 8: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$,
 $(p, q)=(4,4)$ and $\delta=20$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 20\%$	$p = 4$	$q = 4$			
S_n	0.0302	0.02727	0.85839	0.02415	0.00093	0.00073	0.89935	-0.00289
MCD	0.05076	0.0412	0.86838	0.02982	-0.00125	0.00157	0.89067	-0.00293
Comedian	0.02994	0.02718	0.85414	0.02346	-0.00014	-0.00159	0.8974891	-0.00478
OGK	0.03399	0.02742	0.87882	0.024663	-0.00078	0.00538	0.89393	-0.00113
SS_n	0.02979	0.02737	0.83589	0.02353	0.00014	0.00471	0.88700	-0.0056
	$n = 100$		$\delta = 20\%$	$p = 4$	$q = 4$			
S_n	0.01373	0.01292	0.88807	0.01219	0.00061	-0.00023	0.92924	0.00928
MCD	0.01745	0.01693	0.89481	0.0147	-0.00118	-0.00137	0.94478	0.01117
Comedian	0.01382	0.01298	0.92580	0.01234	0.00022	-0.00112	0.94930	0.00698
OGK	0.014927	0.01339	0.94275	0.01302	0.00294	0.00091	0.95761	0.01195
SS_n	0.01379	0.01297	0.87333	0.01210	0.00090	-0.00109	0.92097	0.00568
	$n = 200$		$\delta = 20\%$	$p = 4$	$q = 4$			
S_n	0.00681	0.00629	0.91992	0.00627	0.00026	0.00025	0.95231	0.00228
MCD	0.00701	0.00692	0.91238	0.00677	-0.00074	0.00042	0.95189	0.00254
Comedian	0.00639	0.00632	0.96182	0.00609	0.00015	0.00241	0.97431	0.00436
OGK	0.00704	0.00639	0.96717	0.00653	0.00082	0.002191	0.97723	0.00609
SS_n	0.00683	0.00646	0.90559	0.00614	0.00047	7.08e-5	0.94482	0.00089
	$n = 500$		$\delta = 20\%$	$p = 4$	$q = 4$			
S_n	0.00262	0.00247	0.93383	0.00255	-0.00026	0.00099	0.96364	0.00039
MCD	0.00267	0.00269	0.93775	0.00261	0.00039	-0.00068	0.96565	0.00077
Comedian	0.00258	0.00256	0.98175	0.00255	-0.00049	0.00077	0.98826	0.00242
OGK	0.00263	0.00255	0.97934	0.00264	0.00036	0.00033	0.98715	0.00355
SS_n	0.00266	0.00246	0.91953	0.00251	0.00089	6.15e-5	0.95616	0.00198

Table 9: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (4,4)$ and $\delta = 40$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 40\%$	$p = 4$	$q = 4$			
S_n	0.35211	2.12064	88.3139	74.9682	0.02736	1.10210	7.57509	6.69784
MCD	0.06166	0.14459	5.10457	3.83927	0.00316	0.04959	1.16849	0.29616
Comedian	0.07304	0.20331	8.23891	6.28624	0.01107	0.09460	1.4986	0.61259
OGK	0.24763	2.06194	68.0633	55.9697	0.17555	1.12809	6.87226	5.96703
SS_n	0.04199	0.03976	0.83585	0.03122	0.00137	-0.00386	0.87939	-0.00342
	$n = 100$		$\delta = 40\%$	$p = 4$	$q = 4$			
S_n	0.17121	2.47706	106.977	91.9338	0.05115	1.27435	8.73594	7.85035
MCD	0.02066	0.03643	1.70257	0.75216	0.00331	0.00620	0.97224	0.06375
Comedian	0.02559	0.08129	3.66991	2.36436	0.00931	0.03717	1.16523	0.24823
OGK	0.15370	2.61437	92.12617	76.86808	0.19075	1.38645	8.52452	7.60009
SS_n	0.01897	0.01790	0.88176	0.01688	0.00095	0.00061	0.92145	0.00965
	$n = 200$		$\delta = 40\%$	$p = 4$	$q = 4$			
S_n	0.10238	2.98402	126.0541	108.3557	0.07587	1.51423	10.105	9.19703
MCD	0.00891	0.00863	0.93663	0.00853	-0.00113	0.00138	0.95895	0.00499
Comedian	0.010701	0.03056	1.90188	0.82885	0.00623	0.01251	1.04234	0.09413
OGK	0.10160	3.07438	111.7085	93.8952	0.18774	1.59264	9.79609	8.85033
SS_n	0.00910	0.00820	0.90489	0.00829	-0.00114	-0.00255	0.94256	0.00521
	$n = 500$		$\delta = 40\%$	$p = 4$	$q = 4$			
S_n	0.05855	3.46906	142.8108	122.8374	0.11323	1.74201	11.3629	10.4506
MCD	0.00349	0.008536	1.08623	0.14533	-0.00039	0.00049	0.96910	0.01381
Comedian	0.00454	0.00557	1.0357	0.07907	0.00501	0.00256	0.97785	0.01777
OGK	0.06420	3.80079	137.7814	116.8007	0.1799	1.88859	11.4503	10.4991
SS_n	0.00352	0.00320	0.92963	0.00334	0.00061	-0.00072	0.96053	0.00297

Table 10: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (4, 8)$ and $\delta = 20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non- diagonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 20\%$		$p = 4$	$q = 8$		
S_n	0.02985	0.02757	0.89167	0.02372	0.00022	-0.00246	0.91829	-0.00171
MCD	0.04564	0.03866	0.74667	0.02948	-0.00042	-0.00168	0.82991	-0.00268
Comedian	0.03395	0.03111	0.89529	0.02369	-0.00155	-0.00172	0.920004	-0.00703
OGK	0.02945	0.02885	0.90123	0.02387	-0.0008	-0.00046	0.92355	-0.00212
SS_n	0.03051	0.02776	0.86582	0.02344	-0.00076	0.00254	0.90531	-0.00123
	$n = 100$		$\delta = 20\%$		$p = 4$	$q = 8$		
S_n	0.01373	0.01317	0.92738	0.01242	0.00013	0.00077	0.95016	0.00211
MCD	0.01716	0.01613	0.80859	0.01427	0.00019	-0.00156	0.88370	0.00402
Comedian	0.01364	0.013508	0.94392	0.012340	0.00038	0.00130	0.95839	0.00257
OGK	0.01362	0.01348	0.93933	0.01223	0.00047	-0.00146	0.95648	0.00172
SS_n	0.01373	0.01265	0.89824	0.01202	-2.50e-5	5.39e-5	0.93452	0.00214
	$n = 200$		$\delta = 20\%$		$p = 4$	$q = 8$		
S_n	0.00653	0.00625	0.95156	0.006172	-6.10e-5	0.00399	0.96932	0.00774
MCD	0.00707	0.00704	0.90170	0.00668	0.00083	-0.00075	0.94239	0.00538
Comedian	0.00668	0.00643	0.97214	0.006298	0.000133	0.000511	0.97970	0.00521
OGK	0.006512	0.00639	0.96979	0.00618	0.00032	0.00096	0.97843	0.00433
SS_n	0.00671	0.00641	0.92568	0.00618	0.00026	0.00154	0.95560	0.00438
	$n = 500$		$\delta = 20\%$		$p = 4$	$q = 8$		
S_n	0.00272	0.00263	0.95723	0.00253	-0.00107	-0.00369	0.97559	-3.00e-5
MCD	0.00260	0.00263	0.95060	0.00256	9.74e-5	0.00022	0.97231	0.00084
Comedian	0.002603	0.00253	0.95310	0.00254	0.000723	0.00048	0.96880	0.00039
OGK	0.00252	0.00257	0.99024	0.00252	0.00024	0.00019	0.99262	0.00054
SS_n	0.00259	0.00253	0.94393	0.00254	0.00035	0.00048	0.96880	0.00039

Table 11: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q), (p, q) = (4, 8)$ and $\delta = 40\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 4$	$q = 8$			
S_n	0.043008	0.03916	0.99702	0.13393	0.00179	0.00229	0.90948	0.00685
MCD	1.10588	4.99271	153.939	138.717	0.03637	1.90590	10.9517	10.2712
Comedian	0.04310	0.03926	0.8802	0.05615	0.00159	0.00301	0.90338	0.00150
OGK	0.13148	0.25842	11.0502	7.9792	0.2029	0.1882	2.07959	1.1726
SS_n	0.04175	0.03909	0.8569	0.03099	-0.0019	-0.00078	0.89257	-0.00197
		$n = 100$	$\delta = 40\%$	$p = 4$	$q = 8$			
S_n	0.01849	0.01784	0.91315	0.01628	-0.00064	-0.0013	0.93828	0.00251
MCD	0.14467	1.90623	108.966	98.25095	0.09733	0.77056	6.46039	5.56713
Comedian	0.01890	0.01796	0.92561	0.01641	0.001394	-0.00103	0.94517	0.00326
OGK	0.12073	0.45787	24.4393	18.8932	0.22968	0.36320	3.39921	2.47033
SS_n	0.01879	0.01789	0.91176	0.01632	-0.0015	0.00139	0.93776	0.00265
		$n = 200$	$\delta = 40\%$	$p = 4$	$q = 8$			
S_n	0.00877	0.00813	0.94621	0.00831	-0.00386	-0.00368	0.96353	0.00680
MCD	0.04710	1.13776	65.92517	58.908	0.06842	0.45254	4.20805	3.26446
Comedian	0.009016	0.00862	0.96128	0.008340	-0.000217	0.00154	0.97213	0.00646
OGK	0.11755	0.81882	48.09808	38.7176	0.24354	0.63746	5.47545	4.53889
SS_n	0.00895	0.00865	0.93599	0.00836	-0.00131	0.00097	0.95889	0.00547
		$n = 500$	$\delta = 40\%$	$p = 4$	$q = 8$			
S_n	0.00331	0.00323	0.96203	0.00337	-0.00127	0.00141	0.97745	0.00038
MCD	0.015927	0.52698	25.93215	22.43054	0.03849	0.21017	2.33193	1.37015
Comedian	0.003529	0.00340	0.98661	0.00337	0.00018	0.00072	0.98999	0.00084
OGK	0.10927	1.22138	80.4669	66.3807	0.22964	0.92963	7.98539	7.04439
SS_n	0.00346	0.00341	0.95473	0.00336	-0.0008	0.00065	0.97356	0.00087

Table 12: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (8,4)$ and $\delta = 20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 20\%$	$p = 8$	$q = 4$			
S_n	0.03357	0.03127	0.69526	0.02230	-0.00191	0.00164	0.80639	-0.0047
MCD	0.06377	0.05434	0.66516	0.02753	0.00354	-0.0036	0.86487	-0.00553
Comedian	0.03336	0.03258	0.71466	0.02132	0.00042	0.00444	0.81985	-0.00564
OGK	0.03488	0.03058	0.79689	0.02399	-0.00089	0.00871	0.86366	-0.00098
SS_n	0.03463	0.03043	0.65955	0.02023	-0.00206	0.00436	0.78517	-0.00814
	$n = 100$		$\delta = 20\%$	$p = 8$	$q = 4$			
S_n	0.01464	0.01365	0.80411	0.01147	0.00133	-0.0013	0.88316	0.0069
MCD	0.02019	0.01851	0.85954	0.01404	0.00051	0.00120	0.91408	0.00859
Comedian	0.014704	0.01413	0.85518	0.01197	-0.0006	0.00132	0.91151	0.00620
OGK	0.01461	0.01391	0.84919	0.01187	0.00425	0.00471	0.91644	0.00988
SS_n	0.01455	0.01312	0.78861	0.01169	7.36e-5	0.00088	0.87456	0.00883
	$n = 200$		$\delta = 20\%$	$p = 8$	$q = 4$			
S_n	0.00689	0.00686	0.87209	0.00605	-9.70e-5	-0.00217	0.92732	0.00274
MCD	0.00768	0.00738	0.88049	0.00679	0.00034	-0.00021	0.92846	0.00590
Comedian	0.00681	0.00655	0.88193	0.00623	0.00038	0.00057	0.92771	0.00206
OGK	0.00693	0.00681	0.91868	0.00613	0.00296	0.00237	0.95222	0.00413
SS_n	0.00689	0.00686	0.87209	0.00605	-9.71e-5	-0.00217	0.92732	0.00274
	$n = 500$		$\delta = 20\%$	$p = 8$	$q = 4$			
S_n	0.00264	0.00264	0.91704	0.00259	-0.00021	0.00059	0.95489	0.00075
MCD	0.00270	0.00268	0.90326	0.00254	-0.00012	0.00014	0.94763	0.00186
Comedian	0.00267	0.00258	0.96727	0.00249	0.00024	0.00078	0.98095	0.00151
OGK	0.00282	0.00255	0.96945	0.00255	0.00316	-0.00185	0.9821	0.00333
SS_n	0.00269	0.00252	0.90211	0.00253	-7.60e-5	0.00102	0.94721	0.00198

Table 13: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (8,4)$ and $\delta = 40\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 8$	$q = 4$			
S_n	0.65477	4.49132	187.4866	166.8014	0.00732	1.91785	12.6191	11.8209
MCD	1.10588	4.99271	153.9388	138.7171	0.03637	1.90590	10.9517	10.2712
Comedian	0.08008	0.19894	6.76004	5.36965	0.00618	0.07377	1.24657	0.48109
OGK	0.26099	1.41466	51.98879	43.6377	0.07299	0.78048	5.23331	4.42547
SS_n	0.05081	0.04479	0.62296	0.02713	0.00044	0.00141	0.75465	-0.0112
		$n = 100$	$\delta = 40\%$	$p = 8$	$q = 4$			
S_n	0.32181	5.07361	265.0977	238.2694	0.02099	2.16953	15.7887	14.9364
MCD	0.24450	3.08433	154.1151	139.5274	0.00349	1.27764	9.44718	8.64571
Comedian	0.02494	0.07119	3.67962	2.58406	0.00243	0.02834	1.05494	0.20349
OGK	0.15232	1.84470	84.32217	71.8368	0.07698	1.02136	7.36655	6.48206
SS_n	0.02031	0.01889	0.76514	0.01541	-0.00141	0.00271	0.85653	0.01131
		$n = 200$	$\delta = 40\%$	$p = 8$	$q = 4$			
S_n	0.13881	5.63183	302.1547	271.9262	0.02784	2.34434	17.1804	16.2865
MCD	0.05585	1.92001	108.7991	98.1236	0.00615	0.77234	6.43164	5.52993
Comedian	0.00980	0.01175	1.05728	0.17460	0.00120	0.00140	0.94323	0.026271
OGK	0.09047	2.24832	110.871	94.70453	0.08036	1.24512	9.08741	8.15866
SS_n	0.00927	0.00871	0.85027	0.00785	0.00032	0.001097	0.91304	0.00552
		$n = 500$	$\delta = 40\%$	$p = 8$	$q = 4$			
S_n	0.04544	6.1107	300.593	269.6979	0.0551	2.4702	17.291	16.376
MCD	0.01287	1.34594	74.024	66.1225	0.01029	0.53375	4.6888	3.73511
Comedian	0.00399	0.00338	0.96841	0.00372	0.00695	0.00278	0.98051	0.00804
OGK	0.04652	2.7300	133.465	114.091	0.08045	1.4778	10.582	9.6279
SS_n	0.00360	0.00342	0.90273	0.00332	8.02e-6	0.00049	0.94657	0.00132

Table 14: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$,
 $(p, q)=(10,10)$ and $\delta=20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 20\%$	$p = 10$	$q = 10$			
S_n	0.03946	0.03737	0.62071	0.02136	5.87e-5	0.00402	0.76008	0.02979
MCD	0.18668	0.32411	17.407	14.6341	0.00333	0.20601	2.32459	1.6307
Comedian	0.03551	0.03353	0.65291	0.02126	0.00038	0.00109	0.78266	0.02788
OGK	0.04362	0.03995	0.65303	0.02217	0.00077	0.00833	0.78249	0.03345
SS_n	0.03619	0.03492	0.62575	0.02059	-0.00072	0.00279	0.76535	0.02836
		$n = 100$	$\delta = 20\%$	$p = 10$	$q = 10$			
S_n	0.01591	0.01496	0.78640	0.01161	-0.00027	0.00164	0.86172	0.01279
MCD	0.02294	0.02076	0.95109	0.28122	0.00022	0.00114	0.89014	0.040083
Comedian	0.01493	0.01445	0.81212	0.01136	0.00030	0.00124	0.88852	0.01163
OGK	0.01685	0.01506	0.73256	0.01172	-0.00034	0.00468	0.87174	0.013794
SS_n	0.01519	0.01442	0.77330	0.011306	-0.00016	0.00294	0.86661	0.01135
		$n = 200$	$\delta = 20\%$	$p = 10$	$q = 10$			
S_n	0.01567	0.014839	0.86146	0.011589	0.00031	0.00276	0.93925	0.01267
MCD	0.00790	0.00772	0.87530	0.00656	0.00018	0.00203	0.92913	0.00656
Comedian	0.006871	0.00677	0.90201	0.00608	0.00041	0.00069	0.94349	0.00562
OGK	0.00727	0.00671	0.89834	0.00625	0.00015	0.00209	0.94151	0.00591
SS_n	0.00698	0.00658	0.85951	0.00602	-0.00032	0.00209	0.92048	0.00481
		$n = 500$	$\delta = 20\%$	$p = 10$	$q = 10$			
S_n	0.00268	0.00259	0.93724	0.00253	-0.00128	-0.00194	0.96014	0.00214
MCD	0.00271	0.00277	0.93255	0.00257	0.00017	-0.00036	0.95256	0.00228
Comedian	0.00262	0.00254	0.95852	0.00248	0.00015	0.00053	0.97657	0.00248
OGK	0.00258	0.00255	0.95926	0.00246	0.00254	0.00028	0.97687	0.00224
SS_n	0.00266	0.00257	0.92344	0.00249	0.00029	0.00035	0.95829	0.00155

Table 15: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (10,10)$ and $\delta = 40\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 10$	$q = 10$			
S_n	0.05721	0.0652	0.56855	0.02759	0.00254	0.00557	0.73874	0.04188
MCD	0.89826	6.00411	230.46	213.62	0.05921	1.87974	12.04471	11.3509
Comedian	0.05617	0.05185	0.57761	0.02743	0.00093	-0.00464	0.72452	0.04005
OGK	0.06095	0.05666	0.66691	0.11091	0.00029	0.00393	0.72788	0.05581
SS_n	0.05591	0.05162	0.57793	0.02738	-0.00076	-0.00063	0.72355	0.03901
		$n = 100$	$\delta = 40\%$	$p = 10$	$q = 10$			
S_n	0.02139	0.02036	0.74991	0.01495	-2.60e-6	0.00083	0.84851	0.01577
MCD	0.38991	5.31591	335.99	313.521	0.04517	1.7746	14.483	13.705
Comedian	0.02116	0.02048	0.85555	0.01489	0.00064	0.00112	0.91616	0.01659
OGK	0.02666	0.02482	1.2451	0.27052	0.07492	0.01901	0.98575	0.13838
SS_n	0.02095	0.02005	0.74579	0.01474	0.00016	0.00081	0.84621	0.01597
		$n = 200$	$\delta = 40\%$	$p = 10$	$q = 10$			
S_n	0.00949	0.00935	0.87454	0.00793	3.41e-5	0.00128	0.92195	0.00718
MCD	0.16635	5.79316	459.79	429.114	0.02545	1.9671	17.822	16.948
Comedian	0.00933	0.00938	0.87223	0.00791	-3.00e-5	-0.00136	0.92555	0.00757
OGK	0.01663	0.01355	1.34789	0.22998	0.08342	0.01624	1.0632	0.14346
SS_n	0.00939	0.00891	0.85125	0.0078	-0.00016	-0.00186	0.91390	0.00616
		$n = 500$	$\delta = 40\%$	$p = 10$	$q = 10$			
S_n	0.00351	0.00353	0.92729	0.00345	0.00044	0.00435	0.95649	0.00199
MCD	0.06606	7.41780	635.76	593.08	0.02723	2.4625	22.963	22.017
Comedian	0.00354	0.00348	0.94594	0.00333	0.00013	-0.00051	0.96919	0.00297
OGK	0.01203	0.00558	1.3406	0.14947	0.09007	0.01748	1.0991	0.14387
SS_n	0.00353	0.00344	0.91675	0.00331	-0.00044	0.00113	0.95409	0.00257

Table 16: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (4, 4)$ and $\delta = 20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 20\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.03075	0.02774	0.85563	0.02364	0.00018	-0.00308	0.89928	-0.00583
MCD	0.05089	0.03241	0.86104	0.03019	-0.00204	0.00068	0.89749	-0.00694
Comedian	0.03048	0.02779	0.86394	0.02443	0.00011	0.00439	0.90155	-0.00505
OGK	0.03454	0.02974	0.88734	0.02376	-4.00e-5	0.00607	0.85762	-0.0025
SS_n	0.03024	0.02771	0.82304	0.02354	-0.00019	0.00457	0.88019	-0.0057
	$n = 100$		$\delta = 20\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.014313	0.013099	0.901658	0.012564	0.000809	-0.00017	0.93652	0.00592
MCD	0.016517	0.013104	0.889987	0.013742	-0.00132	-0.00087	0.942827	0.005901
Comedian	0.014158	0.013117	0.902919	0.012439	-0.0012	-0.00032	0.936348	0.00573
OGK	0.014642	0.013542	0.897704	0.012663	0.000848	0.000761	0.936497	0.008697
SS_n	0.014138	0.013011	0.882499	0.012114	0.000674	-5.80e-5	0.92597	0.005487
	$n = 200$		$\delta = 20\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.00669	0.00657	0.91924	0.00641	-0.00011	0.00284	0.95191	0.00348
MCD	0.00719	0.00644	0.92161	0.00672	-0.0013	0.00117	0.96221	0.00484
Comedian	0.00676	0.00635	0.91669	0.00634	0.00015	-0.00092	0.95086	0.00467
OGK	0.00699	0.00619	0.92655	0.00671	4.93e-5	0.00189	0.95447	0.00601
SS_n	0.00661	0.00632	0.90445	0.00629	8.74e-5	0.00249	0.94411	0.00081
	$n = 500$		$\delta = 20\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.00257	0.00241	0.93676	0.00259	0.000414	-4.50e-5	0.96514	0.00081
MCD	0.00269	0.00251	0.93088	0.00256	-0.00019	-0.00012	0.96203	0.00057
Comedian	0.00263	0.00243	0.93226	0.00252	-0.00039	-9.76e-5	0.96284	1.97e-5
OGK	0.00269	0.00243	0.92049	0.00266	8.45e-5	5.13e-5	0.96727	0.00279
SS_n	0.00244	0.00235	0.91845	0.00256	3.89e-4	0.00115	0.95566	0.00021

Table 17: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (4, 8)$ and $\delta = 20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 20\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.034704	0.031897	0.764784	0.023529	-0.00084	0.000461	0.899752	0.026747
MCD	0.047819	0.036478	0.794979	0.028639	-0.00086	7.38e-6	0.861456	-0.00208
Comedian	0.02924	0.028465	0.895826	0.023991	0.000321	-0.00228	0.92042	-0.00292
OGK	0.034667	0.030594	0.802752	0.023804	0.000448	0.008045	0.866346	-0.00156
SS_n	0.029632	0.027593	0.75648	0.023149	-8.30e-5	0.0004134	0.846933	-0.00268
		$n = 100$	$\delta = 20\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.01377	0.01327	0.93041	0.01244	0.00097	-0.00168	0.95109	0.00331
MCD	0.01817	0.01458	0.92737	0.01432	-0.00059	-0.001	0.95088	0.00275
Comedian	0.01356	0.01326	0.92725	0.01231	0.00092	0.0008	0.95011	0.00296
OGK	0.01514	0.01333	0.94102	0.01263	-7.80e-6	0.00287	0.95401	0.00431
SS_n	0.01367	0.01325	0.89929	0.01198	0.00099	0.00208	0.93521	0.00234
		$n = 200$	$\delta = 20\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.00664	0.00637	0.94831	0.00628	0.00036	-2.70e-5	0.96723	0.00535
MCD	0.00735	0.00653	0.93217	0.00655	0.00017	5.53e-5	0.96195	0.00459
Comedian	0.00659	0.00627	0.94099	0.00627	0.00031	0.00028	0.96357	0.00457
OGK	0.00690	0.00647	0.93551	0.00634	1.61e-5	0.00259	0.96473	0.00447
SS_n	0.00675	0.00637	0.92623	0.00618	-0.00089	0.00310	0.95562	0.00431
		$n = 500$	$\delta = 20\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.00261	0.00247	0.95209	0.00253	-8.20e-5	-9.50e-5	0.97302	0.00129
MCD	0.00269	0.00251	0.93088	0.00256	-0.00019	-0.00012	0.96203	0.00057
Comedian	0.00262	0.00251	0.95425	0.00259	0.00039	-0.00074	0.97421	0.00023
OGK	0.00267	0.00253	0.92965	0.00257	-1.00e-5	8.10e-5	0.96142	0.0014
SS_n	0.00254	0.00246	0.90409	0.00252	0.00011	0.00088	0.90899	9.38e-6

Table 18: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (8, 4)$ and $\delta = 20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 20\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.03374	0.03345	0.69862	0.02149	0.00061	0.00055	0.80972	-0.00483
MCD	0.06381	0.04222	0.50153	0.02572	0.00069	0.00162	0.67153	-0.00264
Comedian	0.03402	0.03093	0.70009	0.02088	0.00139	0.00281	0.80951	-0.0049
OGK	0.03992	0.03290	0.61369	0.02133	0.00193	0.00396	0.75319	-0.00154
SS_n	0.03344	0.03091	0.57365	0.02055	-0.00067	-0.00028	0.64131	-0.00433
		$n = 100$	$\delta = 20\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.01487	0.01405	0.80891	0.01198	0.00035	-0.00207	0.88622	0.00762
MCD	0.01943	0.01453	0.668330	0.01385	-0.00033	0.00242	0.800258	0.00817
Comedian	0.01472	0.01376	0.80632	0.01159	-0.00083	-0.00145	0.88429	0.00715
OGK	0.01583	0.01418	0.76464	0.01214	-0.00105	0.00111	0.86020	0.01186
SS_n	0.01481	0.01335	0.65938	0.01139	-0.00018	0.00218	0.80949	0.00567
		$n = 200$	$\delta = 20\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.00684	0.00638	0.88094	0.00623	-0.00059	5.36e-5	0.93169	0.00291
MCD	0.00739	0.00642	0.81891	0.00663	-0.00014	0.00087	0.89748	0.00333
Comedian	0.00688	0.00639	0.87029	0.00611	-0.00074	-0.00126	0.92622	0.00334
OGK	0.00714	0.00636	0.83691	0.00637	-0.00024	0.00124	0.90767	0.00625
SS_n	0.00681	0.00634	0.80894	0.00627	0.000105	0.00212	0.89005	0.00233
		$n = 500$	$\delta = 20\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.00269	0.00248	0.90819	0.00254	0.00024	0.00044	0.95025	0.00282
MCD	0.00271	0.00246	0.89083	0.00260	0.00034	0.00010	0.94093	0.00129
Comedian	0.00268	0.00251	0.91519	0.00258	0.00047	0.00101	0.95395	0.00099
OGK	0.00273	0.00255	0.89548	0.00262	-0.0002	0.00071	0.94343	0.00379
SS_n	0.00261	0.00246	0.87256	0.00254	-0.00044	1.56e-3	0.85725	0.00167

Table 19: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (10, 10)$ and $\delta = 20\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 20\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.03994	0.03749	0.62827	0.02142	0.00063	0.00494	0.75840	0.03005
MCD	0.08538	0.10234	1.99508	1.38534	0.06619	0.02868	0.81063	0.19452
Comedian	0.03685	0.03416	0.64861	0.02095	0.00058	0.00427	0.77916	0.02745
OGK	0.04426	0.04086	0.58296	0.02201	-0.00116	0.00674	0.73376	0.03467
SS_n	0.03686	0.03417	0.62789	0.02058	-0.00056	0.00424	0.75979	0.02731
		$n = 100$	$\delta = 20\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.01586	0.01493	0.76322	0.01169	-0.00032	0.00245	0.86402	0.01219
MCD	0.02425	0.01867	0.83574	0.01409	0.01374	-0.00094	0.87980	0.02225
Comedian	0.01597	0.01414	0.79717	0.01157	0.00016	0.00165	0.87988	0.01213
OGK	0.01679	0.01506	0.79413	0.01162	-0.00038	0.00291	0.88276	0.01287
SS_n	0.01515	0.01418	0.74848	0.01128	4.85e-5	0.00119	0.86394	0.01204
		$n = 200$	$\delta = 20\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.00715	0.00662	0.85347	0.00614	-2.50e-5	0.00082	0.91701	0.00569
MCD	0.00826	0.00719	0.87997	0.00667	0.00168	-0.0004	0.92561	0.00688
Comedian	0.00684	0.00667	0.88076	0.00603	0.00021	-7.50e-5	0.93209	0.00518
OGK	0.00735	0.00689	0.88314	0.006201	-0.0003	0.001344	0.90866	0.00658
SS_n	0.00697	0.00671	0.86112	0.00596	-5.00e-5	0.00193	0.90139	0.00574
		$n = 500$	$\delta = 20\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.00269	0.00259	0.91858	0.00254	-0.00012	0.00128	0.95578	0.00251
MCD	0.00277	0.00262	0.921796	0.00261	2.45e-4	-4.10e-5	0.94686	0.00252
Comedian	0.00262	0.00264	0.93416	0.00251	-3.70e-5	-0.00032	0.96389	0.00224
OGK	0.00271	0.00255	0.92908	0.00252	-4.40e-5	-4.20e-5	0.95079	0.00236
SS_n	0.00261	0.00255	0.91939	0.00248	0.00015	0.00049	0.93522	0.00206

Table 20: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (10, 10)$ and $\delta = 40\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.05844	0.05399	0.58708	0.02813	-0.00063	0.00351	0.73277	0.04215
MCD	2.4997	19.171	210.80	201.92	0.05781	4.0571	13.554	13.225
Comedian	0.05584	0.05243	0.58585	0.02813	-0.00035	-0.00265	0.72996	0.04069
OGK	0.17829	0.53677	26.002	23.626	0.00808	0.21098	2.1958	1.5336
SS_n	0.05579	0.05097	0.57641	0.02753	-0.00089	0.00219	0.72227	0.04067
		$n = 100$	$\delta = 40\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.02148	0.02055	0.73583	0.01469	0.00010	-0.00014	0.85066	0.01669
MCD	1.43679	32.895	332.13	323.11	0.04217	5.5703	17.722	17.467
Comedian	0.02091	0.01974	0.75097	0.01494	-0.0002	-0.00162	0.84909	0.01676
OGK	0.14387	2.00717	136.05	127.88	0.00899	0.68192	6.35096	5.5712
SS_n	0.02103	0.02060	0.70497	0.01489	-0.00081	-0.00059	0.84568	0.01622
		$n = 200$	$\delta = 40\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.00956	0.00911	0.85644	0.00793	0.00023	-0.00096	0.921263	0.00749
MCD	0.67356	53.7666	367.2779	360.0604	0.024282	7.294028	19.03284	18.84639
Comedian	0.00939	0.00910	0.854696	0.00802	-0.00013	-0.00075	0.915971	0.006963
OGK	0.14387	2.007173	136.0479	127.8799	0.008989	0.68192	6.350955	5.571183
SS_n	0.00934	0.00917	0.84965	0.00792	0.00028	-0.00081	0.91332	0.00768
		$n = 500$	$\delta = 40\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.00355	0.00353	0.93521	0.00334	0.00011	0.000211	0.9632	0.00294
MCD	0.20230	79.031	271.08	266.38	7.79e-3	8.88e+0	16.401	16.260
Comedian	0.00354	0.00344	0.91997	0.00330	4.59e-5	-0.00011	0.95565	0.00311
OGK	0.06209	7.3105	532.14	504.957	3.03e-2	2.35e+0	20.2159	19.4717
SS_n	0.00352	0.00348	0.92139	0.00329	-0.00018	0.00029	0.95642	0.00262

Table 21: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (8, 4)$ and $\delta = 40$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.67604	4.7197	189.57	173.68	0.02041	1.93489	12.526	11.876
MCD	0.22249	0.72785	4.68828	4.22266	0.09912	0.16406	0.87398	0.40646
Comedian	0.08008	0.19894	6.76004	5.36965	0.00618	0.07377	1.2466	0.48109
OGK	0.47698	2.4181	97.769	88.577	0.0519	1.05517	7.2745	6.5795
SS_n	0.05105	0.04801	0.63371	0.02721	-0.00129	-0.00042	0.760148	-0.00735
		$n = 100$	$\delta = 40\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.30009	5.8859	290.31	268.66	0.00647	2.3327	16.444	15.771
MCD	0.05243	0.06361	0.69358	0.43759	0.10117	0.01547	0.85527	0.07769
Comedian	0.04822	0.41848	21.122	18.769	0.00071	0.17219	2.0267	1.1927
OGK	0.23910	3.63738	181.25	166.69	0.03763	1.50101	10.970	10.241
SS_n	0.02046	0.01989	0.76972	0.01564	-0.00085	-0.00198	0.85912	0.00857
		$n = 200$	$\delta = 40\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.13794	6.49049	323.99	300.54	0.01517	2.53085	17.8287	17.1642
MCD	0.02638	0.01075	0.28965	0.00773	0.10119	0.01033	0.92628	0.04516
Comedian	0.02253	0.49061	24.8709	22.2412	0.00659	0.19842	2.2407	1.3537
OGK	0.12026	4.7165	237.46	219.63	0.04184	1.8786	13.5439	12.8255
SS_n	0.00927	0.00905	0.85261	0.00857	-0.00052	0.00115	0.91442	0.00469
		$n = 500$	$\delta = 40\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.05049	6.7196	294.32	273.06	0.04917	2.5916	17.09053	16.4615
MCD	0.01503	0.00370	0.37857	0.00479	0.10117	0.00943	0.96087	0.04819
Comedian	0.01964	1.6889	77.773	71.273	0.01879	0.67522	5.2369	4.3807
OGK	0.050407	5.844764	249.5629	231.1968	0.061419	2.2787	14.96317	14.31361
SS_n	0.00363	0.00331	0.89875	0.00327	0.00025	4.42e-4	0.94438	0.00127

Table 22: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (4, 8)$ and $\delta = 40\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.04276	0.04142	1.00681	0.14032	0.00145	0.00236	0.91515	0.01164
MCD	1.61146	19.865	213.19	203.72	0.16089	4.24079	13.9311	13.5893
Comedian	0.04213	0.03914	0.86906	0.03128	-0.00198	3.15e-5	0.89736	-0.00523
OGK	0.34543	2.92446	125.41	115.05	0.08919	1.13075	7.9352	7.1756
SS_n	0.04203	0.03844	0.86211	0.03121	-0.00217	0.00069	0.89494	-0.00511
		$n = 100$	$\delta = 40\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.01878	0.01762	0.92864	0.01637	0.00040	0.00051	0.94626	0.00254
MCD	0.79948	30.776	237.63	230.44	0.11793	5.5050	15.282	15.0549
Comedian	0.01867	0.03220	1.7074	0.74729	0.00051	0.00488	0.97882	0.04113
OGK	0.25305	5.8210	253.85	235.62	0.12353	2.1851	14.5669	13.9005
SS_n	0.01876	0.01779	0.91178	0.01639	-9.50e-5	-0.00079	0.93767	0.003157
		$n = 200$	$\delta = 40\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.00907	0.00831	0.94042	0.00839	0.00074	-0.00114	0.96081	0.00623
MCD	0.32752	40.052	219.84	214.55	0.09014	6.3186	14.784	14.609
Comedian	0.00889	0.00841	0.94039	0.00836	0.00079	3.14e-5	0.96104	0.00689
OGK	0.14479	7.1026	282.49	263.29	0.17926	2.6188	16.513	15.919
SS_n	0.00886	0.00854	0.93573	0.00826	-0.00122	0.00054	0.95858	0.00650
		$n = 500$	$\delta = 40\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.00357	0.00339	0.95067	0.00344	2.40e-4	-1.32e-3	0.97150	0.00135
MCD	0.12316	48.173	184.25	180.13	0.06909	6.9366	13.552	13.40124
Comedian	0.00347	0.00339	0.95503	0.00339	0.00042	0.00012	0.97365	7.16e-5
OGK	0.08471	7.4702	277.98	259.51	2.10e-1	2.72e+0	16.618	16.052
SS_n	0.00349	0.00339	0.92122	0.00337	0.00022	-0.0002	0.95182	9.28e-4

Table 23: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (4,4)$ and $\delta = 40$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 40\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.34236	2.86147	107.304	95.8018	0.00815	1.3031	8.3696	7.6065
MCD	0.20895	0.6777	5.7594	5.1498	0.23056	0.17052	1.0439	0.53301
Comedian	0.07304	0.20331	8.2389	6.2862	0.01107	0.09460	1.4986	0.61259
OGK	0.37440	2.90728	105.80	94.846	0.07036	1.3161	8.3262	7.5881
SS_n	0.04171	0.03936	0.84139	0.03175	0.000396	-0.00082	0.88122	-0.00816
		$n = 100$	$\delta = 40\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.16657	3.34178	126.76	114.233	0.03881	1.5040	9.5526	8.8165
MCD	0.09897	0.24681	2.68858	2.2208	0.23034	0.07856	0.79908	0.29075
Comedian	0.04405	0.58265	22.0002	19.1608	0.01630	0.26029	2.4131	1.5347
OGK	0.16882	3.80005	138.98	125.73	0.07553	1.6884	10.413	9.7134
SS_n	0.01891	0.01788	0.87993	0.01652	0.00164	-0.00066	0.91983	0.00648
		$n = 200$	$\delta = 40\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.10285	3.6858	134.2794	121.1064	0.06407	1.66273	10.2703	9.5508
MCD	0.07246	0.01184	0.49299	0.02680	0.23952	0.02759	0.98878	0.13367
Comedian	0.03068	0.94529	31.8636	28.16068	0.03452	0.41796	3.18009	0.00467
OGK	0.10302	4.5527	151.715	137.491	0.13086	2.00746	11.6645	11.0154
SS_n	0.00890	0.00871	0.91137	0.00847	0.00042	-0.00096	0.94556	0.00389
		$n = 500$	$\delta = 40\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.05775	4.29006	159.64	144.47	0.07819	1.91e+0	11.78005	11.0825
MCD	0.06499	0.00494	0.96339	0.02514	0.24577	0.02804	0.96579	0.14715
Comedian	0.03586	2.48335	78.2417	70.36449	0.10027	1.10e+0	6.6505	5.87e+0
OGK	0.05742	5.15367	159.75	145.08	1.66e-1	2.25e+0	12.521	11.917
SS_n	0.00349	0.00339	0.93097	0.003426	2.55e-4	-0.00032	0.96137	0.00223

Table 24: Efficiency table

	Slope	Intercept	Σ_{diag}	$\Sigma_{offdiag}$
	$n = 200$	$p = 4$	$q = 4$	
SS_n	1.085685	1.019474	2.182346	1.095446
MLE	1.065408	1.081035	2.157384	1.139241
Comedian	1.16082	1.075198	2.532731	1.237662
MCD	1.310039	1.23455	3.135779	1.444395
OGK	1.158311	1.101057	2.477163	1.264569
S_n	1.077284	1.042145	2.115124	1.11251
	$n = 200$	$p = 4$	$q = 8$	
SS_n	1.049875	1.045491	2.150233	1.088122
MLE	1.055721	1.046016	2.134762	1.06304
Comedian	1.126149	1.048017	2.458079	1.199587
MCD	1.261398	1.219316	2.735495	1.35651
OGK	1.13887	1.073517	2.40479	1.212931
S_n	1.049497	1.017444	2.055503	1.079099
	$n = 200$	$p = 8$	$q = 4$	
SS_n	1.104645	1.018578	2.310298	1.161796
MLE	1.081907	1.101591	2.19617	1.152949
Comedian	1.170313	1.17985	2.584451	1.277201
MCD	1.392171	1.324717	3.285776	1.644481
OGK	1.183097	1.148603	2.584904	1.179488
S_n	1.099407	1.074058	2.24533	1.120149
	$n = 200$	$p = 10$	$q = 10$	
SS_n	1.115416	1.026495	2.246079	1.133814
MLE	1.085531	1.062867	2.225373	1.098707
Comedian	1.180156	1.066586	2.417354	1.232591
MCD	1.448076	1.384457	3.186626	1.597878
OGK	1.186367	1.086911	2.585714	1.257713
S_n	1.11442	1.02788	2.22118	1.11389

Table 25: Efficiency table

	Slope	Intercept	Σ_{diag}	$\Sigma_{offdiag}$
	$n = 500$	$p = 4$	$q = 4$	
SS_n	1.067141	0.993516	2.291747	1.102374
MLE	1.05921	1.032378	2.275096	1.114671
Comedian	1.093142	1.039526	2.361259	1.23466
MCD	1.110777	1.07855	2.508448	1.275869
OGK	1.085246	1.100821	2.521479	1.210516
S_n	1.037956	1.02024	2.217112	1.089853
	$n = 500$	$p = 4$	$q = 8$	
SS_n	1.039417	1.044132	2.084362	1.05972
MLE	1.036092	1.038818	2.118347	1.060237
Comedian	1.087771	1.040496	2.325303	1.162874
MCD	1.098278	1.09345	2.279732	1.163004
OGK	1.134125	1.041724	2.430282	1.234794
S_n	1.036082	0.982349	2.174474	1.080231
	$n = 500$	$p = 8$	$q = 4$	
SS_n	1.083061	0.992563	2.245992	1.129318
MLE	1.056213	1.014551	2.321965	1.098386
Comedian	1.099334	1.111282	2.501702	1.193836
MCD	1.119814	1.143253	2.470724	1.279161
OGK	1.101297	1.080718	2.317278	1.220443
S_n	1.057181	1.000702	2.253193	1.107232
	$n = 500$	$p = 10$	$q = 10$	
SS_n	1.061849	1.004919	2.193867	1.101598
MLE	1.055777	1.056073	2.146041	1.073717
Comedian	1.090472	1.054135	2.311923	1.142357
MCD	1.119162	1.106028	2.389408	1.204313
OGK	1.096527	1.051755	2.301928	1.15537
S_n	1.079007	1.06211	2.225079	1.104945

Table 26: Efficiency table

	Slope	Intercept	Σ_{diag}	$\Sigma_{offdiag}$
	$n = 50$	$p = 4$	$q = 4$	
SS_n	1.172021	1.020086	2.287704	1.181081
MLE	1.156195	1.083698	2.37104	1.12325
Comedian	1.361004	1.196674	2.831552	1.366031
MCD	3.324486	2.382297	5.907785	3.015436
OGK	1.469819	1.161894	3.082958	1.417595
S_n	1.151859	1.046601	2.339094	1.155314
	$n = 50$	$p = 4$	$q = 8$	
SS_n	1.140247	1.099694	2.219859	1.110488
MLE	1.142621	1.085648	2.233066	1.107241
Comedian	1.354765	1.185182	2.654161	1.143647
MCD	2.738309	2.108277	4.648089	2.400629
OGK	1.525824	1.257324	3.159617	1.467343
S_n	1.151209	1.071138	2.188045	1.125286
	$n = 50$	$p = 8$	$q = 4$	
SS_n	1.306255	1.117222	2.64119	1.287287
MLE	1.273597	1.220601	2.467596	1.223631
Comedian	1.504346	1.331331	2.927176	1.494309
MCD	4.288275	3.149337	6.679908	3.628854
OGK	1.643489	1.236376	3.41832	1.680805
S_n	1.277141	1.17973	2.529524	1.29809
	$n = 50$	$p = 10$	$q = 10$	
SS_n	1.409954	1.303259	2.673938	1.310709
MLE	1.321088	1.242969	2.464703	1.245198
Comedian	1.503693	1.387149	3.023365	1.38795
MCD	2.95578	2.484511	4.99337	2.432618
OGK	1.854153	1.623738	3.582416	1.667471
S_n	1.554822	1.323204	2.996569	1.373973

Table 27: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1*I_q), (p, q) = (10,10)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.035379	0.034299	0.624847	0.019899	0.000192	1.87e-3	0.774586	0.027986
MCD	0.052203	0.044448	0.647251	0.023585	-0.00015	0.000292	0.781854	0.035432
Comedian	0.03354	0.030931	0.679281	0.019648	0.000477	5.23e-4	0.800382	2.50e-2
OGK	0.04065	0.037191	0.682545	0.02048	2.08e-4	6.03e-3	0.785208	0.032768
SS_n	0.03277	0.030403	0.639593	0.018907	2.51e-4	0.001972	0.765733	0.023259
		$n = 100$	$\delta = 10\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.014004	0.013292	0.862375	0.010382	5.78e-4	7.34e-4	0.860593	0.011466
MCD	0.02302	0.017691	0.808272	0.013155	6.72e-5	0.001166	0.863183	0.01508
Comedian	0.013894	0.012616	0.806761	0.010174	-0.00035	-0.00078	0.886806	1.02e-2
OGK	0.01515	0.013676	0.821858	0.010639	-3.70e-4	1.83e-3	0.896498	0.012231
SS_n	0.013372	0.012622	0.773067	0.010031	0.000441	0.001128	0.867663	1.08e-2
		$n = 200$	$\delta = 10\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.00634	0.005954	0.854939	0.005492	1.40e-5	0.000272	0.918432	0.00517
MCD	0.007377	0.006179	0.875626	0.006039	8.47e-5	-0.00035	0.933666	0.004764
Comedian	0.006177	0.005827	0.892463	0.005505	0.000834	-0.00095	0.938882	0.004963
OGK	0.006604	0.006088	0.870516	0.005617	-0.00017	0.002482	0.935209	0.005521
SS_n	0.00613	0.005825	0.858965	0.005326	-0.00024	1.28e-3	0.920977	0.004581
		$n = 500$	$\delta = 10\%$	$p = 10$	$q = 10$	diag=0.1		
S_n	0.002376	0.002208	0.919783	0.002225	-0.00011	-5.20e-5	0.9566	0.001779
MCD	0.002418	0.002309	0.900211	0.002273	1.25e-4	2.41e-4	0.94635	0.001675
Comedian	0.002348	0.002271	0.936253	0.002213	-1.20e-4	-0.00116	0.965302	0.002007
OGK	0.002436	0.002339	0.903601	0.002292	-1.50e-4	3.31e-4	0.948139	0.0024
SS_n	0.002154	0.0021931	0.679281	0.0019648	0.000477	0.000523	0.800382	0.0012496

Table 28: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (8, 4)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.030071	0.029982	0.710073	0.020074	-0.00024	1.39e-3	0.818126	-0.00602
MCD	0.071754	0.040567	0.752425	0.025876	-0.00251	0.002572	0.832953	-0.00422
Comedian	0.03016	0.0283	0.702836	0.019552	0.000189	1.69e-3	0.814418	-4.97e-3
OGK	0.036603	0.029532	0.601802	0.019494	1.02e-3	7.87e-3	0.846853	0.002305
SS_n	0.021185	0.02856	0.6768	0.019388	1.49e-4	0.000577	0.797973	-0.00343
		$n = 100$	$\delta = 10\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.01468	0.011625	0.822838	0.010568	2.83e-4	-1.67e-3	0.895149	0.005459
MCD	0.018414	0.012494	0.832756	0.012816	-6.80e-4	0.00015	0.878974	0.005181
Comedian	0.013838	0.011703	0.814563	0.010544	0.000571	0.001131	0.890538	5.30e-3
OGK	0.014344	0.012224	0.849691	0.011096	5.24e-6	3.00e-4	0.882167	0.009678
SS_n	0.013151	0.011495	0.786627	0.010442	0.000276	0.001099	0.875251	7.94e-3
		$n = 200$	$\delta = 10\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.006087	0.005765	0.887469	0.005593	-9.50e-5	0.000937	0.936072	0.003351
MCD	0.006688	0.005708	0.874231	0.005953	-1.50e-4	0.000788	0.939898	0.002215
Comedian	0.006099	0.005683	0.87817	0.00559	0.000193	0.000788	0.930824	0.005072
OGK	0.006438	0.005796	0.873996	0.00575	-0.00015	-0.00057	0.93655	0.00307
SS_n	0.006072	0.005668	0.859239	0.005493	-0.00018	-7.10e-4	0.920615	0.001929
		$n = 500$	$\delta = 10\%$	$p = 8$	$q = 4$	diag=0.1		
S_n	0.002327	0.002167	0.919339	0.00227	0.000489	-4.70e-4	0.956496	0.000819
MCD	0.006688	0.005708	0.904231	0.005953	-1.50e-4	7.88e-4	0.919898	0.002215
Comedian	0.002319	0.002195	0.919471	0.002271	-1.20e-4	0.000267	0.956583	0.000463
OGK	0.002443	0.002253	0.905856	0.002292	4.43e-4	3.71e-5	0.938705	0.002677
SS_n	0.002652	0.002503	0.89919	0.00255	-0.00014	-0.00028	0.90555	0.00143

Table 29: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (4, 8)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.026368	0.025535	0.898845	0.021827	-0.00054	-2.40e-3	0.924452	-0.00526
MCD	0.051203	0.036295	0.887359	0.029132	-0.00179	-0.00134	0.893941	-0.00536
Comedian	0.026599	0.02533	0.887046	0.02133	-0.00068	3.81e-3	0.917734	-1.95e-3
OGK	0.032623	0.029198	0.883143	0.023087	1.40e-3	5.66e-3	0.898097	-0.00088
SS_n	0.02599	0.024524	0.849369	0.020729	-1.23e-3	0.003604	0.878265	-0.00183
		$n = 100$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.01207	0.011584	0.935365	0.011002	5.20e-4	1.62e-3	0.955791	0.001446
MCD	0.017647	0.013201	0.950804	0.013175	4.76e-4	-0.00092	0.950689	0.002867
Comedian	0.012224	0.011975	0.928054	0.010863	0.000587	0.000461	0.951575	2.23e-3
OGK	0.013814	0.011857	0.945729	0.011493	-8.30e-4	2.74e-3	0.956208	0.004591
SS_n	0.011325	0.011505	0.884337	0.01069	-0.00068	0.001695	0.928422	1.77e-3
		$n = 200$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.005859	0.005726	0.943262	0.005523	6.59e-4	-0.00039	0.965365	0.004226
MCD	0.006482	0.005635	0.970071	0.005925	1.57e-4	0.000395	0.962094	0.004519
Comedian	0.005881	0.005699	0.944197	0.005567	-0.00016	-9.90e-5	0.965948	0.004217
OGK	0.006364	0.005658	0.92352	0.005751	-0.00016	0.000539	0.98439	0.004844
SS_n	0.005851	0.005604	0.91682	0.00553	0.000377	1.42e-4	0.91738	0.003961
		$n = 500$	$\delta = 10\%$	$p = 4$	$q = 8$	diag=0.1		
S_n	0.002333	0.002207	0.957668	0.002265	0.000236	3.51e-4	0.97629	0.00084
MCD	0.002394	0.002244	0.94019	0.002312	-4.50e-4	5.88e-4	0.97875	0.00059
Comedian	0.002303	0.002211	0.954446	0.002251	-4.00e-4	0.000591	0.97469	0.001185
OGK	0.002394	0.002237	0.95255	0.002337	6.94e-4	1.02e-3	0.98018	0.000802
SS_n	0.00263	0.00248	0.94284	0.00255	0.00042	0.00029	0.96843	0.00039

Table 30: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, 0.1 * I_q)$,
 $(p, q) = (4, 4)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
		$n = 50$	$\delta = 10\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.027062	0.024811	0.869399	0.021403	0.003809	1.82e-3	0.908377	-0.00498
MCD	0.056792	0.029701	0.815927	0.02885	-0.00122	-7.10e-5	0.940357	-0.00533
Comedian	0.027862	0.024672	0.852523	0.021707	0.002757	2.44e-4	0.898504	-3.92e-3
OGK	0.032135	0.025488	0.75953	0.022854	9.46e-4	3.93e-3	0.942867	-0.00075
SS_n	0.027537	0.02368	0.803693	0.01998	5.57e-4	0.005104	0.87283	-0.00295
		$n = 100$	$\delta = 10\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.012804	0.011781	0.903699	0.011783	-1.70e-4	-1.53e-3	0.938678	0.006895
MCD	0.015236	0.01145	0.950362	0.01302	-1.77e-3	0.000362	0.950676	0.008832
Comedian	0.012505	0.011895	0.902279	0.011021	-0.00057	-0.00269	0.93753	6.86e-3
OGK	0.014642	0.013542	0.947704	0.012663	8.48e-4	7.61e-4	0.926497	0.008697
SS_n	0.01248	0.0113	0.864418	0.010806	0.000346	0.002428	0.917793	6.03e-3
		$n = 200$	$\delta = 10\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.005973	0.005682	0.926016	0.005729	-8.00e-5	0.000141	0.956202	0.003477
MCD	0.006437	0.00573	0.946856	0.006063	2.98e-4	2.51e-6	0.93761	0.003293
Comedian	0.005955	0.005523	0.923031	0.005722	-5.90e-5	-9.10e-6	0.954904	0.00261
OGK	0.013524	0.011409	0.91934	0.011265	0.001151	0.003127	0.95392	0.00972
SS_n	0.00591	0.005506	0.898654	0.005729	0.000355	-4.40e-4	0.941665	0.002543
		$n = 500$	$\delta = 10\%$	$p = 4$	$q = 4$	diag=0.1		
S_n	0.002309	0.002166	0.93471	0.002198	4.65e-5	-2.50e-4	0.964442	0.001258
MCD	0.002404	0.00217	0.95404	0.002333	-1.90e-5	5.97e-4	0.969063	0.002317
Comedian	0.00231	0.002195	0.933463	0.002302	-1.90e-4	0.001192	0.963769	0.001277
OGK	0.002426	0.002143	0.93785	0.002358	-4.90e-5	2.73e-4	0.96283	0.000895
SS_n	0.00262	0.00239	0.92092	0.00252	0.00033	0.00052	0.95693	0.00046

Table 31: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (4,4)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 10\%$		$p = 4$	$q = 4$		
S_n	0.027104	0.026141	0.871365	0.022099	-0.00017	-1.70e-3	0.909667	-0.00548
MCD	0.054961	0.030504	0.830277	0.028164	-2.90e-5	-2.78e-3	0.836767	-0.001
Comedian	0.032238	0.026643	0.861882	0.022298	0.002052	3.70e-3	0.845044	-1.03e-3
OGK	0.032483	0.025911	0.846421	0.022184	9.58e-4	4.30e-3	0.836388	0.001282
SS_n	0.026918	0.024661	0.826234	0.021195	4.00e-4	0.001171	0.803227	-0.00357
	$n = 100$		$\delta = 10\%$		$p = 4$	$q = 4$		
S_n	0.01262	0.011744	0.909175	0.011397	6.22e-4	5.36e-4	0.941562	0.006297
MCD	0.015602	0.01156	0.866	0.01277	-2.80e-5	-0.00137	0.859509	0.005811
Comedian	0.013078	0.011632	0.821849	0.011563	0.000731	0.001822	0.893043	8.89e-3
OGK	0.013281	0.011338	0.825212	0.011239	1.36e-3	-7.20e-4	0.895182	0.007572
SS_n	0.012423	0.011437	0.804166	0.010954	0.000505	0.00206	0.807553	5.99e-3
	$n = 200$		$\delta = 10\%$		$p = 4$	$q = 4$		
S_n	0.006075	0.00561	0.927595	0.005794	-2.20e-4	-0.00045	0.956908	0.002803
MCD	0.006341	0.005631	0.86313	0.005914	1.24e-4	1.23e-3	0.922112	0.003357
Comedian	0.006279	0.005663	0.87052	0.005857	-3.30e-4	8.01e-4	0.926773	0.004161
OGK	0.006323	0.00565	0.866304	0.006013	-1.70e-5	0.000297	0.924135	0.005033
SS_n	0.006041	0.005542	0.813558	0.00544	-0.00019	3.30e-4	0.919649	0.002496
	$n = 500$		$\delta = 10\%$		$p = 4$	$q = 4$		
S_n	0.002324	0.002114	0.93284	0.002287	7.79e-5	-3.00e-5	0.963423	0.002273
MCD	0.002454	0.002223	0.904046	0.002375	-1.80e-5	-5.80e-4	0.948241	0.002253
Comedian	0.002425	0.002141	0.92591	0.002396	-4.80e-4	0.001091	0.942233	0.002711
OGK	0.002397	0.002234	0.922206	0.002297	-4.10e-5	6.97e-4	0.957776	0.00141
SS_n	0.002267	0.00207	0.904538	0.002251	0.000522	0.000228	0.903882	0.00139

Table 32: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (4, 8)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 10\%$		$p = 4$	$q = 8$		
S_n	0.026736	0.024352	0.898834	0.021601	0.000235	6.76e-5	0.925397	-0.00177
MCD	0.052629	0.036653	0.87425	0.028786	3.13e-3	-4.60e-4	0.904536	-0.00185
Comedian	0.026819	0.02595	0.895646	0.021803	-7.60e-5	-1.50e-4	0.922931	-2.96e-3
OGK	0.032762	0.027617	0.871278	0.022477	1.77e-3	3.45e-3	0.905827	-0.00057
SS_n	0.026652	0.02444	0.852299	0.020924	-7.90e-4	0.004284	0.898662	-0.00315
	$n = 100$		$\delta = 10\%$		$p = 4$	$q = 8$		
S_n	0.01207	0.011492	0.93025	0.010913	9.31e-4	-2.04e-3	0.953118	0.00125
MCD	0.017246	0.012694	0.895446	0.013573	2.71e-4	-0.00177	0.91355	0.00309
Comedian	0.013746	0.012192	0.897849	0.011448	0.000796	0.002605	0.912437	3.12e-3
OGK	0.013819	0.012194	0.890424	0.011384	5.36e-4	2.83e-3	0.91312	0.004237
SS_n	0.012228	0.011432	0.885593	0.010725	4.20e-6	-0.00143	0.909856	1.53e-3
	$n = 200$		$\delta = 10\%$		$p = 4$	$q = 8$		
S_n	0.005922	0.005727	0.95143	0.00569	2.68e-5	0.000311	0.96582	0.004976
MCD	0.006504	0.005943	0.87355	0.005972	-2.10e-4	2.88e-4	0.97869	0.004817
Comedian	0.006353	0.005859	0.88631	0.005809	-3.90e-4	1.94e-3	0.95359	0.005867
OGK	0.006369	0.005742	0.83585	0.005715	-6.10e-4	0.001927	0.97761	0.004887
SS_n	0.00598	0.005617	0.81959	0.005549	-0.00052	1.08e-3	0.93175	0.004802
	$n = 500$		$\delta = 10\%$		$p = 4$	$q = 8$		
S_n	0.002315	0.002237	0.955434	0.00224	-4.50e-4	6.80e-4	0.975091	0.000792
MCD	0.002346	0.002193	0.94329	0.002277	-9.80e-5	7.93e-4	0.98386	0.000411
Comedian	0.002286	0.002301	0.955494	0.002256	3.59e-5	-0.00134	0.975122	0.00014
OGK	0.002397	0.002234	0.942206	0.002297	-4.10e-5	6.97e-4	0.97776	0.00134
SS_n	0.002227	0.00219	0.938934	0.002256	0.000349	0.001011	0.96662	0.000289

Table 33: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (8,4)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non di- agonal ele- ments MSE	Slope bias	Intercept bias	Diagonal element bias	Non diago- nal element bias
	$n = 50$		$\delta = 10\%$		$p = 8$	$q = 4$		
S_n	0.040228	0.02781	0.70902	0.019555	0.000525	2.45e-3	0.81794	-0.00341
MCD	0.071942	0.042172	0.766495	0.026127	2.23e-3	-1.87e-3	0.742774	-0.00385
Comedian	0.036868	0.029341	0.602844	0.019968	-2.20e-4	2.41e-3	0.74797	1.45e-3
OGK	0.037403	0.030711	0.606282	0.019967	5.17e-4	6.06e-3	0.751147	-0.00039
SS_n	0.030355	0.027533	0.66581	0.019232	-1.20e-4	0.001425	0.71538	-0.00179
	$n = 100$		$\delta = 10\%$		$p = 8$	$q = 4$		
S_n	0.014977	0.012155	0.819943	0.010506	5.67e-4	-1.40e-3	0.894061	0.006268
MCD	0.018887	0.012857	0.792024	0.013133	1.03e-3	-0.0009	0.88467	0.008915
Comedian	0.014252	0.012338	0.79359	0.010878	-0.00105	0.000931	0.89171	9.80e-3
OGK	0.014383	0.012097	0.79174	0.010909	6.13e-4	-2.00e-4	0.89233	0.009278
SS_n	0.013304	0.011938	0.791517	0.010294	2.01e-4	0.003988	0.87971	4.62e-3
	$n = 200$		$\delta = 10\%$		$p = 8$	$q = 4$		
S_n	0.006925	0.005856	0.87833	0.005491	-7.90e-5	0.000477	0.93126	0.003079
MCD	0.006612	0.005592	0.81924	0.006022	4.23e-4	-2.70e-3	0.91267	0.003315
Comedian	0.006405	0.005996	0.82720	0.005495	3.07e-4	1.76e-3	0.90324	0.003814
OGK	0.006369	0.005942	0.83585	0.005715	-6.10e-4	0.001927	0.90776	0.004887
SS_n	0.006235	0.00583	0.80788	0.005459	-0.00031	1.02e-4	0.90002	0.003575
	$n = 500$		$\delta = 10\%$		$p = 8$	$q = 4$		
S_n	0.00234	0.00226	0.916931	0.002298	-4.70e-4	-5.70e-4	0.95514	0.001272
MCD	0.002443	0.002189	0.886638	0.002319	6.42e-5	-4.80e-4	0.959115	0.000909
Comedian	0.002436	0.002232	0.88465	0.0023	-2.40e-4	-0.00032	0.947966	0.001095
OGK	0.002441	0.002285	0.901099	0.002305	-1.20e-4	7.61e-4	0.96845	0.002174
SS_n	0.002157	0.002154	0.877109	0.00224	2.94e-5	-0.00028	0.944794	0.000946

Table 34: Robustness table - Contaminants from $N(2\sqrt{\chi_{p+q,0.99}^2}, I_q)$, $(p, q) = (10,10)$ and $\delta = 10\%$

	Slope MSE	Intercept MSE	Diagonal element MSE	Non diagonal elements MSE	Slope bias	Intercept bias	Diagonal element bias	Non diagonal element bias
		$n = 50$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.035186	0.033186	0.62809	0.019893	-0.00029	1.92e-3	0.79683	0.026861
MCD	0.05331	0.045228	0.64838	0.024382	-4.90e-4	9.81e-4	0.79817	0.036003
Comedian	0.039939	0.030156	0.67491	0.019562	-2.60e-4	-4.90e-4	0.79782	2.40e-2
OGK	0.041184	0.036058	0.68150	0.020469	1.89e-4	3.19e-3	0.79416	0.030117
SS_n	0.032333	0.029723	0.63721	0.018516	-5.00e-4	0.001362	0.77498	0.022447
		$n = 100$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.013988	0.013156	0.79643	0.010543	-2.20e-5	9.67e-4	0.86324	0.011695
MCD	0.023567	0.017868	0.80253	0.013419	8.36e-4	0.000879	0.88694	0.016278
Comedian	0.014097	0.01296	0.81836	0.010321	-0.00027	2.16e-5	0.89316	1.11e-2
OGK	0.015392	0.01365	0.79091	0.010768	-1.90e-4	4.50e-3	0.89586	0.01286
SS_n	0.013361	0.012747	0.77101	0.010076	2.26e-4	0.002149	0.86652	9.51e-3
		$n = 200$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.006289	0.005989	0.875448	0.005516	3.12e-4	0.002718	0.919868	0.006935
MCD	0.007359	0.00635	0.873152	0.006109	3.28e-4	2.85e-5	0.872256	0.005688
Comedian	0.006457	0.005785	0.886198	0.005354	-8.00e-5	1.56e-3	0.935541	0.006612
OGK	0.006611	0.006031	0.892817	0.005625	1.22e-4	0.001466	0.92463	0.005839
SS_n	0.006175	0.005768	0.860194	0.005271	-0.0003	1.43e-3	0.91546	0.005657
		$n = 500$	$\delta = 10\%$	$p = 10$	$q = 10$			
S_n	0.002381	0.002312	0.91882	0.002253	-3.20e-4	4.00e-4	0.95622	0.001973
MCD	0.002433	0.002329	0.91205	0.002315	-4.00e-4	-6.70e-4	0.96731	0.002049
Comedian	0.00244	0.002267	0.935814	0.002231	-8.50e-5	0.000351	0.96506	0.001924
OGK	0.002441	0.002385	0.910099	0.002305	-1.20e-4	7.61e-4	0.94684	0.002174
SS_n	0.002338	0.002314	0.901812	0.00223	-1.60e-5	0.001107	0.95719	0.001919

Table 35: \mathbf{y} - affine equivariance table

	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept
$\delta = 0\%$	$p = 4, q = 4$		$p = 6, q = 10$		$p = 10, q = 6$		$p = 10, q = 10$	
$n = 50$	3.08e-5	8.80e-5	1.67e-5	6.62e-5	1.60e-5	9.53e-5	1.19e-5	8.59e-5
$n = 100$	7.67e-6	2.21e-5	3.68e-6	1.48e-5	2.63e-6	1.92e-5	2.61e-6	1.69e-5
$n = 200$	1.71e-6	5.71e-6	7.03e-7	3.42e-6	5.37e-7	4.13e-6	4.25e-7	3.60e-6
$n = 500$	3.24e-7	1.13e-6	9.88e-8	5.39e-7	1.17e-7	9.51e-7	6.41e-8	5.16e-7
$\delta = 10\%$	$p = 4, q = 4$		$p = 6, q = 10$		$p = 10, q = 6$		$p = 10, q = 10$	
$n = 50$	4.07e-5	9.28e-5	2.21e-5	6.86e-5	1.30e-5	1.15e-4	1.21e-5	8.00e-5
$n = 100$	1.16e-5	3.22e-5	3.64e-6	1.23e-5	3.10e-6	2.13e-5	2.29e-6	1.59e-5
$n = 200$	4.63e-6	1.69e-5	8.22e-7	3.53e-6	6.20e-7	4.77e-6	4.89e-7	3.59e-6
$n = 500$	6.00e-6	6.27e-6	1.40e-7	6.60e-7	2.14e-7	6.08e-6	9.14e-8	6.73e-7
$\delta = 20\%$	$p = 4, q = 4$		$p = 6, q = 10$		$p = 10, q = 6$		$p = 10, q = 10$	
$n = 50$	0.000104	0.002708	4.94e-6	1.46e-5	5.47e-6	0.00021	4.03e-6	2.70e-5
$n = 100$	4.96e-5	0.002438	1.31e-6	4.29e-6	2.74e-6	0.00026	9.84e-7	5.26e-6
$n = 200$	6.42e-5	0.003637	3.18e-7	1.15e-6	1.28e-6	1.93e-4	1.55e-7	1.21e-6
$n = 500$	8.49e-5	0.004147	6.71e-8	2.38e-7	1.88e-6	9.19e-4	3.54e-8	4.32e-6

Table 36: \mathbf{x} - affine equivariance table

	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept
$\delta = 0\%$	$p = 4, q = 4$		$p = 6, q = 10$		$p = 10, q = 6$		$p = 10, q = 10$	
$n = 50$	1.33e-1	4.11e-4	1.45e-1	1.94e-4	1.75e-1	5.19e-4	1.29e-1	2.91e-4
$n = 100$	1.06e-1	8.88e-5	1.01e-1	5.39e-5	1.14e-1	1.02e-4	9.18e-2	8.18e-5
$n = 200$	6.33e-2	2.79e-5	5.79e-2	1.40e-5	8.21e-2	2.52e-5	5.60e-2	1.85e-5
$n = 500$	6.53e-2	4.73e-6	4.32e-2	2.27e-6	3.37e-2	3.25e-6	3.72e-2	2.63e-6
$\delta = 10\%$	$p = 4, q = 4$		$p = 6, q = 10$		$p = 10, q = 6$		$p = 10, q = 10$	
$n = 50$	2.10e-1	4.25e-4	1.43e-1	2.22e-4	2.04e-1	5.88e-4	1.42e-1	2.93e-4
$n = 100$	8.75e-2	3.93e-5	9.87e-2	6.58e-5	1.42e-1	1.99e-4	1.05e-1	1.03e-4
$n = 200$	1.06e-1	4.51e-5	7.96e-2	1.90e-5	8.38e-2	5.43e-5	5.19e-2	3.13e-5
$n = 500$	9.93e-2	1.04e+0	2.78e-2	3.18e-6	5.63e-2	9.95e-6	4.14e-2	4.98e-6
$\delta = 20\%$	$p = 4, q = 4$		$p = 6, q = 10$		$p = 10, q = 6$		$p = 10, q = 10$	
$n = 50$	0.266032	0.000148	1.57e-1	1.23e-4	2.25e-1	0.00024	1.85e-1	1.57e-4
$n = 100$	1.46e-1	6.29e-5	1.15e-1	2.84e-5	1.59e-1	9.06e-5	1.07e-1	5.22e-5
$n = 200$	9.45e-2	9.08e-6	5.58e-2	9.44e-6	1.13e-1	2.91e-5	5.48e-2	1.37e-5
$n = 500$	7.71e-2	1.28e-6	5.89e-2	1.17e-6	5.67e-2	2.28e-6	2.79e-2	2.34e-6